	St Albans City and District Council **Level 2 Strategic Flood Risk Assessment** **Detailed Site Summary Table**
Site details	
Address	Ariston Works
Area	2.52ha
Current land use	Commercial
Proposed land use	Mixed – Residential, Community, Primary School
Flood Risk Vulnerability	Mixed - More Vulnerable and Less Vulnerable
Sources of flood risk	
Location of the site within the catchment	The site is located within the residential area of Bernards Heath in northern St Albans. The site is surrounded mainly by Bernards Heath Woodland. Heathlands School for Deaf Children is located along the site's eastern boundary. Heathlands Drive the access for the Heathlands School runs through the centre of the site. Harpenden Road (A1081) lies just to the west of the site. To the north of the site is residential. The site is within the River Ver catchment, with the river located approximately 1.6 km to the southwest of the site. This site is within the lower catchment, which is primarily urban as the river passes through St Albans. The site falls within the Colne Management Catchment, which covers a much larger area of 1,040 km^2.
Topography	Environment Agency 1m resolution LIDAR across the site shows that topography varies. The site is partly in a woodland as a result 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. The site is comprised of woodland and fields in the northern third of the site and commercial buildings in the southern two-thirds of the site. The LIDAR shows the highest elevations are in the centre and along the southeastern border, mainly between 120.0-120.8mAOD, with the maximum elevation 121.2mAOD on the southeastern border. The sites elevation then decreases northwards to between 111.6-115.1mAOD along the northern border of the site, the lowest elevation is in the northeastern corner. In the southern area of the site there is a slight decrease in elevation to 119.3mAOD on the southern side of the existing building.
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

	main St Albans urban area, 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** – 1% Max depth – 0.15 – 0.30m Max velocity – <0.25m/s **1% AEP** – 1% Max depth – 0.15 – 0.30m Max velocity – <0.25m/s **0.1% AEP** – 5% Max depth – 0.30 – 0.60m Max velocity – 0.25 – 0.50m/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, there is a small area of ponding to the south of the southernmost building within the site. The flood depth is between 0.15 to 0.30m with a velocity of <0.25m/s, as the water is just ponding. The flood hazard is 'Very low' to some minor areas of 'Danger for some'. During the 1% AEP event, the area of ponding has increased in size from the 3.3% event, but the depth remains the same 0.15 to 0.30m, with velocity of <0.25m/s. The flood hazard is 'Very low' to 'Danger for some' in the centre of the ponding. During the 0.1% AEP event, the area of ponding to the south of the southernmost building has increased in size again, in addition to forming part of a wider flow path. Water enters the site from the south, then ponds

	slightly in the southern area of the site before flowing west out of the site. The flood depths vary, the majority of the flow path is 0.15 to 0.30m with some areas reaching a maximum flood depth between 0.30 to 0.60m. The flow velocities are relatively slow moving either <0.25m/s or between 0.25 to 0.50m/s. The flood hazard is classified as 'Very low' to '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 the whole site has groundwater levels at least 5m below ground level. As a result, groundwater flood risk is not likely.
Sewers	The site is located within a postcode area with 29 historic incidences of sewer flooding, according to the Thames Water Hydraulic Sewer Flood Risk Register.
Flood history	There are no reported flood incidents reported by the Environment Agency, St Albans District Council or Hertfordshire County Council within 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 Areas.
Access and egress	Access and egress to the site is currently by Heathlands Drive. Vehicular access to Heathlands Drive is via Harpenden Road – A1081. There is safe access and egress to the site during the 3.3% and 1% AEP surface water events. During the 0.1% AEP surface water event, there is a flow route from the entrance to Heartlands Drive then north along Harpenden Road. The flood depths are <0.15m, which eventually reach a maximum depth of between 0.30 to 0.60m where Harpenden Road meets the Batchwood Drive/Beach Road junction. Flow velocities along this route are primarily between 1.00 – 2.00m/s. The associated flood hazard is 'Very low', however by the Batchwood Drive/Beach Road junction it is classified as 'Danger for most'. Therefore, vehicular access and egress to the site from the north via Harpenden Road may not be possible. Harpenden Road to the south of the site has a small flow path that emerges close to where Townsend Drive meets Harpenden Road. Flood depths along this flow route are primarily between 0.15 to 0.30 reaching a maximum flood depth of 0.30 to 0.60m. The velocities reach a maximum of between 1.00 to 2.00m/s. The hazard although mainly classified as 'Very low' there is small area classified as

