St Albans City and District Council
Level 2 Strategic Flood Risk Assessment
Detailed Site Summary Table

Site details	
Site Code	**M20**
Address	Lower Luton Road, Harpenden, AL5 5AF
Area	0.74ha
Current land use	Greenfield
Proposed land use	Residential
Flood Risk Vulnerability	More Vulnerable
Sources of flood risk	
Location of the site within the catchment	The site is located in Harpenden, a town located to the north of St Albans. The site is situated on the northeastern fringe of the town on the B653, Lower Luton Road. It is currently within the green belt to the east of Crabtree Lane. The site is bordered to the north by Lower Luton Road, to the east and south by fields and the west by properties along Crabtree Lane. Additionally, the River Lee is approximately 0.04km to the south of the site. This section of the River Lee, stretching from Luton Hoo Lakes to Hertford, is 31.7 km long and covers a catchment area of 98.6 km². The catchment is mainly rural but includes some urban areas, such as the northeastern area of Harpenden, where this site is located. The River Lee is part of the broader Lee Upper Management Catchment, which covers an area of 1,025 km². Within this Management Catchment, the site lies in the western upstream area.
Topography	Environment Agency 1m resolution LIDAR across the site shows that the elevation varies, as the site is on a slope, mainly in a southwestern direction, towards the River Ver. The highest elevations are located within the northeastern corner between 92.2-92.6mAOD. The elevations then decrease to 88.1mAOD in the southeastern corner, 86.5mAOD in the northwestern corner and the lowest elevation within the site of 84.3mAOD in the southwestern corner.
Existing drainage features	There are no existing drainage features within the site that are visible on topographic mapping or aerial imagery. The River Lee is close to the southern border of the site, approximately 0.04km.

Fluvial	**The proportion of site at risk FMFP:** FZ3b – 0% FZ3a – 0% FZ2 – 2% FZ1 – 98% 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 Environment Agency's Flood Zone mapping has been used in this assessment, alongside the Upper Lee (2010) 1D hydraulic model received for this Level 2 SFRA. Only the modelled flood extents were available for the Upper Lee model, no hazard, depth or velocity grids were available as the model was 1D only. **Flood characteristics:** There is a small area on the southwestern boundary of the site located within the Environment Agency Flood Zone 2. The defended 0.1% AEP event model extent covers the same area as Flood Zone 2 on the southwestern boundary of the site. Less than 0.01% of the site is located within the Environment Agency's Flood Zone 3a and 3b. Part of the area within Flood Zone 2 is located within a Reduction in Risk of Flooding from Rivers and Sea due to Defences area. This means that this specific area of the site is shown to befit from defences (although may still be at some risk). The Environment Agency's Upper Lee model is undergoing a full revision. No results were available at the time of preparation of this report. It is possible that the predicted fluvial flood risk to the site may change as a result of this remodelling.
Surface Water	**Proportion of site at risk (RoFSW):** **3.3% AEP** – 0% Max depth – N/A Max velocity – N/A **1% AEP** – 0% Max depth – N/A Max velocity – N/A **0.1% AEP** – 2% Max depth – 0.15 – 0.30m Max velocity – 0.25 – 0.5m/s **Available data:** The Environment Agency's Risk of Flooding from Surface Water (RoFSW) map has been used within this assessment.

