Flood Risk Assessment
6362

50 Spital Street,

Dartford,

DA1 2DX

Ambiental Environmental Assessment
Sussex Innovation Centre,
Science Park Square,
Brighton, BN1 9SB

Document Issue Record

Project: Phase 1 Flood Risk Assessment

Prepared for: Atlanta Trust Ltd

Reference: 6362

Site Location: 50 Spital Street, Dartford, DA1 2DX

Proposed Development: The site currently comprises of a mixed use (commercial/retail and offices), three-storey building with basement level. It is understood that the development is for the conversion of the ground, first and second floor office space to create residential dwellings.

Consultant		Date	Signature
Author	Sophie Isaacs	23/06/2021	
Document Check	Lydia Sayers	23/06/2021	
Authorisation	Nick Drewett	30/06/2021	

Please Note:

This report has been prepared for the exclusive use of the commissioning party and may not be reproduced without prior written permission from Ambiental Environmental Assessment. All work has been carried out within the terms of the brief using all reasonable skill, care and diligence. No liability is accepted by AMBIENTAL for the accuracy of data or opinions provided by others in the preparation of this report, or for any use of this report other than for the purpose for which it was produced.

Contact Us:

Ambiental Environmental Assessment
Sussex Innovation Centre,
Science Park Square,
Brighton, BN1 9SB

www.ambiental.co.uk

UK Office: +44 (0) 1273 006 900

Contents

1. Summary

1.1 Ambiental Environmental Assessment has been appointed by Atlanta Trust Ltd to undertake a National Planning Policy Framework (NPPF) compliant Flood Risk Assessment (FRA) for the proposed development at 50 Spital Street, Dartford, DA1 2DX.

1.2 The site currently comprises of a mixed use (commercial/retail and offices), three-storey building with a basement level. It is understood that the development is for the conversion of the existing ground, first and second floor office space to create residential dwellings.

1.3 With reference to the Environment Agency (EA) Flood Map for Planning, the proposed development is located within Flood Zone 1 and 2. The proposed development is considered "More Vulnerable" under Table 2 of the Flood Risk and Coastal Change Planning Practice Guidance and the principles of the National Planning Policy Framework (NPPF).

1.4 Ambiental have assessed the fluvial undefended model outputs provided in the Darent and Cray Modelling Study (2019). It has been demonstrated that the site is unaffected by the modelled fluvial flood extents for the 1 in 100-year, 1 in 100-year +35% (Higher Central climate change) and 1 in 100-year +70% (Upper End climate change) events; however, the rear of the site could be affected by a flood level of 6.16mAOD in the modelled 1 in 1,000-year event, resulting in flood depths of up to 0.16m.

1.5 Surface water flood risk to the site and proposed development is summarised as follows:

- The site boundary is at **medium** risk (affected by 1:100-year event);
- The main access road to the site via Spital Street is at **high** risk (affected in 1:30-year event);
- The car parking area at the rear of the building is at **medium** pluvial flood risk (affected in 1:100-year event);
- The proposed residential units at the first and second floor levels of the existing building should not be at risk of flooding from surface water, as they are above the modelled flood depths in the design 1:100-year event;
- Surface water flood risk to the proposed ground floor flat could be mitigated, by installing demountable barriers at the front entrance and rear of the building during an extreme rainfall event. Also, any airbricks at the rear of the building should have covers;
- Safe access and egress to and from the site can be achieved in the modelled 1:100-year surface water flood event, via the main front entrance at Spital Street. Access via the rear of the site should be avoided in an extreme rainfall event, where possible.

1.6 It is recommended that site users and residents of the proposed flats sign up to the EA Flood Warning Service and keep themselves informed on weather updates for this area.

1.7 In summary:

- The proposed development is for the conversion of the existing ground, first and second floor offices to provide residential dwellings;
- This development is for internal works only and will not change the impermeable surface areas or roof area of the existing building;

- The site is in Flood Zone 1 and 2 (low to medium risk of fluvial flooding);
- The site is unaffected by flooding in the 1:100-year, 1:100-year +35% and 1:100-year +70% fluvial flood events (undefended);
- Spital Street, the main access road to the site, is at high risk of surface water flooding. Analysis of the Environment Agency's hazard grids shows a 'Very Low Hazard' on Spital Street, so access and egress should be achievable in the 1:100-year surface water flood event;
- Demountable flood barriers should be installed at the main entrance and rear of the building, to prevent ingress of surface water floodwaters into the proposed ground floor flat and foyer;
- Any airbricks at the rear of the building should have covers, to prevent ingress of floodwaters to the proposed ground floor flat;
- Residents should sign up to the EA Flood Warning Service and keep themselves informed on weather updates for this area.

Following the guidelines contained within the NPPF, the proposed development could be considered suitable assuming appropriate mitigation (including adequate warning procedures) can be maintained for the lifetime of the development.

Development Description	Existing	Proposed
Development Type:	Existing mixed-use (commercial/retail and offices) three storey building, with basement level.	Conversion of existing ground, first and second floor offices to provide residential dwellings.
Number of Bedrooms:	N/A	N/A
EA Vulnerability Classification:	Less Vulnerable	More Vulnerable.
Ground Floor Level:	Topographic levels within site boundary are between approximately 6.0mAOD and 6.8mAOD (EA's 2m LiDAR DTM dataset).	Proposal is for conversion of ground, first and second floor offices to residential, so no change to existing floor levels.
Level of Sleeping Accommodation:	N/A	Ground, first and second floor levels.
Impermeable Surface Area:	Site is wholly impermeable, as it consists of existing building.	Proposal will not change any impermeable surface area, as development is internal only.
Surface Water Drainage:	Existing building is positively drained.	Recommend discharging via the existing drainage infrastructure.
Site Size:	N/A	Same as existing.
Risk to Development	**Summary**	**Comment**
EA Flood Zone:	Flood Zone 1 and 2	
Flood Source:	Fluvial	River Darent
1:100 Year Flood Level	Site not affected	
1:100 Year Flood Level & Climate Change (35%)	Site not affected Nearest flood level to site is 5.57mAOD	Ambiental have assessed model outputs taken from the Darent and Cray Modelling Study (2019), which was previously provided by the Environment Agency.
1:100 Year Flood Level & Climate Change (70%)	Site not affected Nearest flood level to site is 5.80mAOD	
1:1000 Year Flood Level	6.16mAOD	
Recorded Flood Events in Area:	Yes	1968 flood event, according to EA historic flood data.
Recorded Flood Events at Site:	No	Site is outside historic flood extent for 1968 flood event.
SFRA Available:	Yes	Kent Thameside SFRA Update (2009). Dartford Surface Water Management Plan (SWMP) (2016).
Management Measures	**Summary**	**Comment**
Ground floor level above extreme flood levels:	Yes	Site not affected by modelled 1:100-yr +70%CC fluvial flood level.
Safe Access/Egress Route:	Yes	See Section 7
Flood Resilient Design:	Yes	See Section 7
Site Drainage Plan:	Discharge via existing drainage infrastructure.	
Flood Warning & Evacuation Plan:	Yes	EA Flood Warning Service Area.
Offsite Impacts	**Summary**	**Comment**
Displacement of floodwater:	No	Proposal is for conversion of existing offices to flats, with internal works only. As such, development should not displace any floodwaters.
Increase in surface run-off generation:	Negligible	No increase in impermeable surface areas or roof areas as a result of this development, so any increase in surface water runoff should be negligible.
Impact on hydraulic performance of channels:	None	Development should not affect nearby watercourse.

Table 1 Summary of flood risks, impacts and proposed flood mitigation measures.
N/A[1] not required for this assessment; N/A[2] data not available.

2. Development Description and Site Area

Proposed Development and Location

2.1 The proposed development is located at 50 Spital Street, Dartford, DA1 2DX (Figures 1 and 2).

2.2 The site currently comprises of a mixed use (commercial/retail and offices), three-storey building with a basement level. It is understood that the development is for the conversion of the existing ground, first and second floor office space to create residential dwellings. Plans for the proposed development are included in Appendix 2.

2.3 Topographic levels within the site boundary are between approximately 6.0mAOD and 6.8mAOD, according to the Environment Agency's 2m resolution LiDAR DTM dataset. DTM data provides a representation of the terrain, with features such as buildings and vegetation removed. Figure 3 shows contour lines at 0.1m intervals using the EA LiDAR dataset, at the location of the proposed development. A cross-section of the site topography is also included in this figure, with contour lines shown at 0.1m intervals.

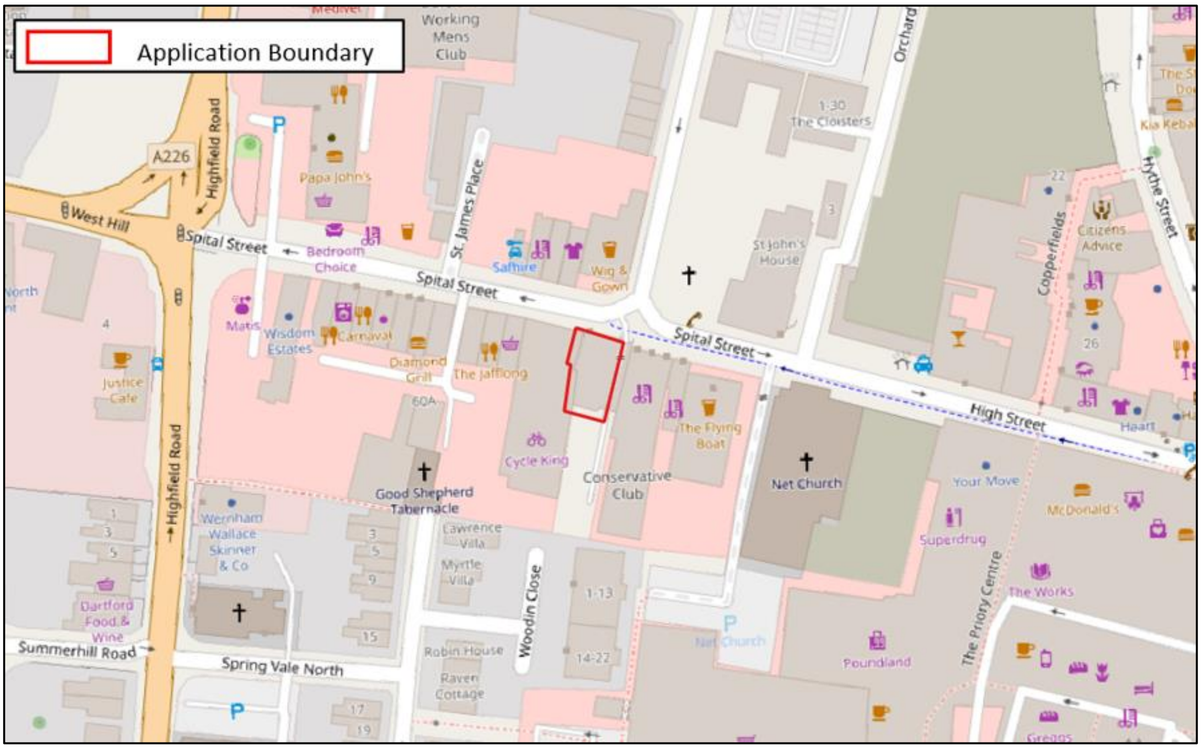


Figure 1 Location Map, identifying the approximate boundary of the proposed development (Source: OpenStreet map)

Figure 2: Aerial Imagery, identifying the location of the proposed development (Source: GoogleMaps)

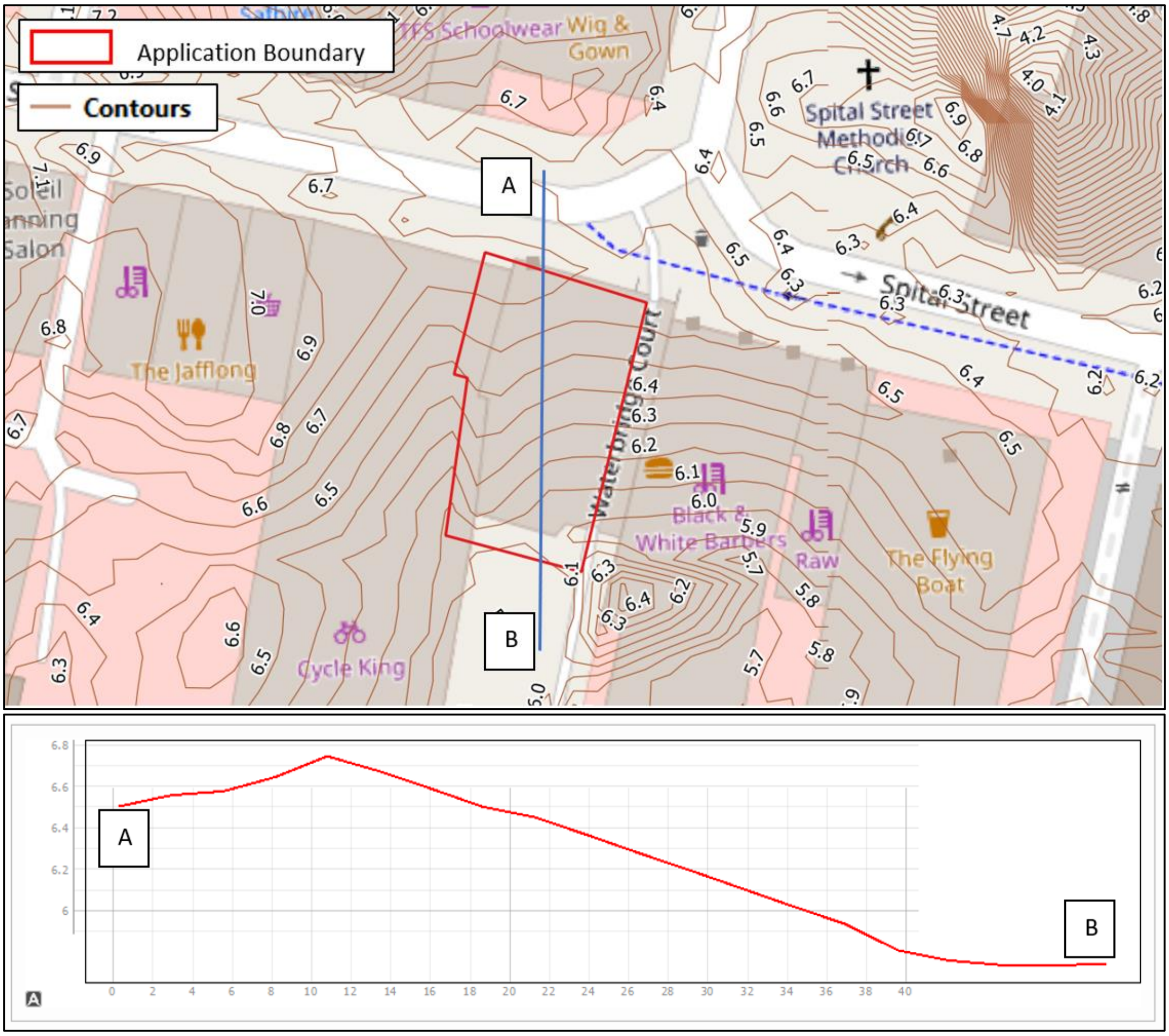


Figure 3: Contour lines at 0.1m intervals using EA's 2m DTM LiDAR, indicating approximate site boundary (Source: EA; OpenStreet map)

Vulnerability Classification

2.4 The online EA Flood Map for Planning demonstrates that the site is in Flood Zones 1 and 2. An extract of the EA Flood Map for Planning is shown in Figure 4.

