	St Albans City and District Council **Level 2 Strategic Flood Risk Assessment** **Detailed Site Summary Table**
Site details	
Site Code	**UC46**
Address	Garage Blocks adj. to 76 Oakley Road and 151 Grove Road, Harpenden
Area	0.12ha
Current land use	Garages and parking
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 southern part of Harpenden, a town to the north of St Albans. The site is currently comprised of several garage units within in a residential area. The northern boundary is made up of Grove Road, and Oakley Road boarders the western side of the site. To the east is a sub-station with access from Grove Road. To the south of the site there are a number of residential houses. The site is located within the Colne Management Catchment, which covers 1,040km^2.
Topography	Environment Agency 1m resolution LiDAR across the site shows the elevation varies slightly across the site. The site aera is comprised of garages with a road providing access off Oakley Road and Grove Lane. The garages are surrounded by grassed verges, with the northern verge containing several large trees. The site highest elevation is along the southern boundary 97.0-97.6mAOD. The elevation then falls gradually to 96.2mAOD along the northern boundary. The lowest elevation is 95.97mAOD in the northeastern 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 the Harpenden urban area, wherever this is the case, 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** – 4% Max depth – 0.15 – 0.30m Max velocity – 0.50 – 1.00 m/s **1% AEP** – 11% Max depth – 0.30 – 0.60m Max velocity – 1.00 – 2.00m/s **0.1% AEP** – 41% Max depth – 0.90 – 1.20m Max velocity – >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:** In the 3.3% AEP event there is a surface water flow path along Grove Road that impinges on the northern boundary of the site, with flood depths ranging from 0.15 to 0.30m. During the 1% AEP event, similar to the 3.3% event there is a larger flow path on Grove Road resulting in a larger amount of surface water encroaching the sites northern boundary. Additionally, there is water pooling in the northeastern corner close to the substation. Another flow path runs north along Oakley Road merging with the Grove Road flow path, affecting the northwestern corner of the site. Flood depths mainly consist of 0.15 – 0.30m with maximum depths reached in the north east and northwest corners 0.30 – 0.60m. Flood velocities along the Grove Road flow path vary from 1.00 to 2.00m/s along the site's northern boundary. During the 0.1% event, the northern third of the site is affected by the surface water flow path along Grove Road. The eastern side of the site has a large area of surface water pooling. There is an additional surface water flow path flowing through the centre of the site from the south to Grove Road. Flood depths vary across the site, with most significant depths along the northern boundary ranging from 0.30 to 0.60m, and predicted ponding in the northeastern corner up to 0.60 to 0.90m. Velocities range from 0.50m/s to over 2.00m/s across the northern area of the site. The

	surface water flow route from the south through the site's centre is below 0.15m until it merges with Grove Road, where depths range from 0.30 to 0.60m and velocities range from 0.50 to 1.00m/s.
Reservoir	The site is not shown to be at risk from the Environment Agency Reservoir Flood Extents.
Groundwater	The JBA Groundwater mapping shows that the site is classed as moderate risk to groundwater as groundwater for the whole site are anticipated to be between 0.5 to 5m below ground level.
Sewers	The site is located within a postcode area where 14 incidents of sewer flooding was reported according to the Thames Water Hydraulic Sewer Flood Risk Register.
Flood history	The site is not shown to be within the reaches of the Environment Agency's Historic Flood Map. St Albans District Council flood record show no records of flooding within the site. However, a flood related incident was reported 0.1km east of the site at the junction of Grove Road and Pipers Lane in June 2016. A car became stuck in the flood water. Suggesting that surface water flooding is an issue along Grove Road.
Flood risk management infrastructure	
Defences	The Environment Agency AIMS dataset shows that the site is not protected by ant flood defences.
Residual risk	The site is not at risk from residual risk.
Emergency planning	
Flood warning	The site is not located in an Environment Agency Flood Warning or Flood Alert Area.
Access and egress	Access and egress to the site is currently from Oakley Road to the west and Grove Road to the north. Vehicular access to Oakley Road is via Grove Road. To the east of the site, Grove Road becomes Pipers Lane. During the 3.33% AEP surface water event, flooding affects Grove Road and Pipers Lane. Flood depths are primarily 0.30 to 0.60m along Grove Road by the site decreasing to 0.15 to 0.30 to the west of the site. The flood waters velocities are mainly 0.25 to 0.5m/s. The resulting flood hazard is 'Very Low' to 'Danger for Most'. It is likely that vehicular access and egress may be possible via Broadstone Road which leads to Oakley Road. However vehicular access and egress to the site via Grove Road would not be possible only for emergency vehicles. During the 1% AEP event, Grove Road and the entrance to Oakly Road by the site's western boundary is affected by flooding. Flood depths are primarily between 0.30 to 0.6m reaching a maximum depth between 0.60 to 0.90. The flood velocities vary between 0.25 to 0.5m/s and 0.50 to