	Description of surface water flow paths: There is no surface water flooding within the site during the 3.3% and 1% AEP surface water events. During the 0.1% AEP event, on the southwestern boundary of the site there is a small area affected by surface water flooding. The maximum flood depth is between <0.15 and 0.15 to 0.30m. The flow velocity are mainly <0.25m/s, reaching a maximum of 0.25 to 0.50m/s within the site. The flood hazard is classified as 'Very low' to 'Danger for some'.
Reservoir	The site is shown to be at risk of Dry Day and Wet Day reservoir flooding according to the Environment Agency's reservoir flood mapping. During the Wet Day scenario, flood risk affects the southwestern area of the site, covering 18% of the site, from the Luton Hoo Lake Lower, managed and operated by Luton Hoo Park Limited. During the Dry Day scenario, a small area, covering 3% of the site along the southwestern boundary, is at risk of flooding from Luton Hoo Lake Lower. These reservoirs are deemed high-risk, and in the very unlikely event that the reservoirs fail, it is predicted that there would be a risk to life.
Groundwater	TJBA Groundwater mapping shows that the western and central areas of the site, accounting for 58% of the site, are at high risk of groundwater flooding, with groundwater within 0.025m of ground level. The remaining areas of the site include 10%, with groundwater levels between 0.25m and 0.50m below ground level, and 32%, mainly in the northeastern area of the site, with groundwater levels between 0.5m and 5m below ground level
Sewers	The site is located within a postcode area with 12 historic incidences of sewer flooding, according to the Thames Water Hydraulic Sewer Flood Risk Register.
Flood history	There are no flood incidents identified within the site. There is one flood incident reported to St Albans District Council in August 2017 on Lower Luton Road by the junction with Common Lane and Crabtree Lane just to the west of the site. Surface water was partly coming from Common Lane causing flooding to Lower Luton Road.
Flood risk management infrastructure	
Defences	The Environment Agency AIMS dataset show that there are embankments on both banks of the River Lee just upstream of the site, upstream of Crabtree Lane.
Residual risk	The site is not at residual flood risk.
Emergency planning	
Flood warning	A small area of the southwestern boundary is located within an Environment Agency Flood Warning and Flood Alert Area. It is located specifically within the 062WAF46UpperLee, River Lee at Luton, Harpenden including Wheathampstead and East Hyde flood alert area.

	And the 062FWF46 Harpenden, River Lee at Harpenden and Wheathampstead including East Hyde including Sopwell, Park Street and Frogmore flood warning area.
Access and egress	The proposed access and egress route to the site is via Lower Luton Road. There is no surface water flooding during the 3.33, 1% or 0.1% AEP events along the part of Lower Luton Road that borders the site. During the 1% AEP surface water event, there is a flow path along Common Lane that dissects the Lower Luton Road continuing down Crabtree Lane. The flood depths on Lower Luton Road are <0.15m with reaching a maximum velocity of 1.00 to 2.00m/s. The flood hazard is classified as 'Very Low', therefore vehicular and pedestrian access and egress is possible from the site west along this route. During the 0.1% AEP surface water event, the surface water route along that crosses Lower Luton Road from Common Lane to Crabtree Lane reaches a maximum depth on Lower Luton Road of 0.30 to 0.60m. The velocity reaches a maximum of >1.20m. The flood hazard is 'Danger for some' to 'Danger for most', therefore vehicular and pedestrian access is not possible.
Dry Islands	The site is not located on a dry island.
Climate change	
Implications for the site	**Management Catchment: Lee Upper 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 Upper Lee 1% AEP fluvial event has been used as a proxy for the flood 3.3% AEP plus climate change event, as no results were available at the time of preparation of this report for the EA updated Upper Lee model. Thus, <0.01% of the site is affected by the 3.3% plus climate change event. The 0.1% AEP fluvial event has been used as a proxy for the 1% plus climate change event. As a result, 2% of the site, along the southern border is at risk of fluvial flooding. It is possible that the predicted fluvial flood risk to the site may change as a result of the Upper Lee remodelling. **Surface Water:** The latest climate change allowances have 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 40% climate change event the flood extent is similar to that in the 0.1% AEP event, only affected an area on the southwestern boundary. Flood depths remain similar to the 0.1% AEP with maximum

	flood depth between 0.30 to 0.60m but, a larger area experiences velocities 0.25 to 0.50m/s. This shows that the site is somewhat sensitive to increases in pluvial flooding due to 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 surface water drainage and integrated flood risk management	

Broad-scale assessment of potential SuDS	**Geology & Soils**
	• Geology at the site consist of:
	  ○ Bedrock – Bedrock geology of the site is Lewes Nodular Chalk Formation and Seaford Formation – Chalk. A type of sedimentary bedrock.
	  ○ Superficial deposits – The superficial deposits consist of Alluvium – Clay, silt sand and gravel. In addition to Kesgrave Catchment Subgroup – Sand and gravel. Both deposits are types of sedimentary superficial deposits.
	• Soils at the site consist of:
	  ○ Slightly acid loamy and clayey soils with impeded drainage
	Sustainable Drainage Systems (SuDS)
	• Groundwater levels for over half of the site are indicated to be at or very near (within 0.025m) ground level and there is a risk of groundwater flooding at the surface during a 1% AEP event, which may flow to and pool within topographic low spots. Detention and attenuation features should be designed to prevent groundwater ingress from impacting hydraulic capacity and structural integrity. Additional site investigation work may be required to support the detailed design of the drainage system. This may include groundwater monitoring to demonstrate that a sufficient unsaturated zone has been provided above the highest occurring groundwater level. Below ground development such as basements are not appropriate at this site.
	• BGS data indicates that the underlying geology is chalk, clay, silt, sand and gravel which is likely to be free draining. This should be confirmed through infiltration testing, with the use of infiltration maximised as much as possible in accordance with the SuDS hierarchy.
	• The whole site is located within Groundwater Source Protection Zone 3. Proposed SuDS should be discussed with relevant stakeholders (St Albans City and District Council, Hertfordshire County Council (LLFA), and the Environment Agency) at an early stage to understand possible opportunities and constraints. The Groundwater Source Protection Zone guidance is currently undergoing a review; therefore developers should ensure they are using the latest guidance available.
	• The site is not located within a historic landfill site.