2.5 Areas in Flood Zone 1 have a low probability of less than 1 in 1,000 (<0.1%) of flooding from fluvial sources annually; whilst, areas in Flood Zone 2 have a medium probability of between a 1 in 100 (1%) and 1 in 1,000 (0.1%) of river flooding in any year.

2.6 Under Table 2 of the Flood Risk and Coastal Change Planning Practice Guidance and the principles of the National Planning Policy Framework (NPPF), the existing site is classified as 'Less Vulnerable' (commercial/retail and offices) and the proposed development is 'More Vulnerable' (residential). Therefore, this demonstrates that the vulnerability to the site in terms of flood risk will increase post-development.

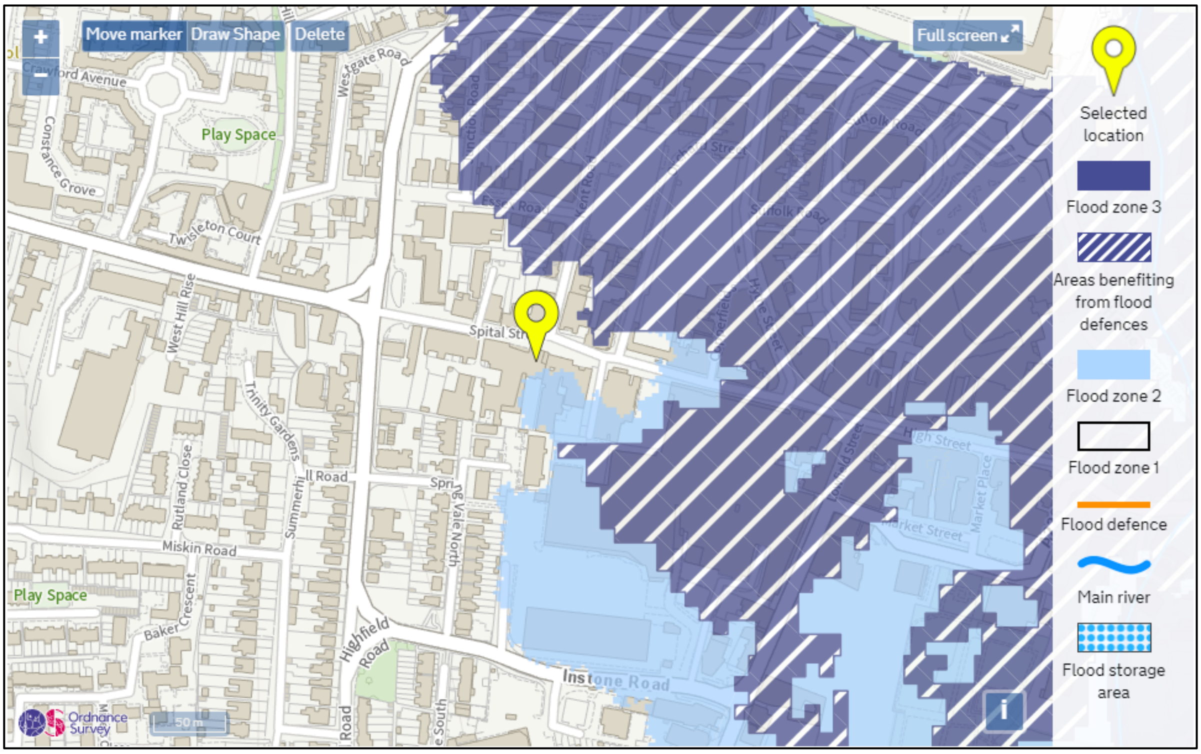


Figure 4: EA Flood Map for Planning, indicating the location of site (Source: EA)

Geology

2.7 The British Geological Survey (BGS) Geology of Britain Viewer indicates that the bedrock underlying the site is a member of the Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (undifferentiated), comprising of chalk (Source: BGS). The superficial deposits underlying the site are identified as Taplow Gravel, which comprises mainly of sand and gravel (Source: BGS). This is demonstrated in Figures 5 and 6, respectively.

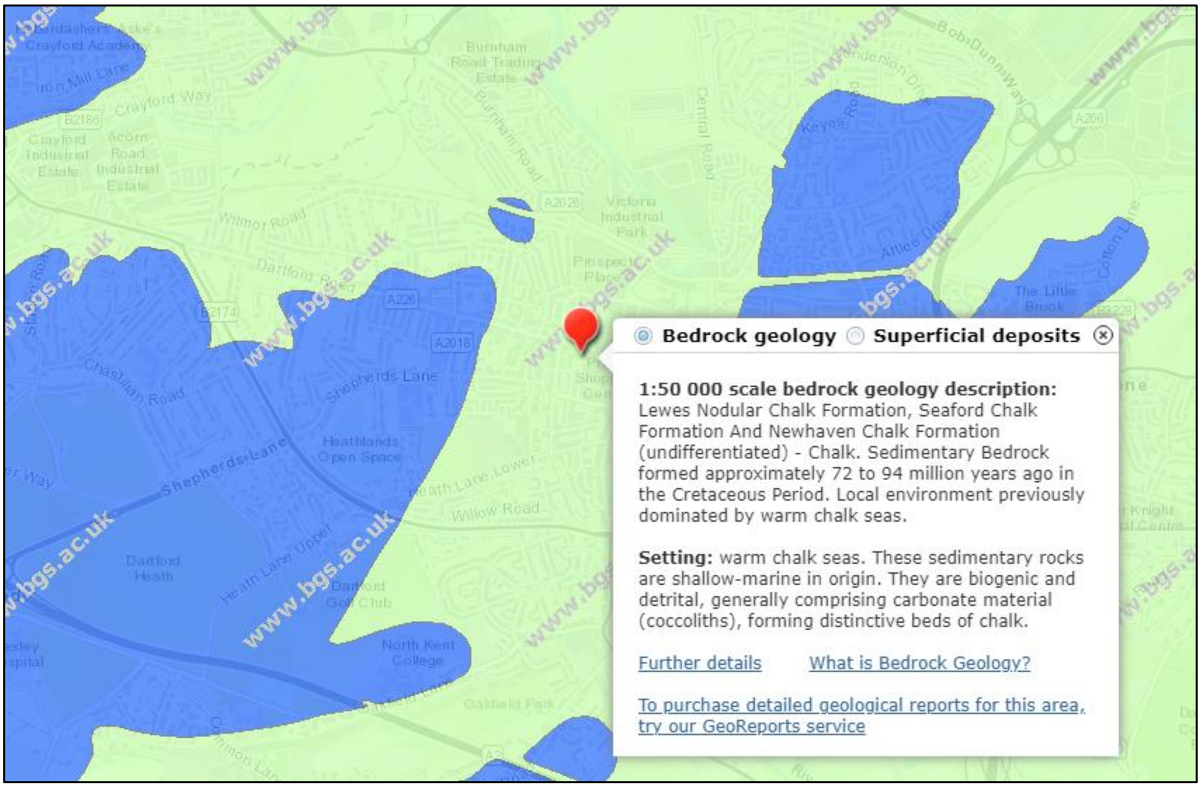


Figure 5: Bedrock Geology, according to BGS Geology of Britain Viewer showing location of site (Source: BGS)

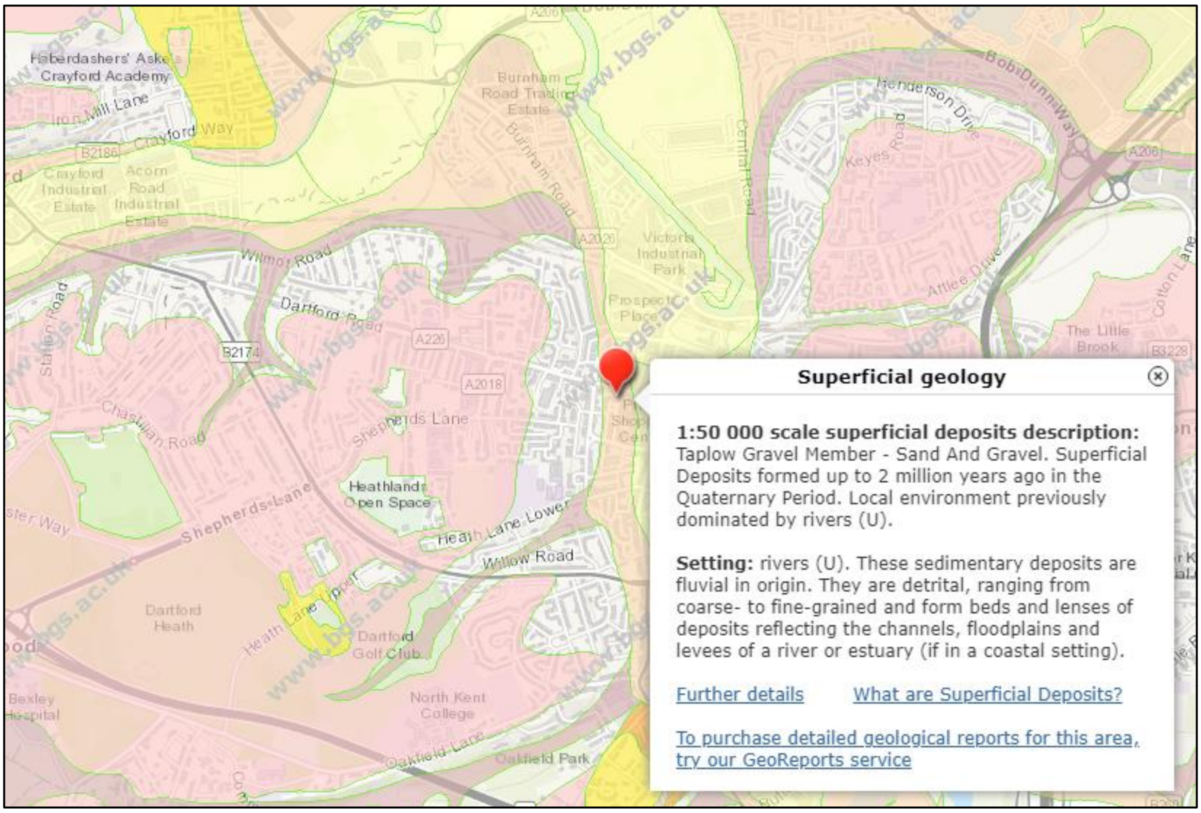


Figure 6: Superficial Deposits, according to BGS Geology of Britain Viewer showing location of site (Source: BGS)

2.8 Ambiental have reviewed DEFRA's online MagicMaps and found that the aquifer designated beneath the site for Bedrock geology is a Principal aquifer (see Figure 7); and a Secondary 'A' aquifer for Superficial Deposits (see Figure 8).

2.9 A Principal aquifer is highly permeable, supporting water supply and/or river base flow on a strategic scale; whilst a Secondary 'A' aquifer can be defined as permeable, supporting water supplies at a local scale and may contribute to base flow of rivers.