	1.00m/s. The flood hazard along Grove Road is 'Danger for Most', therefore vehicular access and egress will not be possible. During the 0.1% AEP event, flooding effects Grove Road and Oakley Road. Flood depths vary along Grove Road/Pipers Lane from 0.60 to 0.90m with the maximum flood depths >1.2m close to the site. The resulting flood hazard is 'Danger for all', so 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:** 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. Flood depths and velocities are also similar to the 0.1% AEP event, reaching a maximum along the northern boundary of 1.1m and 2.4m/s. The flood hazard along Grove Road is 'Danger for most' affecting the northern boundary of the site, the rest of the site is categorized as 'Danger for some'. 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 - The bedrock of the site is Lewes Nodular Chalk formation and Seaford Chalk Formation. This a type of sedimentary bedrock.

	○ Superficial - The superficial deposits consist of River Terrace Deposits – sands and gravels. This is a type of sedimentary deposit. • Soils at the site consist of: ○ Freely draining slightly acid but base-rich soils **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 site is not located within a historic landfill site. • Surface water discharge rates must 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 3.3%, 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 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 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 site is within Flood Zone 1 but at risk from other sources of flooding. The Sequential Test must be passed, the criteria for which is highlighted within the Level 1 Assessment. The Exception Test is not required under the NPPF, even though the site is classified as 'More Vulnerable'. However, it must be shown that the development will be safe for its lifetime and the risk can be managed through a sequential approach to design.
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 other sources of flooding (surface water and groundwater) • All sources of flooding should be considered as part of a site-specific FRA. • Consultation with the 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

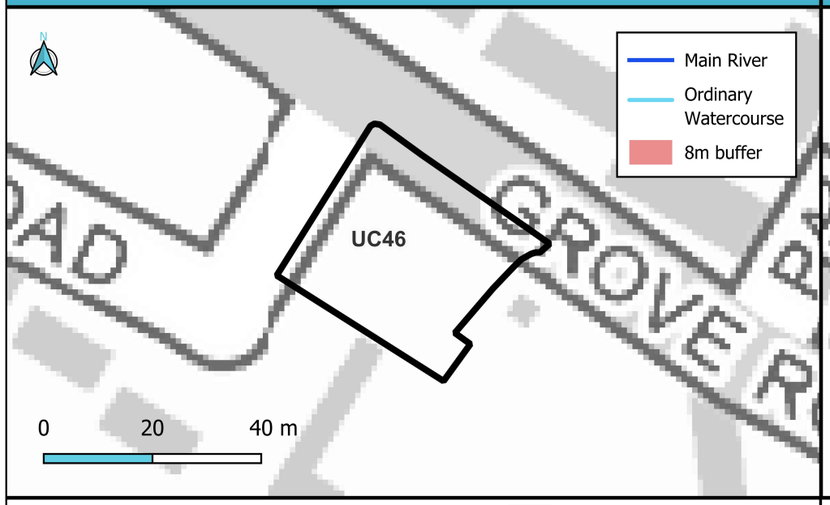
	across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure runoff rates are as close as possible to greenfield rates. • Planning permission is required to surface more than 5 square metres of unpaved ground using a material that cannot absorb water. • Arrangements for safe access and egress will need to be demonstrated for all the surface water events with an appropriate allowance for climate change, using the depth, velocity, and hazard outputs. As access and egress will not be possible during 1% and 0.1% events, a Flood Warning and evacuation Plan will be required. • Consultation with RMAs early on should be implemented to ensure an appropriate flood evacuation plan is put in place for the site. This should consider the Highly Vulnerable nature of residents, widespread extents of flooding, and potential for rapid inundation of the site in event of breach. • 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. • Safe access and egress can be demonstrated in the surface water plus climate change events. 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	UC46
Site Name	Garage Blocks adj. to 76 Oakley Road and 151 Grove Road, Harpenden

