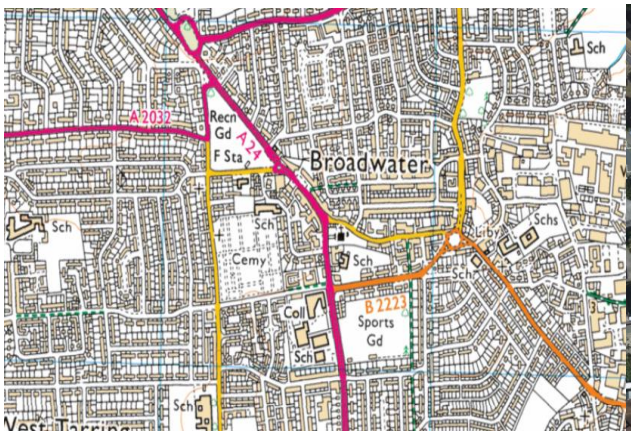
WtFR Ltd

# Flood Risk Assessment

Development at

15-17 Broadwater Street West, Worthing, BN14 9BT






On behalf of
KJC architects

Date: 12th May 2024

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Issue sheet

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# 1. Introduction

WtFR Ltd has been commissioned by Gierdi Ahmetaga to undertake a Flood Risk Assessment (FRA) in connection with the planning application for the proposed development at 15-17 Broadwater Street West, Worthing, BN14 9BT.

This FRA has been produced to demonstrate how risks from all sources of flooding to the site and flood risk to others from the development will be managed, in order to satisfy the requirements, set out in the National Planning Policy Framework (NPPF).

A full assessment of the flood risk to the site and consideration of the surface water management as a result of the development has been considered as part of this analysis.

Data has been gathered from a number of other sources including: the Environment Agency (EA), the British Geological Society (BGS), National Soil Research Institute (NSRI), aerial photographs, Ordnance Survey (OS), commercially available historical mapping and relevant strategic documents developed by West Sussex Council and Worthing Borough Council, in their capacity as the Local Planning Authority and Lead Local Flood Authority.

# 2. Site Description

Area Size: 200m$^2$

Grid reference: TQ 14558 04460

The proposal is for the change of use of the ground floor to 2 shops with 2 new side entrances at 15-17 Broadwater Street West, Worthing, BN14 9BT.

Figures 1 and 2 below show location details of the development site. Figure 3 shows an aerial photograph of the development site.