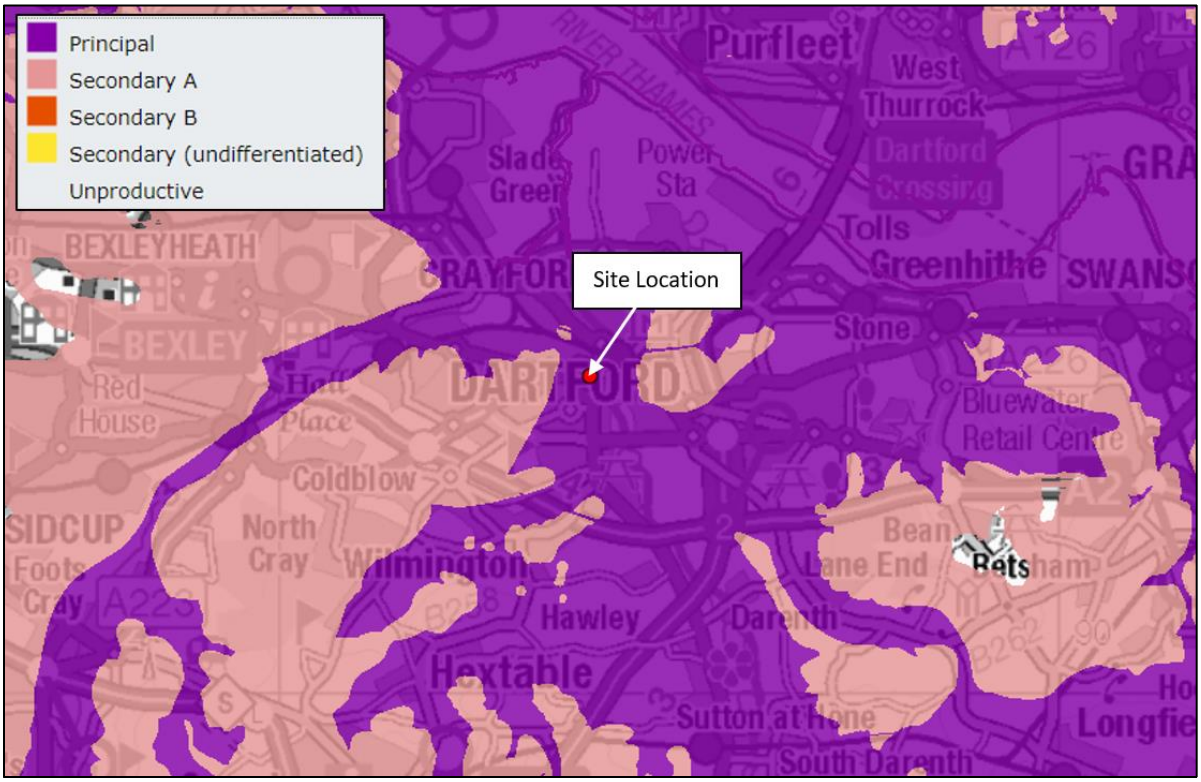


Figure 7: Aquifer Designation of Bedrock Geology, indicating location of site (Source: MagicMap online)

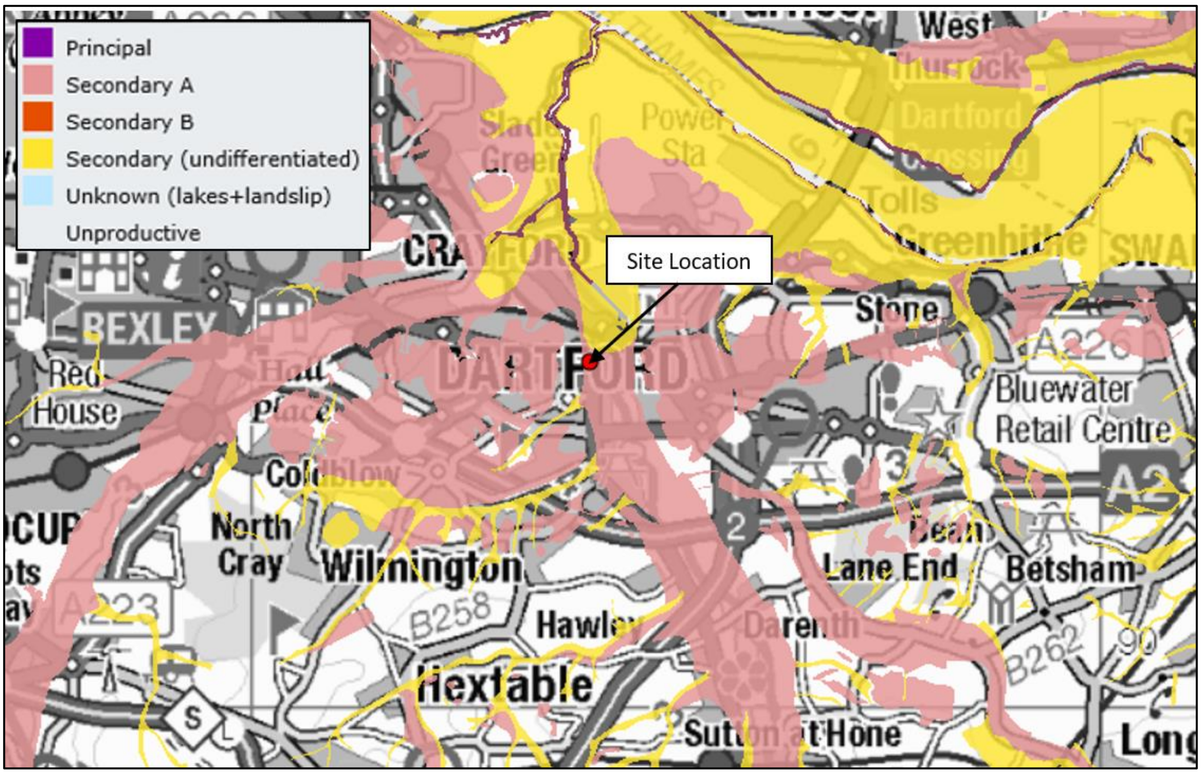


Figure 8: Aquifer Designation Map for Superficial Deposits Geology, indicating the site location (Source: MagicMap)

2.10 Source protection zones are defined around large potable groundwater abstraction sites and indicate the risk of contamination from activities in the vicinity of the abstraction site. As indicated in Figure 9 below, the site is not within an EA Groundwater Source Protection Zone.

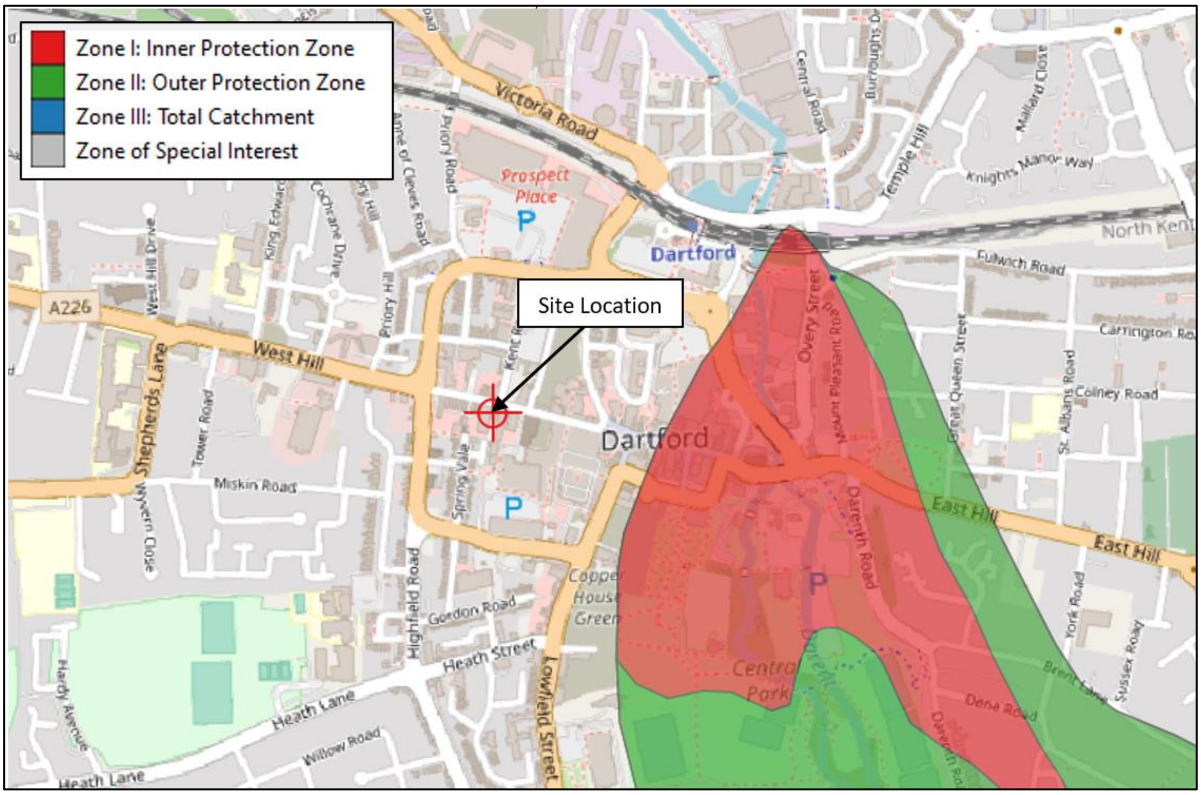


Figure 9: EA Groundwater Source Protection Zones, indicating location of site (Source: MagicMap)

3. Sequential Test/Exception Test

3.1 Under the Flood Risk and Coastal Change Planning Practice Guidance, all new planning applications should undergo a *Sequential Test*. This test should be implemented by local planning authorities with a view to locating particularly vulnerable new developments (e.g. residential, hospitals, mobile homes etc.) outside of the floodplain.

3.2 The Flood Risk and Coastal Change Planning Practice Guidance (PPG) *Sequential Test: Flood Risk Vulnerability and Flood Zone 'Compatibility' Table* is reproduced below;

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	**Zone 1**	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test Required	✓	✓
	Zone 3a	Exception Test Required	✓	×	Exception Test Required	✓
	Zone 3b ***Functional Floodplain***	Exception Test Required	✓	×	×	×

Table 2 The Sequential Test: Flood Risk Vulnerability and Flood Zone 'Compatibility' Table as specified by NPPF. Please note: ✓ means development is appropriate; × means the development should not be permitted.

3.3 The proposed development is 'More Vulnerable' under Table 3 of the Flood Risk and Coastal Change Planning Practice Guidance (PPG) and the National Planning Policy Framework (NPPF) and located in Flood Zone 1 and 2 according to the EA Flood Map for Planning. As such, the proposed development could be considered appropriate, as indicated in Table 2 above.

3.4 The proposed development is for the conversion of the existing offices to provide residential units, so could be considered as a change of use development.

3.5 The revised NPPF states that:

"Applications for some minor developments and ***changes of use should not be subject to the sequential or exception tests*** *but should still meet the requirements for the site-specific flood risk assessments."*

(Source: NPPF)

3.6 Therefore, the proposed development should not be subject to the Sequential Test or the Exception Test.

3.7 As the site and proposed development are located within Flood Zone 1 and 2 and in an area at risk of surface water flooding, the planning application submitted by the client is required to be accompanied by an FRA. This should show that the development can be achieved in a sustainable manner, with an overall reduction of flood risk to the site and the surrounding area.

4. Site Flood Hazards

Sources of Flooding

4.1 The proposed development is located within Flood Zone 1 and 2 (low and medium risk of flooding) and is considered to be 'More Vulnerable' according to NPPF guidelines. Table 3 summarises the potential sources of flooding to the site:

Source	Description
Fluvial	Flood Zone 1 and 2 – River Darent
Tidal	Site is not in an area at risk of tidal flooding
Surface	Main access to site is at high risk Site boundary and car parking area at rear is at medium risk
Groundwater	*'Potential for groundwater flooding of property situated below ground level'*
Sewer	Local area has been affected by sewer flooding in the past

Table 3 Summary of flood sources.

Mechanisms and History of Flooding

4.2 The EA Flood Map for Planning demonstrates the site to be located within Flood Zone 1 and 2 (low and medium risk of flooding). It is important to note that the EA Flood Map for Planning shows only the potential floodplain; the mitigating effects of any flood defences currently in place are not considered.

Fluvial

4.3 The site is in Flood Zone 1 and 2, as indicated in Figure 4, and is thus considered to be in an area at low to medium risk of flooding.

4.4 The nearest watercourse to the site is the River Darent, which is identified by the Environment Agency as a Main River. The River Darent is located approximately 425m east of the site, at its closest proximity, as indicated in Figure 10 below. The River Darent discharges into the River Thames approximately 4km north of the site.

4.5 Ambiental have previously been provided with the Darent and Cray Modelling Study, which was completed in 2019. Modelled flood data has been provided for a range of return periods, for both the defended and undefended scenarios. The site does not benefit from flood defences, according to the EA Flood Map for Planning. Thus, Ambiental have used the model outputs for the undefended scenarios to assess the flood risk posed to the site from the nearby River Darent. The model data indicates that the dominant source of flood risk in this area is fluvial.

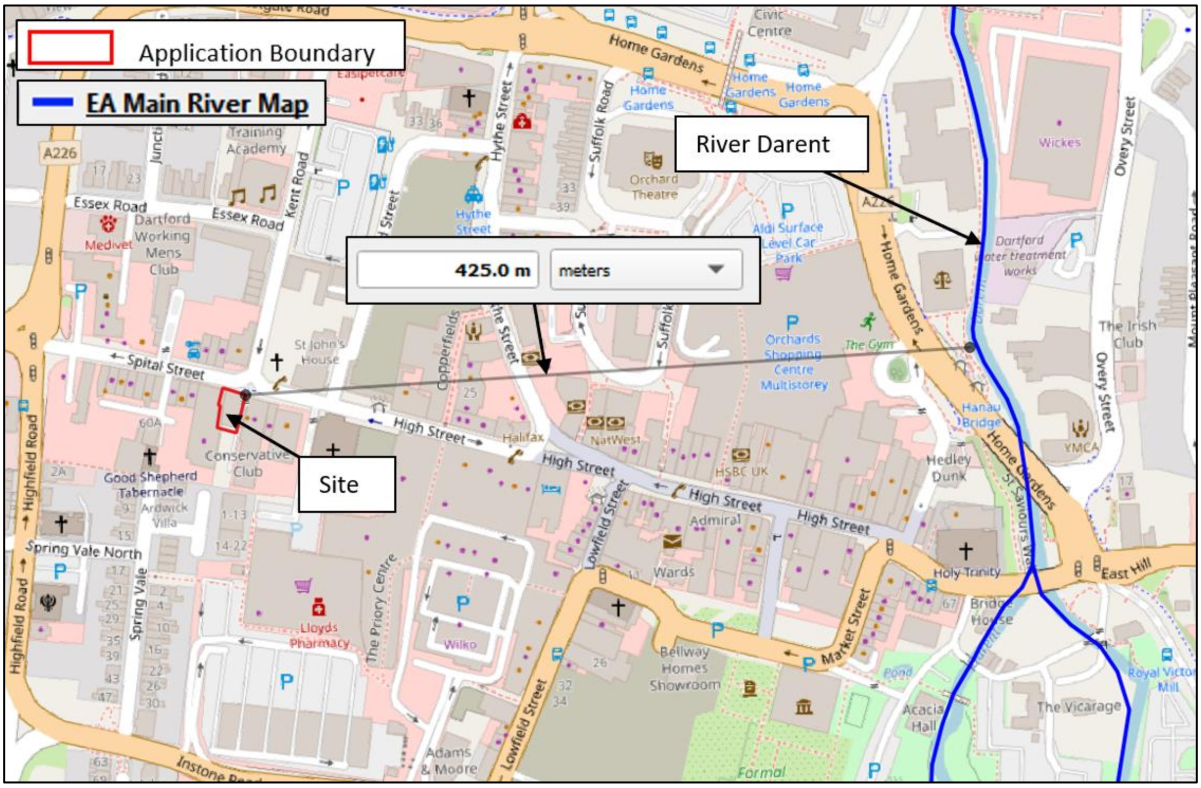


Figure 10: Distance between site and River Darent (Source: EA; OpenStreet map)

Undefended

4.6 The modelled 1 in 100-year and 1 in 1,000-year undefended flood extents are shown in Figure 11. The site is shown to remain unaffected by the modelled 1 in 100-year event and could be affected by flooding in the modelled 1 in 1,000-year event.

