	St Albans City and District Council **Level 2 Strategic Flood Risk Assessment** **Detailed Site Summary Table**
Site details	
Site Code	**UC39**
Address	Garage Block to east of 8 Heath Close, Harpenden
Area	0.13ha
Current land use	Mixed – Garages and Allotment
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 south Harpenden to the southeast of Harpenden Common. The Thames link Railway borders the site to the north-east, the south and west of the site are bordered by residential homes. The site is 2.9km to the east of the River Ver and 1.7km to the southwest of the River Lea. The site is located within the Colne Management Catchment, which covers an area of 1,040km2.
Topography	Environment Agency 1m resolution LiDAR across the site shows that topography varies slightly. The site area is a densely developed urban area and LiDAR data is unlikely to be representative of the actual site topography, this may have an impact on some of the flood risk datasets used in the assessment. There is a slight gradient across the site from southeast to northwest. The maximum elevation is in the southeastern corner 101.1mAOD in the small area of greenspace. The lowest elevation is 99.3mAOD located in the concreted area in the northern corner.
Existing drainage features	There are no existing drainage features within the site that are visible on topographic mapping or aerial imagery. Given that the site is within a urban area of Harpenden, it is likely to be drained by the surface water drainage network.
Fluvial	**The proportion of site at risk FMFP:** FZ3b – 0% FZ3a – 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 Environment Agency's Flood Zone mapping has been used in this assessment. No detailed hydraulic modelling was available for this site. **Flood characteristics:** The site is located within Flood Zone 1 and is therefore at negligible risk of fluvial flooding.
Surface Water	**Proportion of site at risk (RoFSW):** **3.3% AEP** – 13% Max depth – 0.15 – 0.30m Max velocity – 0.25 – 0.50m/s **1% AEP** – 33% Max depth – 0.30 – 0.60m Max velocity – 0.50 – 1.00m/s **0.1% AEP** – 95% Max depth – >1.20m Max velocity – 1.00 – 2.00m/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:** During the 3.3% AEP event, pooling occurs in two areas: the northern corner and western corner. Flood depths in these areas range from 0.15 to 0.30, with flood velocities predominantly <0.25m/s, although some small pockets reach 0.25 to 0.50 m/s. The resulting hazard is primarily categorized as 'very low', but there is a small section classified as 'Danger for some'. During the 1% AEP event, the northern area of the site is affected by surface water flooding, up to northern most block of garages. Flow direction is primarily northward, with localized ponding between the northern garage block and residential houses. Flood depths vary from 0.15 to 0.60m across the site, with velocities mostly below 0.25m/s, except around the northern garage block where they peak at 0.50 to 1.00 m/s. Consequently, the hazard level shifts predominantly to 'Danger for some,' with the northern and western corners classified as 'Danger for most.' During the 0.1% AEP event, surface water affects the entire site except for a 5% area at the southern end. Flood depths fluctuate across the site, with the highest >1.2m in the northern half and the lowest recorded at 0.15 to 0.30m in the southern corner. The surface water flow path then continues north from the site towards Southdown Road. Flood velocities within the site are mainly <0.25m/s with reaching a maximum 1.00 to 2.00m/s along the southern/western boundary. The resulting flood hazard is 'Danger for

	most' across the site with a small area in the southern corner classed as 'Danger for some'.
Reservoir	The Environment Agency's reservoir maps show the site is not at risk of flooding from reservoir.
Groundwater	The JBA Groundwater mapping, shows that groundwater levels at the site are likely to be between 0.5 to 5m below ground level.
Sewers	The site is located within a postcode area with 14 historic incidences of sewer flooding, according to the Thames Water Hydraulic Sewer Flood Risk Register.
Flood history	There is no record of any flood incidences occurring at the site.
Flood risk management infrastructure	
Defences	The Environment Agency AIMS dataset shows that the site is not protected by any formal flood defences.
Residual risk	The site is not at residual risk of flooding.
Emergency planning	
Flood warning	The site is not located within any Environment Agency Flood Warning or Alert Area.
Access and egress	Access and egress to the site is currently by Heath Close. Vehicular access to Heath Close is via Queens Road. For the 3.33% AEP event there is a small area of pooling on Heath Close by the western corner of the site. Flood depths range between 0.15 – 0.30m with a section between 0.30 to 0.60 on the northern side of the ponding. Velocities are low <0.25m/s, with the resulting risk classified as 'very low' and 'danger to some'. Vehicular and pedestrian access and egress may be possible via this route. During the 1% AEP event the surface water flood extent extends along Heath Close from the portion within the site boundary further north. The flood depths are predominantly between 0.30 to 0.60m with velocities mainly <0.25m/s with a maximum of 0.25 to 0.50m/s along Heaths Close. The resulting hazard is 'Danger to some' with a small area of 'Danger to most' at the current entrance to the site. Vehicular access and egress is not possible via this route. During the 0.1% AEP event, much of Heath Close is flooded. This flooding reaches a maximum depth and velocity of >1.2m and 1.00 to 2.00m/s. The resulting flood hazard on Heath Close is 'Danger to Most'. Vehicular access and egress is not possible. Developers will need to demonstrate that safe access and egress in the 0.1% AEP event, including allowance for climate change.