*Figure 1 – Location of the site, highlighted.*

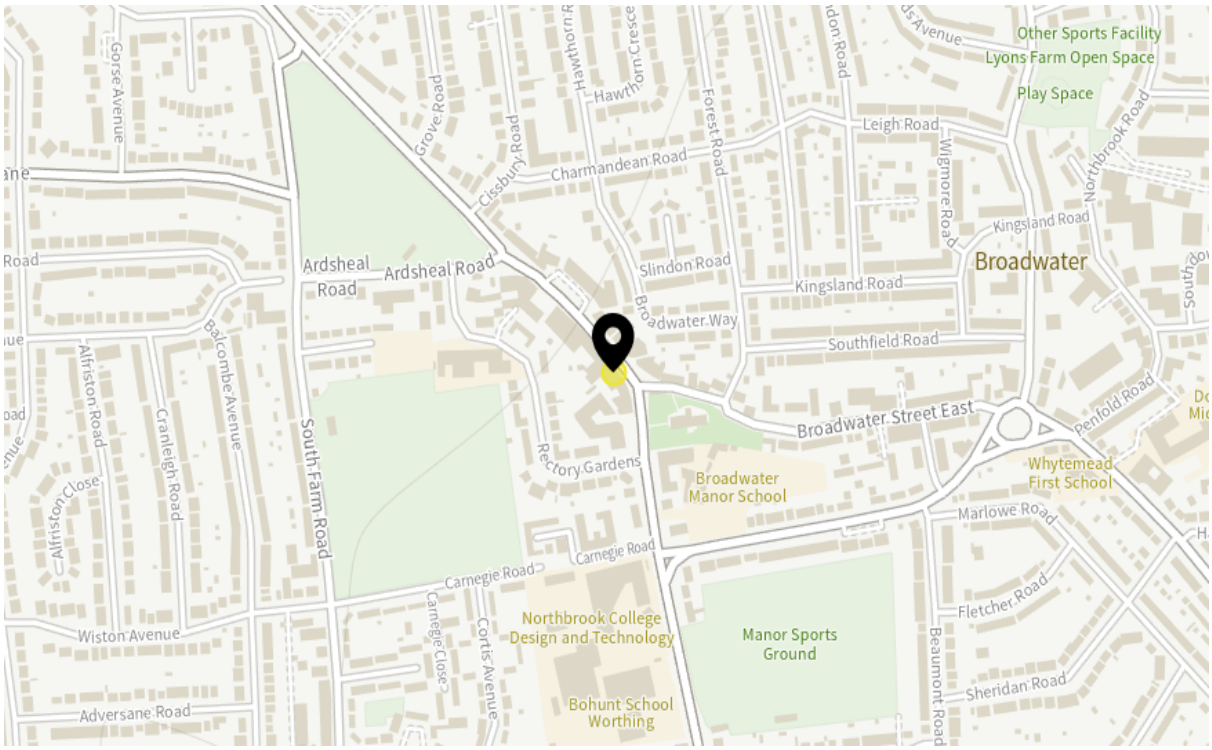



*Figure 2 –detailed location of the development site, highlighted.*



*Figure 3 – aerial photograph of the development site.*

# 3. Flood Risk Assessment

## 3.1 National Planning Policy

Paragraph 173 of the NPPF states "When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment[59]. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (the sequential and exception tests, as applicable) it can be demonstrated that:

a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;

b) the development is appropriately flood resistant and resilient;

c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;

d) any residual risk can be safely managed; and

e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan".

Footnote 59 states "A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use".

Furthermore paragraph 30 of the Planning Practice Guide on Flood Risk and Climate Change states "A site-specific flood risk assessment is carried out by (or on behalf of) a developer to assess the flood risk to and from a development site. Where necessary, the assessment should accompany a planning application submitted to the local planning authority. The assessment should demonstrate to the decision-maker how flood risk will be managed now and over the development's lifetime, taking climate change into account, and with regard to the vulnerability of its users.

The objectives of a site-specific flood risk assessment are to establish:

- whether a proposed development is likely to be affected by current or future flooding from any source;
- whether it will increase flood risk elsewhere;
- whether the measures proposed to deal with these effects and risks are appropriate;
- evidence for the local planning authority to apply (necessary) the Sequential Test, and;
- whether the development will be safe and pass the Exception Test, if applicable".

Continuing paragraph 31 of the Planning Practice Guidance quotes "The information provided in the flood risk assessment should be credible and fit for purpose. Site-specific flood risk assessments should always be proportionate to the degree of flood risk and make optimum use of information already available, including information in a Strategic Flood Risk Assessment for the area, and the interactive flood risk maps available on the Environment Agency's web site.

A flood risk assessment should also be appropriate to the scale, nature and location of the development. For example, where the development is an extension to an existing house (for which planning permission is required) which would not significantly increase the number of people present in an area at risk of flooding, the local planning authority would generally need a less detailed assessment to be able to reach an informed decision on the planning application. For a new development comprising a greater number of houses in a similar location, or one where the flood risk is greater, the local planning authority would need a more detailed assessment".

## 3.2 Local Planning Policy

Local Authorities consider flood risk through relevant environmental and climate change policies which enforce the requirements of the NPPF. Relevant local policy, as outlined by London Borough of Richmond upon Thames, is contained within the;

i) Strategic Flood Risk Assessment
ii) Local Flood Risk Management Strategy

The Strategic Flood Risk Assessment (SFRA) and the Local Flood Risk Management Strategy (LFRMS) are key sources of flood risk specific information for the area. The SFRA provides a more detailed review of flood risks and recommendations for ensuring developments can be constructed and operated safely in accordance with the NPPF.

## 3.3 Flood Risk Zones, Vulnerability and Classification

These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. They are shown on the Environment Agency's Flood Map for Planning available on the Environment Agency's web site, as indicated in the table below.

*Table 1 – Flood Zones*

| **Flood Zone** | **Definition** |
|---|---|
| Zone 1<br>*Low Probability* | Land having a less than 1 in 1,000 annual probability of river or sea flooding.<br>(Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3) |
| Zone 2<br>*Medium Probability* | Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or<br>Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.<br>(Land shown in light blue on the Flood Map) |
| Zone 3a<br>*High Probability* | Land having a 1 in 100 or greater annual probability of river flooding; or<br>Land having a 1 in 200 or greater annual probability of sea flooding.<br>(Land shown in dark blue on the Flood Map) |
| Zone 3b<br>*The Functional Floodplain* | This zone comprises land where water has to flow or be stored in times of flood.<br>Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency.<br>(Not separately distinguished from Zone 3a on the Flood Map) |

*Table 2 – Flood Risk Vulnerability Classification*

| **Essential Infrastructure** |
|---|
| • Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk.<br>• Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood.<br>• Wind turbines. |
| **Highly Vulnerable** |
| • Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding.<br>• Emergency dispersal points.<br>• Basement dwellings.<br>• Caravans, mobile homes and park homes intended for permanent residential use.<br>• Installations requiring hazardous substances consent (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure'). |
| **More Vulnerable** |
| • Hospitals<br>• Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.<br>• Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.<br>• Non–residential uses for health services, nurseries and educational establishments.<br>• Landfill* and sites used for waste management facilities for hazardous waste.<br>• Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan. |
| **Less Vulnerable** |
| • Police, ambulance and fire stations which are **not** required to be operational during flooding.<br>• Buildings used for shops; financial, professional and other services; restaurants, cafes and hot food takeaways; offices; general industry, storage and distribution; non-residential institutions not included in the 'More Vulnerable' class; and assembly and leisure.<br>• Land and buildings used for agriculture and forestry.<br>• Waste treatment (except landfill* and hazardous waste facilities).<br>• Minerals working and processing (except for sand and gravel working).<br>• Water treatment works which do not need to remain operational during times of flood.<br>• Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place. |