4.7 Figure 12 presents a close-up of the modelled 1 in 1,000-year flood extent at the site. It shows that the rear of the site could be affected by a flood level of 6.16mAOD, according to the model outputs provided by the Environment Agency. The lowest topographic levels are at the rear of the site and are approximately 6.0mAOD (EA 2m resolution DTM LiDAR data). When compared with the modelled flood level of 6.16mAOD, it is demonstrated that the rear of the site could be affected by up to 0.16m of flood depths in the 1 in 1,000-year undefended fluvial flood event.

4.8 The proposed flats will be at the ground, first and second floor levels of the existing building.

4.9 Plans provided by the client indicate that the main access to the proposed ground floor flat will be via the front entrance, via Spital Street. Spital Street is not shown to be at risk of fluvial flooding in the 1 in 100-year and 1 in 1,000-year events. The rear of the site is shown to be affected by flooding in the 1 in 1,000-year event. As per the plans, there is an existing entrance at the side of the building. This does not provide access to the proposed ground floor flat. Thus, it is considered that the ground floor flat may not be affected by fluvial flooding.

4.10 The impact of climate change on flood risk at the site has been assessed in Section 5 of this Flood Risk Assessment.

4.11 In the event of an extreme flood occurring, upper floors of the building should be used as safe internal refuge. Site users and residents should also sign up for the EA Flood Warning Service. Further flood mitigation measures should not be required for the proposed conversion of offices to flats.

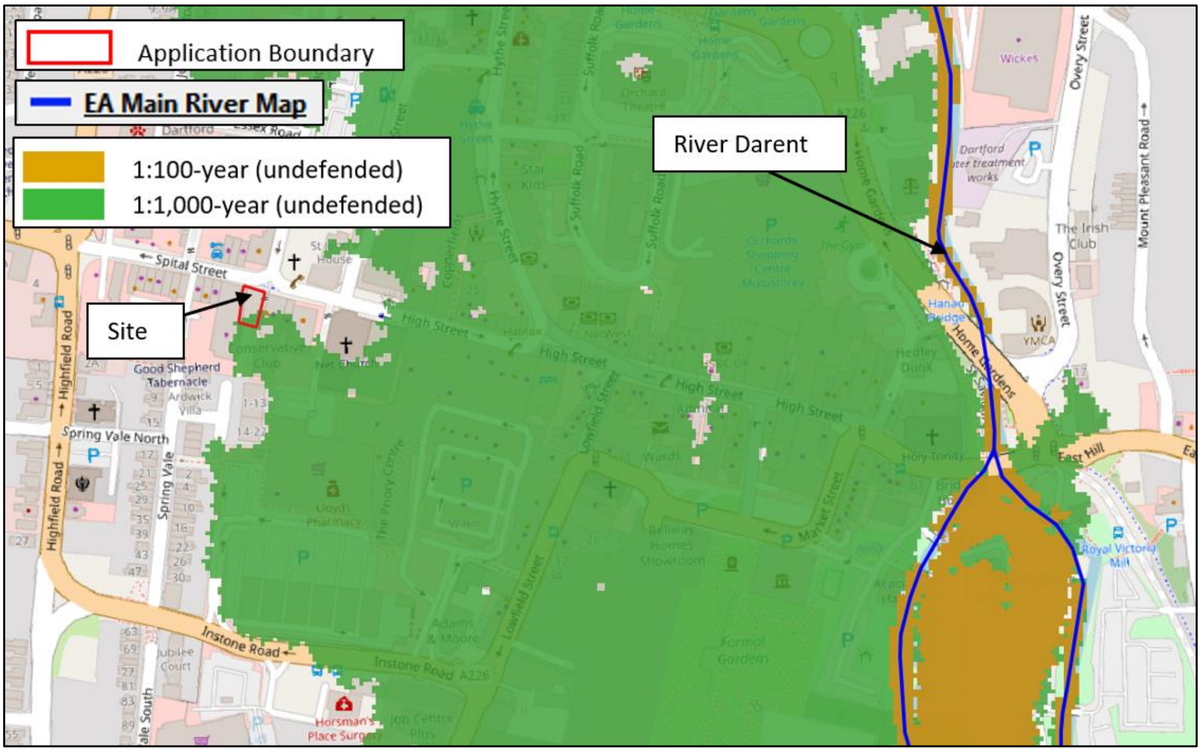


Figure 11: Modelled flood extents for 1:100-year and 1:1,000-year events, showing site boundary (Source: EA; OpenStreet map; Darent and Cray model)

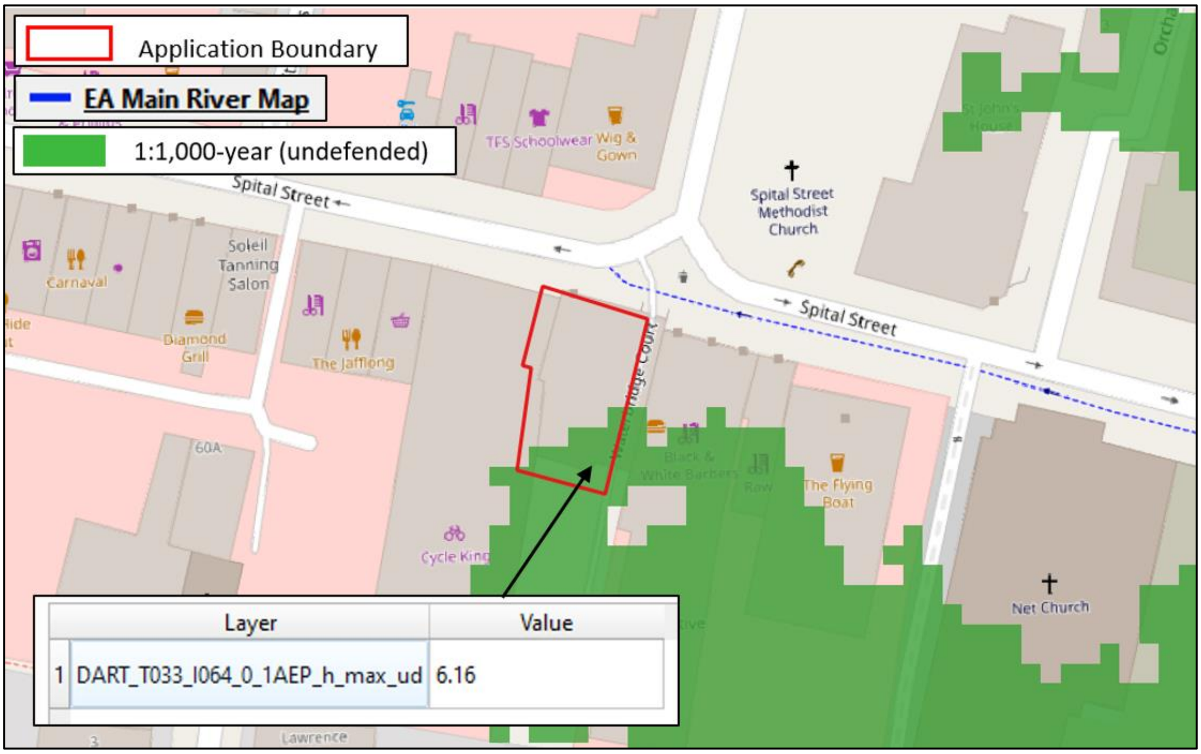


Figure 12: Close-up of 1 in 1,000-year fluvial defended flood event at site (Source: EA: OpenStreet Map)

Surface Water (Pluvial)

4.12 Based on plans of the proposed development, access to the proposed flats will be via the main entrance to the existing building, which is on the northern side and via Spital Street. This is an existing entrance to the building.

4.13 The Environment Agency Flood Risk from Surface Water map (Figure 13) shows Spital Street to be within an area of 'High' risk of flooding from surface water.

4.14 The proposed residential flats at the first and second floor levels should not be at risk of flooding from surface water. However, the ground floor flat and access to the residential flats via the main entrance on Spital Street could be at risk of flooding.

4.15 The following definitions of the annual surface water flood risk classifications are given by the EA:

- 'High Risk'; >3.3% AEP (more often than 1 in 30);
- 'Medium Risk'; 3.3% to 1.1% AEP (between 1 in 30 and 1 in 100);
- 'Low Risk'; 1% to 0.1% AEP (between 1 in 100 and 1 in 1000);
- 'Very Low Risk'; <0.1% AEP (less often than 1 in 1000).

4.16 Using the EA's Risk of Flooding from Surface Water dataset, Spital Street at the entrance to the building is shown to be affected by flooding in all assessed return periods. The modelled flood depths on Spital Street are as follows:

- Up to 150mm on Spital Street, with a small area affected by 300mm to 600mm in front of the existing building in the 1:30-year event (see Figure 14);
- Flood depths range in the 1:100-year year event, with most of Spital Street affected by up to 300mm and some area in front of the existing building affected by between 300mm and 900mm (see Figure 15);
- Most of Spital Street could experience flood depths of up to 300mm, with a small area in front of the building affected by 600mm to 900mm of flood depths (see Figure 16);

4.17 Access to the proposed flats is via the main entrance on Spital Street. Given the surface water flood depths of 300mm on Spital Street in the 1:100-year event, it is recommended that demountable flood barriers 600mm in height are installed at the entrance to the building prior to an extreme rainfall event. This will provide mitigation against the ingress of floodwaters into the proposed ground floor flat and the main entrance/foyer, which provides access to all the proposed residential flats.

4.18 In the EA modelled 1 in 100-year event, there could be flood depths of up to 600mm to the rear of the existing building, in the car parking area, as shown in Figure 15. The rear of the site boundary is shown to be affected by 150mm to 600mm of flood depths in this event.

4.19 During the EA modelled 1:1,000-year surface water flood event, the rear (south) of the site boundary is shown to be affected by flood depths of 300mm to 600mm. The existing car parking area could experience between 600mm and 900mm of flooding. This is shown in Figure 16.

4.20 As per plans provided by the client, it is understood that there will be not be an entrance way provided at the rear of the building, to provide access to the ground floor flat. Furthermore, the existing windows are more than 1m above ground level, based on images of the existing building (see Appendix 1). It is recommended that demountable flood barriers are installed at the rear of the building if there are thresholds, to prevent ingress of surface water into the proposed ground floor flat in the 1:100-year event.

4.21 There is an existing entrance doorway at the side of the building, which provides access to the existing commercial/retail space and offices on the ground floor. The plans provided by the client indicate that this doorway will not be used to access the proposed ground floor flat. This walkway is not affected by flooding in the 1:100-year surface water flood event, so mitigation measures should not be required for surface water flood risk.

4.22 In summary:

- The site boundary is at **medium** risk (affected by 1:100-year event);
- The main access road to the site via Spital Street is at **high** risk (affected in 1:30-year event);
- The car parking area at the rear of the building is at **medium** pluvial flood risk (affected in 1:100-year event).
- The proposed residential units at the first and second floor levels of the existing building should not be at risk of flooding from surface water, as they are above the modelled flood depths in the design 1:100-year event;
- Surface water flood risk to the proposed ground floor flat will be mitigated, by installing demountable barriers at the front entrance and rear of the building during an extreme rainfall event. Also, any airbricks at the rear of the building should have covers;
- Access and egress routes to and from the site during the design 1:100-year surface water flood event have been assessed further in Section 7.