	• Where possible, proposed attenuation features such as basins, ponds and tanks should be located outside of Flood Zone 2 to avoid the potential risks to the hydraulic capacity or structural integrity of these features. Surface water outfalls that discharge into the River Lee may be susceptible to surcharging/tide locking due to water levels in the River Lee. 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 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 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 (St Albans City and District Council, Hertfordshire County Council (LLFA) 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	The Local Authority will need to confirm that the Sequential Test has been carried out in line with national guidelines. The Sequential Test will need to be passed before the Exception Test is applied. The NPPF classifies residential development as 'More Vulnerable'. The exception test is required for this site because part of the site is within Flood Zone 2, 3a and 3b (<0.01%) and the development type is 'More Vulnerable'.

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 site is:
	  ○ Within fluvial flood zones 2, 3a, and 3b
	  ○ 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. Consideration of groundwater risk is likely to require ground investigations to confirm the risk to the site.
	• Consultation with St Albans City and District Council, Hertfordshire County Council (Lead Local Flood Authority), Thames 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); St Albans City and District Council's Local Plan Policies and Hertfordshire County Council's Guidance for Developers.
	• 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).
	• Planning permission is required to surface more than 5 square metres of unpaved ground using a material that cannot absorb water.
	• Mitigation for seasonal high groundwater levels must be considered (for example by raising finished floor levels to an appropriate height above ground level).
	• Due to the high groundwater flood risk, basements are not advised.
	• The design of SuDS schemes must consider the seasonally high groundwater table. Infiltration techniques may be ineffective and may pose a pollution risk. SuDS may need to be shallow and take up larger areas. Above ground conveyance and attenuation can be used but

	care must be taken that groundwater does not enter the SuDS feature and reduce the storage capacity and structural integrity of the design

Key messages

The Exception Test will be required for this site, and St Albans Council will need to carefully consider the benefits of developing the site against the flood risks from fluvial, surface water, reservoir and groundwater. Development may be possible provided the flood risk part of the Exception Test can be satisfied as below:

- The area in the southwest of the site located in Flood Zone 3b is left undeveloped.
- Development is steered away from the area of fluvial flood risk in the southwestern area of the site and the small flow paths/areas of surface water ponding 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.
- A site-specific FRA demonstrates that the site is not at an increased risk of flooding in the future 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

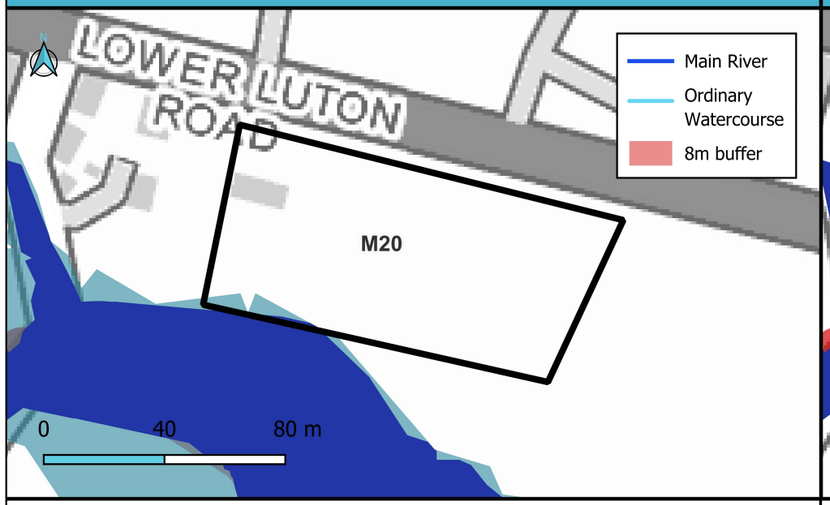
Flood Zones	Flood Zones 2 and 3a have been taken from the Environment Agency's Flood Map for Planning mapping. Flood Zone 3b has been created from the existing Flood Zone 3a (1 in 100 year) to represent the functional floodplain.
Climate change	The 1% AEP and 0.1% fluvial events from the Upper Lee (2010) model have been used as proxies for the climate change events. The 1% AEP event represents Flood Zone 3b plus climate change event and the 0.1% AEP event used to represent Flood Zone 3a plus climate change. The functional floodplain Flood Zone 3b will need to be reviewed and defined for development sites at the site-specific Flood Risk Assessment (FRA) stage, potentially through more detailed hydraulic modelling. The Environment Agency's Upper Lee model is undergoing a full revision, but was no results were available at the time of preparation of this report.
Fluvial depth, velocity and hazard mapping	No results are available at the time of preparation of this report.
Surface Water	The Environment Agency's Risk of Flooding from Surface Water dataset has been used for this assessment. The latest climate change allowances have been applied to the RoFSW 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.