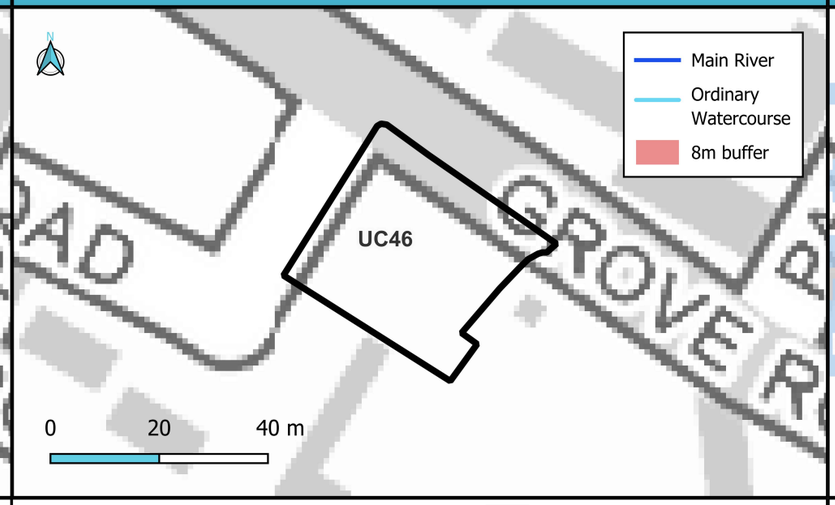
St Albans District Council
Strategic Flood Risk Assessment
Level 2 Detailed Site Summary

Flood Zone Map (present day)



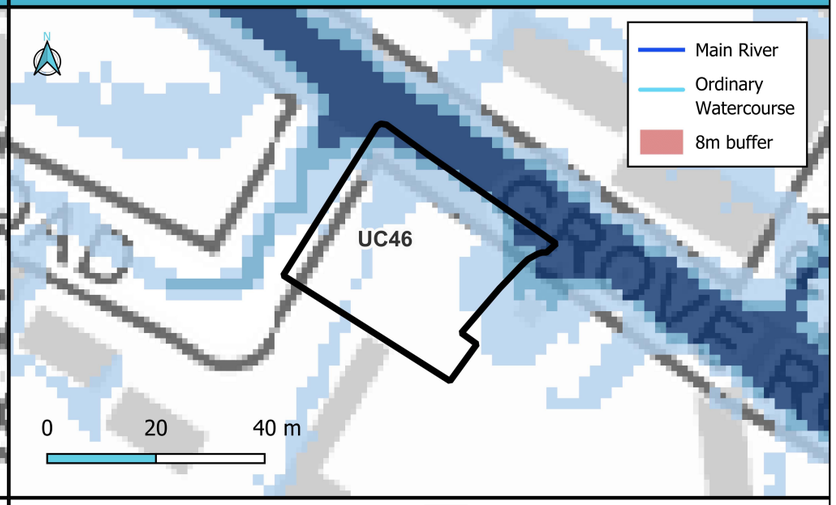
Flood Zone 2 (Between 1% and 0.1% AEP)
Flood Zone 3a (Between 3.33% and 1% AEP)
Flood Zone 3b (Less than 3.33% AEP)
Site boundary
Other site

Flood Zone 3b + Climate Change



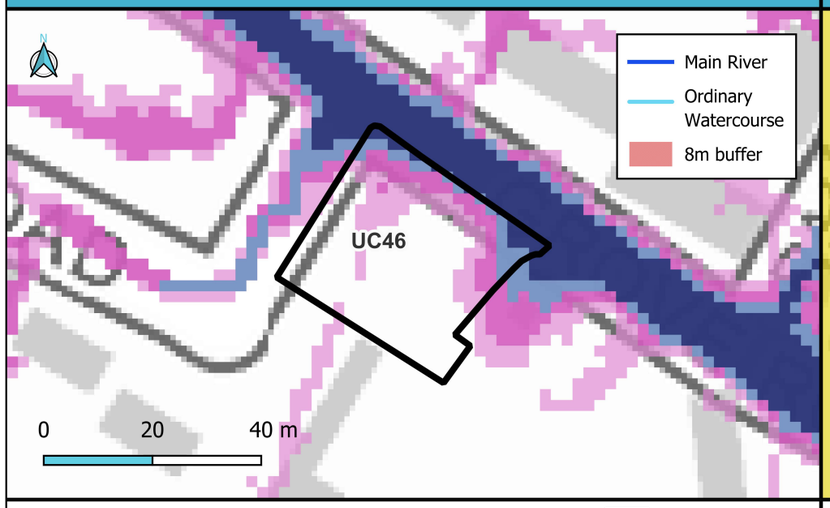
Flood Zone 3b + 21% (Central allowance)
Flood Zone 3b + 35% (Higher allowance)
Flood Zone 3b
Site boundary
Other site