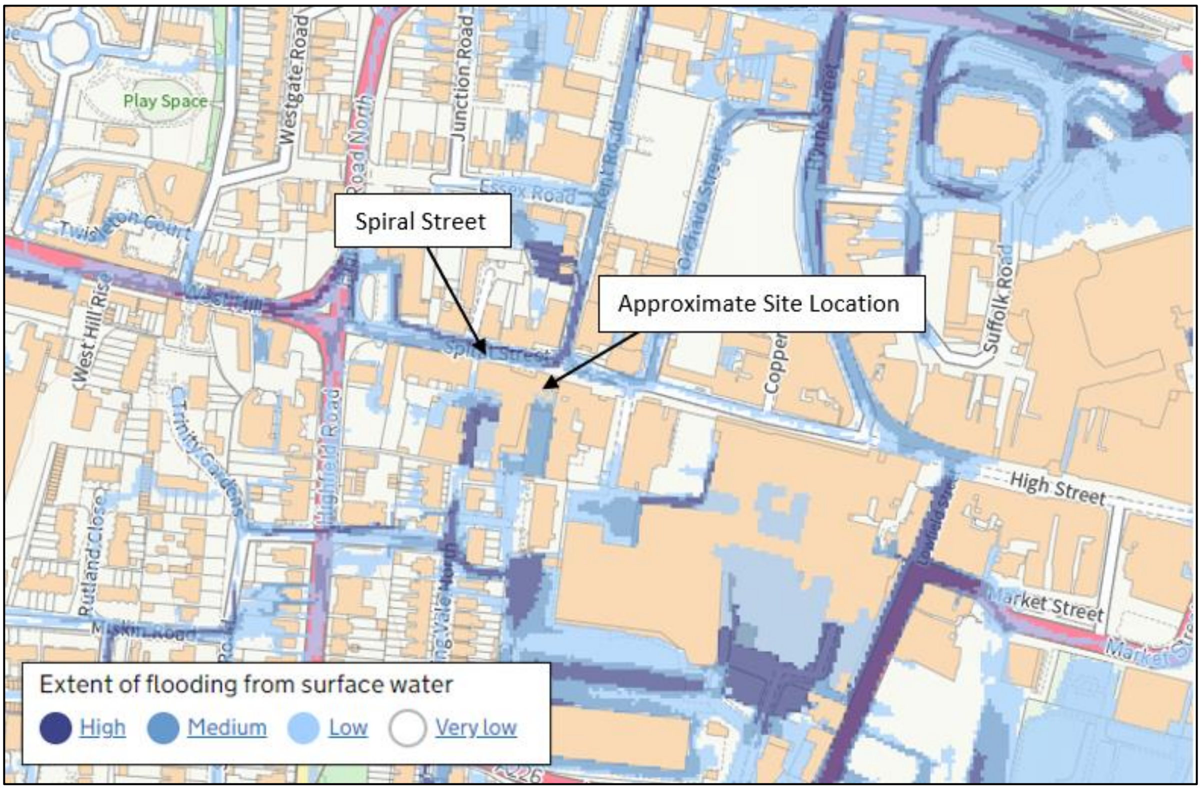


Figure 13: EA Surface Water Flood Risk Map, indicating the location of the site (Source: EA)

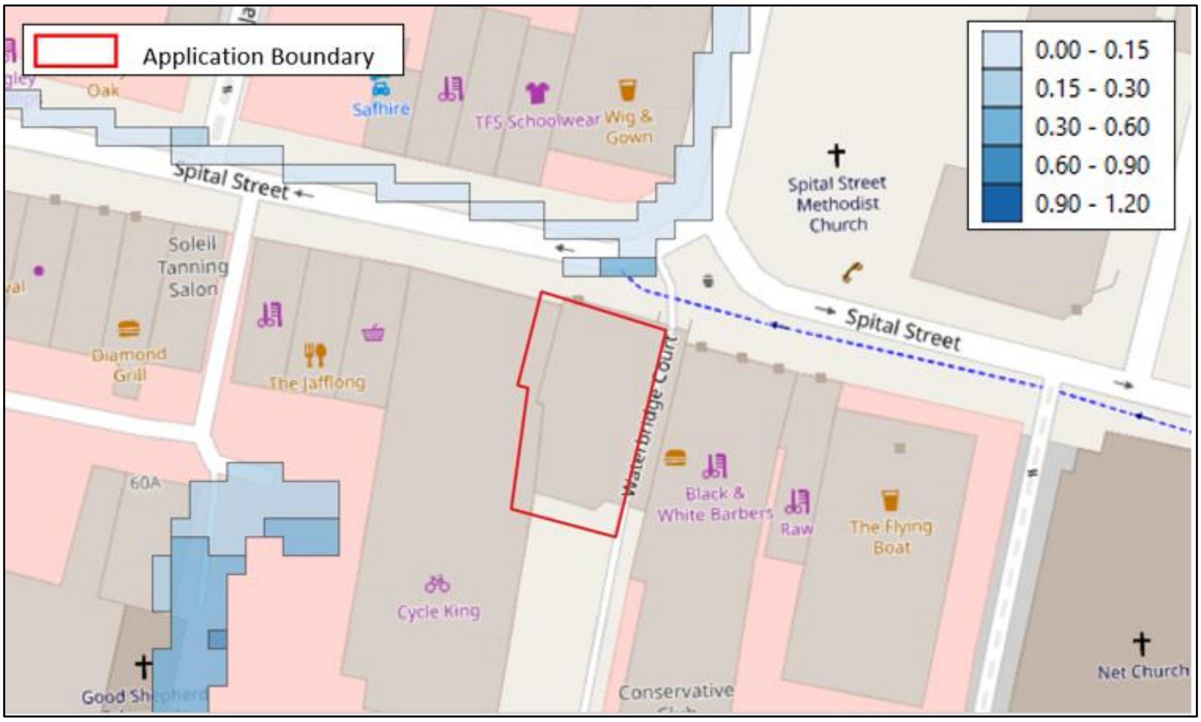


Figure 14: EA RoFSW 1 in 30-year surface water flood depths, indicating the location of the site (Source: EA)

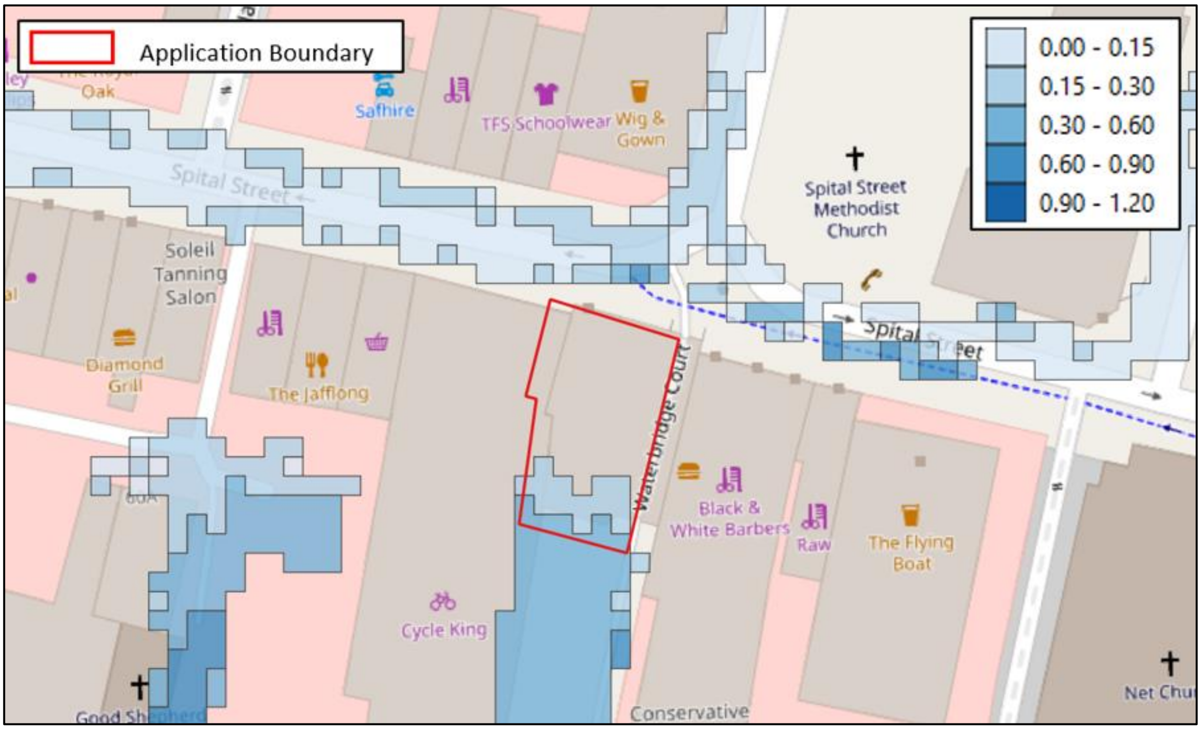


Figure 15: EA RoFSW 1 in 100-year surface water flood depths, indicating the location of the site (Source: EA)

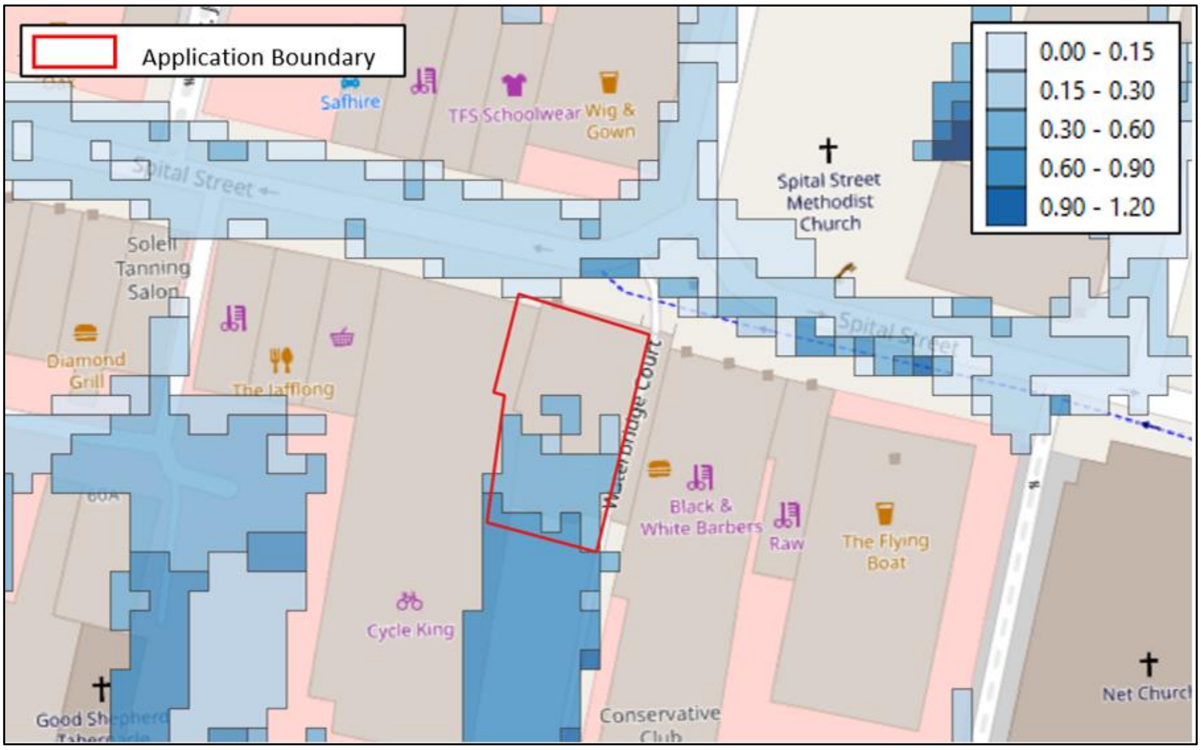


Figure 16: EA RoFSW 1 in 1,000-year surface water flood depths, indicating the location of the site (Source: EA)

Groundwater

4.23 Groundwater flooding usually occurs in low lying areas underlain by permeable rock and aquifers that allow groundwater to rise to the surface through the permeable subsoil following long periods of wet weather. Low lying areas may be more susceptible to groundwater flooding because the water table is usually at a much shallower depth and groundwater paths tend to travel from high to low ground.

4.24 BGS Susceptibility to Groundwater Flooding mapping shown in Figure 17, shows that the site is located in an area identified as having *'Potential for groundwater flooding of property situated below ground level'.*

4.25 The proposed development is for the conversion of the existing ground, first and second floor levels of the building to provide residential units. As such, the residential units should not be affected by any groundwater flood risk.

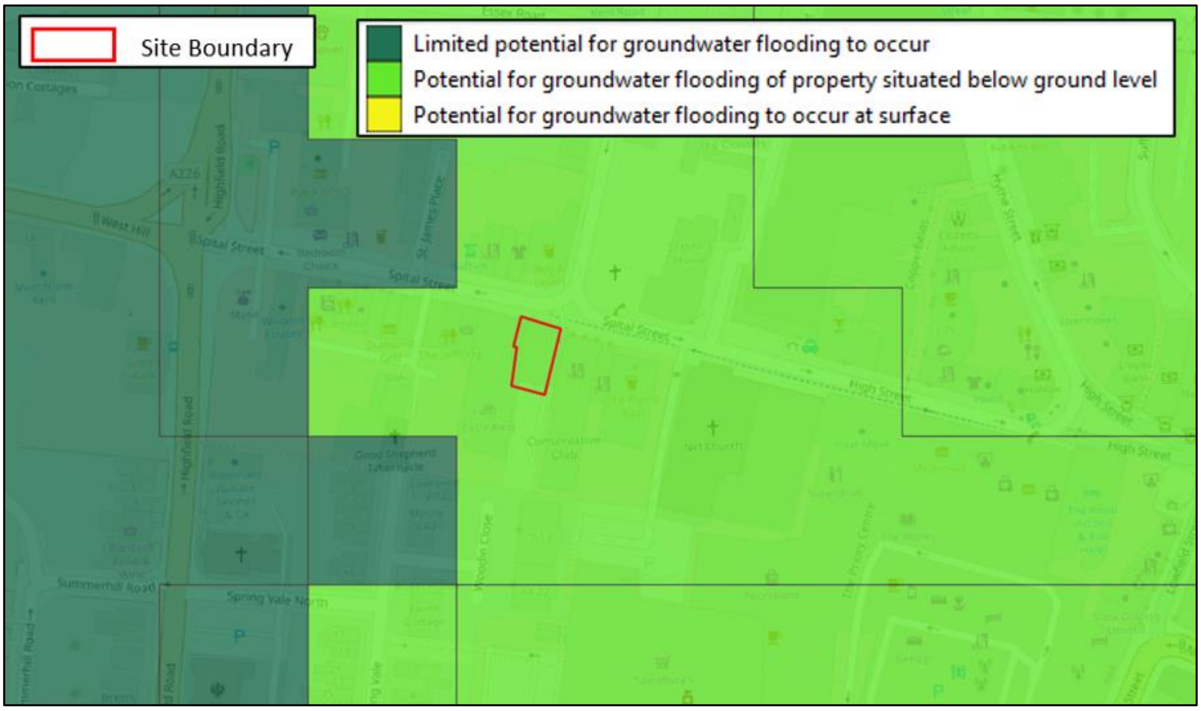


Figure 17: BGS Groundwater Susceptibility Map, indicating location of site (Source: BGS)

Sewer

4.26 The Dartford Surface Water Management Plan (SWMP) was completed by JBA Consulting in 2016. The map shown in Figure 18 shows an extract of the sewer flood mapping included within the SWMP and the approximate location of the site. The site is shown to be in an area which has been affected by 1 to 2 sewer flood incidents in the past. The records of sewer flood incidents date from between 1953 and 2013. Due to the nature of this information, it is not known whether the existing building to be converted has been affected by sewer flooding in the past.