	'Danger for most' on Harpenden Road just south of Towsend Drive. As a result, vehicular access and egress to the site from the south via Harpenden Road may not be 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 latest climate change allowances have been applied to the River Ver (2019) model to indicate the impact of fluvial flood risk. Mapping shows that the site is within Flood Zone 1 and with the latest climate change allowances applied fluvial flood risk to the site remains 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 several areas of ponding within the southern area. It is less of a flow route as the 3 areas of ponding don't connect as they do in the 0.1% AEP event. Within the site the maximum flood depth, velocity and hazard is 0.36m, 0.31m/s and '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 – Bedrock geology of the site is mainly Lambeth Group – Clay, silt and sand. There is a small area of the site to the north where the bedrock is Lewes Nodular Chalk Formation and Seaford Formation – Chalk. Both types of bedrock are sedimentary.
	  ○ Superficial deposits – The superficial deposit of the site is comprised of Kesgrave Catchment Subgroup – sand and gravel. A sedimentary superficial deposit.
	• 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 at least 5m below ground level and groundwater flooding is not likely, however below ground development such as basements may still be susceptible to groundwater flooding. • BGS data indicates that the underlying geology is Chalk, Clay, Silt and Sand 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 site is located within the Groundwater Source Protection Zones 2 and 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. • The site is not located within a historic landfill site. • In the current developed southern half of the site 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. And in the northern greenfield part of the site surface water discharge rates should not exceed the existing greenfield runoff rates. 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)

	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. • 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 site is within Flood Zone 1 but at risk from surface water 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. 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:
	  ○ Greater than one hectare
	  ○ At risk of flooding from surface water
	• 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.
- 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.
- 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.
- 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

The site is in Flood Zone 1 however has some significant risk of surface water flooding. Development is likely to be able to proceed if:

- 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.
- 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.

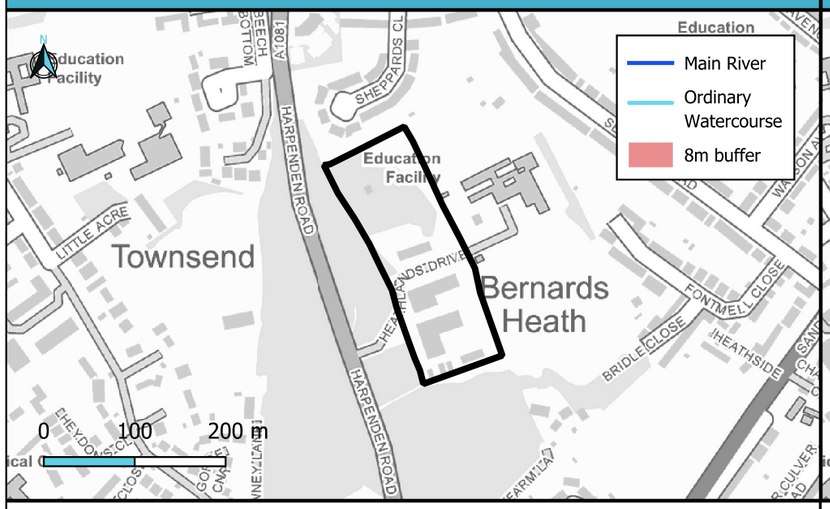
- Safe access and egress can be demonstrated in the surface water plus climate change events. This includes measures to reduce flood risk along these routes such as raising access, but not displacing floodwater elsewhere.
- A site-specific Surface Water Drainage Strategy, and SuDS maintenance and management plan is submitted along with the FRA.
- 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 Environment Agency's RoFSW map to indicate the impact on surface water flood risk. The most recent uplifts have been applied to the River Ver (2019) hydraulic model to understand the impacts on fluvial flood risk.
Fluvial depth, velocity and hazard mapping	The site falls outside of any the climate change flood extents assessed
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	
Site Name	Ariston Works