Site Reference	M20
Site Name	Land between Lower Luton Road, Crabtree Lane and River Lea

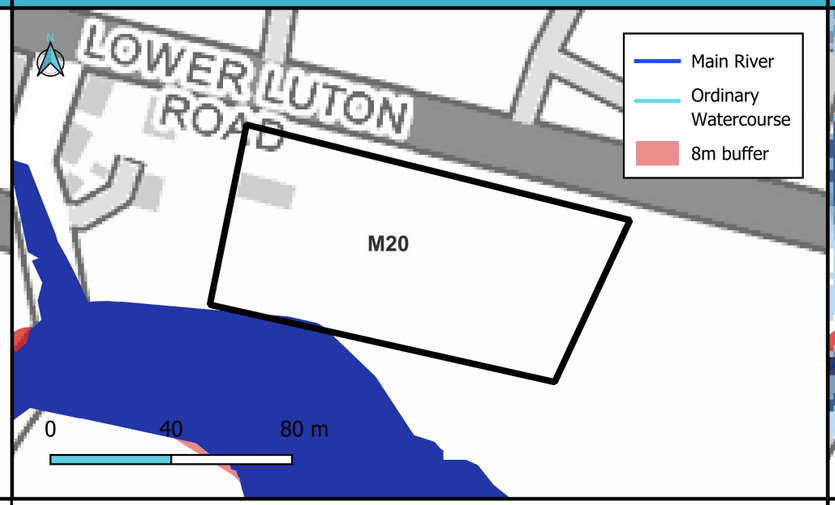
St Albans District Council
Strategic Flood Risk Assessment
Level 2 Detailed Site Summary

Flood Zone Map (present day)



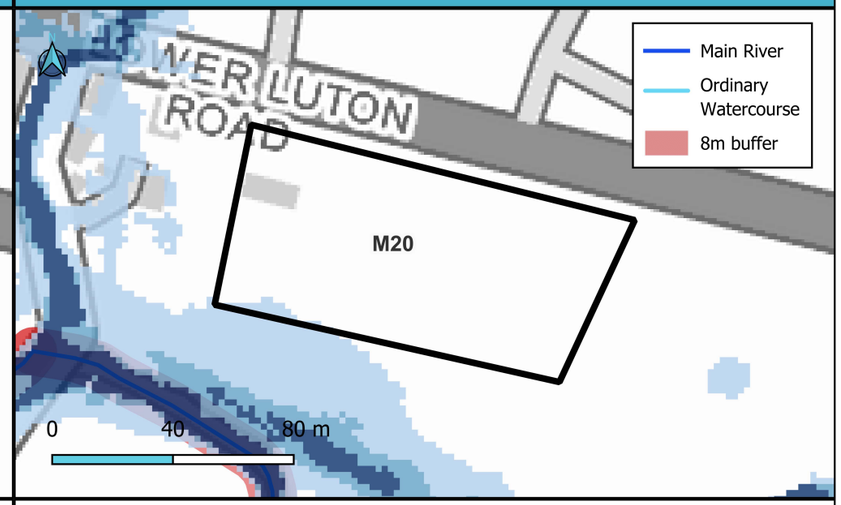
Flood Zone 2 (Between 1% and 0.1% AEP)
Flood Zone 3a (Between 3.33% and 1% AEP)
Flood Zone 3b (Less than 3.33% AEP)
Site boundary
Other site