Dry Islands	The site is not located on a dry island.
Climate change	
Implications for the site	**Management Catchment: Colne 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:** As the site is within Flood Zone 1 even with the climate change allowances applied fluvial flood risk to the site is negligible. **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, with the site almost entirely covered in surface water. The flood depths reach a maximum of 1.55m by the current entrance of the site with the rest of the sites flood depths between 0.3 to 1.5m, the smaller depths in the southeastern area. The maximum velocity and hazard at the site is 1.8m/s and 'Danger to most'. The access and egress route along Heath Close remains categorized as 'Danger to most' so safe access and egress is not possible to non-emergency response vehicles. 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 Chalk Formation – chalk. This is a sedimentary bedrock.
	• Soils at the site consist of:
	  ○ Slightly acid loamy and clayey soils with impeded drainage.
	Sustainable Drainage Systems (SuDS)
	• Groundwater levels are indicated to be between 0.5 and 5m below ground level and there is a risk of flooding to subsurface assets and below ground development such as basements. Groundwater monitoring is recommended to determine the seasonal variability of groundwater levels, as this may affect the design of the surface water drainage system.

	• BGS data indicates that the underlying geology is Chalk 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 guidence is currently undergoing a review, therefore developers should ensure they are using the latest guidence regarding this. • The site is not located within a historic landfill site. • Surface water discharge rates should not exceed existing 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 3.33%, 1% and 0.1% AEP events. 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) and the Environment Agency) 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.
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 not required for this site because there is no fluvial flood risk.
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: ○ At risk of surface water flooding and groundwater flooding. • All sources of flooding should be considered as part of a site-specific FRA. • Consultation with St Albans City and District Council, Hertfordshire County Council, 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). • 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 greenfield rates. • Planning permission is required to surface more than 5 square metres of unpaved ground using a material that cannot absorb water. • Arrangements for safe access and egress will need to be demonstrated for the 1% and 0.1% surface water events with an

	appropriate allowance for climate change, using the depth, velocity, and hazard outputs.
	• 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. This is particularly important given the risk of breach at the site.
	• Should built development be proposed within the 1% AEP surface water flood extent, careful consideration will need to be given to flood resistance and resilience measures.
	• Flood resilience and resistance measures should be implemented where appropriate during the construction phase, e.g. raising of floor levels. These measures should be assessed to make sure that flooding is not increased elsewhere.
	  ○ raise them as much as possible
	  ○ include extra flood resistance and resilience measures.
	• Other examples of flood resistance and resilience measures include:
	  ○ using flood resistant materials that have low permeability to at least 600mm above the estimated flood level
	  ○ making sure any doors, windows or other openings are flood resistant to at least 600mm above the estimated flood level
	  ○ by raising all sensitive electrical equipment, wiring and sockets to at least 600mm above the estimated flood level.