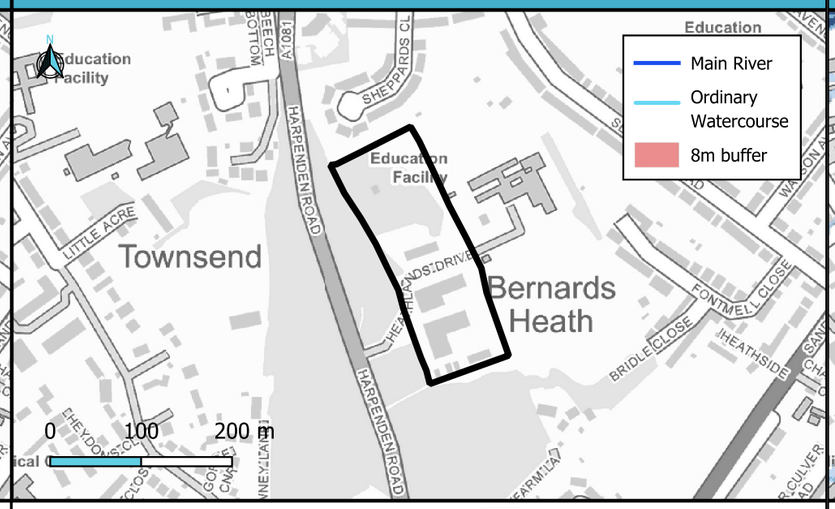
St Albans District Council
Strategic Flood Risk Assessment
Level 2 Detailed Site Summary

Flood Zone Map (present day)



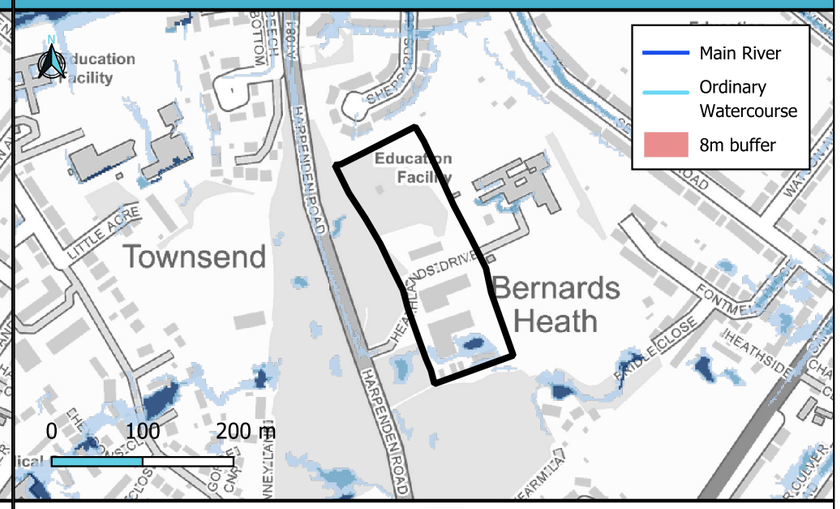
Flood Zone 2 (Between 1% and 0.1% AEP)
Flood Zone 3a (Between 3.33% and 1% AEP)
Flood Zone 3b (Less than 3.33% AEP)
Site boundary
Other site