Flood Zone 3b + Climate Change



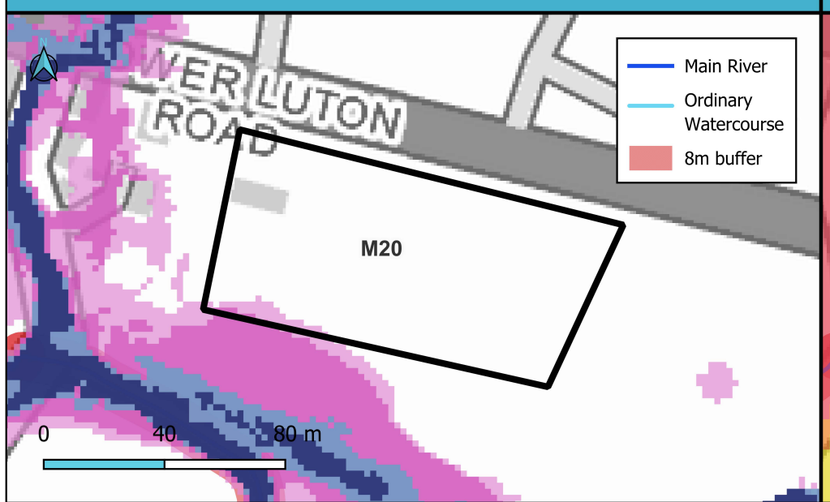
Flood Zone 3b + 21% (Central allowance)
Flood Zone 3b + 35% (Higher allowance)
Flood Zone 3b
Site boundary
Other site

Surface Water Map (RoFSW)



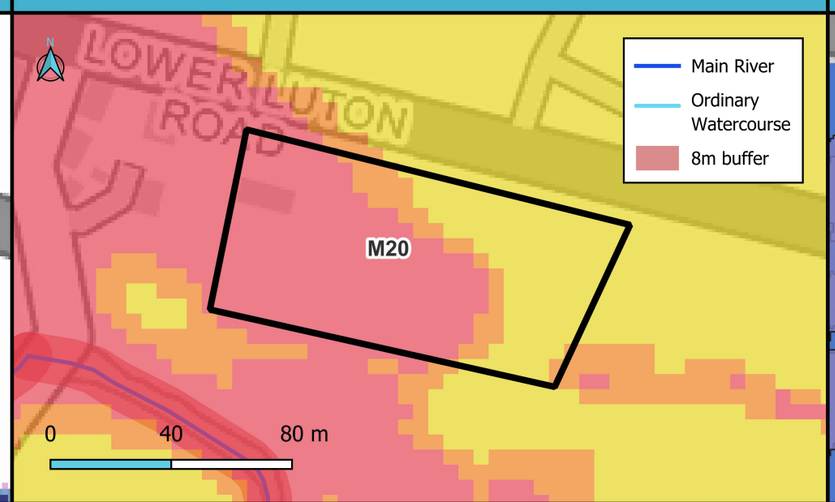
RoFSW 1 in 30-year (3.33% AEP)
RoFSW 1 in 100-year (1% AEP)
RoFSW 1 in 1000-year (0.1% AEP)
Site boundary
Other site

Surface Water Map + Climate Change



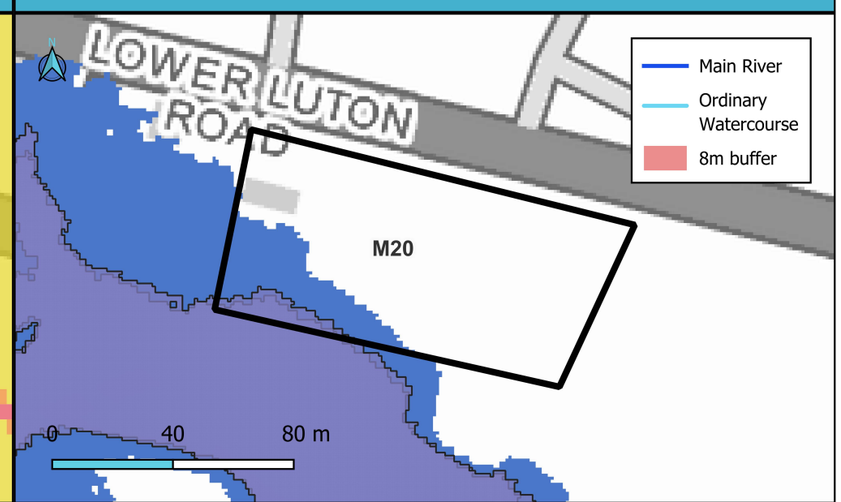
RoFSW 1 in 30-year (3.33% AEP)
RoFSW 1 in 30-year (3.33% AEP) plus 40%
RoFSW 1 in 100-year (1% AEP)
RoFSW 1 in 100-year 1% AEP plus 40%
Site boundary
Other site

