

Flood Risk Assessment

11-15 South Street, Havant, PO9 1BU

Rev 2

Reference

Date **06.11.2023**

REVISION

Revision	Status	Description	Date	Issued	Checked
-	Final v1	Issued for Approval	21.09.22	RH	RH
2	Final v1	Updated with Flood Storage Calculations	23.11.23	RH	RH

1 SITE AND DEVELOPMENT OVERVIEW

DEVELOPMENT DESCRIPTION	EXISTING (PRE-DEVELOPMENT)	PROPOSED (POST-DEVELOPMENT)
Site Use	Mixed use office, commercial and residential (report ref: existing site coverage)	Mixed use commercial and residential development
Development Use	Mixed use Commercial and Residential (report ref: existing site use)	Mixed use Commercial and Residential (report ref: proposed site use)
Use Design Life		100 years (epoch 2115)
Number of Dwellings		17
EA Vulnerability Classification	Less Vulnerable and More Vulnerable (ref: existing site vulnerability)	Less Vulnerable and More Vulnerable (ref: proposed site vulnerability)
Development Class		Major
County Planning Authority	Havant Borough Council (HBC) (ref: district Council)	
District Planning Authority		
Local Sewer Authority	Southern Water (ref: Local Sewer Authority)	
SITE CATCHMENT CHARACTERISTICS	DESCRIPTION	SOURCE
Management Catchment	East Hampshire Management Catchment (report ref: River Basin Catchment)	https://environment.data.gov.uk/catchment-planning
Nearest EA Main River	Lavant located 250m to the west (report ref: EA Main River)	https://environment.maps.arcgis.com/apps/MapSeries/
Nearest Ordinary watercourse or surface waters	70m to the west (report ref: local water features)	Online Mapping and topography
KEY FLOOD RISK AND DATA SOURCES	DATA TYPE	SOURCE
EA Fluvial and Tidal Planning Data	UK Government Flood Maps for Planning (ref: FMP)	https://flood-map-for-planning.service.gov.uk/
EA Surface Water Data	DEFRA Risk of Flooding from Surface Water Sources GIS Data (ref: RoFSW)	https://environment.data.gov.uk/DefraDataDownload/?Mode=rofsw
EA Long term Flood Risk	UK Government Long term Flood Risk Maps (ref: LTFRM)	https://www.gov.uk/check-long-term-flood-risk
Environment Agency Product 4/5 Data	See Appendix 2 (report ref: EA Product Data)	Havant Flood Mapping Study which was produced in 2009 by Royal Haskoning
Historic Flood Risk Data	DEFRA Historic Flood Outlines GIS Data	https://environment.data.gov.uk/DefraDataDownload/?mapService=EA/HistoricFloodMap&Mode=spatial
Strategic Flood Risk Assessment Data	PUSH SFRA (2016) (ref SFRA)	https://pcc.dynamicmaps.co.uk/MapThatPublic/Default.aspx#
Local Flood Risk Assessment Data	(refer to SFRA)	
Topographic Information	DEFRA Opensource LIDAR Data	https://environment.data.gov.uk/DefraDataDownload/?Mode=survey
River or Sea Flood Risk Present	High	Refer Section 3: Table 3
Surface Water Flood Risk Present	Low	Refer Section 3: Table 3
DESIGNATION	FLOOD RISK DESIGNATION	NOTE
Critical Design Flood Event (DFE)	Fluvial Flood Risk	*Designation based on highest flood risk between River, Sea or Surface Water - Refer Section 3: Table 3

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2 INTRODUCTION

The following report is a Flood Risk Assessment (FRA) for the proposed mixed used development (residential and commercial) located at the land 11-15 South Street, Havant, PO9 1BU, at approximate National Grid Reference SU71820618 (see site location map, Figure 1).

This assessment is required under the National Planning Policy Framework (NPPF) and Local and District Councils given the location, scale and associated flood risks.

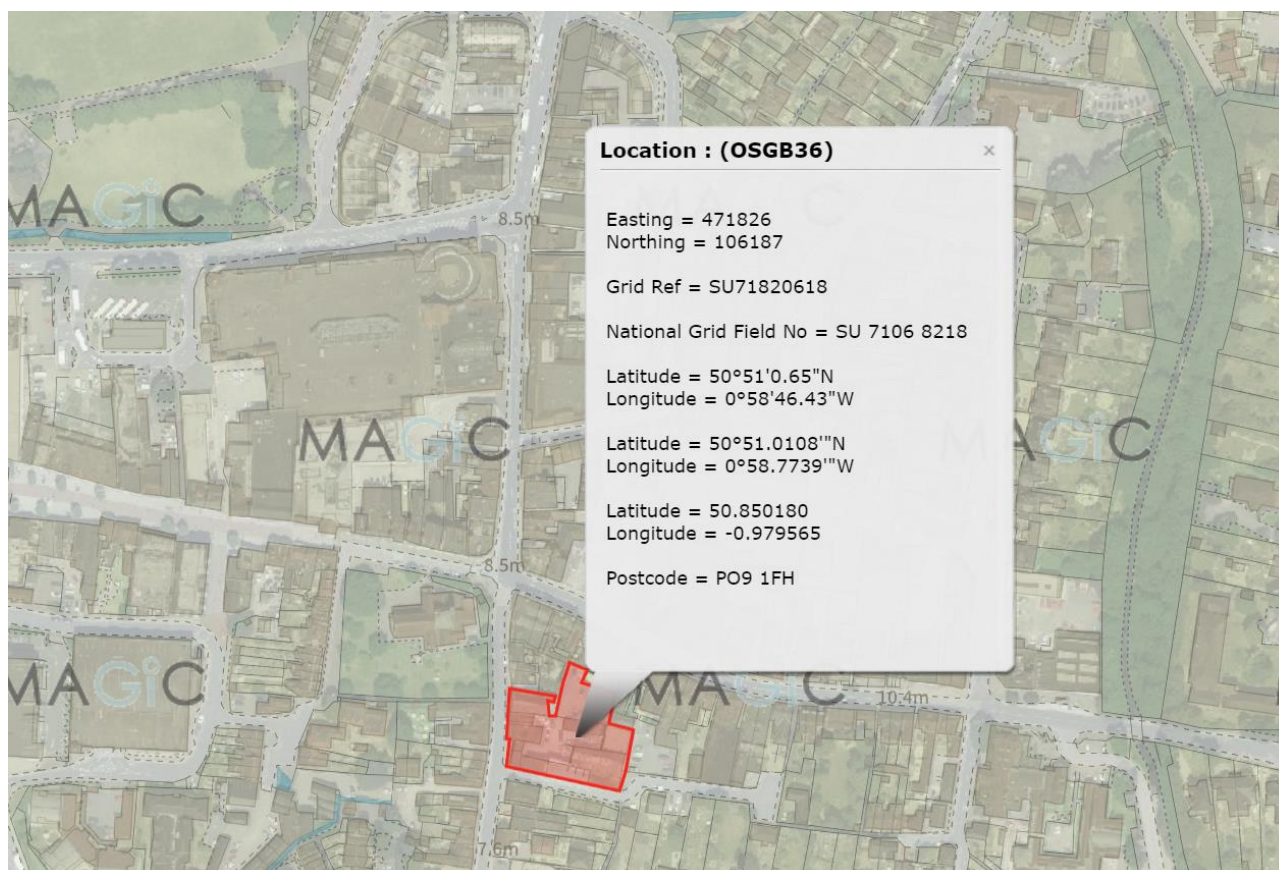


Figure 1 - Site Location Plan (site bordered red) Source: Location Map

This FRA has been written in general accordance with the National Planning Policy Framework (NPPF) and the Planning Policy Guidance (PPG), Environment Agency (EA) Standing Advice, LFRMS, County SFRA and associated guidance.

This FRA has relied upon publicly available information and data provided from the EA (where relevant). The interpretation of this data has been undertaken with the understanding of its accuracy and to a detail deemed suitable for this development type, location, and relevant flood risk.

Where required, assumptions or extrapolation of the data may have been undertaken to estimate (in particular) climate change impacts or extreme flood extents. This is only undertaken where up-to date climate change modelling is not available and site-specific detailed modelling is considered excessive for the scale of development.

DEVELOPMENT PROPOSALS

Part demolition and part redevelopment of existing buildings and change of use from Class A2, B1(c) and B8 to C3 use with the construction of 7 town house dwellings and 10 apartments at land to the rear of 11, 13 and 15 South Street, Havant. All residential apartments will have a minimum FFL of 8.60mAOD

FLOOD RISK VULNERABILITY

This FRA has been undertaken with due regard to the statutory requirements of the NPPF (2022) and with reference to the Planning Practice Guidance (PPG) in relation to development and flood risk. This FRA has been undertaken to inform on the current flood risk to the site. Therefore, this FRA aims to ensure that the development proposals take into account the site-specific flood risk and to **avoid** inappropriate development in areas potentially at risk of flooding.

Annex 3 of the NPPF Flood Risk Vulnerability Classification provides guidance on assigning development vulnerability. A summary of this information is provided in Table 1.

Table 1 – Extract from Annex 3 of the National Planning Policy Framework and Table 2: Flood risk vulnerability classification of PPG detailing Flood Risk Vulnerability Classification by use. (Existing Site Classification is Shaded Gray, Proposed Site-specific classification shaded blue).

ESSENTIAL INFRASTRUCTURE	HIGHLY VULNERABLE	MORE VULNERABLE	LESS VULNERABLE	WATER-COMPATIBLE
Essential transport infrastructure	Police and ambulance stations; fire stations and telecom installations	Hospitals	Police, ambulance and fire stations which are not required to be operational during flooding.	Flood control infrastructure.
Essential utility infrastructure which has to be located in a flood risk area for operational reasons	Emergency dispersal points.	Residential institutions such as residential care homes, prisons and hostels.	Buildings used for commercial purposes and of a non-residential nature	Water transmission infrastructure and pumping stations.
Wind turbines.	Basement dwellings.	Buildings used for dwelling houses and sleeping, drinking establishments	Land and buildings used for agriculture and forestry.	Sewage transmission infrastructure and pumping stations.
Solar farms.	Caravans, mobile homes and park homes intended for permanent residential use.	Non-residential uses for health services, nurseries and educational uses	Waste treatment (except landfill* and hazardous waste facilities).	Sand and gravel working.
	Installations requiring hazardous substances consent.	Landfill* and sites used for waste management facilities for hazardous waste.	Minerals working and processing (except for sand and gravel working).	Docks, marinas and wharves and Navigation facilities.
		Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.	Water treatment and Sewage treatment works which do not need to remain operational during times of flood.	Ministry of Defence installations.

The site is presently a mix of 'More Vulnerable' and 'Less Vulnerable' uses. The development proposals are considered to increase vulnerability and site massing (in terms of number of dwellings) post development, and therefore, there will be an overall increase in vulnerability post development, but no change in classification.

3 FLOOD RISK ASSESSMENT SCOPE

Flood risk as defined by the NPPF, is a combination of the probability and the potential consequences of flooding. Areas at risk of flooding are those at risk of flooding from any source, now or in the future. Sources include rivers and the sea, direct rainfall on the ground surface, rising groundwater, overwhelmed sewers and drainage systems, reservoirs, canals and lakes and other artificial sources. Flood risk also accounts for the interactions between these different sources. This term is key to the application of the presumption in favour of sustainable development in paragraph 11 of the National Planning Policy Framework (NPPF).

The NPPF requires flood risk to be considered on all sites, however more detailed site-specific FRA's are required when one or more of the following criteria apply to the site:

- Where a site is affected by the **Design Flood Event** (DFE) from any source (typically the 1% AEP) for all proposals of any new development (including minor development and change of use); or
- Greater than 1 ha in size and located in Flood Zone 1; or
- Located in Flood Zone 1 where there are critical drainage problems or within a designated Critical Drainage Area (CDA) as notified to the LPA by the Environment Agency; or
- Subject to a change of use to a higher vulnerability classification which may be subject to other sources of flooding; or
- A Major planning application (i.e. more than 10 residential dwellings).

The NPPF designates that the '**Design Flood Event**' (DFE) is used to assess the suitability of a development proposal against the criteria of the NPPF. The design flood, is a flood event of a given annual flood probability, but is generally taken as:

- River flooding likely to occur with a 1% annual probability (a 1 in 100 chance each year), typically shown as Flood Zone 3a as designated on the EA's Flood Map for Planning; or
- Tidal flooding with a 0.5% annual probability (1 in 200 chance each year), typically shown as Flood Zone 3a as designated on the EA's Flood Map for Planning; or
- Surface water flooding likely to occur with a 1% annual probability (a 1 in 100 chance each year), typically shown as the Medium Risk of Surface Water flooding as designated on the EA's Long Term Flood Risk mapping,

In addition to assessing present day risk, the Design Flood Event also must be assessed to include an appropriate allowance for climate change (refer to Section 5 for climate change allowances) based on the site's geographical location, vulnerability, and design life.

The NPPF considers residential developments to have a minimum design life of 100 years, with non-residential developments having a design life of 75 years (note, some developments may have greater than 100 years like critical infrastructure).

For the purpose of this FRA, the worst case DFE (whether this be from tidal, river or surface water sources), has been used to steer the recommendations of this report. Consideration of extreme events above that of the DFE have not been considered further.

Table 1 of the NPPF provides definitions of the Flood Zones, from low to high probability of river and sea flooding and also in regard to surface water flood risk. These Flood Zone Classification for the purpose of this FRA are:

- Flood Zone 1 - land assessed as having a less than a 1 in 1,000 annual probability (<0.1%);
- Flood Zone 2 - land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river (1% – 0.1%), 1:100 year or greater of surface water flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year;

- Flood Zone 3 - 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. Flood Zone 3b is land have greater than 1 in 20 to 1 in 30 year annual probability of flooding.