Surface Water Map (RoFSW)



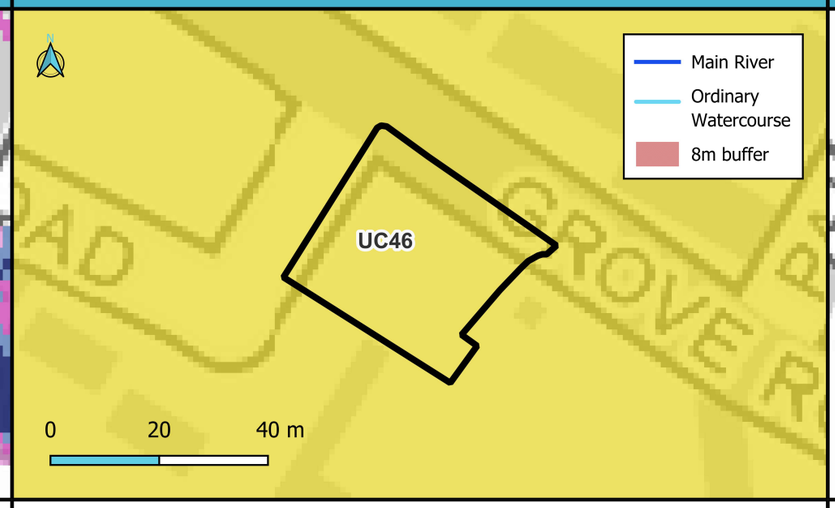
RoFSW 1 in 30-year (3.33% AEP)
RoFSW 1 in 100-year (1% AEP)
RoFSW 1 in 1000-year (0.1% AEP)
Site boundary
Other site

Surface Water Map + Climate Change



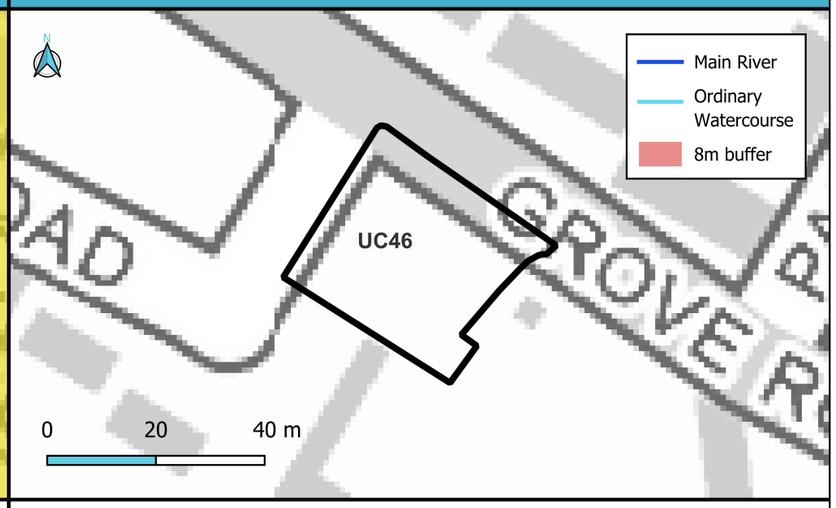
RoFSW 1 in 30-year (3.33% AEP)
RoFSW 1 in 30-year (3.33% AEP) plus 40%
RoFSW 1 in 100-year (1% AEP)
RoFSW 1 in 100-year 1% AEP plus 40%
Site boundary
Other site