Groundwater (Gw) Flood Risk 1% AEP



GW levels <0.025m below ground
GW levels 0.025m to 0.5m below ground
GW levels 0.5 to 5m below ground
GW levels atleast 5m below ground
Site boundary
Other site

Reservoir Flood Risk



Reservoir 'Dry Day' flood extent
Reservoir 'Wet Day' flood extent
Reservoir - Fluvial contribution to flood extent
Site boundary
Other site

Site Reference	M20
Site Name	Land between Lower Luton Road, Crabtree Lane and River Lea

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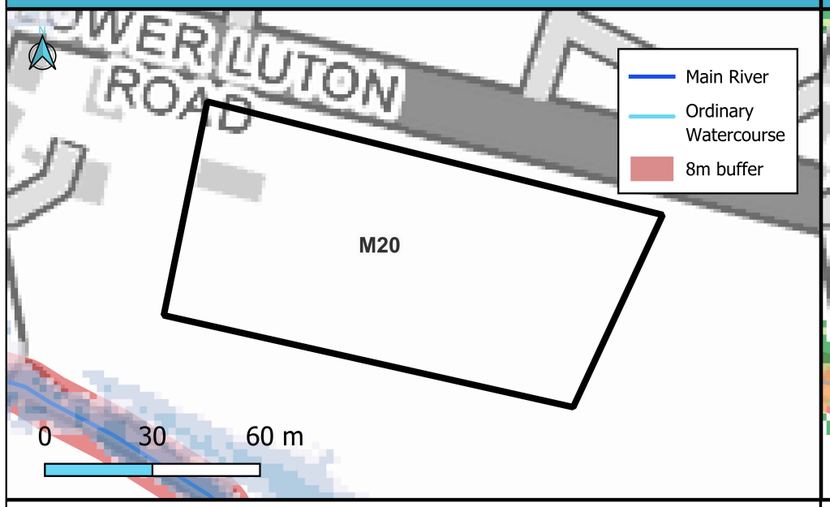
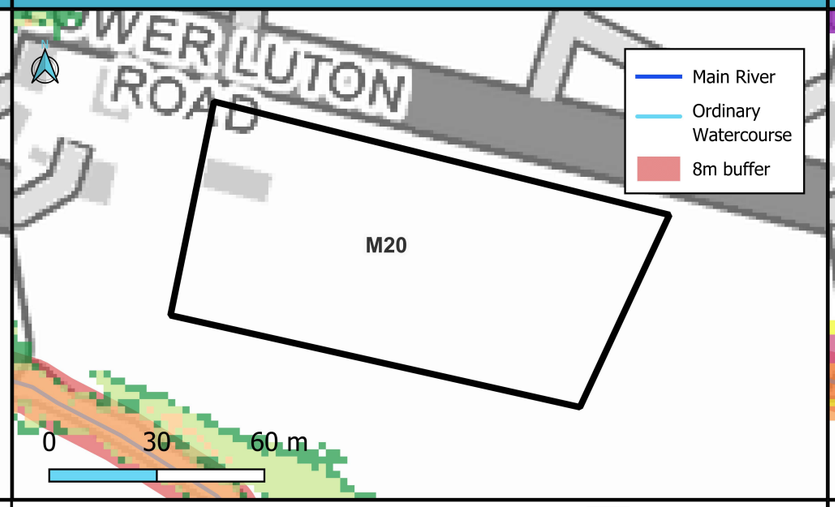
Level 2 Detailed Site Summary