| **Water Compatible Development** |
|---|
| • Flood control infrastructure.<br>• Water transmission infrastructure and pumping stations.<br>• Sewage transmission infrastructure and pumping stations.<br>• Sand and gravel working.<br>• Docks, marinas and wharves.<br>• Navigation facilities.<br>• Ministry of Defence installations.<br>• Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.<br>• Water-based recreation (excluding sleeping accommodation).<br>• Lifeguard and coastguard stations.<br>• Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.<br>• Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan. |

* Landfill as defined in Schedule 10 to the Environmental Permitting (England and Wales) Regulations 2010.

*Table 3 - Flood risk vulnerability and flood zone 'compatibility'*

| **Flood Zones** | **Flood Risk Vulnerability Classification** | | | | |
|---|---|---|---|---|---|
| | **Essential Infrastructure** | **Highly Vulnerable** | **More Vulnerable** | **Less Vulnerable** | **Water Compatible** |
| **Zone 1** | ✓ | ✓ | ✓ | ✓ | ✓ |
| **Zone 2** | ✓ | Exception Test required | ✓ | ✓ | ✓ |
| **Zone 3a†** | Exception Test required† | ✗ | Exception Test required | ✓ | ✓ |
| **Zone 3b*** | Exception Test required* | ✗ | ✗ | ✗ | ✓* |

**Key:**

✓ Development is appropriate

✗ Development should not be permitted.

Notes to table 3:

- This table does not show the application of the Sequential Test which should be applied first to guide development to Flood Zone 1, then Zone 2, and then Zone 3; nor does it reflect the need to avoid flood risk from sources other than rivers and the sea;
- The Sequential and Exception Tests do not need to be applied to minor developments and changes of use, except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site;

- Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

† In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

* In Flood Zone 3b (functional floodplain) essential infrastructure that has to be there and has passed the Exception Test, and water-compatible uses, should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows and not increase flood risk elsewhere.

# 4. Sources of flooding

## 4.1 Fluvial/Tidal

The Environment Agency's Flood Map for Planning (Rivers and Sea) identifies fluvial and tidal flood zones, and provides an indication of whether or not these zones are protected, due to the presence of flood defences (also highlighted). Figure 4, below, presents the Flood Map for the surrounding area.