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

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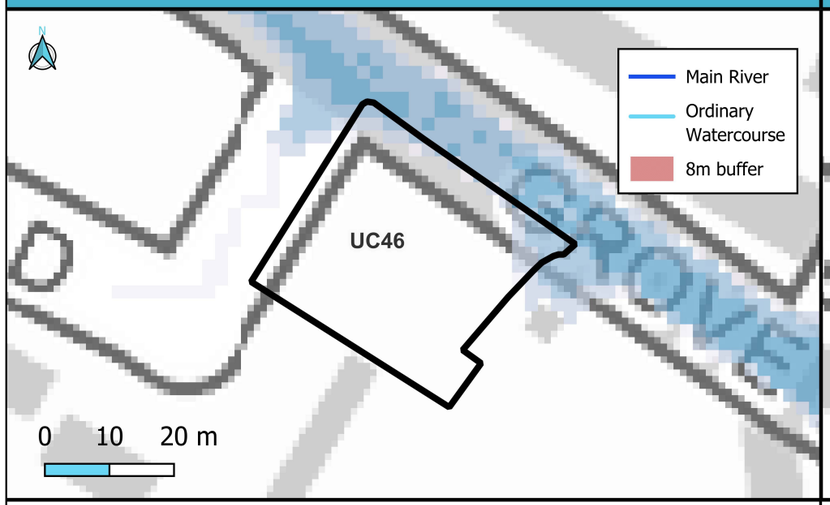
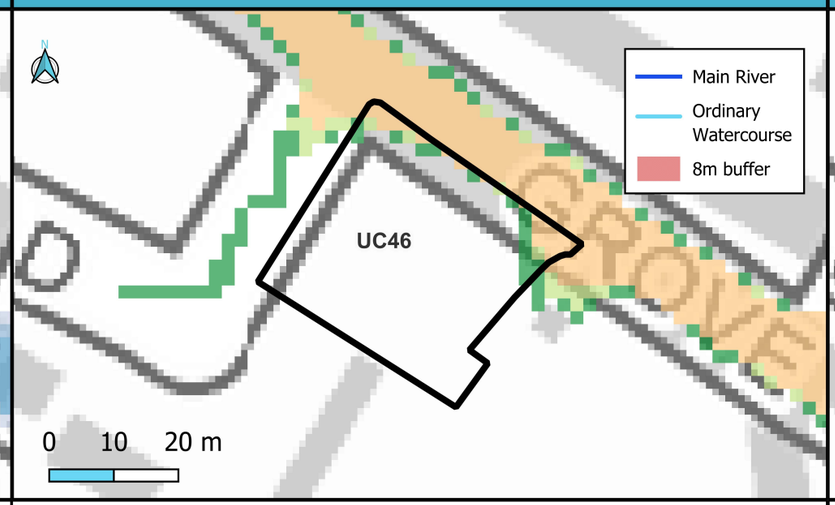
Strategic Flood Risk Assessment
Level 2 Detailed Site Summary

RoFSW Max Depth - 1% AEP



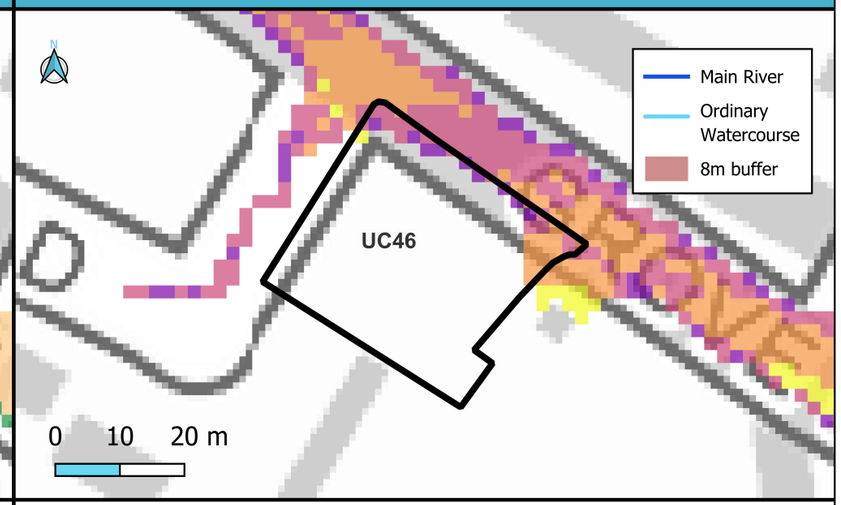
Depth (m)
0.00 - 0.15
0.15 - 0.30
0.30 - 0.60
0.60 - 0.90
0.90 - 1.20
> 1.20
Site boundary
Other site