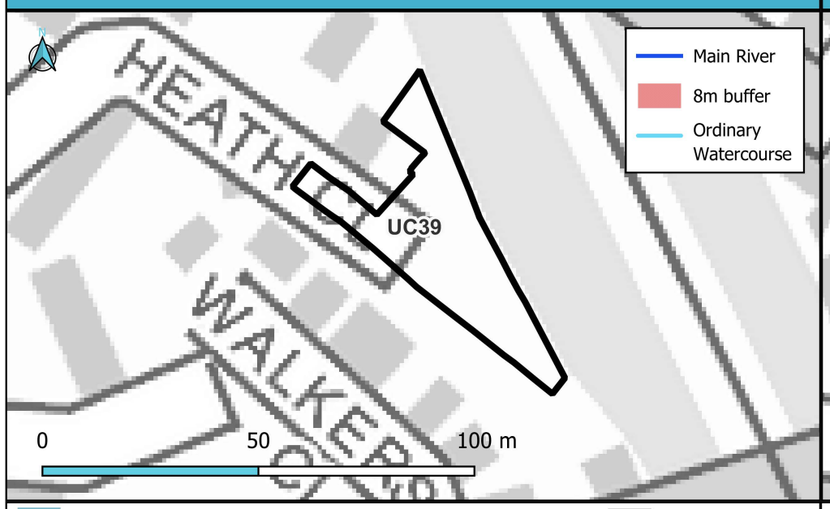
Key messages	
Development is likely to be able to proceed if: • A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with development steered away from the areas identified to be at risk of surface water flooding across the site. • Arrangements for safe access and egress will need to be demonstrated for the 1% surface water events with an appropriate allowance for climate change, using the depth, velocity, and hazard outputs. This includes measures to reduce flood risk along these routes such as raising access, but not displacing floodwater elsewhere. • 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. There is no detailed hydraulic modelling available at this location.

Climate change	The latest climate change allowances have been applied to the RoFSW map to indicate the impact on surface water flood risk. In the absence of detailed hydraulic modelling, Flood Zone 2 has been used as an indicative assessment of future fluvial risk at 1% AEP.
Fluvial depth, velocity and hazard mapping	There is no detailed hydraulic modelling available at this location.
Surface Water	The Environment Agency's Risk of Flooding from Surface Water dataset has been used for this assessment.
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	UC39
Site Name	Garage Block to east of 8 Heath Close, Harpenden

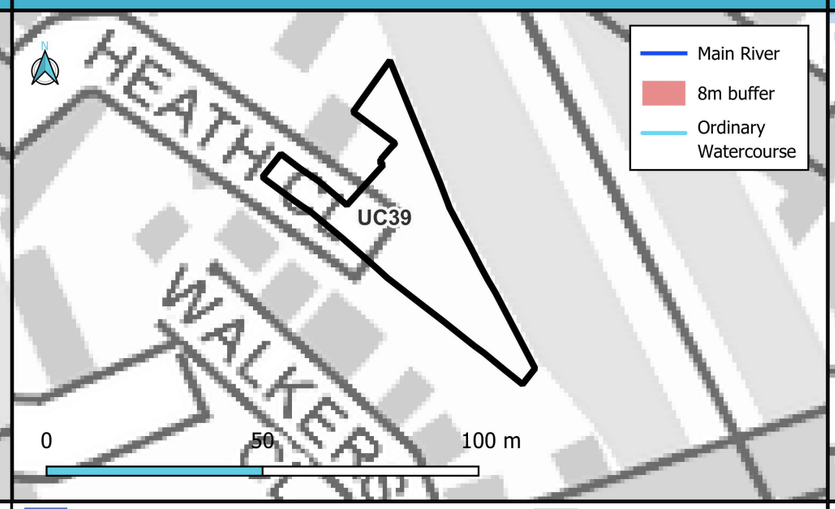
St Albans District Council
Strategic Flood Risk Assessment
Level 2 Detailed Site Summary

Flood Zone Map (present day)



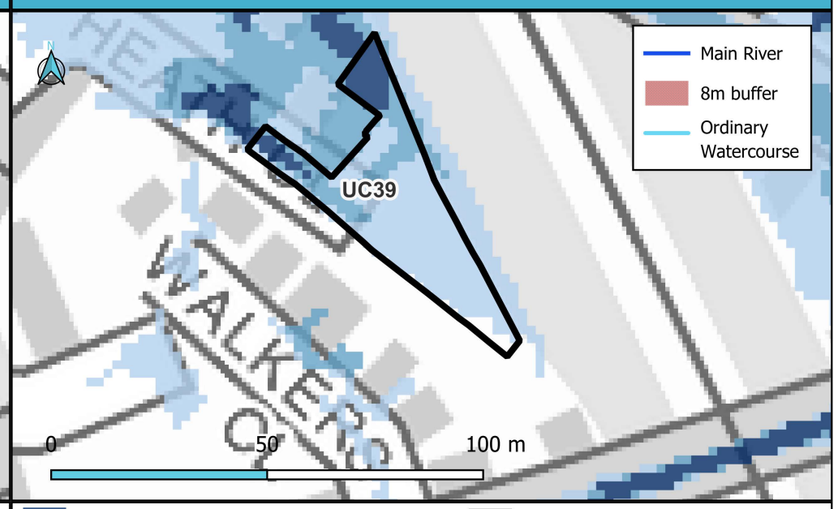
- Flood Zone 2 (Between 1% and 0.1% AEP)
- Flood Zone 3a (Between 3.33% and 1% AEP)
- Flood Zone 3b (Less than 3.33% AEP)
- Site boundary