Flood Zone 3b + Climate Change



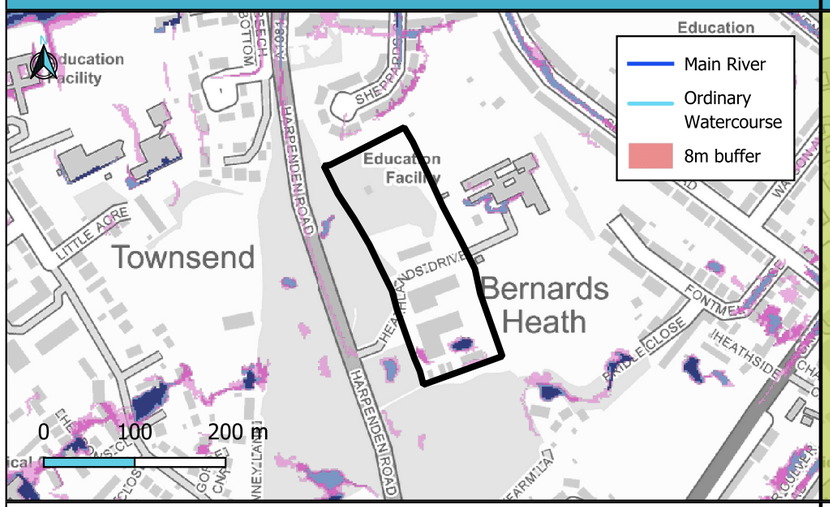
Flood Zone 3b + 21% (Central allowance)
Flood Zone 3b + 35% (Higher allowance)
Flood Zone 3b
Site boundary
Other site

Surface Water Map (RoFSW)



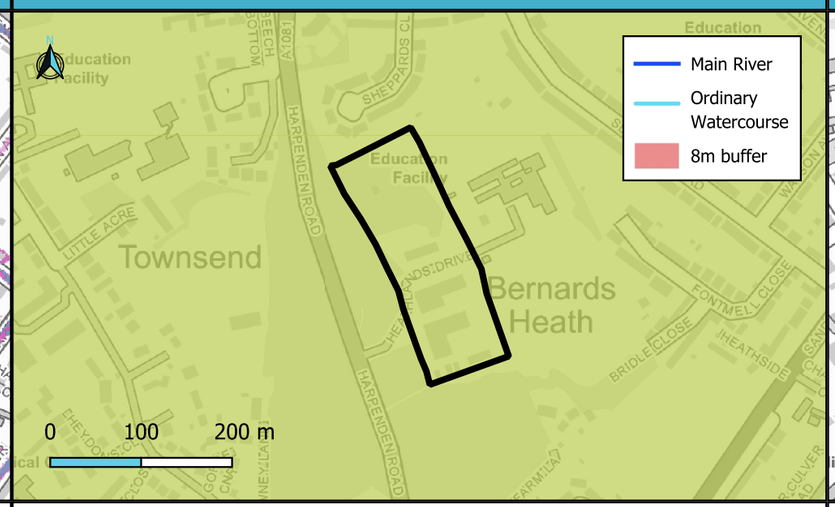
RoFSW 1 in 30-year (3.33% AEP)
RoFSW 1 in 100-year (1% AEP)
RoFSW 1 in 1000-year (0.1% AEP)
Site boundary
Other site

Surface Water Map + Climate Change



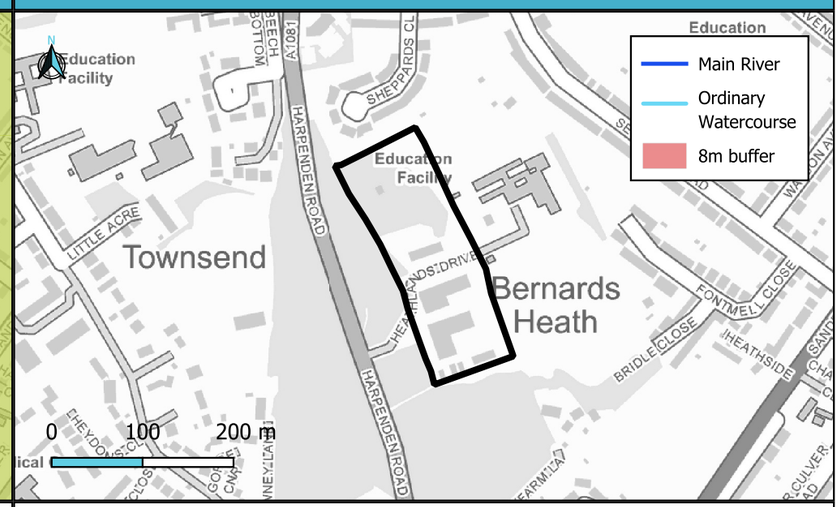
RoFSW 1 in 30-year (3.33% AEP)
RoFSW 1 in 30-year (3.33% AEP) plus 40%
RoFSW 1 in 100-year (1% AEP)
RoFSW 1 in 100-year 1% AEP plus 40%
Site boundary
Other site