Following an assessment from the various sources of flood risk for the DFE, this site-specific FRA has applied the key principles for decision making when flood risk is a consideration and includes in order of importance:

1. **Avoid** – This is to physically locating the development proposals to areas of lowest flood risk within the site and/or determined how to vertically place the proposals to such that more vulnerable uses are positioned above the design flood level (such as raising floor levels or placing more vulnerable uses on upper levels). Developers should refer to the BS 85500:2012-Flood resistant and resilient construction. Guide to improving the flood performance of buildings for applicable strategies);
2. **Control** - Planning authorities and developers can investigate measures to control the risk of flooding affecting the site (this may be through flood defences, flood gates, flood storage or other engineered solutions such as SUDS). This is rarely applied at the site level and is mostly address through strategic and county level flood defence strategies. At this site level, typically this will be through applying a Water Exclusion or Water Entry strategy when design a building or space.
3. **Mitigate** – Is the use of flood resistance and resilience measures to address any residual risks remaining after the use of the avoidance and control measures described above. Passive measures should be prioritised overactive measures as they are likely to be more effective and more reliable. Flood Resilience is an approach to building design which aims to reduce flood damage and speed recovery and reoccupation following a flood. It uses a combination of flood resistance and recovery measures (referred to here as resilience measures), and is described in the industry-developed CIRIA Property Flood Resilience Code of Practice, which provides advice for both new-build and retrofit.
4. **Managing Residual Risk** – this will usually involve ensuring either safe access and egress is available from the safe in a DFE, Flood Warning Systems/Evacuation Plans are in place, safe refuge is on site during a DFE, the building is designed to account for flood loadings etc.
5. **Flood Risk is not increased elsewhere** – assuming all the above items can be address, it is critical that the development does not increase flood risk elsewhere as a result. Typically this is addressed by ensuring flood waters are not displaced (in surface water or river flood affected areas, the loss of floodplain storage is less likely to be a concern in areas benefitting from appropriate flood risk management infrastructure or where the source of flood risk is **solely** tidal.) or appropriate hydraulic modelling is provided in support of an application to demonstrate that flood risk is not increased outside of a site (such as through on site flood compensation or detailed site specific hydraulic modelling).

It should be noted, where up to date flood risk or climate change models are not available, best efforts have been made to assess these risks and extrapolate the available data where necessary. However, this approach may require further detailed modelling if deemed necessary by the reviewing authorities. Detailed hydraulic modelling is deemed outside the scope of this report.

SEQUENTIAL TEST/EXCEPTION TEST

In order to protect people and property from flooding, the NPPF and Policy CS15 seek to steer development to areas with the lowest probability of flooding. The starting point is therefore, that development should be avoided on this wider site unless it can be demonstrated through the application of the Sequential and Exception Tests that there are no other reasonably available sites at a lower risk of flooding, that the development would provide wider sustainable benefits to the community that outweigh remaining flood risks and that the development would be safe for its lifetime without increasing flood risk elsewhere.

For the purpose of this assessment, the application of the Sequential Test has been broken down into three levels. Passing the Sequential Test at the strategic level is a weighting of the risks versus benefit of a development against a wider criterion (such as meeting other sustainability targets, housing needs or other strategic planning goals) than just purely avoiding

flood risk issues. However, the Sequential Test can also be applied at the site level, where development is steered towards lower areas of flood risk within a site boundary and is much more objective in its assessment. For the purpose of this FRA, the assessment 'Level' of the Sequential Test is considered to be:

Level 1 - At the high-level, this test is first implemented by local planning authorities (LPA) at the strategic planning scale. The Sequential Test is applied to steer local planning policy by directing particularly vulnerable new developments (e.g., residential, hospitals, mobile homes etc.) outside of the floodplain and for designating new land uses and future development areas.

Level 2 - At the second instance, the Sequential Test is implemented for a specific development at the request of the LPA to assess other sites within an area defined by the LPA, this type of Sequential Test is present where there is a significant conflict between a proposed development and flood risk.

Level 3 - The third instance is where the Sequential Test is applied with the confines of the site, namely by steering development proposals to **avoid** areas of flood risk within a site itself.

Application of the first and second level of the Sequential Test are deemed outside the scope of this report.

Table 2 below presents a helpful guide in identifying the suitability of a site prior to applying the Level 1 and 2 of the Sequential Tests and identifies when the Exception Test is required.

Table 2 - The Sequential Test: Flood Risk Vulnerability and Flood Zone 'Compatibility' Table as specified by NPPF. Shaded cells denote the proposed re-development. Please note: ✓ means development is appropriate; x means the development should not be permitted and should be subject to a full sequential test. Refer to Table 2 for selected Flood Zone Designation

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	✓	x	Exception Test Required	✓
	Zone 3b Functional Floodplain	Exception Test Required	✓	x	x	x

Based on the principles above, a development of this nature is considered appropriate in its current location (subject to passing an Exception Test). The LPA have accepted that the site meets the requirements and passes the Sequential Test (see letter dated 05.10.2023 in Appendix 2 for correspondence).

Therefore, this FRA presents the findings of the Exception Test and recommendations for incorporation of flood resilient measures to improve long term flood resilience of the proposals. The following sections undertakes further analysis of the data available from the Local and District Council and EA data sets relating to flooding from a number of sources.

Table 3 summarises the sites primary flood risk classifications and the critical source for the DFE. This designation is based on the SFRA's Fluvial Flood Maps (plus climate Change) (extract provided in Figure 2) and the EA's Long Term Flood Risk Maps (LTFRM): Risk of Flooding from Surface Water (RoFSW) (extract provided in Figure 3).

FLOOD RISK DATA USED TO DETERMINE THE DESIGN FLOOD EVENT

The Partnership for Urban South Hampshire Strategic Flood Risk Assessment (PUSH SFRA) was delivered in December 2007 before the Havant Flood Mapping Study was carried out in March 2008 by Atkins for the EA. The PUSH SFRA was reviewed in 2012 and again in 2016, but the flood maps within the PUSH SFRA for the Havant streams were not updated, using results from the 2008 flood model.

The Portsmouth City Council's website states: The Environment Agency's modelling of flood risk has also been improved. This has led to some updates to the present-day maps of flood risk which the PUSH SFRA doesn't take into account. These changes may supersede some areas displayed in the hazard mapping and climate change mapping layers.

We have looked at the final flood extent map from the Havant Flood Mapping Study Final Report, and it shows the change from the Existing Flood Zone 3 (pre 2008) and the Havant Flood Mapping Study (2008) Flood Zone 3. It is evident that the pre model flood extents match the PUSH SFRA mapping, and the study matches the EA current flood mapping extents. Therefore, it is considered that the EA flood mapping should be used to assess the site-specific flood risk for this application.

Section 5.0 of the SFRA also states: “The SFRA has assessed flood risk across the sub-region at a strategic level. The outputs and findings of the SFRA are therefore sufficiently detailed to inform strategic decision making in relation to spatial planning.

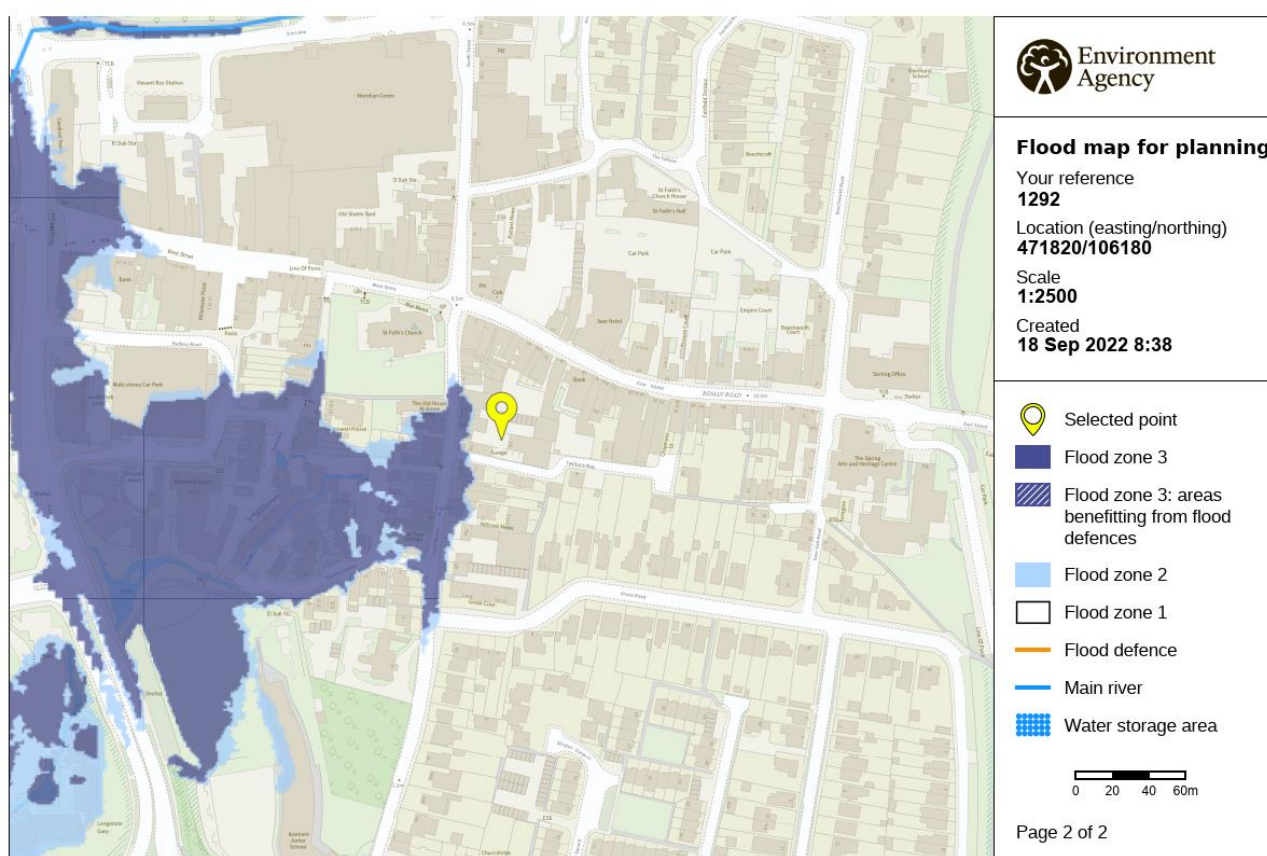
The outputs and findings of the SFRA should therefore not preclude the need for detailed site-specific flood risk assessments to accompany planning applications for proposed developments”.

Other sources of flooding have been considered in the Section 6 below (such as groundwater and sewer flooding), but these are typically considered to be ‘minor’ sources of flood risk.

Table 3 - Summarises the overall Flood Zone designation based on the highest rated flood risk from either rivers and sea or surface water.

FLOOD ZONE AND DFE SOURCE IDENTIFICATION SUMMARY			
	FLOOD ZONES AFFECTING THE SITE		DOMINANT SOURCE FOR THE DESIGN FLOOD EVENT (DFE)
	Flood Zone 2 (medium risk)	Flood Zone 3 (high risk)	Source
River Or Sea	No	No	Surface Water
Surface Water	Present (only partially affected)	Present (only partially affected)	

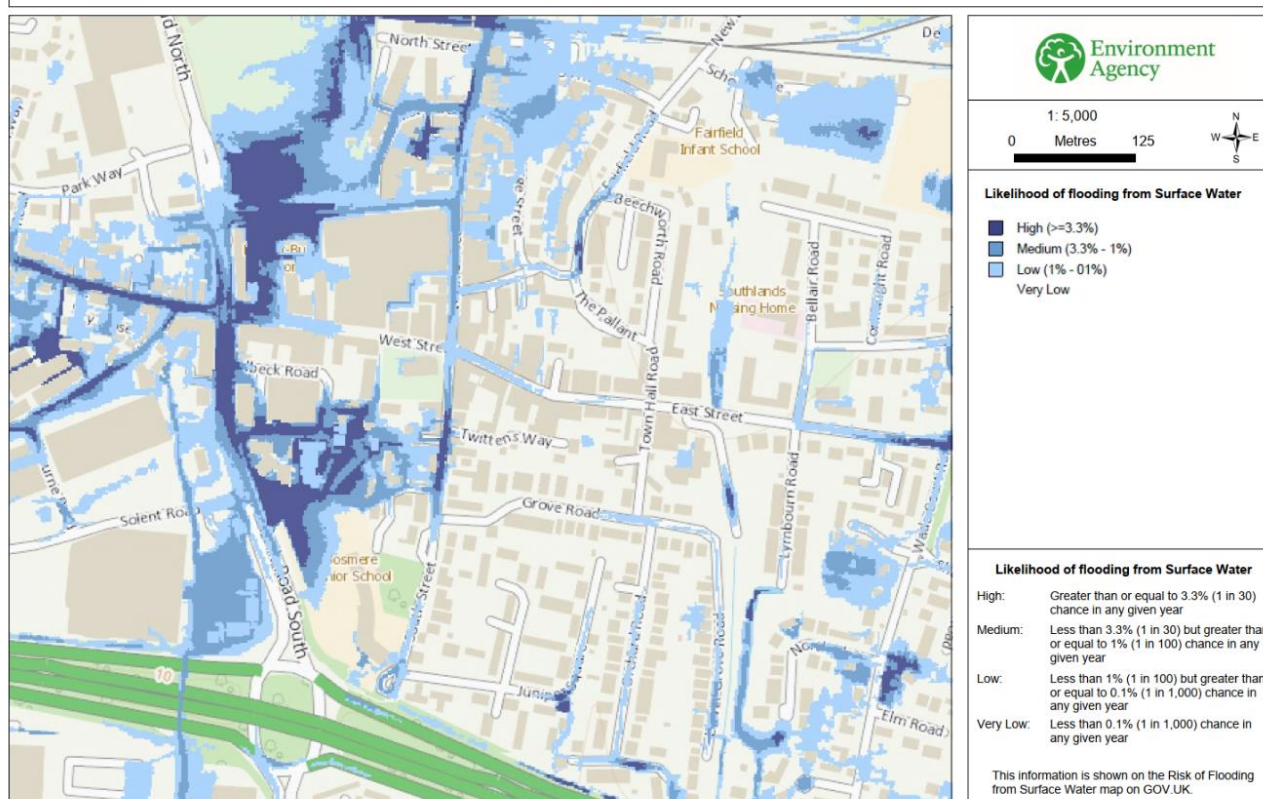
**Flood Zone Designation for assessment is based on the highest flood risk from river, sea or surface water flooding taken from EA’s Flood Map for Planning and EA’s LTFRM:RoFSW*



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Figure 2 extract Flood Maps for Planning (Source: DEFRA)

Risk of flooding from Surface Water Centred on South Street - Created 7 Sept 2022



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Figure 3 - extract from the EA's Long-Term Risk of Flooding from Surface Water (RoFSW) maps

4 LOCAL FEATURES

LOCALITY

The site is located in South Street within the St Faiths Conservation Area boundary. It comprises No.S 11-15 South Street. No's 11 and 13 are attached to each other with No. 13 being Grade II listed. These feature commercial units at ground floor and residential accommodation above. No. 15 comprises a residential unit which forms the corner of South Street and Twittens Way. To the rear of these units is a large courtyard containing a collection of buildings used for offices and a garage space.