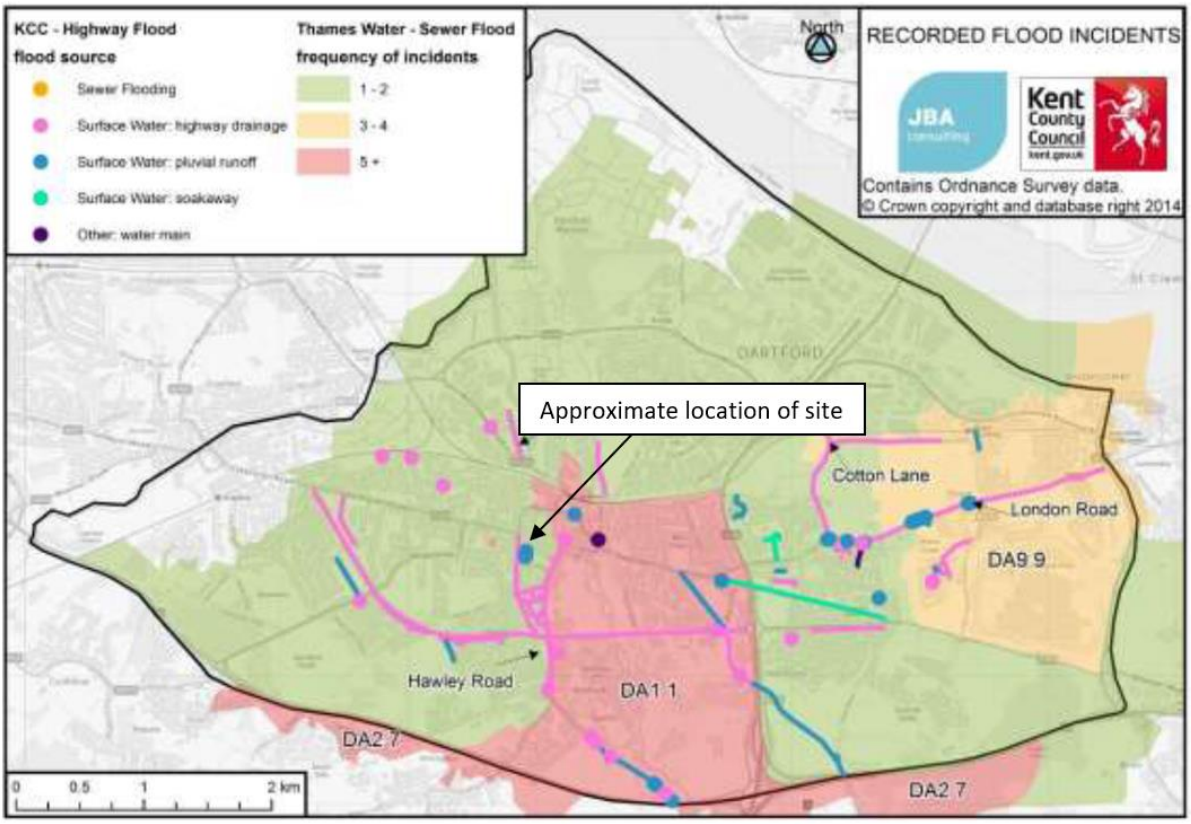


Figure 18: Sewer Flood Map in Dartford SWMP, indicating approximate location of site (Source: Dartford SWMP)

Surface Water Drainage Strategy

4.27 In order to mitigate flood risk posed by the development, adequate control measures are required to be considered. This will ensure that surface water runoff is dealt with at its source and the flood risk on/off site is not increased over the lifetime of the development.

4.28 Under the NPPF, following development, surface water runoff rates should be equivalent to (or below) the existing site run-off rate for all events up to the 1 in 100-year storm event, with an allowance for climate change.

4.29 The site currently comprises of a mixed use (commercial/retail and offices), three-storey building with a basement level. It is understood that the development is for the conversion of the existing ground, first and second floor office space to create residential dwellings. The development is for internal works only.

4.30 As such, the roof area and impermeable surface area will remain unchanged post-development and when compared to the existing situation. Thus, there should be no changes to the amount of surface water runoff generated on site following an extreme rainfall event. It is considered that the existing building is positively drained, so surface water runoff should continue to be discharged and attenuated via the existing drainage infrastructure.

Records of Historical Flooding

4.31 According to the EA historic flood data, the site lies outside the historic flood extent for the 1968 event, which occurred as a result of channel capacity exceedance (no raised defences at this time). This is shown in Figure 19 below.

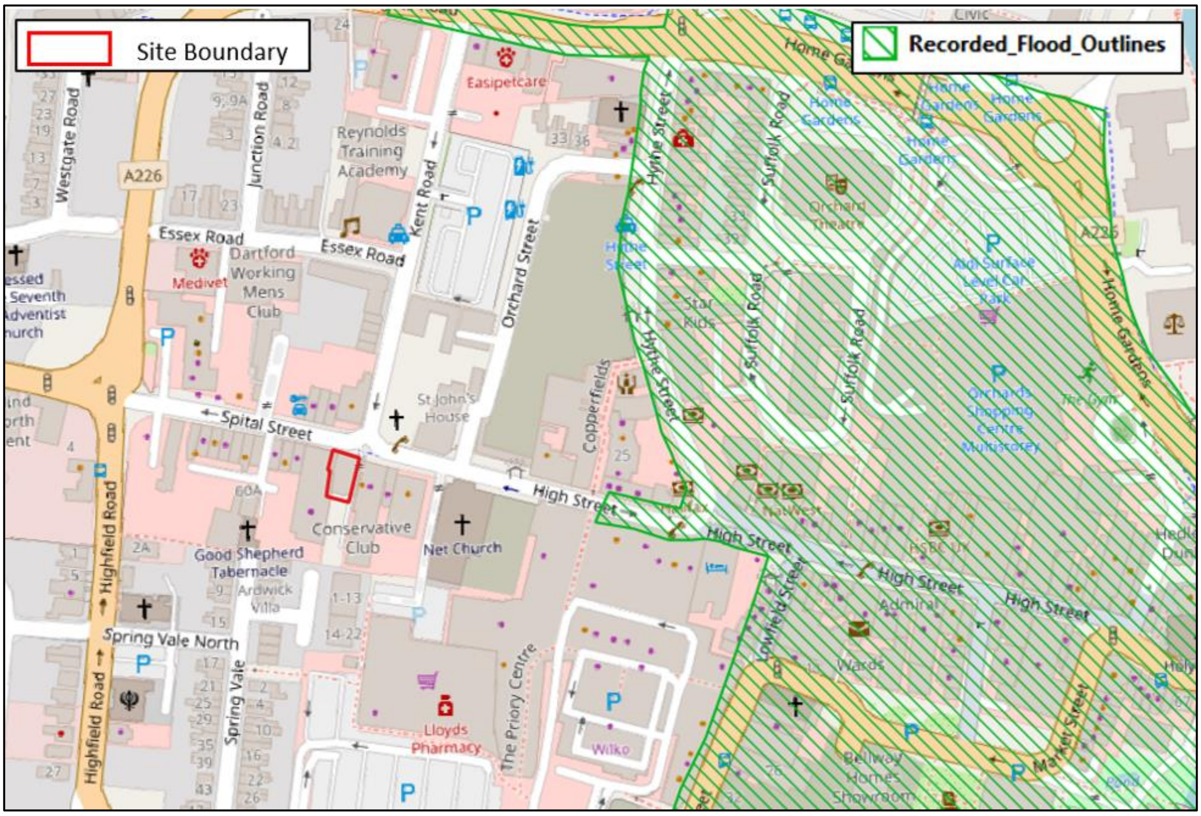


Figure 19: EA Historic Flood Map, indicating the location of site (Source: EA)

5. Probability of Flooding

Flood Zones

5.1 According to the EA Flood Map for Planning, the site is located within Flood Zone 1 and 2 (low and medium risk of flooding).

5.2 The EA Flood Map for Planning has been produced in part using a relatively coarse, national scale flood modelling strategy, and in part by detailed modelling. It is important to note that only the potential floodplain is modelled; **the mitigating effects of any flood defences currently in place are not considered**. For reference, the definition of the NPPF flood risk zones is included below.

Zone	Description
1	**Low Probability.** This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).
2	**Medium Probability.** This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% – 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% – 0.1%) in any year.
3a	**High Probability.** This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.
3b	**The Functional Floodplain.** This zone comprises land where water has to flow or be stored in times of flood. SFRA's should identify this Flood Zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the EA, including water conveyance routes).

Table 4 Definition of the NPPF Flood Zones. (Source: EA)

Climate Change on Site

5.3 Climate change is likely to increase the flow in rivers, raise sea levels and increase storm intensity. The range of allowances in *Table 5* is based on percentiles. A percentile is a measure used in statistics to describe the proportion of possible scenarios that fall below an allowance level. The 50th percentile is the point at which half of the possible scenarios for peak flows fall below it and half fall above it.

5.4 The:

- central allowance is based on the 50th percentile
- higher central is based on the 70th percentile
- upper end is based on the 90th percentile

5.5 So, if the central allowance is 30%, scientific evidence suggests that it is just as likely that the increase in peak river flow will be more than 30% as less than 30%.

5.6 At the higher central allowance, 70% of the possible scenarios fall below this value. So, if the higher allowance is 40%, then current scientific evidence suggests that there is a 70% chance that peak flows will increase by less than this value, but there remains a 30% chance that peak flows will increase by more (Source: EA).

5.7 The risk of flooding to the site would, therefore, be expected to increase following the effects of climate change. The likely increases in peak rainfall intensity would also lead to an increased risk of surface water flooding. The increase in river flows for the Thames river basin has been provided below in *Table 6*.

Flood Zone	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
1	Central	Central	Central	Central	None
2	Upper End	Higher Central and Upper End	Higher Central and Upper End	Central and Higher Central	Central
3a	Upper End	Development should not be permitted	Higher Central and Upper End	Central and Higher Central	Central
3b	Upper End	Development should not be permitted	Development should not be permitted	Development should not be permitted	Central

Table 5: Allowance and Flood Zone Table (Source EA)

Allowance category	Total potential change anticipated for the 2020's (2015 to 2039)	Total potential change anticipated for the 2050's (2040 to 2069)	Total potential change anticipated for the 2080's (2070 to 2115)
H++	25%	40%	80%
Upper end	25%	35%	70%
Higher central	15%	25%	35%
Central	10%	15%	25%

Table 6: Peak river flow allowances for the Thames River Basin district (Source EA)

5.8 The proposed development is 'More Vulnerable' under the Flood Risk and Coastal Change PPG and the NPPF. The site is in Flood Zone 1 and 2.

5.9 With reference to Table 5, 'More Vulnerable' developments in Flood Zone 2 should consider the 'Higher Central' and 'Upper End' allowances. For the Thames basin, this equates to an increase in peak flows of +35% and +70%, respectively.

5.10 Ambiental have previously been provided with the Darent and Cray Modelling Study, which was completed in 2019. It is considered that this model should use the latest EA climate change allowances, which were updated in 2016 for fluvial flood risk. On this basis, the modelled outputs from this study have been used to assess the potential impact of climate change on flood risk at the site.

5.11 The site does not benefit from flood defences according to the EA Flood Map for Planning. Thus, the undefended climate change model outputs have been used to assess flood risk in the climate change events.

5.12 Figure 20 shows the modelled flood extents for the 1 in 100-year +35%CC and +70%CC fluvial events. The site is demonstrated to be outside the modelled flood extents for both assessed climate change scenarios. Thus, it could be considered that the proposed flats could be safe for their lifetime (100 years).

5.13 This analysis has, however, demonstrated that road networks to the east of the site could be affected by flooding in the future, because of climate change. Residents will therefore need to sign up to the EA Flood Warning Service for this area.

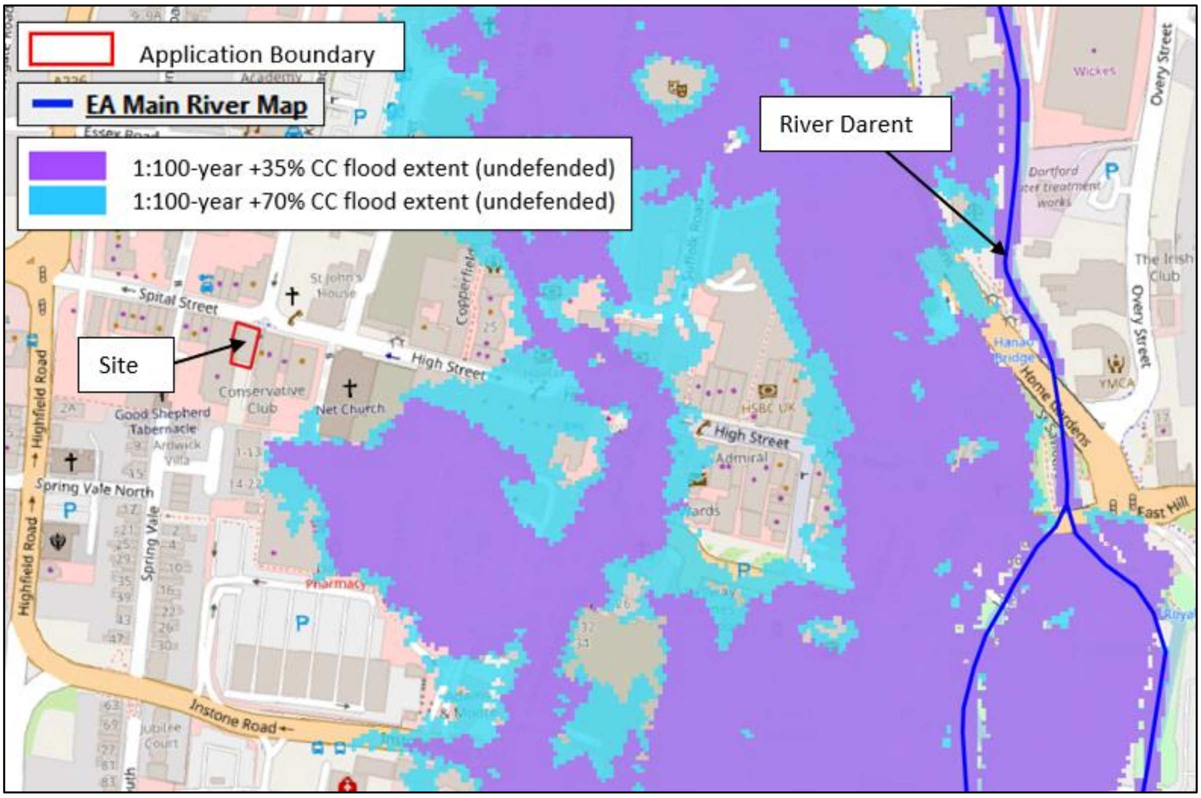


Figure 20: Modelled flood extents for 1:100-year +35%CC and +70% CC events (Source: EA; OpenStreet map; Darent and Cray model)

6. Residual Risks

Identification of Residual Risks

6.1 Residual risks are those remaining after applying the sequential approach to the location of development and taking mitigating actions. Examples of residual flood risk include:

- the failure of flood management infrastructure such as a breach of a raised flood defence, blockage of a surface water conveyance system, overtopping of an upstream storage area, or failure of a pumped drainage system;
- failure of a reservoir, or;
- a severe flood event that exceeds a flood management design standard, such as a flood that overtops a raised flood defence, or an intense rainfall event which the drainage system cannot cope with.