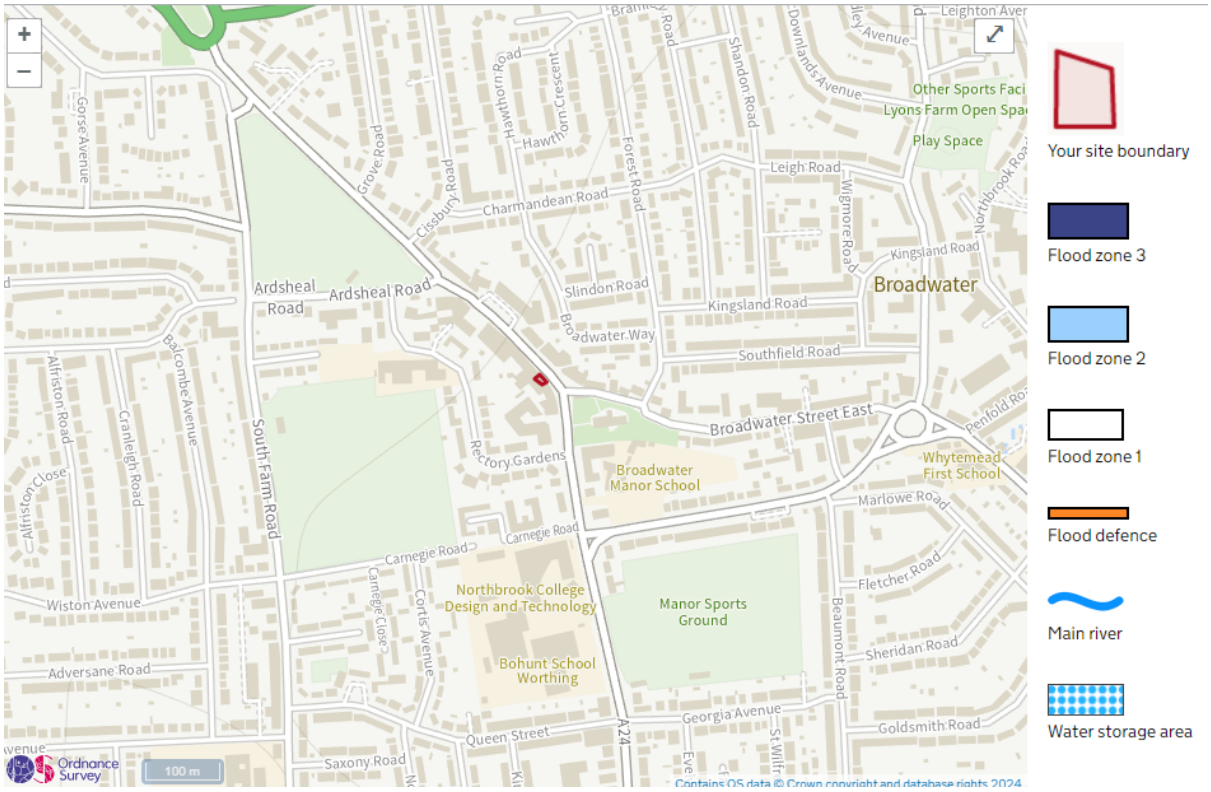



*Figure 4 – Fluvial flood risk – EA Flood Map.*

The EA Flood Map identifies the development site to lie within Flood Zone 1, where the chance of flooding in any given year is less than 1 in 1000 (0.1%).

## 4.2 Historic Flooding

The EA does not have records of historic flood events from rivers affecting the area local to this property. Further analysis of strategic flood risk documents developed by the West Sussex Council and Worthing Borough Council does not indicate flooding from other sources.

## 4.3 Surface Water Flooding

The Environment Agency's updated Flood Map for Surface Water (uFMfSW) identifies pluvial flood risk. Figure 5 below presents the uFMfSW for the development site and the surrounding area.

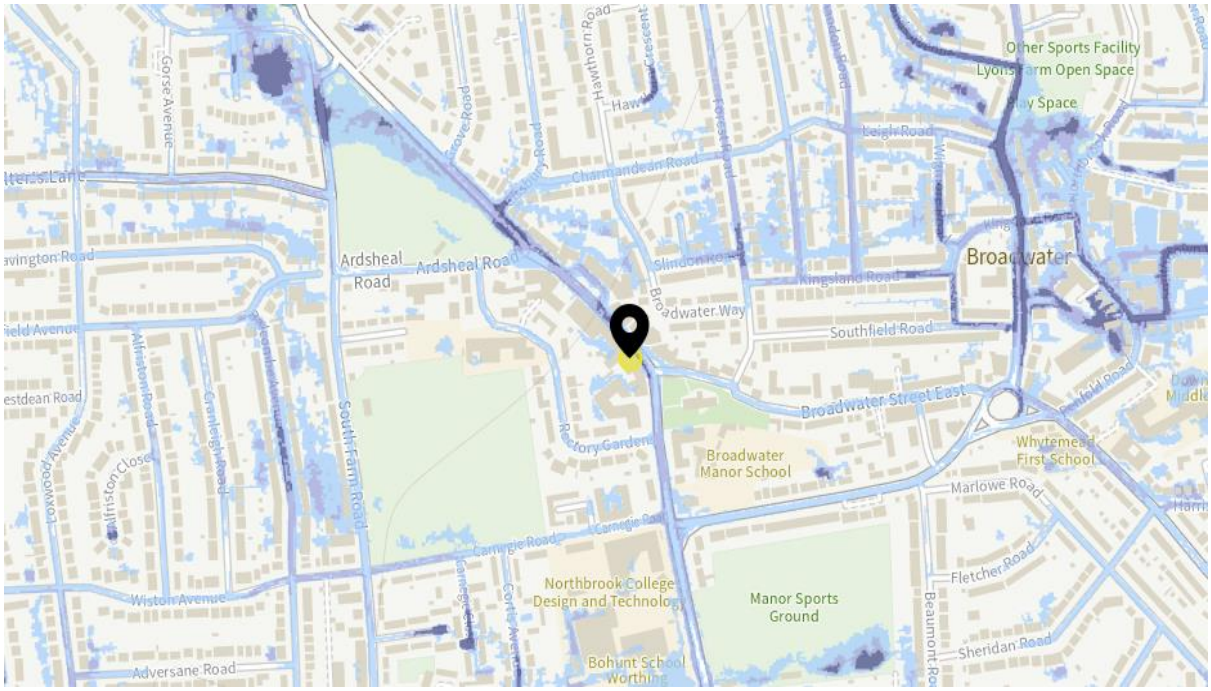



*Figure 5 – Flooding from surface water sources, uFMfSW, site highlighted.*

The uFMfSW shows that area in the vicinity of the development site is at medium risk of surface water flooding. Medium risk means that the probability of flooding in any given year is between 1 in 100 (1%) and 1 in 30 (3.3%).

## 4.4 Reservoir

The Environment Agency's Risk of Reservoir Flooding Map identifies the maximum extent of flooding that may be expected in the unlikely event that a reservoir dam failed. The development is not at risk of flooding.

## 4.5 Groundwater

The Environment Agency's Groundwater Vulnerability Map indicates that the development site is situated over a medium groundwater vulnerability area, as shown in Figure 6. Further analysis shows that the development site is not situated over a Groundwater Source Protection Zone, as shown in Figure 7.