The site lies within the urban area as defined by policies CS17 and AL2 in adopted local plan. The site is also located within the built-up area of Havant within the Town Centre where policies seek to protect existing retail, commercial and office uses.

RIVERS AND WATERCOURSES.

The nearest major watercourse to the site is understood to be the Lavant. The Lavant passes through Havant from northeast, towards the south. The Lavant is culverted in places throughout Havant, with the nearest point of the Lavant located approximately 250m to the west. The Lavant is classified as an EA main river at this location and is understood to be the primary source of fluvial flood risk in this area.

There appears to be a small tributary of the Lavant located off The Parchment, c70m to the southwest of the site. This appears to be partly culverted or channelised in places and flowing west into the Lavant. It is understood that this tributary is an ordinary watercourse, picking up both the highway drainage and local urban drainage. It appears to form the base route for wider catchment overland flowing towards the west.

It is understood that the site currently discharges runoff (foul and surface water) into the local Southern Water sewer and drainage network. The surrounding road network is shown to include highway drainage.

TOPOGRAPHY

Based on the available LIDAR data, the local area appears to be fall towards the west. There appears to be a subtle 'valley' in the land following Twitters Way, joining with South Street, and continuing west towards the Lavant. This valley appears to pick up some catchment runoff (refer to Section 6 Pluvial Flood Risk for more details), before directing overland runoff west.

There appears to be c.1.8m of fall from the eastern boundary (c.9.8mAOD) to the western boundary (c8.0mAOD)

Figure 4 provides contours based on the LIDAR data. This data should be confirmed with site specific topographic survey.

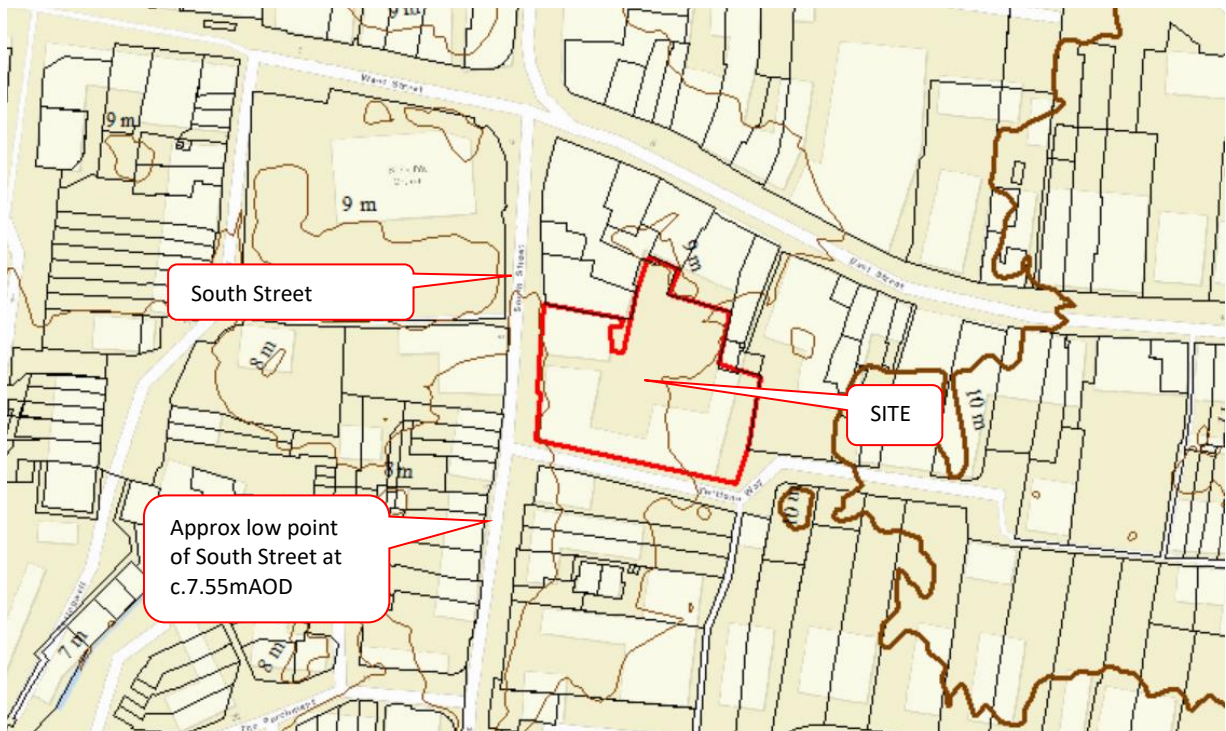


Figure 4 – Contour Map, site bordered red, yellow line represent section line of path profile (source: DEFRA Lidar Data 1m)

GEOLOGY & HYDROGEOLOGY

The online British Geological Survey (BGS) (Figure 5) shows the site to be underlain by 1:50 000 scale bedrock geology description: Lewes Nodular Chalk, Seaford Chalk, Newhaven Chalk, Culver Chalk and Portsdown Chalk Formations - Chalk, with Superficial deposits of the Head - Clay and gravel.

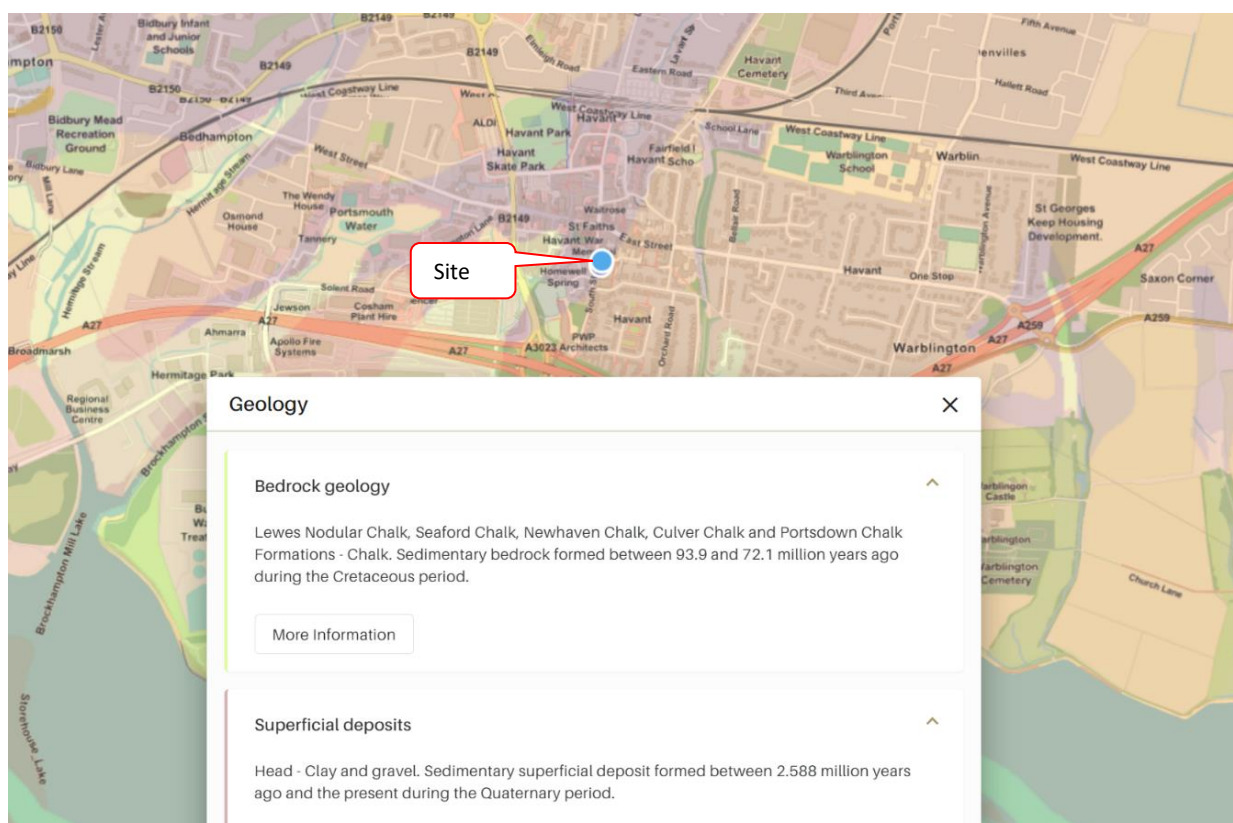


Figure 5 extract from BGS Bedrock and Superficial Deposits Mapping (source: BGS)

Table 4 below present a summary of the site hydrogeological classifications and considerations.

Table 4 - Summary of Hydrogeology Classifications (source Magic Map, BGS) – applicable classification shaded Blue

HYDROGEOLOGY CLASSIFICATIONS			
Aquifer Designation (Bedrock)	Principle	Secondary	Unproductive
Aquifer Designation (Superficial)	Principle	Secondary	Unproductive
Groundwater Vulnerability	High	Medium	Low
Located within Source Protection Zone	Yes	No	N/A
Soluble Rock Risk	Present	Not Present	N/A

Portsmouth Water (PW) highlighted that the site is located within Source Protection Zone 1 (SPZ1) of the groundwater catchment for an essential public water supply source. It is also within 200 meters of a Spring on company land used for potable water supply. The bedrock underneath the site is the chalk aquifer which is known to be karstic facilitating rapid subsurface flow. Thus, the groundwater environment is of high sensitivity and consequently all measures to prevent pollution during and post construction will be required in order to safeguard the local public water supply.

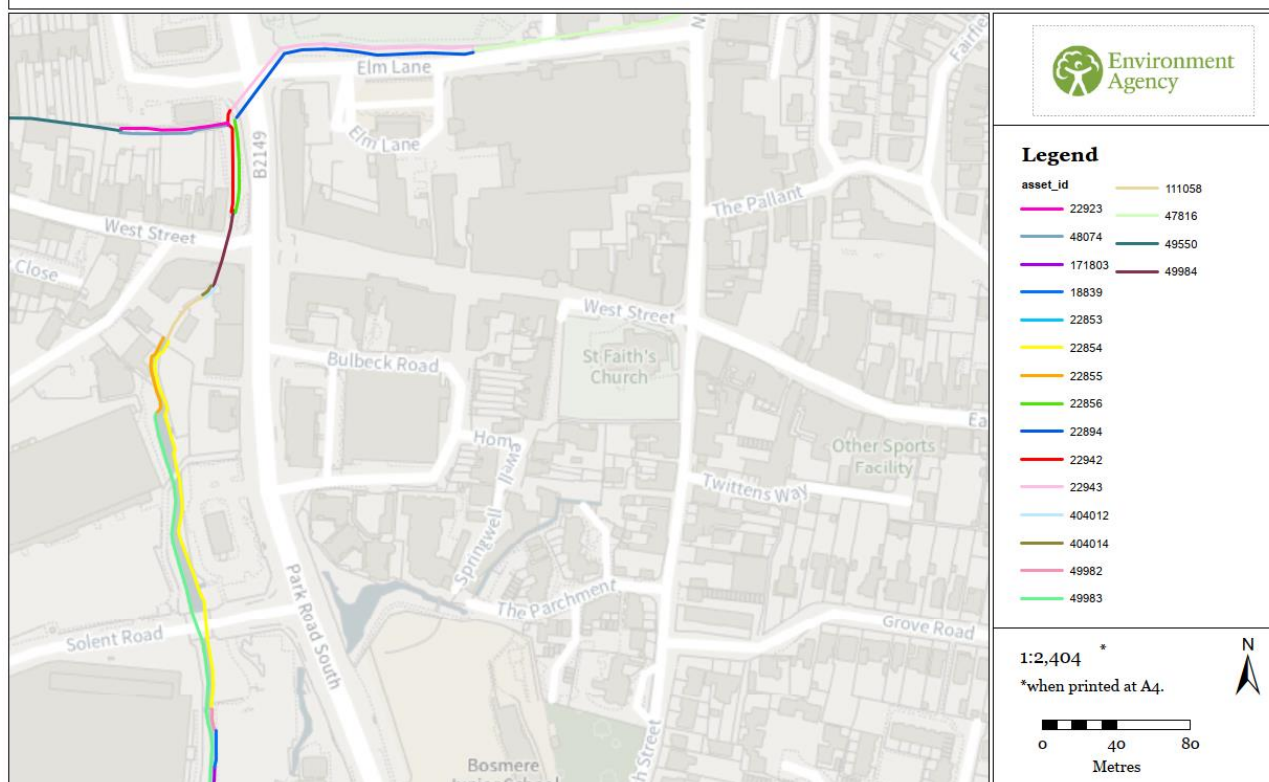
Details of groundwater levels and soil permeability are unknown and should be confirmed, but it is likely that should space permit, infiltration would be feasible (subject to relevant approvals by PW and the EA). The design permeability should be investigated further for the purpose of surface water management on the site, however, based on the previous drainage schemes for the earlier phases, it is deemed unlikely that infiltration will be feasible on this site. Nonetheless, this should be confirmed through onsite material testing.

FLOOD DEFENCES

The Environment Agency releases a range of flood asset information as Open Data through their AIMS Defence (Spatial Flood Defences) GIS mapping. They are the only comprehensive and up-to-date group of datasets in England that show flood defences currently owned, managed or inspected by the EA.

EA AIMS Defence data (2021) shows a variety of defences along the Lavant nearby the site. Defences range from natural high ground to engineered high ground and simple culverts. The Standard of Protection (SoP) from these defences are understood to be up to the fluvial 1 in 40 year event.