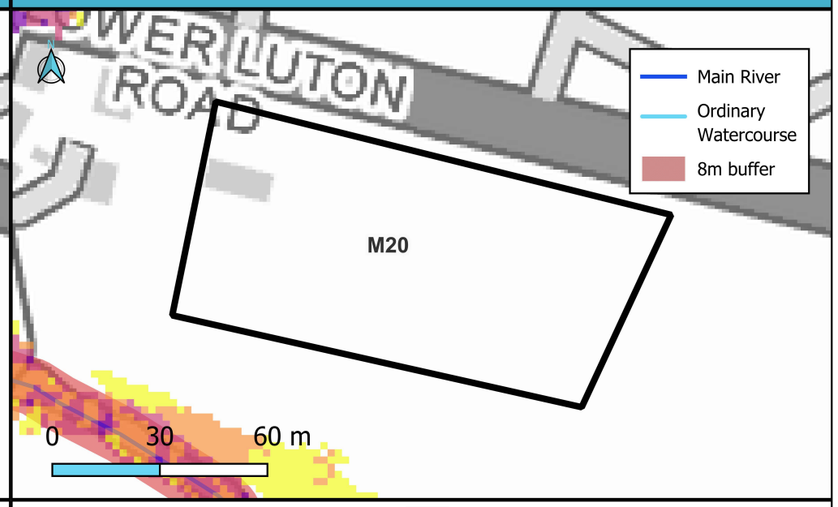
RoFSW Max Depth - 1% AEP



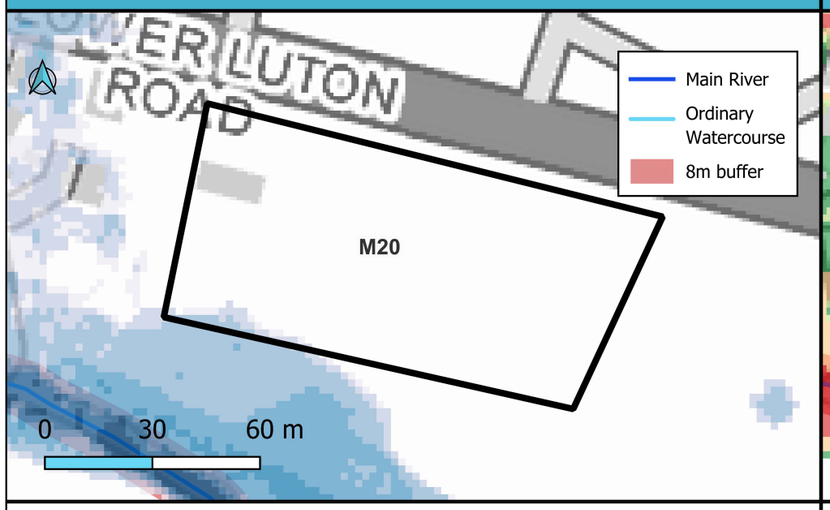
RoFSW Max Hazard - 1% AEP



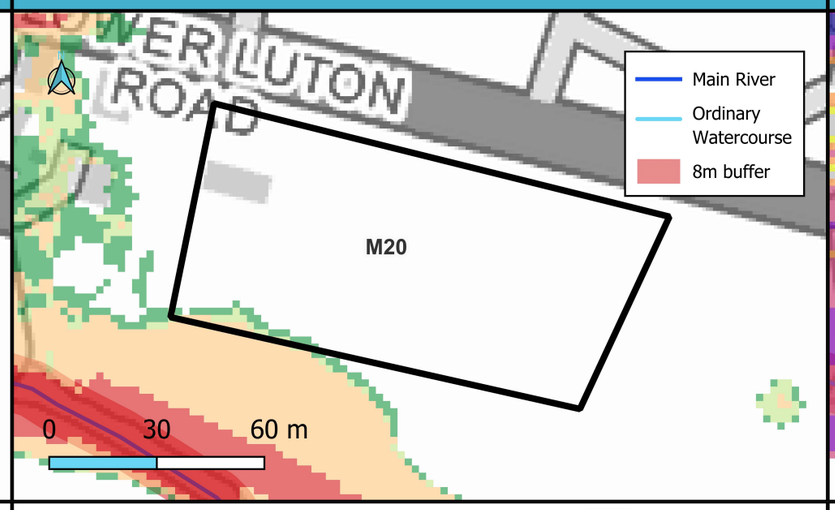
RoFSW Max Velocity - 1% AEP



RoFSW Max Depth - 1% AEP + 40% CC



RoFSW Max Hazard - 1% AEP + 40% CC



RoFSW Max Velocity - 1% AEP + 40% CC