Flood Zone 3b + Climate Change



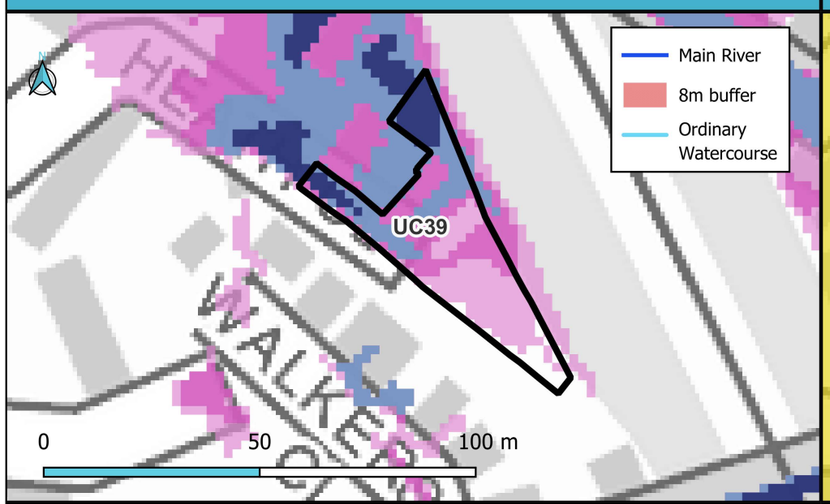
- Flood Zone 3b + 21% (Central allowance)
- Flood Zone 3b + 35% (Higher allowance)
- Flood Zone 3b
- Site boundary

Surface Water Map (RoFSW)



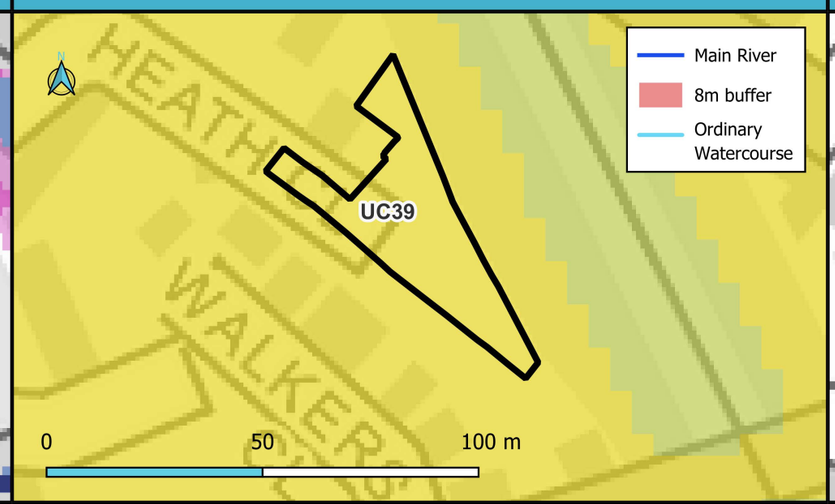
- RoFSW 1 in 30-year (3.33% AEP)
- RoFSW 1 in 100-year (1% AEP)
- RoFSW 1 in 1000-year (0.1% AEP)
- Site boundary