1D Modelled Flood Levels Centred on Grid Ref: 471819, 106184 - Created 7 Sept 2022



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Asset ID	Asset sub-type	Length	Maintainer	Current condition	Standard of Protection	Date of last inspection
48074	Natural High Ground	59.12	Environment Agency	Fair	1:40	31/05/2022
22923	Natural High Ground	59.71	Environment Agency	Fair	1:40	31/05/2022
171803	Natural High Ground	44.15	Unknown		1:40	01/07/2022
22853	Natural High Ground	109.52	Private individual, Company or Charity		1:40	01/07/2022
22855	Natural High Ground	44.84	Unknown		1:40	01/07/2022
22894	Natural High Ground	146.06	Private individual, Company or Charity		1:40	01/07/2022
22943	Natural High Ground	147.7	Private individual, Company or Charity		1:40	01/07/2022
49982	Natural High Ground	13.35	Unknown		1:40	01/07/2022
22854	Natural High Ground	205.99	Unknown		1:40	01/07/2022
22856	Wall	50.11	Private individual, Company or Charity		1:40	01/07/2022
22942	Natural High Ground	56.12	Private individual, Company or Charity		1:40	01/07/2022
49983	Natural High Ground	350.8	Private individual, Company or Charity		1:40	01/07/2022
404014	Engineered High Ground	6.87	Unknown			01/07/2022
18839	Natural High Ground	19.98	Unknown		1:40	01/07/2022
404012	Engineered High Ground	8.82	Unknown			01/07/2022
47816	Simple Culvert	229.92	Private individual, Company or Charity		1:40	01/07/2022
49550	Simple Culvert	118.89	Private individual, Company or Charity		1:40	31/05/2022
49984	Simple Culvert	42.39	Private individual, Company or Charity		1:40	01/07/2022
111058	Simple Culvert	31.52	Private individual, Company or Charity		1:40	01/07/2022

Figure 6 - extract from EA AIMS defence data base

5 CLIMATE CHANGE

In 2022, the EA issued updated guidance on the impacts of climate change on flood risk to support the NPPF. This guidance sets out that peak rainfall intensity, sea level, peak river flow; offshore wind speed and extreme wave heights are all expected to increase in the future as a result of climate change.

The guidance acknowledges that in relation to certain factors there is considerable uncertainty with respect to the absolute level of change that is likely to occur. As such, in these instances, the guidance provides estimates of possible changes that reflect a range of different emission scenarios (Table 5).

Table 5 - Extract from NPPF designating Flood Risk Climate Change Allowances by Flood Zone and Use. Sites required climate change probability scenario highlighted blue

FLOOD ZONE	ESSENTIAL INFRASTRUCTURE	HIGHLY VULNERABLE	MORE VULNERABLE	LESS VULNERABLE	WATER COMPTABLE
1/2	Higher Central and Upper End	Higher Central and Upper End	Central and Higher Central	Central	None of these allowances
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

INCREASES IN SEA AND TIDAL LEVELS

There are a range of allowances for each river basin district and epoch for sea level rise. They are set out in 'Table 2: sea level allowances by river basin district for each epoch in mm for each year (based on a 1981 to 2000 baseline) – the total sea level rise for each epoch is in brackets of the NPPF: Flood risk assessments: climate change allowances' and are based on percentiles. A percentile describes the proportion of possible scenarios that fall below an allowance level.

The allowances in the NPPF account for slow land movement. This is due to 'glacial isostatic adjustment' from the release of pressure at the end of the last ice age. The northern part of the UK is slowly rising, and the southern part is slowly sinking. This is why net sea level rise is less for the north-west and north-east than the rest of the country.

For flood risk assessments and strategic flood risk assessments, a site should assess both the higher central and upper end allowances.

Based on the PUSH data available, the nearest area of tidal flood risk (including climate change) is c500m from the site. Therefore, it is highly unlikely that tidal or sea flooding from will ever affect the site, even when considering climate change.

INCREASES IN PEAK RIVER FLOW ALLOWANCES

The PPG states that the increases in peak river flow should be assessed as a percentage uplift that varies based on the river basin district, the proposed lifetime of the development and the sites vulnerability and flood zone mapping. Based on the site's vulnerability classification (refer to Section 2 above), Table 6 below highlights the minimum climate change values to be adopted based on the sites River Management Catchment.

Table 6 - Summary of Table 1: peak river flow allowances by river basin district (base on a 1981 to 2000 baseline). Site required climate change based on Table 5.

East Hampshire Management Catchment peak river flow allowances			
Design Epoch	Central	Higher	Upper
2020s	15%	22%	37%
2050s	17%	26%	51%
2080s	33%	49%	99%

The PUSH SFRA (2007, review 2016) and the EA flood model (2008) were both delivered before the latest climate change (CC) allowances were made available at the end of 2018 (UKCP18). This means that any future design flood levels shown are now out of date and not appropriate.

The Product 4 provided comes from the 2008 Flood 1D Model showing levels at nodes along the main river but does not provide levels in close proximity to the development site. Due to this fact, and it being a smaller development, the EA have accept a more conservative approach for this development.

Determining the design flood level in this case is considered only possible by checking the DTM levels at the Flood Zone 3 (1% AEP) extents from our mapping. This has been done, with the EA accepting that DFL of 8.0m AOD would be acceptable. An acceptable freeboard allowance then needs to be added to this as seen below.

The have advised that based on general guidance (an in the absence of more accurate flood modelling, that to determine a suitable finish floor to account for the potential risks and uncertainty of climate change impacts to flood levels, that FFLs should account for an additional 600mm freeboard on peak design flood levels, including more extreme events which go beyond the likely 1% AEP (1 in 100 year) plus climate change level.

As such, the EA have accepted that a FFL of 8.6m AOD or above would be acceptable for the residential uses.

INCREASES IN SURFACE WATER FLOODING AND RAINFALL ALLOWANCES

When considering climate change impacts to surface water (pluvial) flooding, the DEFRA peak climate change rainfall allowances present predicted rainfall increase due to climate change in different regions around England. For all developments with a design epoch up to (and presently beyond) 2070, the NPPF states developments should adopt the Upper End and Central allowances. The site-specific climate change allowances based on the DEFRA data is summarised in Table 7 below and should also be adopted for the purposes of surface water drainage design.

Table 7 - Summary of Table 2: peak rainfall intensity allowance in small catchments (less than 5km2) or urban drainage

East Hampshire Management Catchment Management Catchment peak rainfall allowances 2070's	3.3% Annual Exceedance Probability Event	1% Annual Exceedance Probability Event
Central	20%	25%
Upper End	25%	45%

Based on the EA data available, surface water flood risk is considered the primary source of flood risk to the site. However, neither the EA or LPA have provided climate change affected surface water flood risk models for this site, and so it's not possible to directly determine the DFE level (plus an allowance for climate change) from this source. In the absence of this data, a very conservative estimation of the DFE climate change impacts can be made by looking at the 1 in 1000 year event. This approach has therefore been adopted for this FRA.

Nevertheless, current planning policy dictates that the sites surface water drainage systems are designed to accommodate the 1% AEP plus climate change, to account for future climate change risks associated with flooding from this source. Therefore, assuming that the sites surface water drainage is adequately designed to accommodate both the sites surface water runoff (and any external catchment areas directed through the site), it is considered that surface water climate change impacts can be controlled.

6 SOURCES OF FLOOD RISK

In order to assist the implementation of the Governments NPPF, the EA has undertaken national scale flood risk mapping. This mapping takes into account a range of sources including flooding from rivers, sea, surface water and reservoir breach. Furthermore, each Council produces a Strategic (county scale) Flood Risk Assessments (SFRA) that aim to specifically identify local flood risk issues (such as critical drainage areas and local groundwater flooding).

The following section reviews both the EA data as well as the relevant information available from the SFRA.

FLUVIAL (RIVER) AND TIDAL (SEA)

The EA have undertaken fluvial and tidal modelling of the nation's main rivers in flood to support and ensure developments are steered away from flood prone areas or are designed to ensure risk to people is not increased as a result. It should be noted that the EA's Flood Maps for Planning do not allow for the presence of defences and so illustrate a conservative representation of flood risk from rivers or seas.

The EA has provided product 4 information (see Appendix 2) relevant to the site from their Havant Flood Mapping Study which was produced in 2009 by Royal Haskoning (Figure 7). This data appears to match that presented on the EA Flood Maps for Planning and confirms that flooding is fluvial from the Lavant located 250m to the west of the site.

The Product 4 specifically affecting the site comes from the 2008 Flood 1D Model showing levels at nodes along the main river but does not provide levels in close proximity to the development site. Due to this fact, and it being a smaller development, we would probably accept a more conservative approach for this development.

Determining the design flood level in this case is only possible by checking the DTM levels at the Flood Zone 3 (1% AEP) extents from our mapping. The EA have provided an estimate and concluded that an average present day DFL of 8.0m AOD would be acceptable.

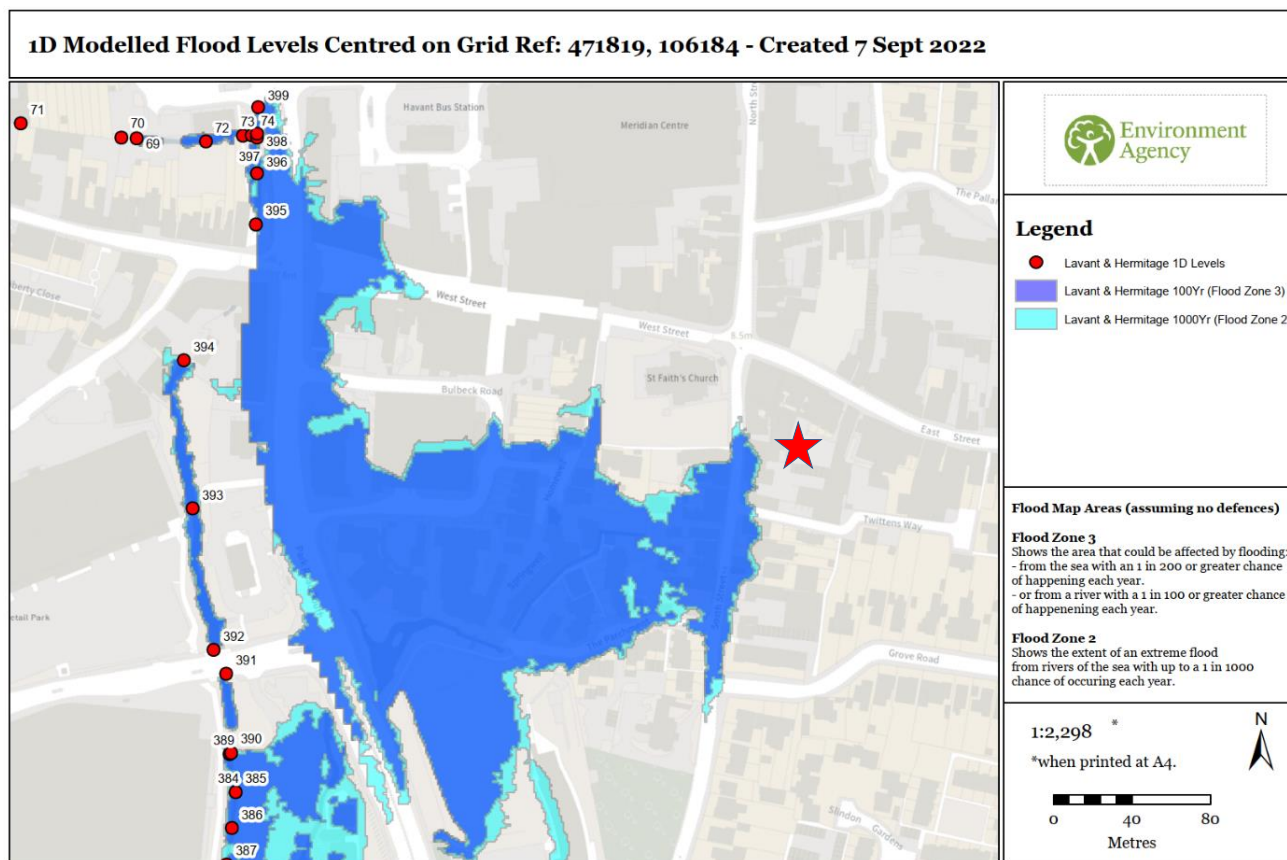


Figure 7 Extract from the EA's Product 4 Havant Flood Mapping Study which was produced in 2009 by Royal Haskoning

FLOOD PLAIN STORAGE COMPENSATION

Based on a DFL of 8.6mAOD, care needs to be taken to ensure that new development does not remove flood plain storage capacity from the flood plain and therefore will need to be considered. Because the development proposals will increase the built footprint, the proposals need to consider this risk to avoid increase flood risk elsewhere.

A Flood Storage and Compensation design has been undertaken for the site based on the topographic survey provided by the client and a DFL of 8.60mAOD (to take into account climate change allowances).

To calculate the pre and post development flood storage Autodesk Civil 3D has been utilised via the following:

- 1) The Topographic Survey was converted into a TIN Surface.
- 2) A second TIN surface with a single elevation of 8.60mAOD was created to emulate the DFL.
- 3) A third TIN surface was created for the post development scenario, with the FFL set to no lower than 8.60mAOD for all new buildings or residential uses, and the external levels designed to result in a no net loss of flood plain storage.
- 4) Using the 'Create New Volume Surface' the volumetric difference between the existing TIN surface and the DFL surface was calculated.
- 5) This was repeated for the post development scenario, with the volumetric difference taken between the proposed TIN surface and the DFL surface.

The drawings in Appendix 3 (reference 1416_FSC01) presents the results of this process and demonstrates that a no net loss of flood plain storage can be achieved. However, there will be a requirement to reduce ground levels within the carparking area marginally to meet this requirement. Proposed external levels are shown on the attached.

PLUVIAL (SURFACE WATER)

Surface water flooding is the term applied to flooding when intense rainfall overwhelms the ability of the land to infiltrate water, or in urban areas for the sewers and road drains to drain the water away, resulting in surface water runoff and consequent flooding. It is a particular problem in urban areas where the excess water will often travel along streets and paths, between and through buildings and across open space. It can result in indiscriminate flooding to properties when not controlled. The high-profile flooding across the UK in the summer of 2007 was largely attributed to excess runoff where the capacity of the drains was exceeded by intense summer rainstorms and led to the Government commissioning the independent Pitt Review in 2008.