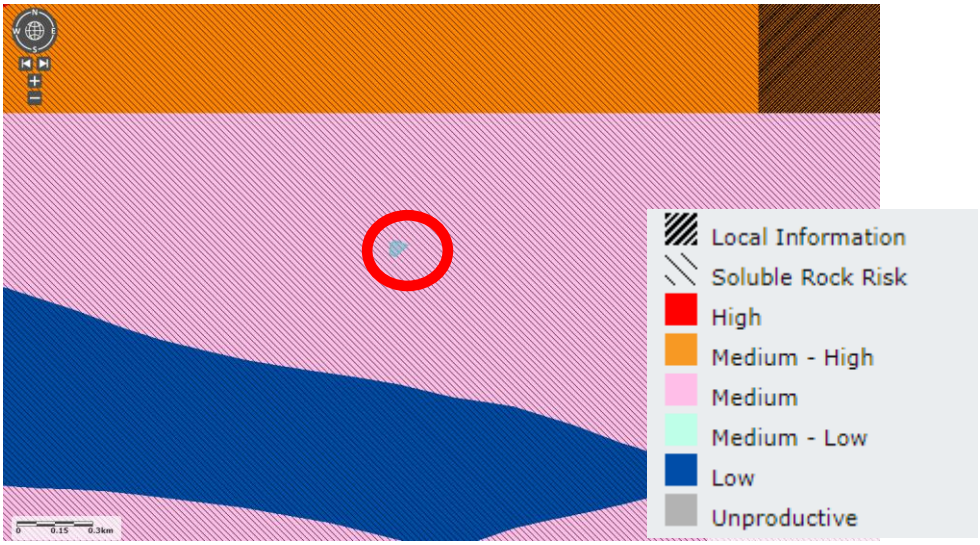



*Figure 6 – Groundwater vulnerability map, site highlighted.*

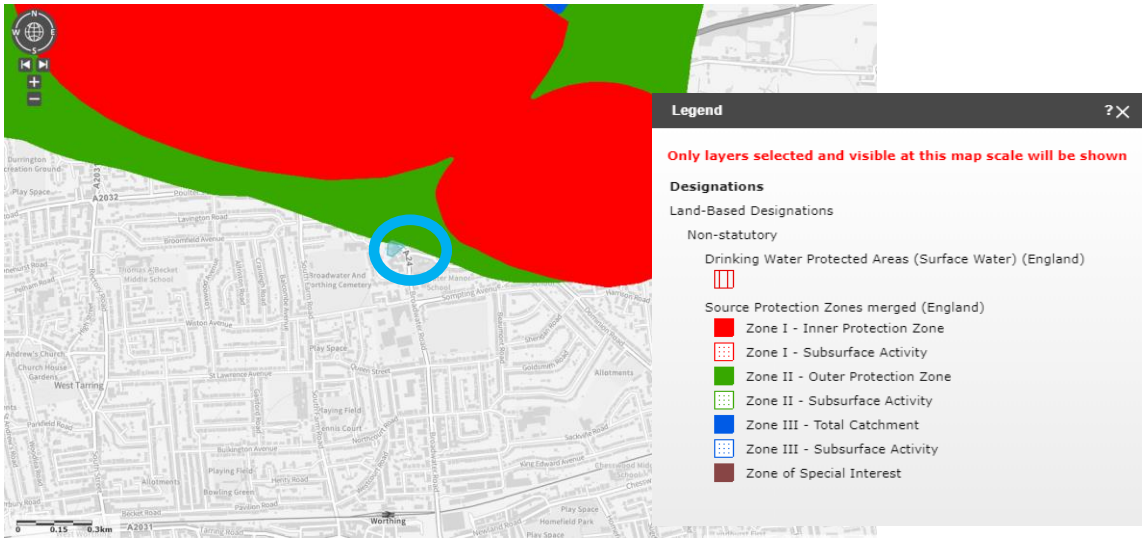



*Figure 7 – Groundwater source protection zones, site highlighted.*

Due to the minimal groundworks required for this development the impact on groundwater is considered to be negligible.

However, it is recommended that a groundwater mitigation plan is developed that may be implemented if groundwater is encountered during construction.

## 4.6 Geology

Figures 8 and 9 present information from the British Geological Survey.