Surface Water Map + Climate Change



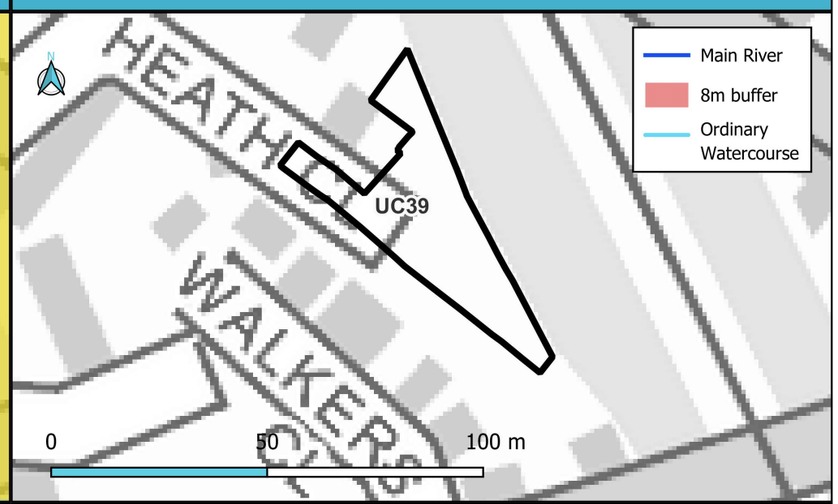
- RoFSW 1 in 30-year (3.33% AEP)
- RoFSW 1 in 30-year (3.33% AEP) plus 40%
- RoFSW 1 in 100-year (1% AEP)
- RoFSW 1 in 100-year 1% AEP plus 40%
- Site boundary

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

Reservoir Flood Risk



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

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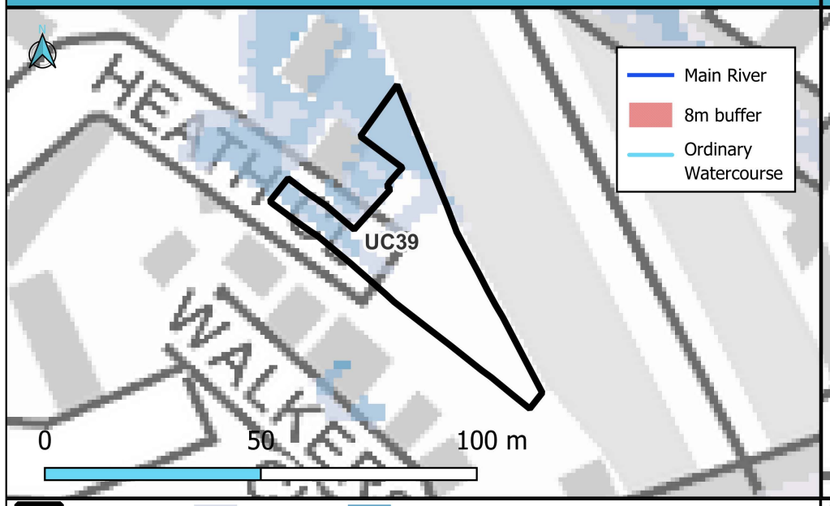
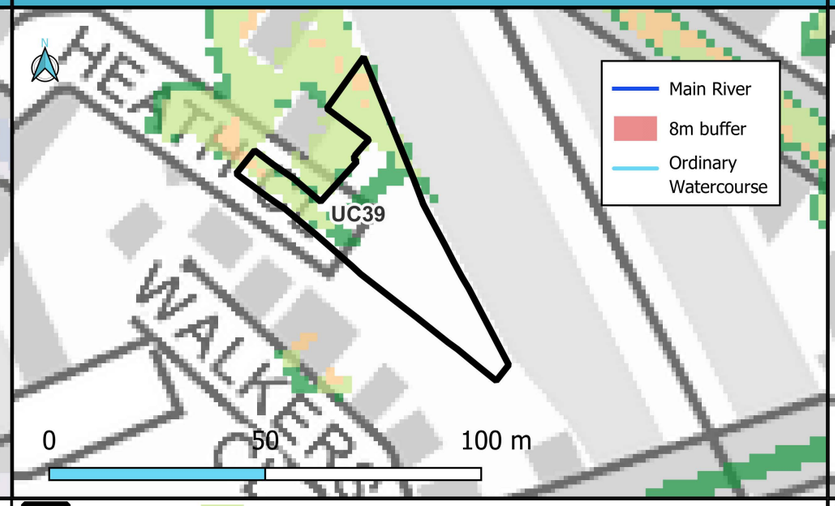
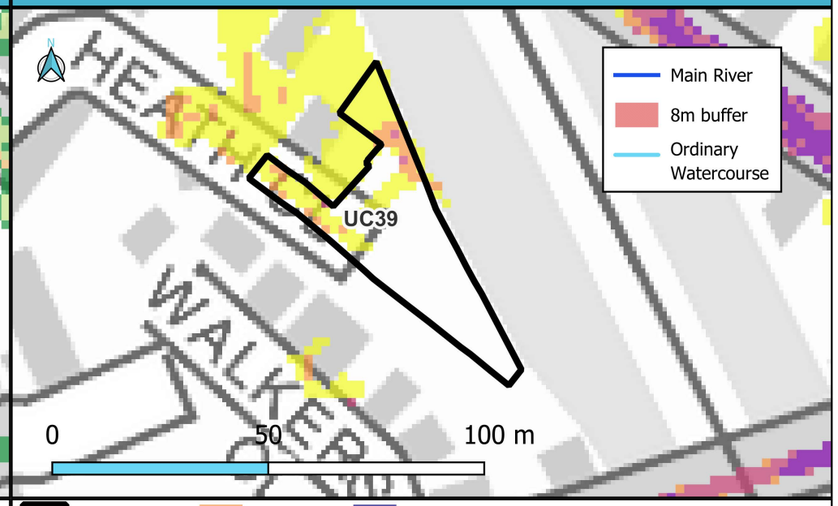
RoFSW Max Depth - 1% AEP