The HBC SFRA recommends the use of the EA RoSWF maps to assess the risk from these sources. These maps use remotely sensed LiDAR data to determine large areas of topography. In all urban areas this LiDAR has been edited to remove the buildings. This editing process results in a slightly un-even surface profile, which can result in the production of small depressions that fill with water but in reality, is not at risk of surface water flooding. This should be taken into account where very localised areas of flooding are evident and are independent of wider surface water flood flows and routes.

The EA mapping shows 3 event scenarios for the 1 in 30 (3.3% chance of occurring in any one year) return period (high risk – Figure 8), the DFE 1 in 100 (1% chance of occurring in any one year) return period (medium risk – Figure 9) and 1 in 1000 (0.1% chance of occurring in any one year) return period (low risk – Figure 10). Extracts of this mapping is provided below, along with an analysis of their likely source and projected impacts on the development.

Figure 8 shows the high-risk scenario (1 in 30-year event or equivalent Flood Zone 3b). In this event, the site is wholly unaffected by surface water flooding. Surface water flooding is noted within South Street just to the south of the site, where surface water appears to pond in a dip in the road profile.



Figure 8 EA Long Term Flood Risk Maps (Depths) – High Risk of surface water flooding (source: EA Long Term Flood Risk Maps), site bordered red.

Figure 9 presents the medium risk scenario (DFE, 1 in 100-year return period or equivalent Flood Zone 3a). This shows that the site remains wholly unaffected. However, the modelling indicates that the flooding within South Street continues to build up within the road reserve, potentially affecting the road reserve along the frontage of the site with South Street, but unlikely to directly affect or inundate the site. Surface water flooding is noted to be directed towards the west and away from the site towards the Lavant. The flooding in the road is shown to reach up to 600mm in depth in this event.

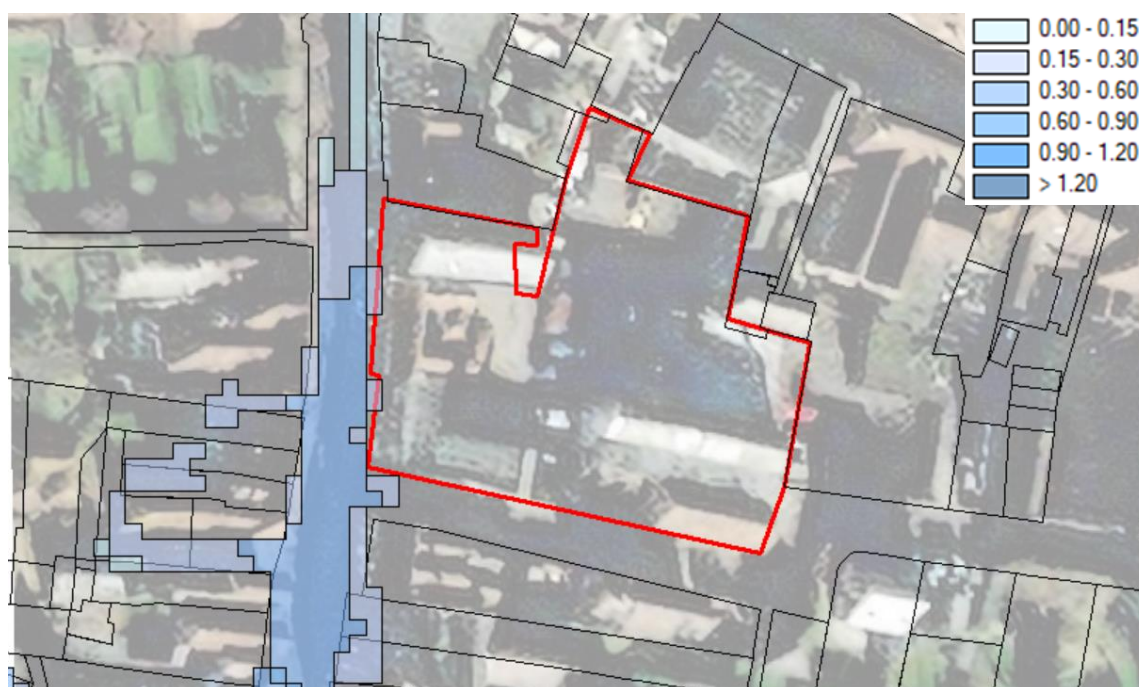


Figure 9 EA Long Term Flood Risk Maps – Medium Risk of surface water flooding depths (source: EA Long Term Flood Risk Maps), site bordered red

The low-risk scenario (1 in 1000-year event) continues to show that the majority of the site remains unaffected. As per the above scenarios, surface water flood risk appears concentrated to the dip in South Street at the southwestern corner of the site. The modelling suggests that overland flows are directed along South Street, past the site, where flows pond,

then eventually overtop the kerb and continue to drain away to the west. This event does show that some surface water flooding could affect marginally affect the site along the frontage with South Street, but it's likely to be of both low depth and velocity in this case.

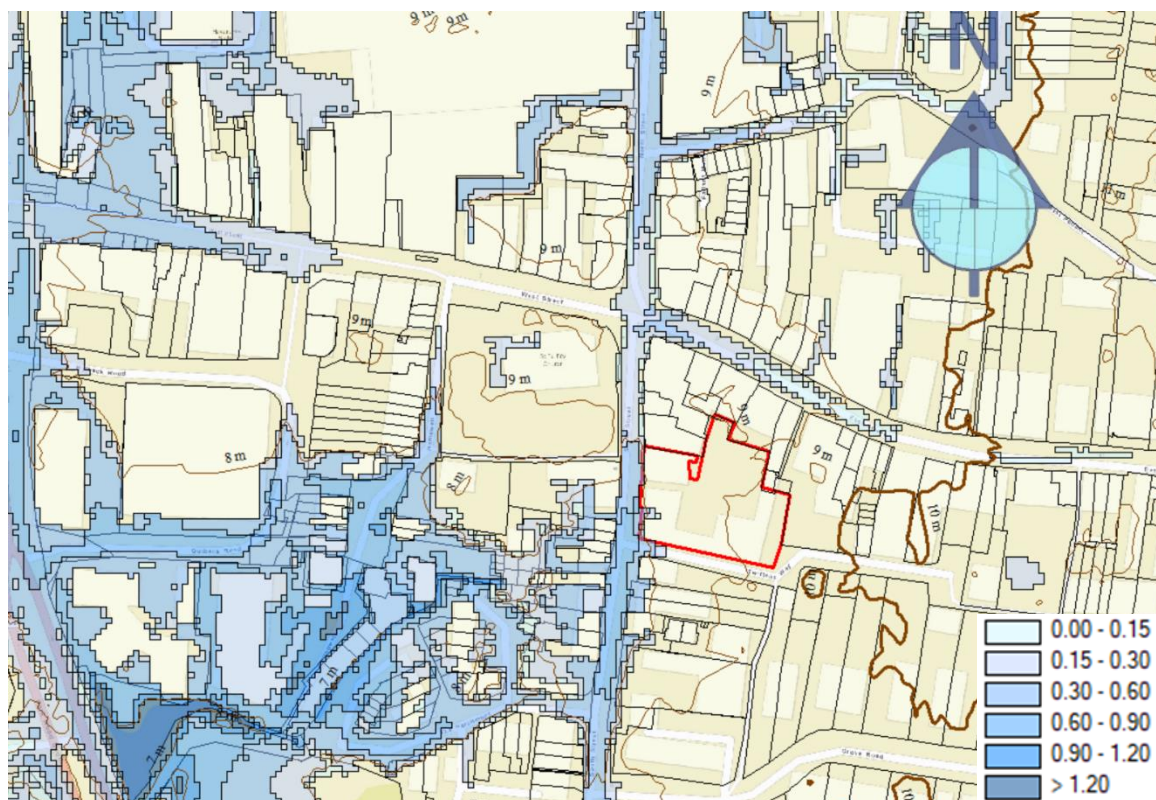


Figure 10 EA Long Term Flood Risk Maps – Low risk of surface water flooding depth (source: EA Long Term Flood Risk Maps), site bordered red.

Although surface water flooding is shown to affect South Street in all events, the modelling does show that the site is naturally located above the DFE to avoid flood risk from this source. Despite the high risk of surface water flooding within South Street, it is considered that the site itself is at low risk of surface water flooding directly.

It should be noted that the RoFSW dataset does not include drainage that is present within South Street. In reality, this drainage would mitigate much of the high-risk flood event and a large proportion of the medium risk (DFE) event.

Impacts of Climate Change

With changes in climate profiles, it is expected that rainfall intensities and frequencies will increase, and as such the risk to property will increase with this. The EA and SFRA have not included climate change modelling for surface water flooding. In the absence of this data, a very conservative estimation of the DFE plus climate change impacts can be made by looking at the 1 in 1000 year event. In the case of this site, the 1 in 1000 year event continues to show that the site would remain largely unaffected by surface water flooding, except for a very small area along the frontage of South Street. Therefore, it can be considered that the site would largely be protected during DFE plus climate change with the risk mitigated through the adoption of a Water Exclusion building strategy (refer to Section 8).

It should be noted that the Council considers the implementation of SuDS as an essential element of reducing future flood risk to both the site and its surroundings. Indeed, reducing the rate of discharge from sites is one of the most effective ways of reducing and managing flood risk. SuDS can effectively be used to minimise the potential increase of risk to the property and users in the future. In accordance with the NPPF, the sites surface water drainage should account for up to a 45% climate change allowance to site rainfall profiles, to ensure climate change is appropriately considered.

SUDS should try to achieve an infiltration solution, however careful consideration of the underlying geology location in Source Protection Zone 1 will need be very carefully considered and designed in collaboration with the EA to ensure the underlying aquifer is protected both during construction and throughout operation.

RESERVOIR FLOODING (BREACH)

Reservoirs with an impounded volume greater than 25,000 cubic metres are governed by the Reservoirs Act 1975 and are listed on a register held by the Environment Agency. The level and standard of inspection and maintenance required under the Act means that the risk of flooding from reservoirs is relatively low. Recent changes to legislation under the Flood and Water Management Act require the Environment Agency to designate the risk of flooding from these reservoirs. The Environment Agency is currently progressing a 'Risk Designation' process so that the risk is formally determined.

Reservoir flooding is very different from other forms of flooding. It may happen with little or no warning and evacuation will need to happen immediately. The likelihood of such flooding is difficult to estimate, but it is less likely than flooding from rivers or surface water. It may not be possible to seek refuge upstairs from floodwater as buildings could be unsafe or unstable due to the force of water from the reservoir breach or failure. The risk of inundation to the study area as a result of reservoir breach or failure of a number of reservoirs within the area was assessed as part of the National Inundation Reservoir Mapping (NIRIM) study.

The EA has undertaken failure scenarios of the UK reservoirs and summarised these extents through their Long Term Flood Risk Maps for Reservoir Flooding. Figure 11 shows that the site is at very low risk of flooding from any reservoir failures.

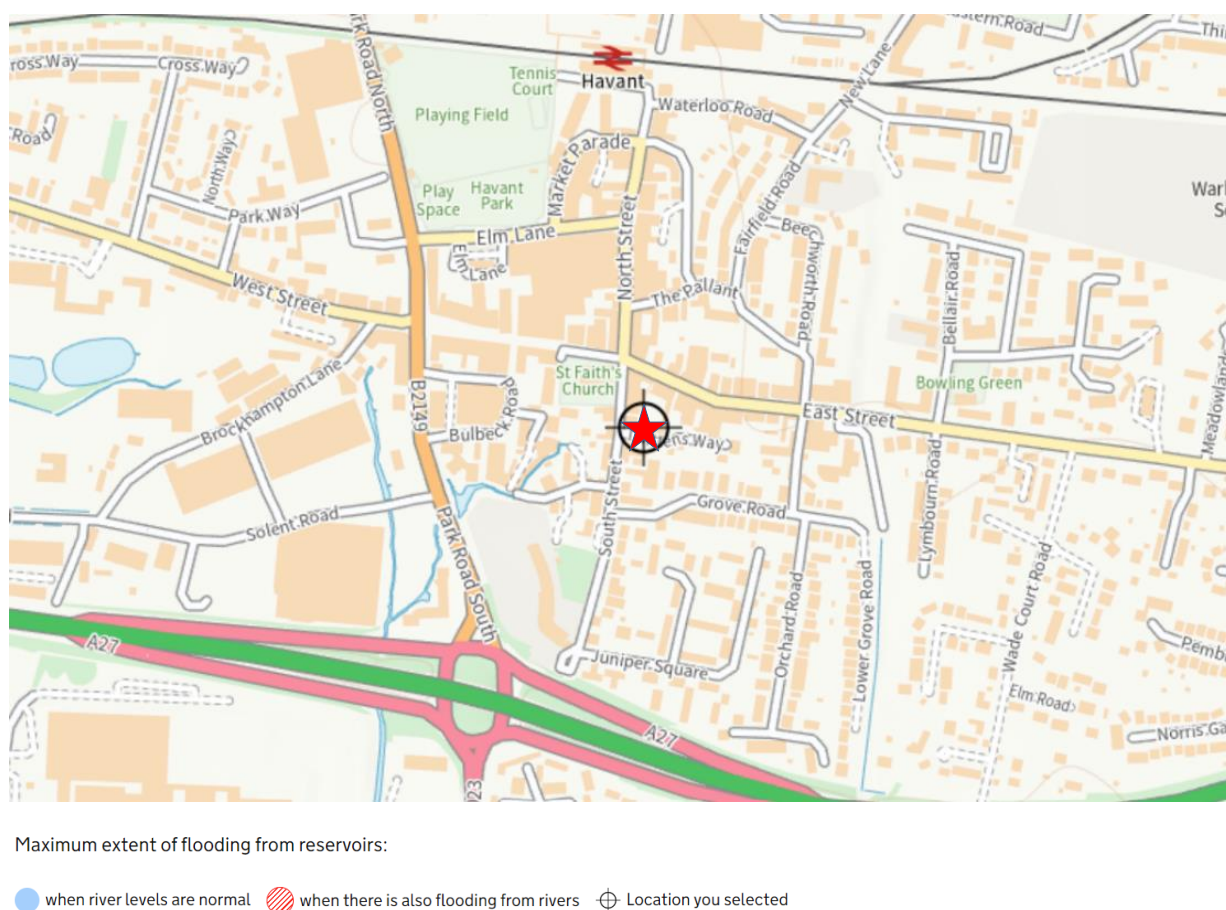


Figure 11 extract from EAs LTFRM Reservoir Flood Risk (star marks approximate site location)

HISTORICAL, SEWERS AND DRAINAGE

A common source of flooding is a result of sewer or other drainage infrastructure becoming surcharged and flooding. The HBC (PUSH) SFRA presents recorded incidences of sewer or drainage flooding recorded by Southern Water. This information shows only one recorded instance of sewer flooding in the local area located approximately 220m to the south and is understood to be from sewer overload. However, the SFRA does not present any specific records of flooding from sewer flooding affecting the site.