Defence Breach

6.2 The site is in Flood Zone 1 and 2 and does not benefit from flood defences according to the EA Flood Map for Planning (see Figure 4).

6.3 Thus, there is no residual risk of flooding to the site in the event of breach or failure of flood defences.

Reservoir Failure

6.4 The online EA Flood Risk from Reservoir Map (Figure 21) demonstrates that the site is outside flood extents in the event of reservoir flooding.

Figure 21: EA Flood Risk from Reservoir map, showing location of site (Source: EA)

Drainage Exceedance

6.5 In the event of drainage failure/exceedance, overland flows would be dictated by site topography. Given that the proposal is for the partial conversion of the existing building, the proposed residential flats should not be affected by drainage exceedance. Any overland flows would be directed as per the existing situation.

7. Flood Risk Management Measures

Flood Risks

7.1 The site currently comprises of a mixed use (commercial/retail and offices), three-storey building with a basement level. It is understood that the development is for the conversion of the existing ground, first and second floor office space to create residential dwellings.

7.2 The site is in Flood Zones 1 and 2, according to the EA Flood Map for Planning (see Figure 4).

7.3 Ambiental have assessed the fluvial undefended model outputs provided in the Darent and Cray Modelling Study (2019). It has been demonstrated that the site is unaffected by the modelled fluvial flood extents for the 1 in 100-year, 1 in 100-year +35% (Higher Central climate change) and 1 in 100-year +70% (Upper End climate change) events; however, the rear of the site could be affected by a flood level of 6.16mAOD in the modelled 1 in 1,000-year event, resulting in flood depths of up to 0.16m.

7.4 Surface water flood risk is summarised as follows:

- The site boundary is at **medium** risk (affected by 1:100-year event);
- The main access road to the site via Spital Street is at **high** risk (affected in 1:30-year event);
- The car parking area at the rear of the building is at **medium** pluvial flood risk (affected in 1:100-year event).
- The proposed residential units at the first and second floor levels of the existing building should not be at risk of flooding from surface water, as they are above the modelled flood depths in the design 1:100-year event;
- Surface water flood risk to the proposed ground floor flat will be mitigated, by installing demountable barriers at the front entrance and rear of the building during an extreme rainfall event. Also, any airbricks at the rear of the building should have covers;
- Safe access and egress to and from the site can be achieved in the modelled 1:100-year surface water flood event, via the main front entrance at Spital Street. Access via the rear of the site should be avoided in an extreme rainfall event, where possible.

7.5 It is recommended that site users and residents of the proposed flats sign up to the EA Flood Warning Service and keep themselves informed on weather updates for this area.

Flood Warning Service

7.6 It is recommended that residents are aware of the EA Flood Information service which identifies whether any flood warnings or alerts have been issued for a specific postcode or place in England or Wales: https://flood-warning-information.service.gov.uk/.

7.7 During periods of bad weather, site users should monitor local weather reports and sign up for the Met Office UK weather warnings. Warnings can be monitored through an Apple/Android app, Twitter or directly via emails. Further information can be found at https://www.metoffice.gov.uk/.

7.8 The EA operates a 24-hour telephone service on 0345 988 1188 that provides frequently updated flood warnings and associated floodplain information. Further information can be found on www.environment-agency.gov.uk/floodline. Floodline Warnings Direct is a free service operated by the EA that provides flood warnings direct to occupants by telephone, mobile phone, fax or pager.

7.9 The proposed development site is located within an EA Flood Warning Service Area, as shown in Figure 22. As such, it is recommended that site users sign up to this service.

7.10 Upon receipt of a Flood Warning, site users are advised to evacuate the site to a designated place of safe refuge within Flood Zone 1.

7.11 If flood waters along the proposed evacuation route have exceeded 25cm, site users are advised, if possible, to seek refuge at the upper floors on site.

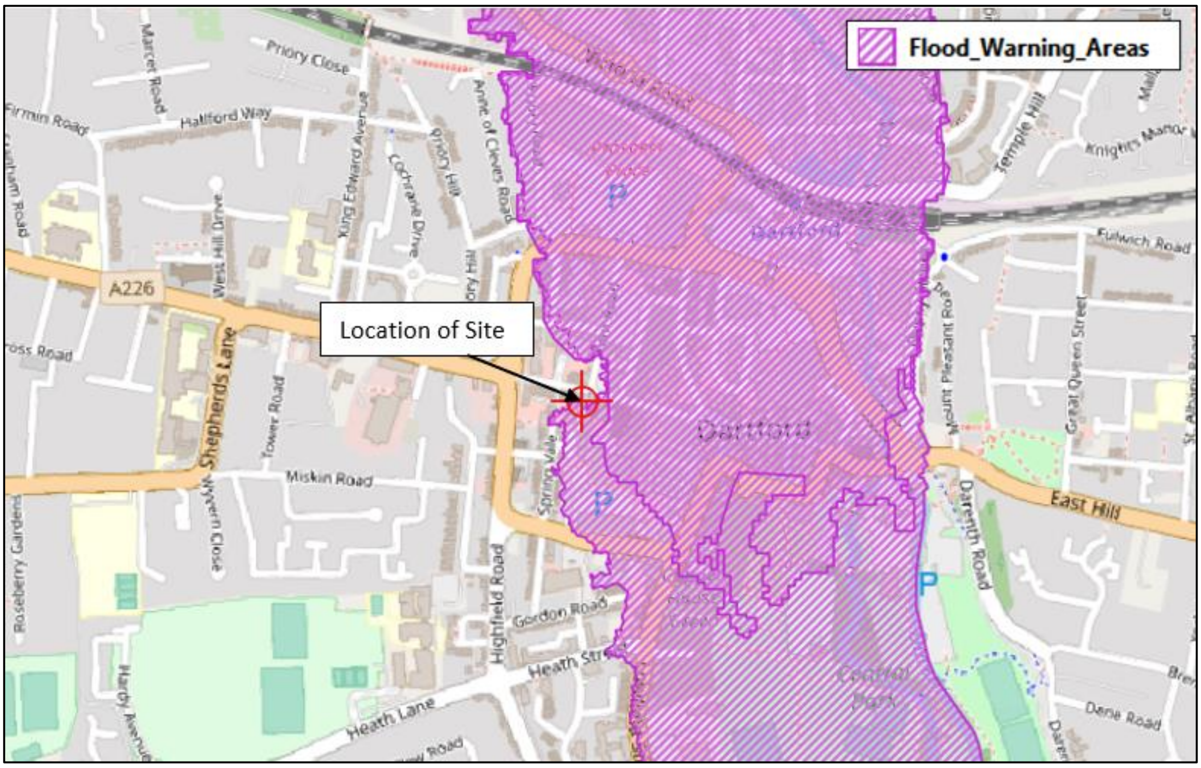


Figure 22: EA Flood Warning Area, showing location of site (Source: EA)

What to do if you receive a **Flood Alert**

7.12 A flood alert means you need to prepare, flooding is possible. You should:

- check your flood risk - https://flood-warning-information.service.gov.uk/long-term-flood-risk
- sign up for flood warnings - https://www.gov.uk/sign-up-for-flood-warnings
- keep up to date with the latest situation - call Floodline on 0345 988 1188 or follow @EnvAgency and #floodaware on Twitter for the latest flood updates
- have a bag ready with vital items like insurance documents and medications in case you need to leave your home
- check you know how to turn off your gas, electricity and water mains supplies
- plan how you'll move family and pets to safety

What to do if you receive a **Flood Warning**

7.13 A flood warning means you need to act, flooding is expected. You should do all the actions for a flood alert but also:

- move vehicles to higher ground if it's safe to do so
- move family and pets to safety
- move important items upstairs or to a safe place in your property, starting with cherished items and valuables, then furniture and furnishings
- turn off gas, electricity and water supplies if it's safe to do so; never touch an electrical switch if you're standing in water
- if you have property protection products such as flood barriers, or air brick covers, use them now
- keep track of the latest situation - https://flood-warning-information.service.gov.uk/warnings

What to do if you receive a **Severe Flood Warning**

7.14 A severe flood warning means there is danger to life: you must act now:

- call 999 if you're in immediate danger
- follow advice from the emergency services and evacuate if you're told to do so
- make sure you have an emergency kit including a torch, spare batteries, mobile phone and charger, warm clothes, important numbers like your home insurance, water, food, first aid kit and any medicines and baby care items you may need
- alert neighbours and offer help if it's safe to do so
- avoid driving or walking through flood water: just 30cm (1 foot) of fast flowing water could move your car and even shallow moving water can knock you off your feet
- keep your family and pets away from floodwater – it may contain heavy debris, sharp objects, open manhole covers, sewage and chemicals
- wash your hands if you've been in contact with flood water which may contain toxic substances

Access/Egress

7.15 As previously discussed in the report, Spital Street in front of the site is at high risk of surface water flooding and could be affected by up to 300mm of flood depths in the 1:100-year surface water flood event. As such, Ambiental have assessed the surface water hazard grids for the 1:100-year event, provided within the EA's Risk of Flooding from Surface Water dataset. This is in accordance with guidance set out in DEFRA's Flood Risk to People document.

7.16 The hazard grids in the modelled 1 in 100-year pluvial flood event indicate that the hazard ratings along the main access road to the site, Spital Street, and other road networks north of the site could be less than 0.75 (see Figure 23). This corresponds with the 'Very low hazard - Caution' rating, as indicated in Table 7 below. Figure 23 also indicates that there is a hazard rating of 0.75 to 1.25 and 1.25 to 2.0 at the rear of the site, in the existing car parking area. These ratings correspond with a 'Danger for Some – includes children, the elderly and the infirm' and 'Danger for most – includes the general public', respectively.

7.17 This demonstrates that safe access and egress to and from the site can be achieved in the modelled 1:100-year surface water flood event, via the main front entrance at Spital Street. Access via the rear of the site should be avoided in an extreme rainfall event, where possible.

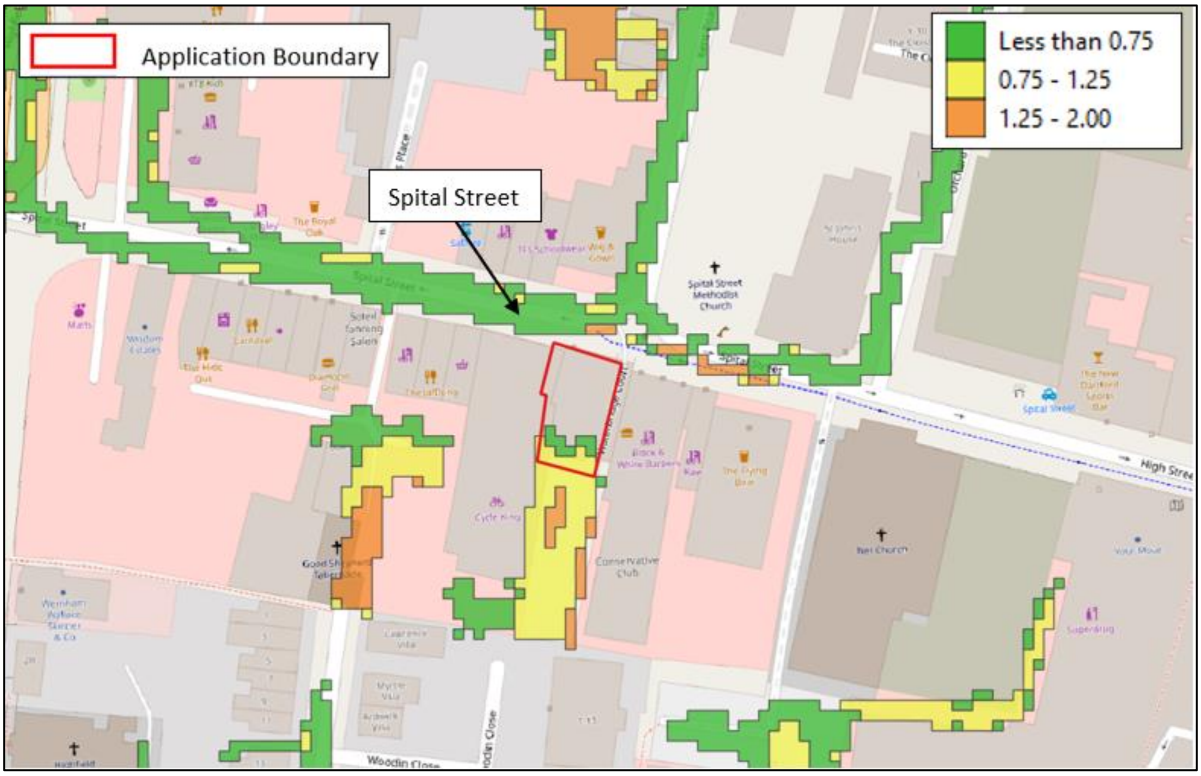


Figure 23: EA RoFSW Modelled hazard grids for 1:100-year surface water event (Source: EA)

Flood Hazard	Colour	Hazard to People Classification	
Less than 0.75		Very low hazard	- Caution
0.75 to 1.25		Danger for some	- includes children, the elderly and the infirm
1.25 to 2.0		Danger for most	- includes the general public
More than 2.0		Danger for all	- includes the emergency services

Table 7: Flood hazard classifications, according to DEFRA's Flood Risk to People document

8. Off Site Impacts

Impact to Flood Risk Elsewhere

8.1 The proposal is for the conversion of the existing ground, first and second floor offices to create flats. There will be no change in built footprint as a result of this development. As such, there should be no displacement of floodwaters.