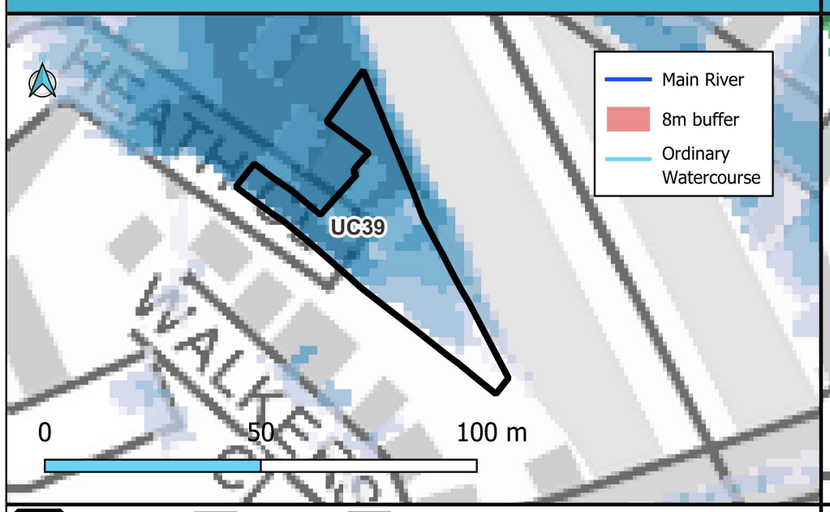
RoFSW Max Hazard - 1% AEP



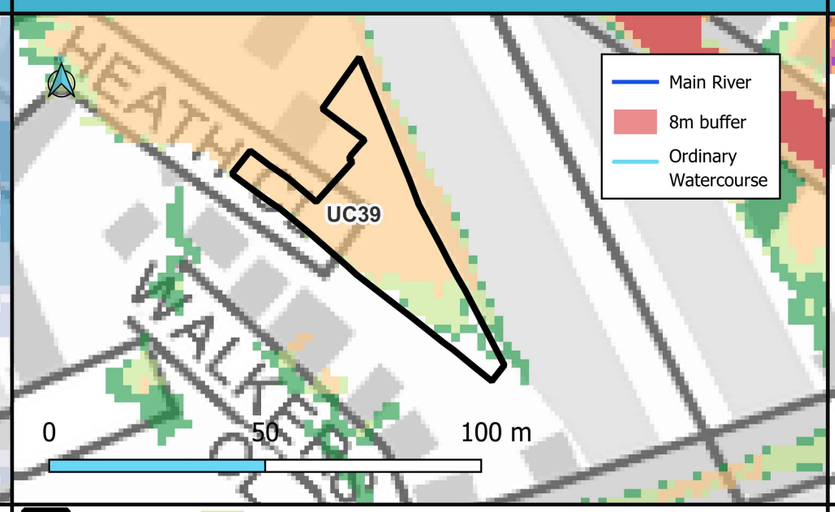
RoFSW Max Velocity - 1% AEP



RoFSW Max Depth - 1% AEP + 40% CC



RoFSW Max Hazard - 1% AEP + 40% CC



RoFSW Max Velocity - 1% AEP + 40% CC