As part of any planning application Portsmouth Water (PW) are likely to seek and consider details in respect of surface water drainage, foul water drainage, land contamination, piling and foundation design, and construction management. Southern Water (SW) highlight that a formal application for a connection to the public foul and surface water will be required. In situations where surface water is being considered for discharge to the network, SW require the following hierarchy for surface water to be followed which is reflected in part H3 of the Building Regulations. Whilst reuse does not strictly form part of this hierarchy, Southern Water would encourage the consideration of reuse for new developments: Reuse – Infiltration – Watercourse - Storm Sewer - Combined Sewer. This does however need to be considered in combination with Portsmouth Water's concerns in respect of the safeguarding of the public water supply.

The EA have confirmed that there are no historical records of flooding affecting the site directly.

There have been no other noted flood events specifically at the site, however this does not directly indicate that the site has not flooded in the past or may flood in the future.

Therefore, it is considered the risk of sewer flooding to the site is considered low, assuming that any new development flows include appropriate protective measures to manage runoff and not increase the risk of sewer flooding.

GROUNDWATER

Groundwater flooding is the emergence of groundwater at the ground surface or into subsurface voids arising as a result of:

- ⇒ abnormally high groundwater heads or flows;
- ⇒ the introduction of an obstruction to groundwater flow; or
- ⇒ the rebound of previously depressed groundwater levels.

Groundwater flooding usually occurs following a prolonged period of low intensity rainfall. As groundwater flow is much slower than surface flow, the flooding may not recede for long periods of time, typically weeks or even months. It is important to recognise the risk of groundwater flooding is typically highly variable and heavily dependent upon local geology, topography and weather conditions, as well as local abstraction regimes. Groundwater flooding is hard to predict and challenging to mitigate.

The PUSH SFRA shows that the site straddles two areas of increasing bedrock permeability. Typically, bedrock with high permeability can have variable groundwater levels as they function as principal aquifers and can be more at risk of groundwater emergence at the surface.

Where specific groundwater flood modelling is not available, it is suitable to review ground water flood risk in combination with surface water flood risk (as groundwater emergence would typically follow similar overland flow routes as surface water flooding). Given, that the site is wholly unaffected by surface water flooding for all modelled events, it remains highly unlikely that the site would become inundated by groundwater emergence should it occur in the area. Therefore, it is considered that groundwater flood risk is low.

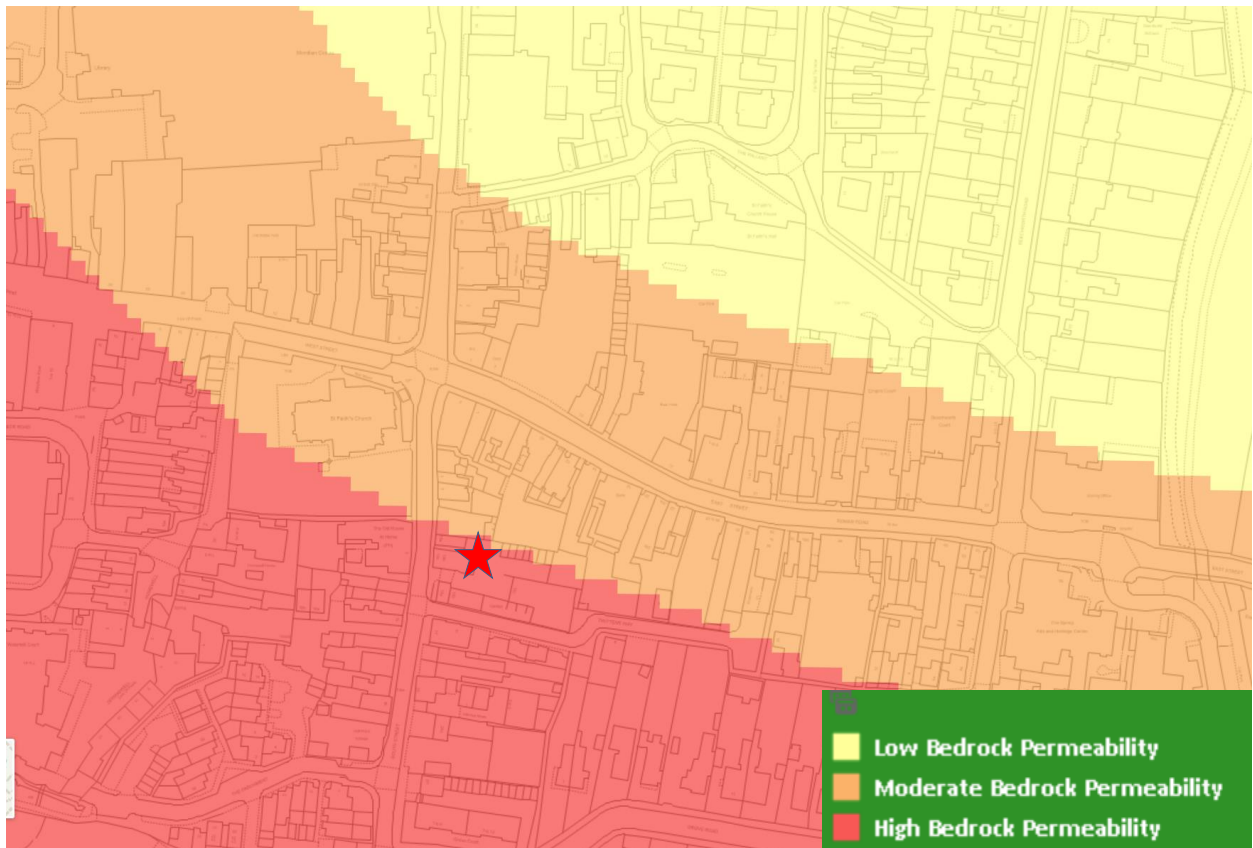


Figure 12 - extract from PUSH SFRA Mapping Groundwater flood risk

Impacts of Climate Change

The potential effects of climate change on groundwater levels are uncertain. Greater seasonality in groundwater level fluctuation is a potential outcome under a pattern of higher winter rainfall and less summer rainfall. Broad predictions of the impacts of climate change on groundwater levels are difficult to make at the present time.

RESIDUAL RISKS

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;
- 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.

The EA data shows defences are located along the Lavant in the site area. However, their SOP is less than the DFE, and is considered unlikely that should the defences fail, the site would be affected.

Although the site is located in an urbanised flood plain, the new development could remove flood plain storage capacity from the flood plain and will need to be considered. The EA has requested a comparison of the pre demolition footprint and proposed footprint is calculated and a check is undertaken to ensure there is no reduction in post development flood storage volumes. The EA have confirmed that they would accept some rudimentary calculations using available Lidar DTM levels and the flood level as above. Flood Compensation calculations'

Surface water drainage should be designed to account for the 1 in 100 year plus climate change, with external levels formed to direct site runoff around buildings and building thresholds to mitigate against flooding in an extreme rainfall event.

Wider area levels appear to show that in extreme flood events, surface flooding would be directed to the west before it could widely inundate the site.

SUMMARY OF RISKS

Table 8 below summarises the generalised risk from the various sources of flooding assessed above, and if the site is at risk of a DFE from this source.

Table 8 - Summarising sources of flooding that affect the site up to the DFE. Critical DFE shaded blue

Source of Flooding	Flood Risk	Is the site at risk of a DFE
Fluvial	Very Low	No
Tidal/Sea	Very Low	No
Surface Water	Very Low	Not directly
Reservoir	Very Low	No
Groundwater	Very Low	No
Sewers and Drainage	Very Low	No

The primary risk to the site is considered to be from surface water flooding. Although the site is not directly affected by surface water flooding for the DFE, access and egress away from the site beyond Twitters Way could be limited.

In accordance with the PPG and NPPF, Section 7 presents the proposed measures to avoid, control, mitigate, manage residual risk and ensure flood risk is not increased elsewhere, relevant to the DFE.

7 FLOOD MITIGATION MEASURES

The proposals allow the opportunity to improve flood resilience of the site by incorporating a number of flood mitigation measures, both through the incorporation of flood resilient building materials, surface water drainage improvements and signing up to the EA Flood Warning/Alert System.

Table 9 presents the key flood mitigation measures based the critical DFE on the NPPF and PPG decision making principles:

Table 9 - Key Decision Making principles and measures applied to avoid, control, mitigate, and manage flood risk

DECISION MAKING: ORDER OF PRIORITY	PROPOSED MEASURES
1. Avoid	The development proposals can raise the FFLs to ensure the more vulnerable uses are above the DFE.
2. Control	Surface Water Drainage systems to incorporate SUDS to manage the DFE on site, while reducing downstream flood risk by reducing post development site runoff to as close as greenfield as possible
3. Mitigate	Development to adopt Water Exclusion building strategy. Refer to Section 8 below for recommended Building Measures
4. Manage residual flood risk	FFL's are raised to 8.60mAOD (to be above the DFL) with external ground levels designed to direct exceedance flows away from building thresholds. Refer to Section 9 for assessment of Access and Egress (Flood Evacuation Planning).
5. Flood Risk is not increased elsewhere	Any new drainage should be designed in accordance with Building Regulations Part H, SuDS Manual and 'DCG' guidance, ensuring drainage proposals include an allowance for climate change; Any additional flows to be directed into the Local Sewer Authorities public sewers or water courses to receive confirmation of capacity and connection approvals prior to detailed design and construction. Site levels have been designed to ensure no net loss in flood plain storage.

8 BUILDING MATERIAL MITIGATIONS

The national government produced guidance for improving the flood resilience of building in the Communities and Local Government (CLG) 2007 'Improving the Flood Performance of New Buildings' publication. This publication provides recommendations on how to protect buildings in the case of a flood event, and propose two scenarios based on maximum expected flooded depths:

Water exclusion strategy – where emphasis is placed on minimising water entry whilst maintaining structural integrity, and on using materials and construction techniques to facilitate drying and cleaning. This strategy is favoured when low flood water depths are involved (not more than 0.3m). According to the definitions adopted in this Guidance, this strategy can be considered as a resistance measure but it is part of the aim to achieve overall building resilience

Water entry strategy – where emphasis is placed on allowing water into the building, facilitating draining and consequent drying. Standard masonry buildings are at significant risk of structural damage if there is a water level difference between outside and inside of about 0.6m or more. This strategy is therefore favoured when high flood water depths are involved (greater than 0.6m) by utilising resilient materials, and construction methods.

Given the primary risk is related to surface water flooding along South Street from an extreme event or failure of onsite drainage, it is considered that some key principles of the **Water Exclusion Strategy** should be adopted for the buildings on the site. Some simple construction measures can greatly protect buildings during such an event without incurring large additional construction costs. Such measures include (but not limited to):

- 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
- Using flood resilient materials (for example lime plaster) 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
- Making it easy for water to drain away after flooding such as installing a sump and a pump
- Making sure there is access to all spaces to enable drying and cleaning
- Ensuring that soil pipes are protected from back-flow such as by using non-return valves

The below are standards that should be followed and adhered to wherever possible:

- Standards for the installation and retrofit of resistance measures are in British Standard 851188-1:2019+A1:2021.
- Standards for speeding the recovery of buildings after a flood are in British Standard 85500:2015.
- Standards for dealing with and preventing water from the surrounding ground entering below ground structures such as basements are in British Standard 8102:2009.
- Comply with relevant Building Regulations in Part P. They set minimum and maximum heights for certain electrical infrastructure. We strongly recommend the use of flood resistance and resilience measures. Physical barriers raised electrical fittings and special construction materials are just some of the ways you can help reduce flood damage.

To find out which measures will be effective for this development, please contact your building control department. If you'd like to find out more about reducing flood damage, visit the Flood Risk and Coastal Change pages of the planning practice guidance. Further guidance on flood resistance and resilience measures can also be found in:

- Government guidance on flood resilient construction <https://www.gov.uk/government/publications/flood-resilient-construction-of-new-buildings>
- CIRIA Code of Practice for property flood resilience
https://www.ciria.org/Research/Projects_underway2/Code_of_Practice_and_guidance_for_property_flood_resilience_.aspx
- British Standard 85500 – Flood resistant and resilient construction
<https://shop.bsigroup.com/ProductDetail/?pid=000000000030299686>

Please note, that while PFR measures are Kitemarked to a height of 0.9m, research carried out for the Department for Communities and Local Government (DCLG) and the Environment Agency has recommended that the use of such measures should generally be limited to a nominal protection height of 0.6m above FFL's. To find out which measures will be effective for this development, please contact your building control department.

Further detail can be found at <https://assets.publishing.service.gov.uk/>:

9 SITE ACCESS AND EGRESS (FLOOD EVACUATION PLANNING)

To comply with the NPPF, all occupants should be able to make their way, unassisted by the Emergency Services, to dry land. This is known as 'safe access to dry land' and does not have to be dry, just not *hazardous* at the peak of the predicted critical 1% (1 in 100 year) plus climate change storm.

Table 13.1 of FD2320 shows the maximum depths/velocity combinations that are safe for 3 categories of user (occupant). The methodology for calculating "Flood Hazard" is reproduced below according to the methodology stated within the "Supplementary Note on Flood Hazard Ratings and Thresholds for Development Planning and Control Purposes – Clarification of the Table 13.1 of FD2320/TR2 and Figure 3.2 of FD2321/TR1" (Figure 13).