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	
Site Name	Ariston Works

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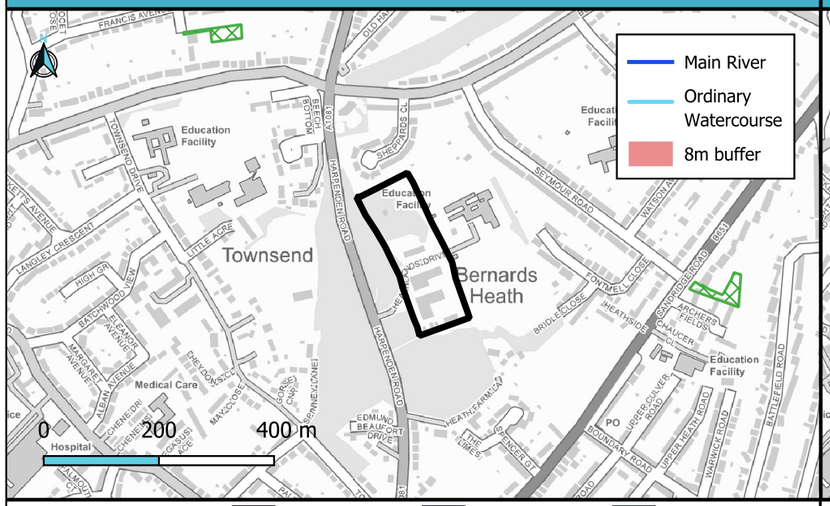
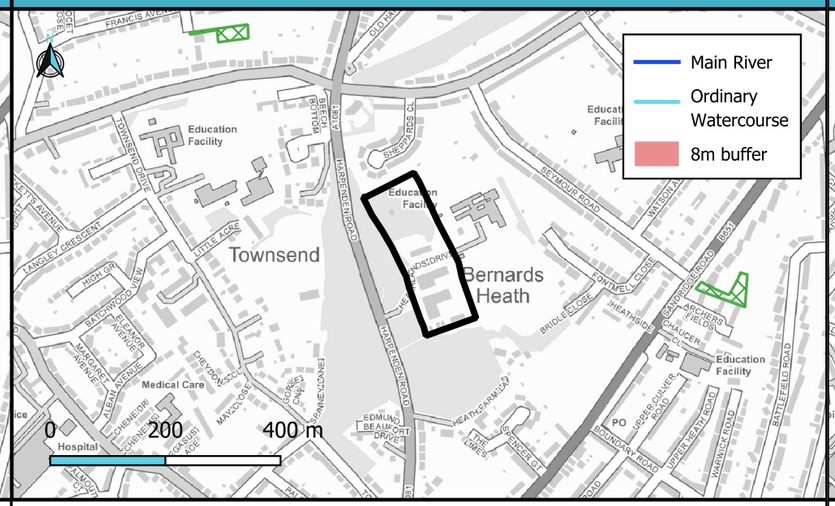
Strategic Flood Risk Assessment
Level 2 Detailed Site Summary