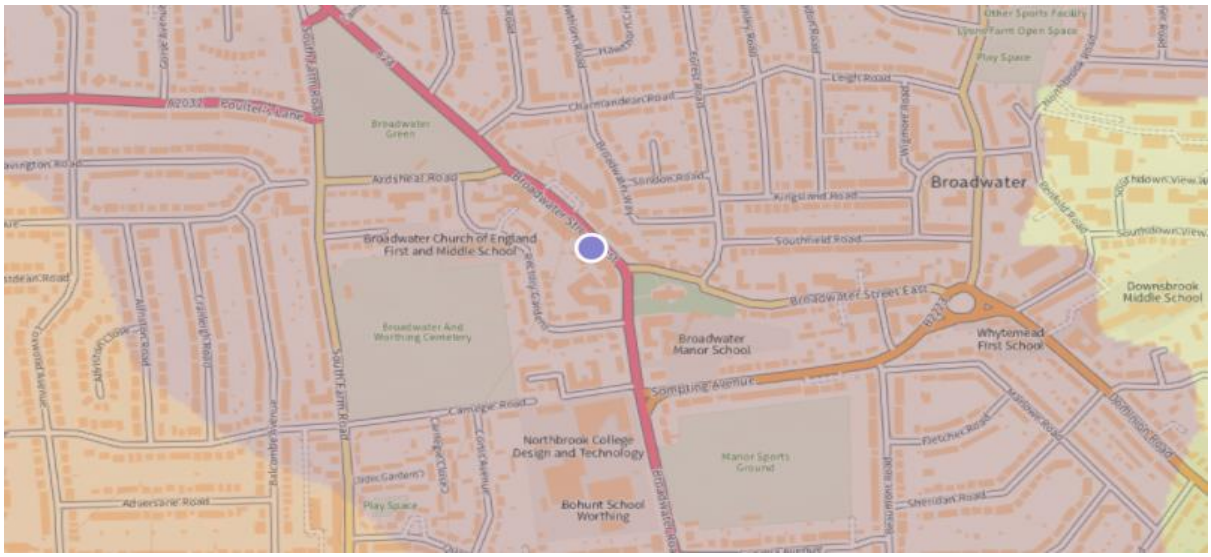



*Figure 8 – Superficial Geology of the development.*

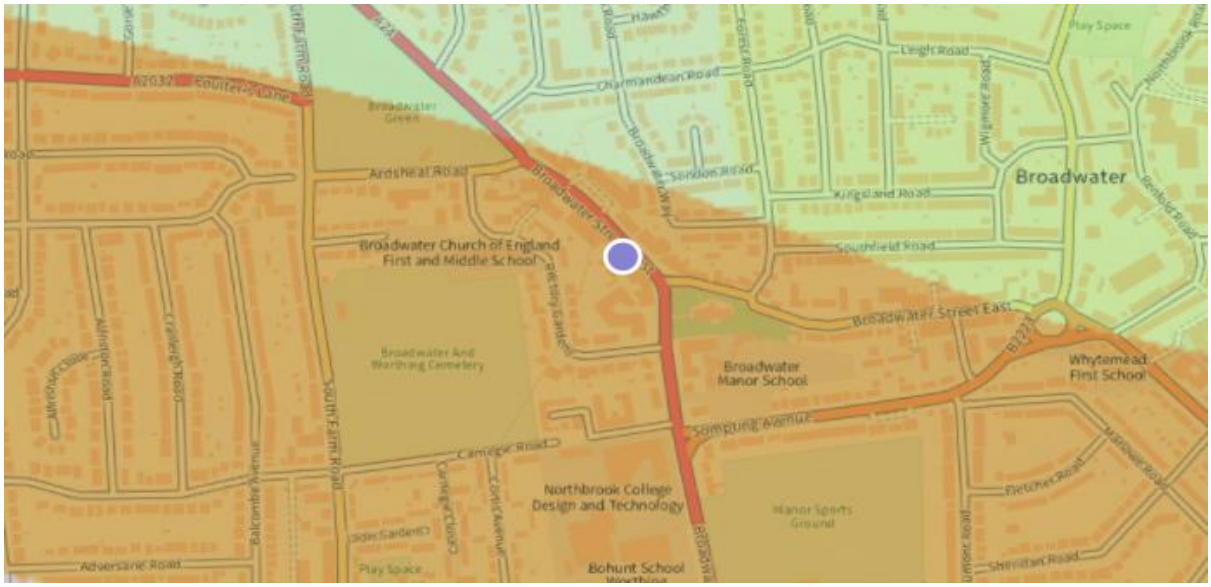



*Figure 9 – Bedrock geology of the development.*

The superficial deposit records at the development site are described as Head - Clay, silt, sand and gravel. The sedimentary superficial deposit formed between 2.588 million years ago and the present during the Quaternary period.

With regards to the bedrock, the site is underlain by the Lambeth Group - Clay, silt and sand. The sedimentary bedrock formed between 59.2 and 47.8 million years ago during the Palaeogene period.

# 5. Proposed development

This FRA is prepared to support a planning application for the change of use of the ground floor to 2 shops with 2 new side entrances at 15-17 Broadwater Street West, Worthing, BN14 9BT.

Buildings used for residential dwellings are classified as being **More Vulnerable** development within Table 2 of the Planning Practice Guidance. More Vulnerable developments within Flood Zone 1 are acceptable.

Figure 10 shows the existing ground floor layout and Figure 11 shows the proposed ground floor layout.