For an access/egress route to be acceptable under the NPPF, the combination of flood depths, velocities and debris must be analysed.

HR	Depth of flooding - d (m)												
	DF = 0.5				DF = 1								
Velocity v (m/s)	0.05	0.10	0.20	0.25	0.30	0.40	0.50	0.60	0.80	1.00	1.50	2.00	2.50
0.0	0.03+0.5= 0.53	0.05+0.5= = 0.55	0.10+0.5= = 0.60	0.13+0.5= = 0.63	0.15+1.0= = 1.15	0.20+1.0= = 1.20	0.25+1.0= = 1.25	0.30+1.0= = 1.30	0.40+1.0= = 1.40	0.50+1.0= = 1.50	0.75+1.0= = 1.75	1.00+1.0= = 2.00	1.25+1.0= = 2.25
0.1	0.03+0.5= 0.53	0.06+0.5= = 0.56	0.12+0.5= = 0.62	0.15+0.5= = 0.65	0.18+1.0= = 1.18	0.24+1.0= = 1.24	0.30+1.0= = 1.30	0.36+1.0= = 1.36	0.48+1.0= = 1.48	0.60+1.0= = 1.60	0.90+1.0= = 1.90	1.20+1.0= = 2.20	1.50+1.0= = 2.55
0.3	0.04+0.5= 0.54	0.08+0.5= = 0.58	0.15+0.5= = 0.65	0.19+0.5= = 0.69	0.23+1.0= = 1.23	0.30+1.0= = 1.30	0.38+1.0= = 1.38	0.45+1.0= = 1.45	0.60+1.0= = 1.60	0.75+1.0= = 1.75	1.13+1.0= = 2.13	1.50+1.0= = 2.50	1.88+1.0= = 2.88
0.5	0.05+0.5= 0.55	0.10+0.5= = 0.60	0.20+0.5= = 0.70	0.25+0.5= = 0.75	0.30+1.0= = 1.30	0.40+1.0= = 1.40	0.50+1.0= = 1.50	0.60+1.0= = 1.60	0.80+1.0= = 1.80	1.00+1.0= = 2.00	1.50+1.0= = 2.50	2.00+1.0= = 3.00	2.50+1.0= = 3.50
1.0	0.08+0.5= 0.58	0.15+0.5= = 0.65	0.30+0.5= = 0.80	0.38+0.5= = 0.88	0.45+1.0= = 1.45	0.60+1.0= = 1.60	0.75+1.0= = 1.75	0.90+1.0= = 1.90	1.20+1.0= = 2.20	1.50+1.0= = 2.50	2.25+1.0= = 3.25	3.00+1.0= = 4.00	3.75+1.0= = 4.75
1.5	0.10+0.5= 0.60	0.20+0.5= = 0.70	0.40+0.5= = 0.90	0.50+0.5= = 1.00	0.60+1.0= = 1.60	0.80+1.0= = 1.80	1.00+1.0= = 2.00	1.20+1.0= = 2.20	1.60+1.0= = 2.60	2.00+1.0= = 3.00	3.00+1.0= = 4.00	4.00+1.0= = 5.00	5.00+1.0= = 6.00
2.0	0.13+0.5= 0.63	0.25+0.5= = 0.75	0.50+0.5= = 1.00	0.63+0.5= = 1.13	0.75+1.0= = 1.75	1.00+1.0= = 2.00	1.25+1.0= = 2.25	1.50+1.0= = 2.50	2.00+1.0= = 3.00	3.50	4.75	6.00	7.25
2.5	0.15+0.5= 0.65	0.30+0.5= = 0.80	0.60+0.5= = 1.10	0.75+0.5= = 1.25	0.90+1.0= = 1.90	1.20+1.0= = 2.20	1.50+1.0= = 2.50	1.80+1.0= = 2.80	3.40	4.00	5.50	7.00	8.50
3.0	0.18+0.5= 0.68	0.35+0.5= = 0.85	0.70+0.5= = 1.20	0.88+0.5= = 1.38	1.05+1.0= = 2.05	1.40+1.0= = 2.40	1.75+1.0= = 2.75	3.10	3.80	4.50	6.25	8.00	9.75
3.5	0.20+0.5= 0.70	0.40+0.5= = 0.90	0.80+0.5= = 1.30	1.00+0.5= = 1.50	1.20+1.0= = 2.20	1.60+1.0= = 2.60	3.00	3.40	4.20	5.00	7.00	9.00	11.00
4.0	0.23+0.5= 0.73	0.45+0.5= = 0.95	0.90+0.5= = 1.40	1.13+0.5= = 1.63	1.35+1.0= = 2.35	1.80+1.0= = 2.80	3.25	3.70	4.60	5.50	7.75	10.00	12.25
4.5	0.25+0.5= 0.75	0.50+0.5= = 1.00	1.00+0.5= = 1.50	1.25+0.5= = 1.75	1.50+1.0= = 2.50	2.00+1.0= = 3.00	3.50	4.00	5.00	6.00	8.50	11.00	13.50
5.0	0.28+0.5= 0.78	0.60+0.5= = 1.10	1.10+0.5= = 1.60	1.38+0.5= = 1.88	1.65+1.0= = 2.65	3.20	3.75	4.30	5.40	6.50	9.25	12.00	14.75
Flood Hazard Rating (HR)		Colour Code		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									

Figure 13: Extracts from the Supplementary Note to FD2320/TR2 and FD2321/TR1 describing the methodology for calculating 'Flood Hazard' under the NPPF (Source: EA)

Figure 14 below illustrates that Flood Hazard throughout the site and the direct access into the site from Twitters Way is less than 'very low', so access to 'dry land' is considered feasible. Although vehicle access from Twitters Way on South Street could be limited in this event due to the flooding South Street, there is pedestrian access from Twitters Way to East Street, Grove Road or Townhall Road, where associated flood risk is very low.

Alternatively, given that the site is shown to be wholly unaffected by flooding for the DFE from all other sources, worst case, safe refuge would be available on site. It is likely that with the highway drainage present, that flooding within South Street would be relatively short lived, and safe access and egress would be restored relatively quickly.

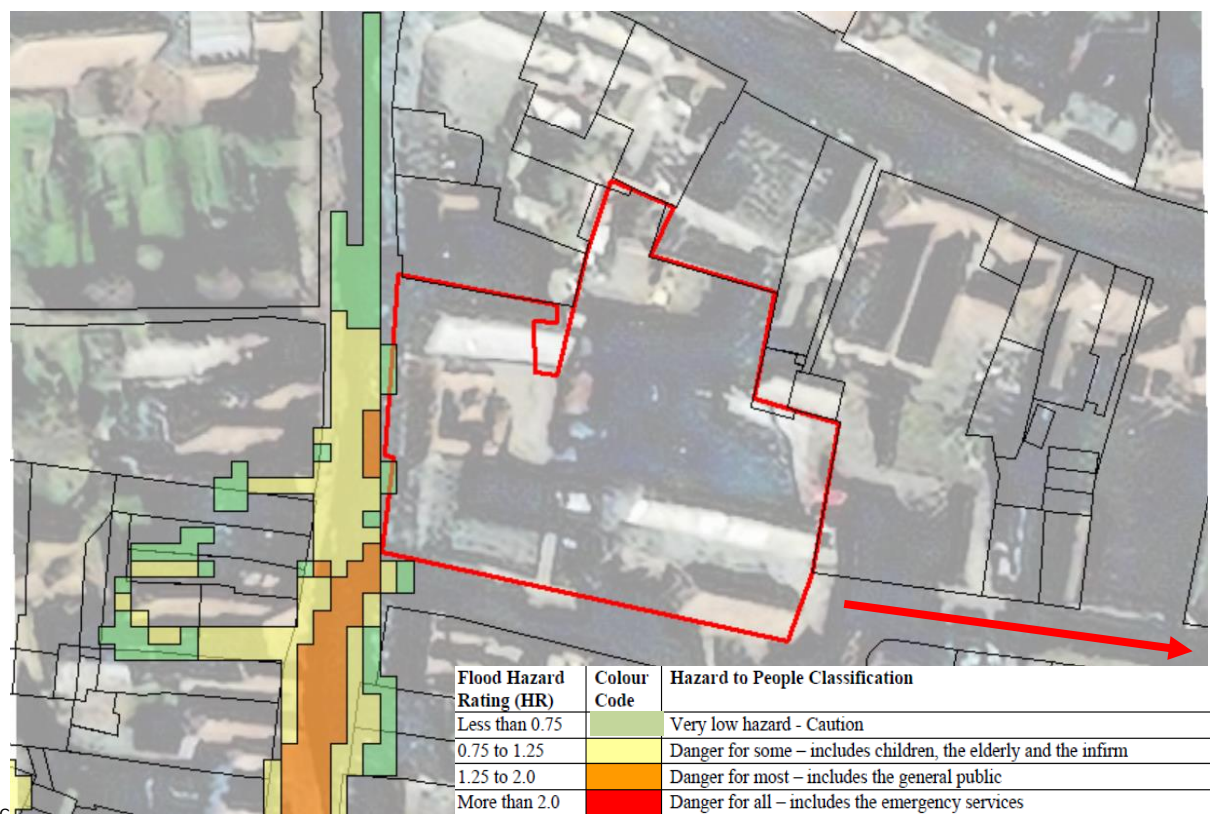


Figure 14 - EA RoFSW Hazard Mapping – Medium Risk of surface water flooding (source: Risk of Flooding from Surface Water (RoFSW)) - Red arrows designate suggested evacuation route.

The applicant/occupants should phone Floodline on 0345 988 1188 to register for a flood warning or visit <https://www.gov.uk/sign-up-for-flood-warnings>. It's a free service that provides warnings of flooding from rivers, the sea and groundwater, direct by telephone, email, or text message.

Flood warnings can give people valuable time to prepare for flooding – time that allows them to move themselves, their families, and precious items to safety. Flood warnings can also save lives and enable the emergency services to prepare and help communities.

For practical advice on preparing for a flood, visit <https://www.gov.uk/prepare-for-flooding>.

To get help during a flood, visit <https://www.gov.uk/help-during-flood>.

For advice on what do after a flood, visit <https://www.gov.uk/after-flood>.

Further information can be found on www.environment-agency.gov.uk/floodline. General advice includes:

On receipt of a FLOOD ALERT, the individual property owners and occupiers should:

- ⇒ Monitor the situation via local media;
- ⇒ Make themselves aware of forecast local weather conditions;
- ⇒ Alert both current visitors, and those scheduled to arrive, of the situation;
- ⇒ Prepare to evacuate if necessary.

On receipt of a FLOOD WARNING, the individual property owners and occupiers should:

- ⇒ Follow advice to “go in, stay in, and tune in”;
- ⇒ Move all vehicles to an area outside of the potential flood extent, if safe to do so;

- ⇒ Alert scheduled visitors that they should seek alternative accommodation;
- ⇒ Be prepared to follow instruction from the Emergency Services.

On receipt of a SEVERE FLOOD WARNING, the individual property owners and occupiers should:

- ⇒ Follow advice to “go in, stay in, and tune in”;
- ⇒ Remain attentive to local media forecasts and news bulletins;
- ⇒ Do not evacuate unless instructed to do so by the Emergency Services;

If flood waters along the proposed evacuation route have exceed 25cm, site users are advised to seek advice from emergency services.

10 CONCLUSION

This assessment is required under the National Planning Policy Framework (NPPF) and Local and District Councils given the location, scale, and associated flood risks.

Table 3 summarises the sites primary flood risk classifications and the source for the DFE. This designation is based on the SFRA's Fluvial Flood Maps (plus climate Change) (extract provided in Figure 2) and the EA's Long Term Flood Risk Maps (LTFRM): Risk of Flooding from Surface Water (RoFSW) (extract provided in Figure 3).

The LPA have accepted that the site meets the requirements and passes the Sequential Test (see letter dated 05.10.2023 in Appendix 2 for correspondence). As such this FRA presents the findings of the Exception Test and recommendations for incorporation of flood resilient measures to improve long term flood resilience of the proposals.

This FRA (in conversation and agreement with the EA), have determine that fluvial flood risk is the dominant source of flooding to the site. The EA have confirmed that a design flood level (including an allowance for climate change) of 8.60mAOD will be suitable for setting FFLs. As such, the development proposals will need to ensure that FFLs are set no lower than 8.60mAOD for the residential uses.

To mitigate against an increase in flood risk elsewhere, external ground levels have been designed to ensure there is no loss of flood plain as a result of increasing built footprint on site. In addition, SUDS are to be implemented to reduce post development runoff rates, further reducing development flood risk.

The development should also include flood resilient construction and design methods, specifically those relating to the Water Exclusion building strategy. Refer to Section 8 below for recommended Building Measures.

The applicant/occupants should phone Floodline on 0345 988 1188 to register for a flood warning or visit <https://www.gov.uk/sign-up-for-flood-warnings>. It's a free service that provides warnings of flooding from rivers, the sea and groundwater, direct by telephone, email, or text message.

Figure 14 illustrates that Flood Hazard throughout the site and the direct access into the site from Twitters Way is less than 'very low', so access to 'dry land' is considered feasible. Although vehicle access from Twitters Way on South Street could be limited in this event due to the flooding South Street, there is pedestrian access from Twitters Way to East Street, Grove Road or Townhall Road, where associated flood risk is very low from all sources.

Table 9 summarises how this FRA has applied the PPG's key decision making principles to avoid, control, mitigate, manage residual risk and to ensure the development proposals do not increase flood risk post development. Based on the PPG and NPPF, and assuming the recommendations of this FRA are followed, it is considered that the development proposals on this site should be considered appropriate.