Generation of Runoff

8.2 In order to mitigate flood risk posed by the development, adequate control measures are required to be considered. This will ensure that surface water runoff is dealt with at its source and the flood risk on/off site is not increased over the lifetime of the development.

8.3 Under the NPPF, following development, surface water runoff rates should be equivalent to (or below) the existing site run-off rate for all events up to the 1 in 100-year storm event, with an allowance for climate change.

8.4 The site currently comprises of a mixed use (commercial/retail and offices), three-storey building with a basement level. It is understood that the development is for the conversion of the existing ground, first and second floor office space to create residential dwellings. The development is for internal works only.

8.5 As such, the roof area and impermeable surface area will remain unchanged post-development and when compared to the existing situation. Thus, there should be no changes to the amount of surface water runoff generated on site following an extreme rainfall event. It is considered that the existing building is positively drained, so surface water runoff should continue to be discharged and attenuated via the existing drainage infrastructure.

9. Conclusion

9.1 Ambiental Environmental Assessment has been appointed by Atlanta Trust Ltd to undertake a National Planning Policy Framework (NPPF) compliant Flood Risk Assessment (FRA) for the proposed development at 50 Spital Street, Dartford, DA1 2DX.

9.2 The site currently comprises of a mixed use (commercial/retail and offices), three-storey building with a basement level. It is understood that the development is for the conversion of the existing ground, first and second floor office space to create residential dwellings.

9.3 With reference to the Environment Agency (EA) Flood Map for Planning, the proposed development is located within Flood Zone 1 and 2. The proposed development is considered "More Vulnerable" under Table 2 of the Flood Risk and Coastal Change Planning Practice Guidance and the principles of the National Planning Policy Framework (NPPF).

9.4 Ambiental have assessed the fluvial undefended model outputs provided in the Darent and Cray Modelling Study (2019). It has been demonstrated that the site is unaffected by the modelled fluvial flood extents for the 1 in 100-year, 1 in 100-year +35% (Higher Central climate change) and 1 in 100-year +70% (Upper End climate change) events; however, the rear of the site could be affected by a flood level of 6.16mAOD in the modelled 1 in 1,000-year event, resulting in flood depths of up to 0.16m.

9.5 Surface water flood risk to the site and proposed development is summarised as follows:

- The site boundary is at **medium** risk (affected by 1:100-year event);
- The main access road to the site via Spital Street is at **high** risk (affected in 1:30-year event);
- The car parking area at the rear of the building is at **medium** pluvial flood risk (affected in 1:100-year event);
- The proposed residential units at the first and second floor levels of the existing building should not be at risk of flooding from surface water, as they are above the modelled flood depths in the design 1:100-year event;
- Surface water flood risk to the proposed ground floor flat could be mitigated, by installing demountable barriers at the front entrance and rear of the building during an extreme rainfall event. Also, any airbricks at the rear of the building should have covers;
- Safe access and egress to and from the site can be achieved in the modelled 1:100-year surface water flood event, via the main front entrance at Spital Street. Access via the rear of the site should be avoided in an extreme rainfall event, where possible.

9.6 It is recommended that site users and residents of the proposed flats sign up to the EA Flood Warning Service and keep themselves informed on weather updates for this area.

9.7 In summary:

- The proposed development is for the conversion of the existing ground, first and second floor offices to provide residential dwellings;
- This development is for internal works only and will not change the impermeable surface areas or roof area of the existing building;
- The site is in Flood Zone 1 and 2 (low to medium risk of fluvial flooding);

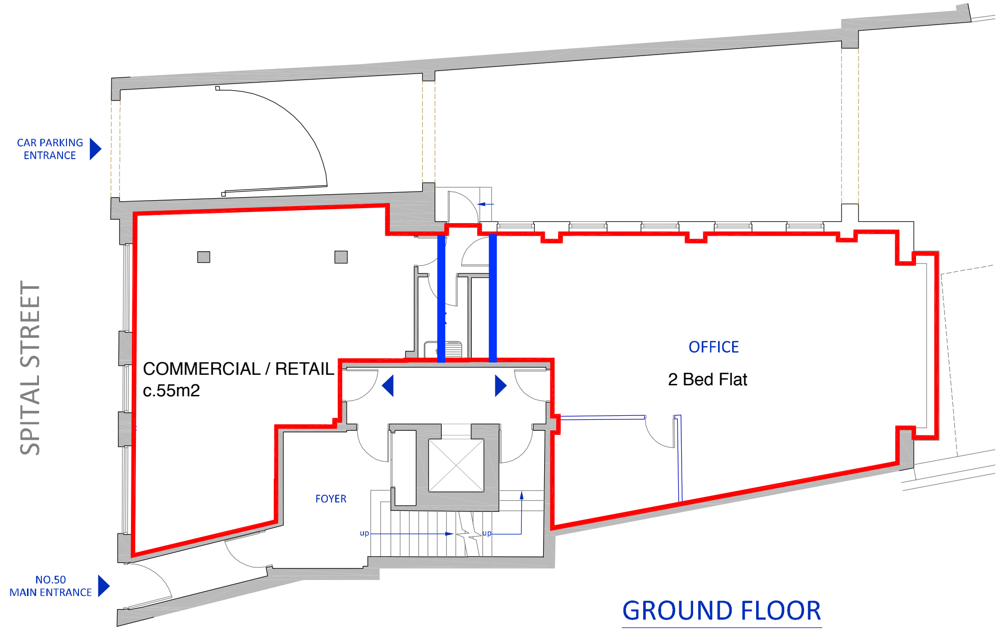
- The site is unaffected by flooding in the 1:100-year, 1:100-year +35% and 1:100-year +70% fluvial flood events (undefended);
- Spital Street, the main access road to the site, is at high risk of surface water flooding. Analysis of the Environment Agency's hazard grids shows a 'Very Low Hazard' on Spital Street, so access and egress should be achievable in the 1:100-year surface water flood event;
- Demountable flood barriers should be installed at the main entrance and rear of the building, to prevent ingress of surface water floodwaters into the proposed ground floor flat and foyer;
- Any airbricks at the rear of the building should have covers, to prevent ingress of floodwaters to the proposed ground floor flat;
- Residents should sign up to the EA Flood Warning Service and keep themselves informed on weather updates for this area.

Following the guidelines contained within the NPPF, the proposed development could be considered suitable assuming appropriate mitigation (including adequate warning procedures) can be maintained for the lifetime of the development.

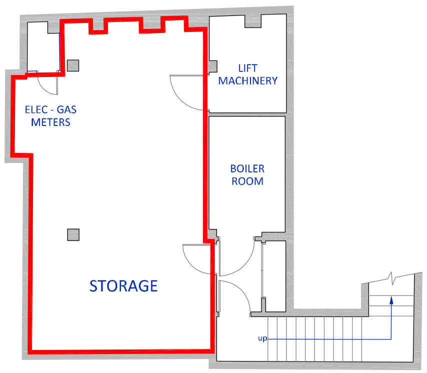
Appendix I - Site Plans

Ambiental Environmental Assessment
Sussex Innovation Centre,
Science Park Square,
Brighton, BN1 9SB

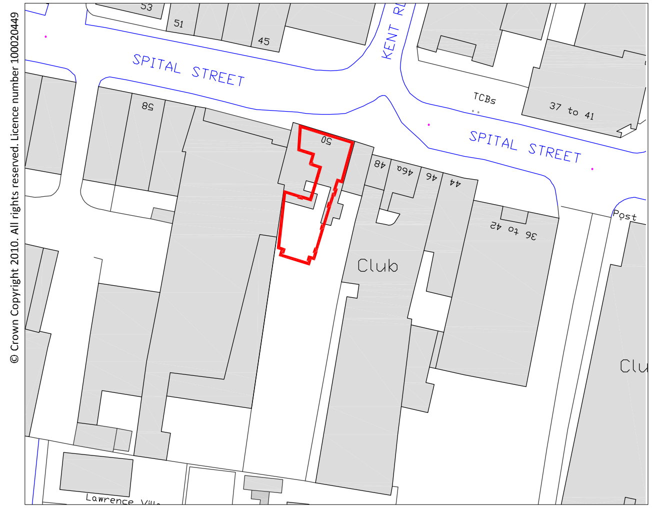
PLEASE NOTE - A3 PLANS TO BE PRINTED "AS IN DOCUMENT" NOT ENLARGED OR SHRUNK TO FIT PAGE



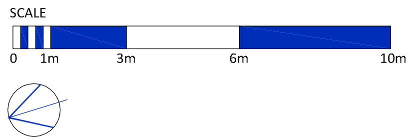
GROUND FLOOR



BASEMENT



LOCATION PLAN
SCALE 1:1250
NORTH



NORTH

PLAN LONDON LTD© COPYRIGHT PROTECTED 2011

client	address	location	date	scale	sheet
	WATERBRIDGE COURT 50 SPITAL STREET DARTFORD DA1 2DT	BASEMENT AND GROUND FLOOR LEASE PLAN	12.10.2011	1:200	A3
			dwg no.	revision	drawn / checked
			PL4135-01		MZ / SB

Plan London
Tel | 0845 2262776
www.plan-london.co.uk
29-35 Lordship Lane | London | SE22 8EW

FIRST FLOOR

SECOND FLOOR

0 2.5 5 m

P0S Proposed Floor Plans 1:50 @ A1, 1:100 @ A3

NOTE:

Architectural Information - the level of detail shown on the drawings is relative to the submission of a PLANNING APPLICATION.
The drawings should therefore not be used for any other purpose without both the prior the agreement of the architect, and subsequent checking / development by others
Dimensions and setting out - should be checked on site; see above

Structure & Construction – these drawings, unless expressly noted otherwise, have not been fully coordinated with a Structural Engineer's input and show indicative construction build-up only

Building Control - the client / the contractor will liaise directly with Local Authority to ensure the project is completed in accordance with the Building Regulations

Planning - the client/ the contractor will ensure that the project is completed in accordance with the approved Planning drawings and take responsibility for the discharge of any planning conditions

Party Walls & Rights to Light – the client/ the contractor will ensure that any notices and consents required are obtained before work commences

Freeholder / Leaseholder / Restricted covenants / Easement approvals - the client will ensure that any notices and consents required are obtained before work commences

Archaeological & Ecological – the client/ the contractor will ensure that any notices and consents required are obtained before work commences

NOTE:
Glazing Allowances will need to be negotiated with Building Control as per Approved Document L1B Conservation of Fuel and Power

Areas provided on drawings are rounded to the nearest whole unit. Measurements are based upon received survey information and as such a reasonable allowance should be made for discrepancies or deviations that may occur during construction.

Revisions

No.	Description	Date

PROPOSED

Note: Do not scale from this drawing. All dimensions to be checked on site by the contractor and to be his responsibility.

Arcvelop Ltd.
1 Pembridge Villas
Notting Hill
London
W2 4XA

T 0207 050 0703
E info@arcvelop.com

Project Name: **Waterbridge Court 50 Spital Street**
Project Number: **10015**

Drawing Name
Proposed Floor Plans
Drawing No
P0S
Revision

Scale
1:50 @ A1, 1:100 @ A3

50 Spital Street, Dartford

DA1 2DT

Pre-Application Photo Schedule

This document has been prepared by Arcvelop Ltd. appointed as the Architect's representing 50 Spital Street, Dartford, DA1 2DT.

Fig. 1 - Front Facade, 50 Spital Street

Fig. 2 - 52 Spital Street, Neighbouring Property

Fig. 3 - 48 Spital Street, Neighbouring Property

Fig. 4 - Ground Floor Side Entrance

Fig. 5 - Rear Elevation from car park

Fig. 6 - Rear Elevation air conditioning units

Fig. 7 - Access through to rear car park

Fig. 8 - Existing rear Car Parking

Fig. 9 - Internal condition of Second Floor

Fig. 10 & 11 - Internal condition of First Floor

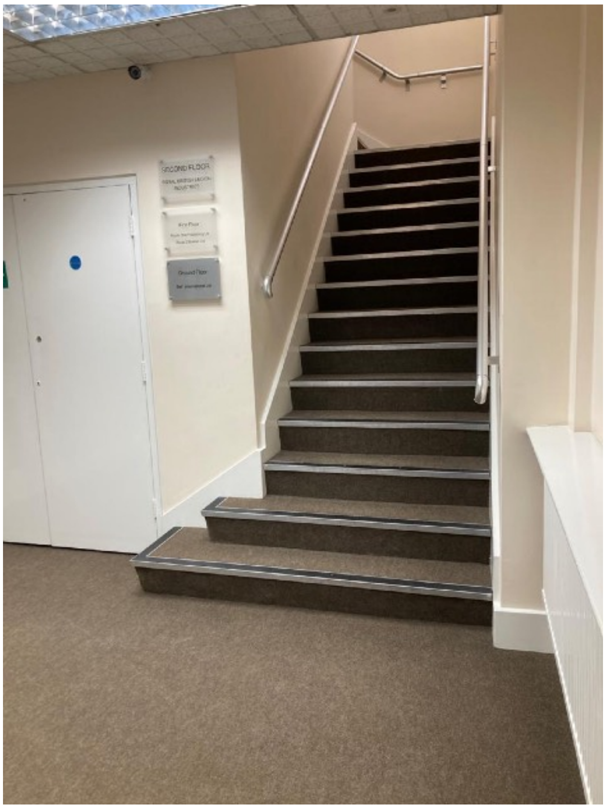


Fig. 12 & 13 - Internal condition of Communal & Main Entrance

Marc Alexander Turnier
ARB RIBA BA (Hons) MArch (dist.) PG Dip (dist.)
Managing Director
Arcvelop Ltd.