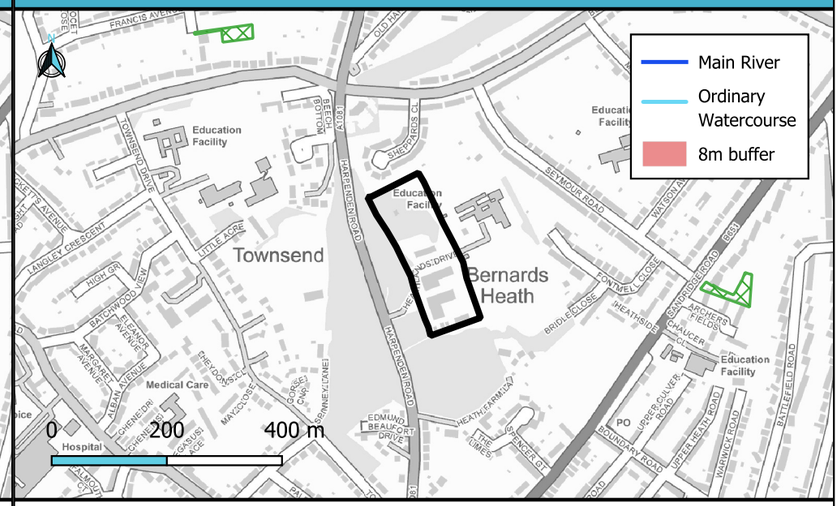
Max Fluvial Flood Depth (m) - 1% AEP



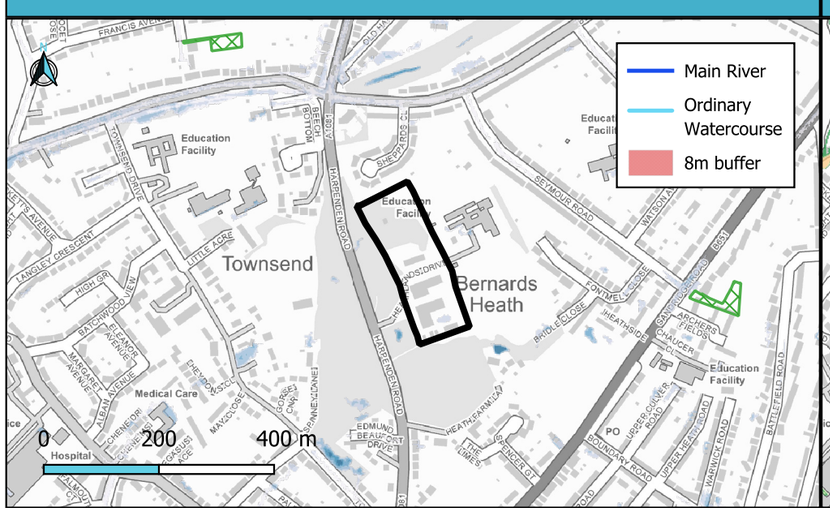
Max Fluvial Flood Level (mAOD) - 1% AEP



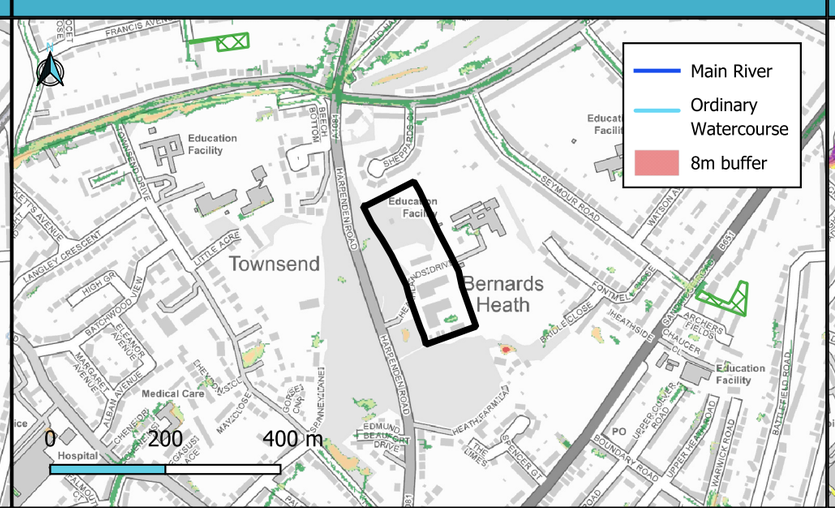
Max Fluvial Flood Velocity (m/s) - 1% AEP



RoFSW Max Depth - 1% AEP



RoFSW Max Hazard - 1% AEP



RoFSW Max Velocity - 1% AEP