RoFSW Max Hazard - 1% AEP



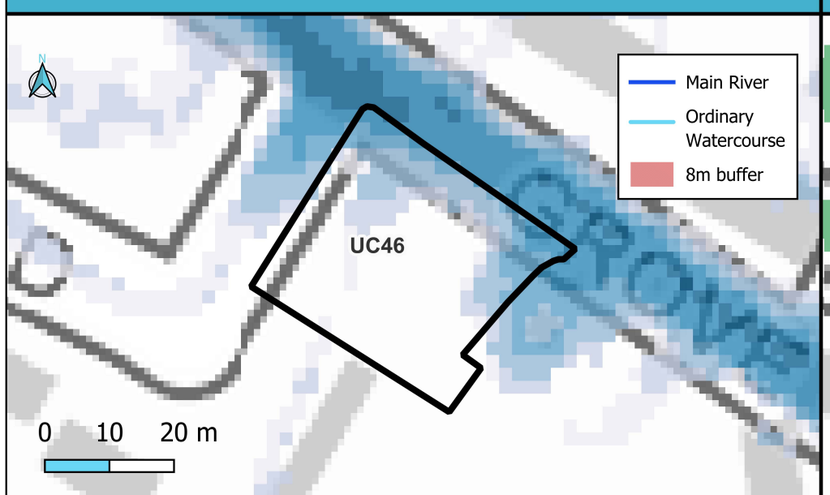
Hazard
< 0.75: Low
0.75 - 1.25: Moderate
1.25 - 2.00: Significant
> 2.00: Extreme
Site boundary
Other site

RoFSW Max Velocity - 1% AEP



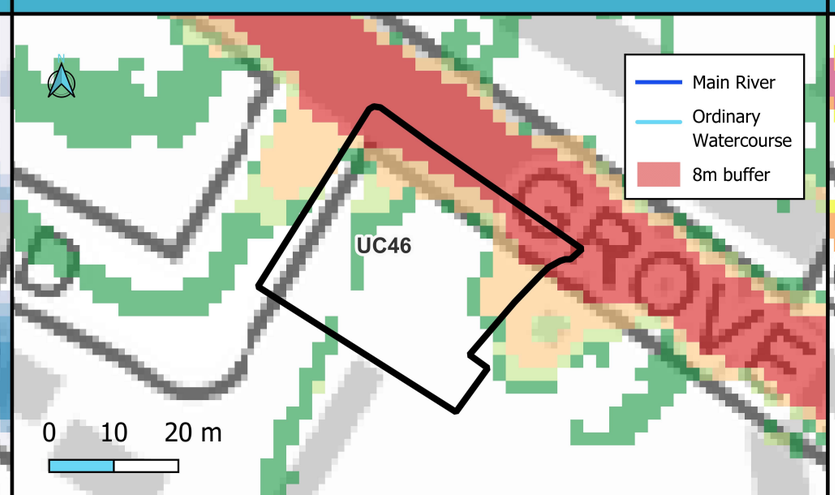
Velocity (m/s)
0.00 - 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 2.00
> 2.00
Site boundary
Other site

RoFSW Max Depth - 1% AEP + 40% CC



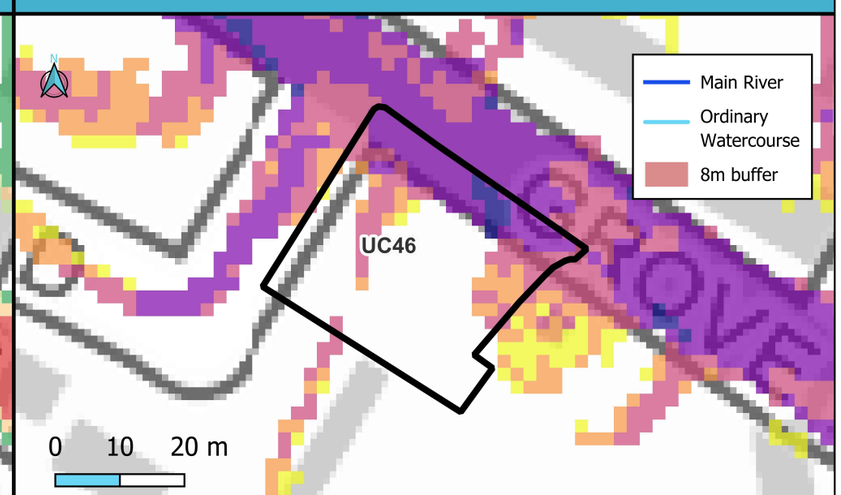
Depth (m)
<= 0.15
0.15 - 0.30
0.30 - 0.60
0.60 - 0.90
0.90 - 1.20
> 1.20
Site boundary
Other site

RoFSW Max Hazard - 1% AEP + 40% CC



Hazard
< 0.75: Low
0.75 - 1.25: Moderate
1.25 - 2.00: Significant
> 2.00: Extreme
Site boundary
Other site

RoFSW Max Velocity - 1% AEP + 40% CC



Velocity (m/s)
0.00 - 0.25
0.25 - 0.50
0.50 - 1.00
1.00 - 2.00
> 2.00
Site boundary
Other site