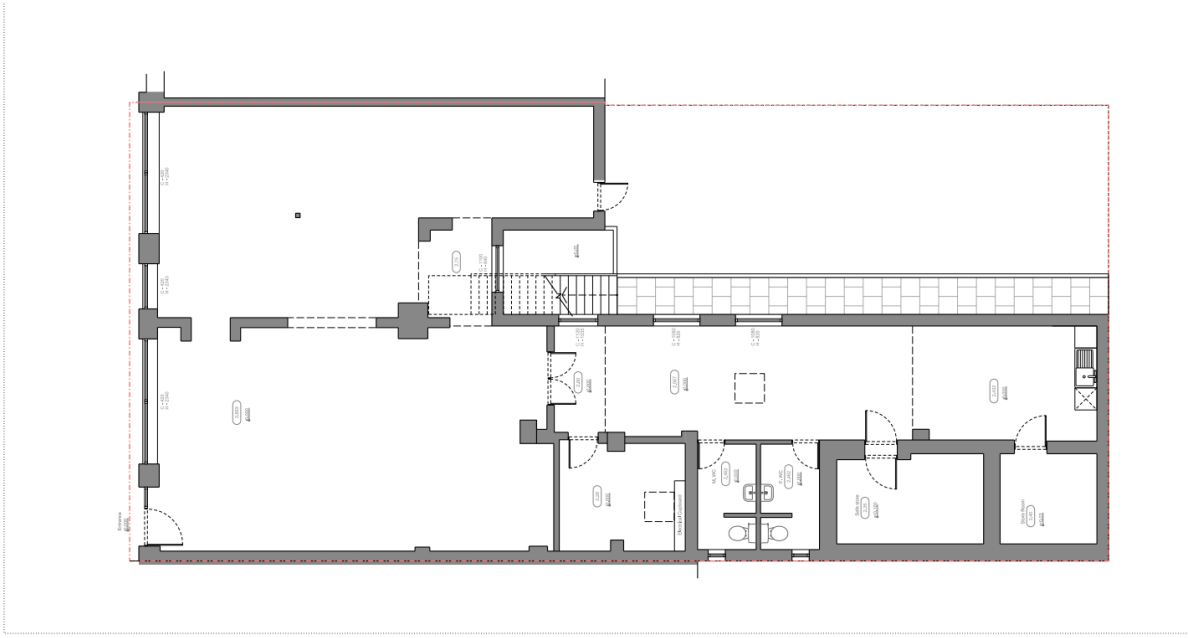



*Figure 10 – Existing ground floor layout.*

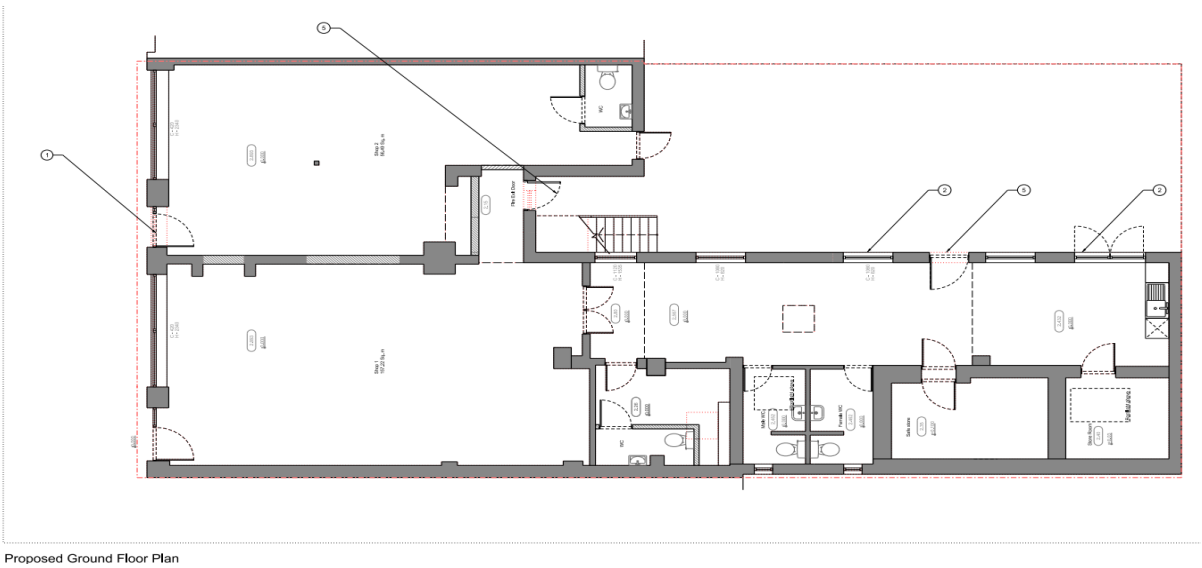



*Figure 11 – Proposed ground floor layout.*

# 6. Surface Water Drainage

The existing runoff rate from the site can be calculated using the Modified Rational Rainfall Method. Where Q = 2.78 * Cv * Cr * Ri * A

Cv = **0.75** – Fully impermeable areas i.e. existing roads and hardstanding

Cr = **1.3** – Routing Coefficient (CIRIA C697 recommends a value of 1.3)

Ri = **120**mm Rainfall intensity

A = **0.02**ha current impermeable area

Q = 2.78 * 0.75 * 1.3 * 120 * 0.02

**Q = 6.5l/s**

It is assumed that the existing arrangement for the discharge of surface water from the development is into the surface water or combined sewerage system. The impermeable area of the existing building will not be increased, therefore the method of surface water disposal will be as existing.

On this basis, the proposed discharge of surface water from the development will not see any surface water flooding on site in the 1 in 30 year and 1 in 100 year plus climate change events. Therefore, it will not increase the risk of surface water / sewer flooding elsewhere.

# 7. Hierarchy of disposing surface water

The Planning Practice Guidance and part H of the Building Regulations state that "generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable:

- into the ground (infiltration);
- to a surface water body;
- to a surface water sewer, highway drain, or another drainage system;
- to a combined sewer".

## 7.1 Infiltration

Due to the minimal amount of permeable ground, infiltration is not considered a viable option.

## 7.2 Surface Water Body

There are no watercourses within immediate vicinity of the development site.

## 7.3 Surface Water or Combined Sewer

It is assumed that a public surface water or combined sewer serves the existing property. As such, it is recommended that surface water is discharged to the public sewerage system.

# 8. Use of SuDS

The NPPF, Planning Practice Guide and the Ministerial Statement all look at the use of SuDS as a priority to aid the disposal of surface water from new developments.

Due to the minor nature of the development proposal there is limited capacity to include SuDS measures although permeable paving will be used and the use of water butts may be considered for use, where appropriate, to minimise surface water runoff from the site.

# 9. Management of flood risk

## 9.1 Fluvial

The EA Flood Map identifies the development site to lie within Flood Zone 1, where the chance of flooding in any given year is less than 1 in 1000 (0.1%).

Residential dwellings are classified as being a More Vulnerable development within Table 2 of the Planning Practice Guidance. More vulnerable developments are acceptable in Flood Zone 1.

## 9.2 Surface Water

The uFMfSW shows that area in the vicinity of the development site is at medium risk of surface water flooding. Medium risk means that the probability of flooding in any given year is between 1 in 100 (1%) and 1 in 30 (3.3%).

To mitigate against extreme events it is recommended that flood resistance and resilience measures are incorporated in the development. Suitable measures are specified in section 9.3 of this report.

It is assumed that a public surface water or combined sewer serves the existing property. As such, it is recommended that surface water is discharged to the public sewerage system.

Appropriate SuDS features and measures will be incorporated within the development to minimise surface water discharges.

As such, the proposed development will not increase the risk of flooding elsewhere from surface water sources.

## 9.3 Flood Resistance and Resilience Measures

It is recommended that the proposed works incorporate flood resilience and resistance measures. This would ensure that any extreme flooding and flooding in exceedance events could be mitigated against. Such measures could include:

- External walls rendered resistant to flooding to higher level;
- External ventilation outlets, utility points and air bricks fitted with removable waterproof covers;
- Ground level electrical main ring run from higher level; and on separately switched circuit from first floor;
- Electrical incomer and meter situated at higher level;
- Boilers, control and water storage / immersion installed at higher level;
- Gas meter installed at higher level;
- Plumbing insulation of closed-cell design;

- Non-return valves fitted to all drain and sewer outlets;
- Manhole covers secured;
- Anti-siphon fitted to all toilets;
- Kitchen units of solid, water resistant material;
- Use of MDF carpentry (i.e. skirting, architrave, built-in storage) avoided at ground floor level.

# 10. Conclusions

The EA Flood Map identifies the development site to lie within Flood Zone 1, where the chance of flooding in any given year is less than 1 in 1000 (0.1%).

Residential dwellings are classified as being a More Vulnerable development within Table 2 of the Planning Practice Guidance. More vulnerable developments are acceptable in Flood Zone 1.

The uFMfSW shows that area in the vicinity of the development site is at medium risk of surface water flooding. Medium risk means that the probability of flooding in any given year is between 1 in 100 (1%) and 1 in 30 (3.3%).

To mitigate against extreme events it is recommended that flood resistance and resilience measures are incorporated in the development. Suitable measures are specified in section 9.3 of this report.

It is assumed that a public surface water or combined sewer serves the existing property. As such, it is recommended that surface water is discharged to the public sewerage system.

Appropriate SuDS features and measures will be incorporated where appropriate within the development to minimise surface water discharges.

As such, the proposed development will not increase the risk of flooding elsewhere from surface water sources.

There is no evidence of historic flooding of the development site.

The development is not at risk from reservoir flooding.

Based on the likely flooding risk, it is considered that the proposed development can be operated safely in flood risk terms, without increasing flood risk elsewhere and is therefore appropriate development in accordance with the NPPF.

**Disclaimer**

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