APPENDIX 1 – SUPPORTING INFORMATION



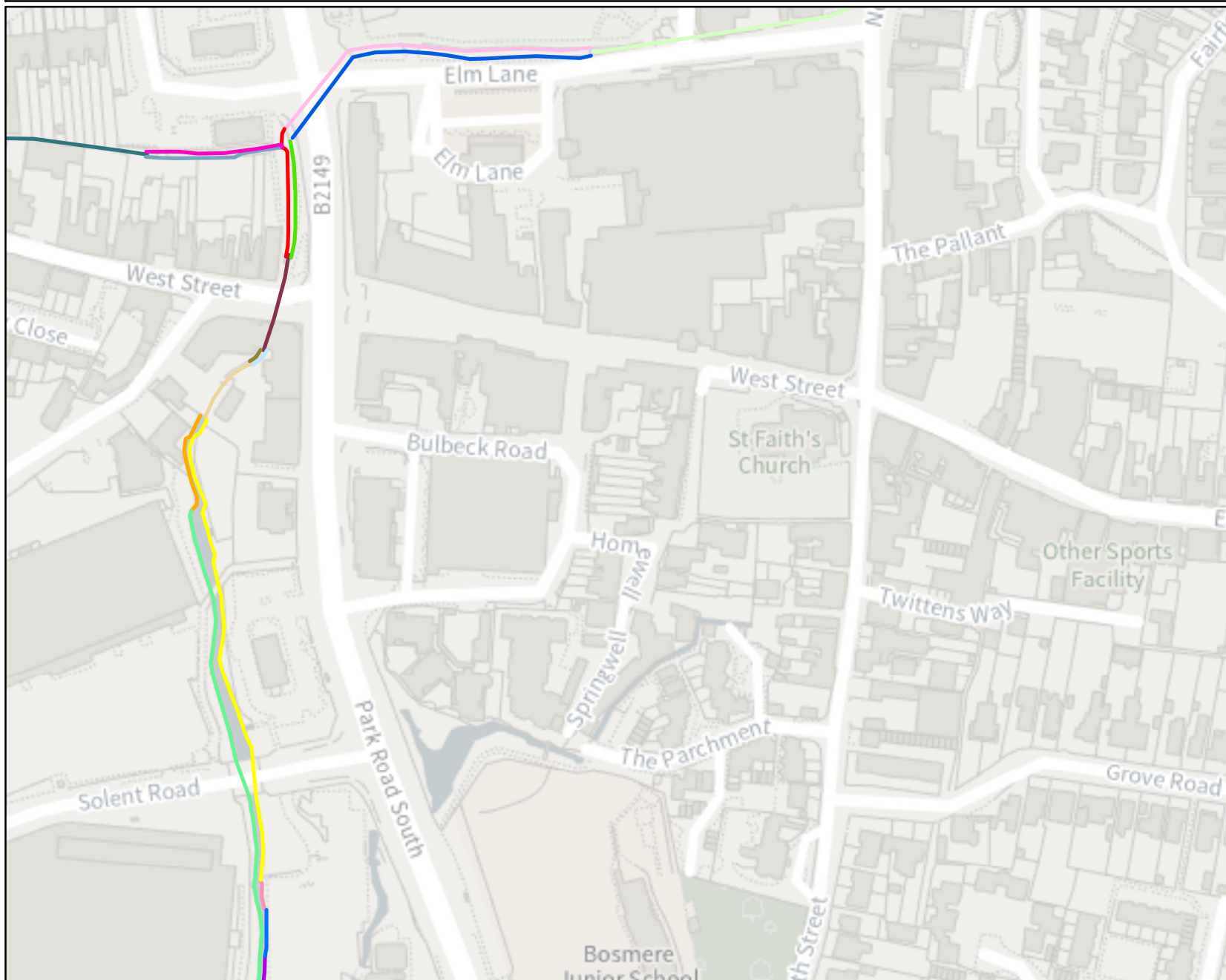
1.100	1.200	20150-1 D110	
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1:100

0 2m 4m 6m 8m 10m

APPENDIX 2 - EA DATA

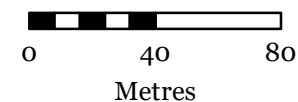
1D Modelled Flood Levels Centred on Grid Ref: 471819, 106184 - Created 7 Sept 2022



Legend

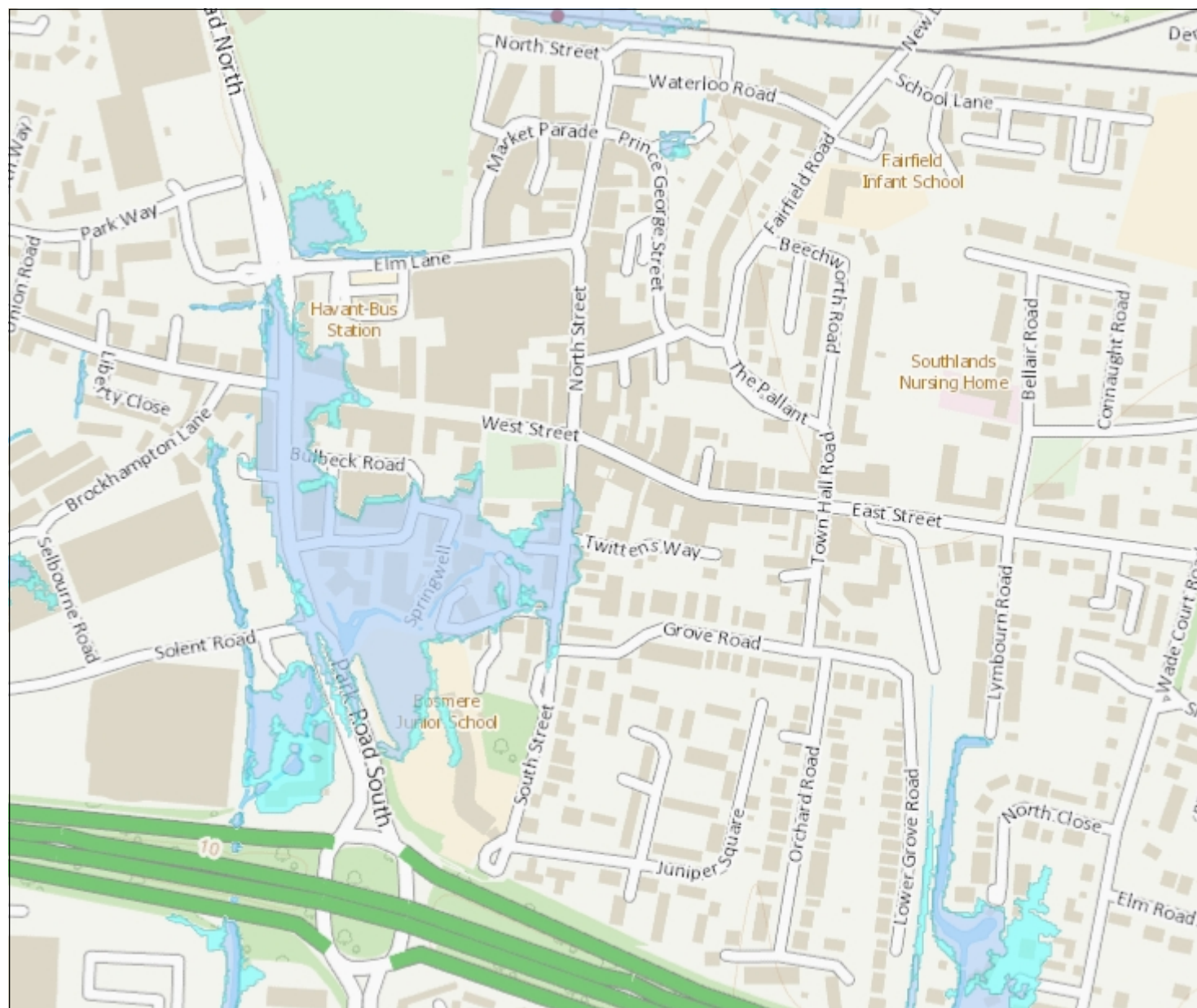
asset_id	
22923	111058
48074	47816
171803	49550
18839	49984
22853	
22854	
22855	
22856	
22894	
22942	
22943	
404012	
404014	
49982	
49983	

1:2,404 *
*when printed at A4.



Asset ID	Asset sub-type	Length	Maintainer	Current condition	Standard of Protection	Date of last inspection
48074	Natural High Ground	59.12	Environment Agency	Fair	1:40	31/05/2022
22923	Natural High Ground	59.71	Environment Agency	Fair	1:40	31/05/2022
171803	Natural High Ground	44.15	Unknown		1:40	01/07/2022
22853	Natural High Ground	109.52	Private individual, Company or Charity		1:40	01/07/2022
22855	Natural High Ground	44.84	Unknown		1:40	01/07/2022
22894	Natural High Ground	146.06	Private individual, Company or Charity		1:40	01/07/2022
22943	Natural High Ground	147.7	Private individual, Company or Charity		1:40	01/07/2022
49982	Natural High Ground	13.35	Unknown		1:40	01/07/2022
22854	Natural High Ground	205.99	Unknown		1:40	01/07/2022
22856	Wall	50.11	Private individual, Company or Charity		1:40	01/07/2022
22942	Natural High Ground	56.12	Private individual, Company or Charity		1:40	01/07/2022
49983	Natural High Ground	350.8	Private individual, Company or Charity		1:40	01/07/2022
404014	Engineered High Ground	6.87	Unknown			01/07/2022
18839	Natural High Ground	19.98	Unknown		1:40	01/07/2022
404012	Engineered High Ground	8.82	Unknown			01/07/2022
47816	Simple Culvert	229.92	Private individual, Company or Charity		1:40	01/07/2022
49550	Simple Culvert	118.89	Private individual, Company or Charity		1:40	31/05/2022
49984	Simple Culvert	42.39	Private individual, Company or Charity		1:40	01/07/2022
111058	Simple Culvert	31.52	Private individual, Company or Charity		1:40	01/07/2022

Flood Map for Planning (Rivers and Sea) Centred on South Street - Created 7 Sept 2022



1: 5,000

0 Metres 125



Flood Map for Planning (Rivers & Sea)

- Defences
- Flood Storage Areas
- Areas benefiting from flood defences
- Flood Zone 3
- Flood Zone 2

Flood Map Areas (assuming no defences)

Flood Zone 3 shows the area that could be affected by flooding:

- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

Flood map for planning

Your reference
1292

Location (easting/northing)
471820/106180

Created
18 Sep 2022 8:38

Your selected location is in flood zone 1, an area with a low probability of flooding.

You will need to do a flood risk assessment if your site is **any of the following:**

- bigger than 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

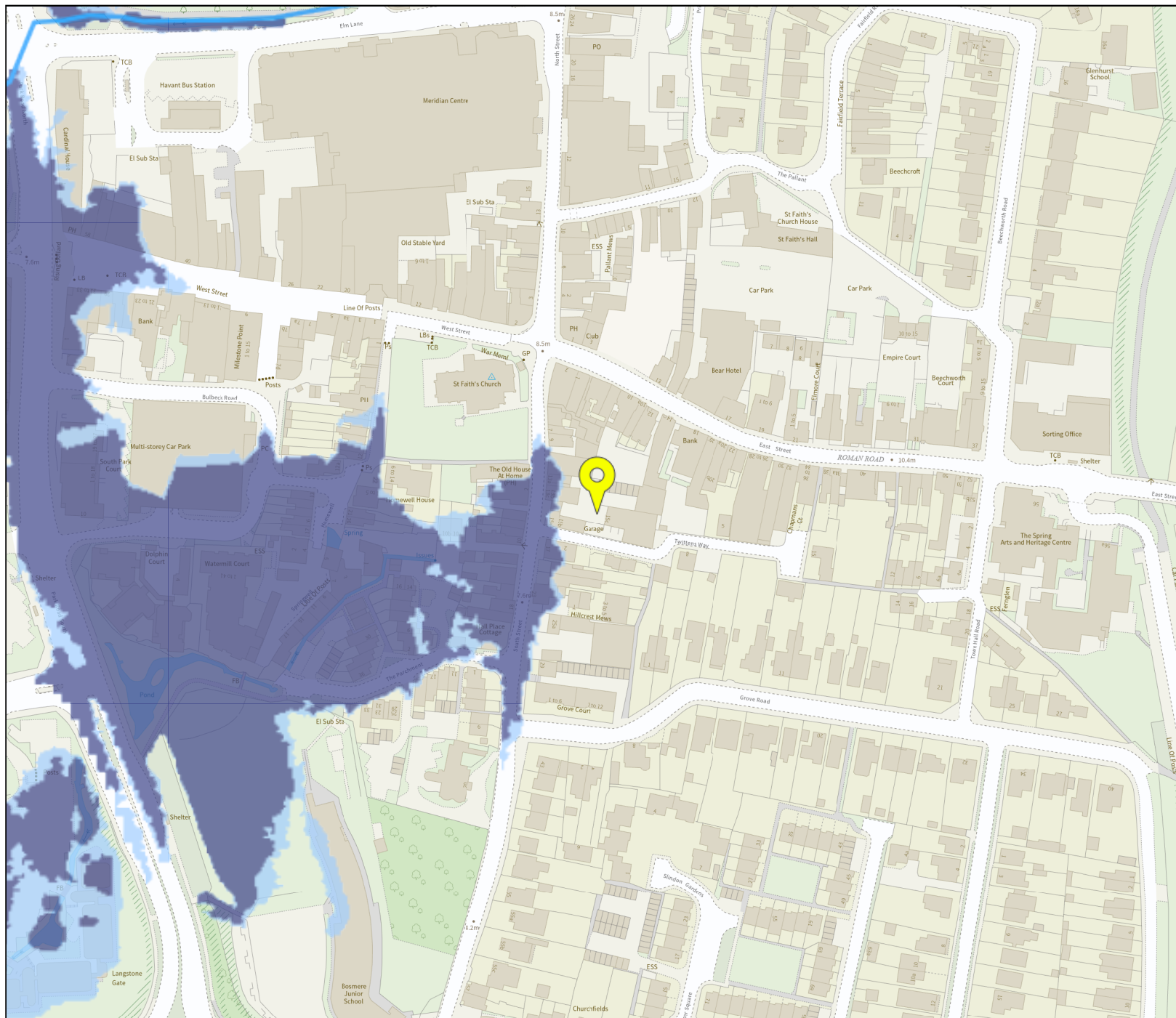
Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

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Flood map for planning

Your reference
1292

Location (easting/northing)
471820/106180

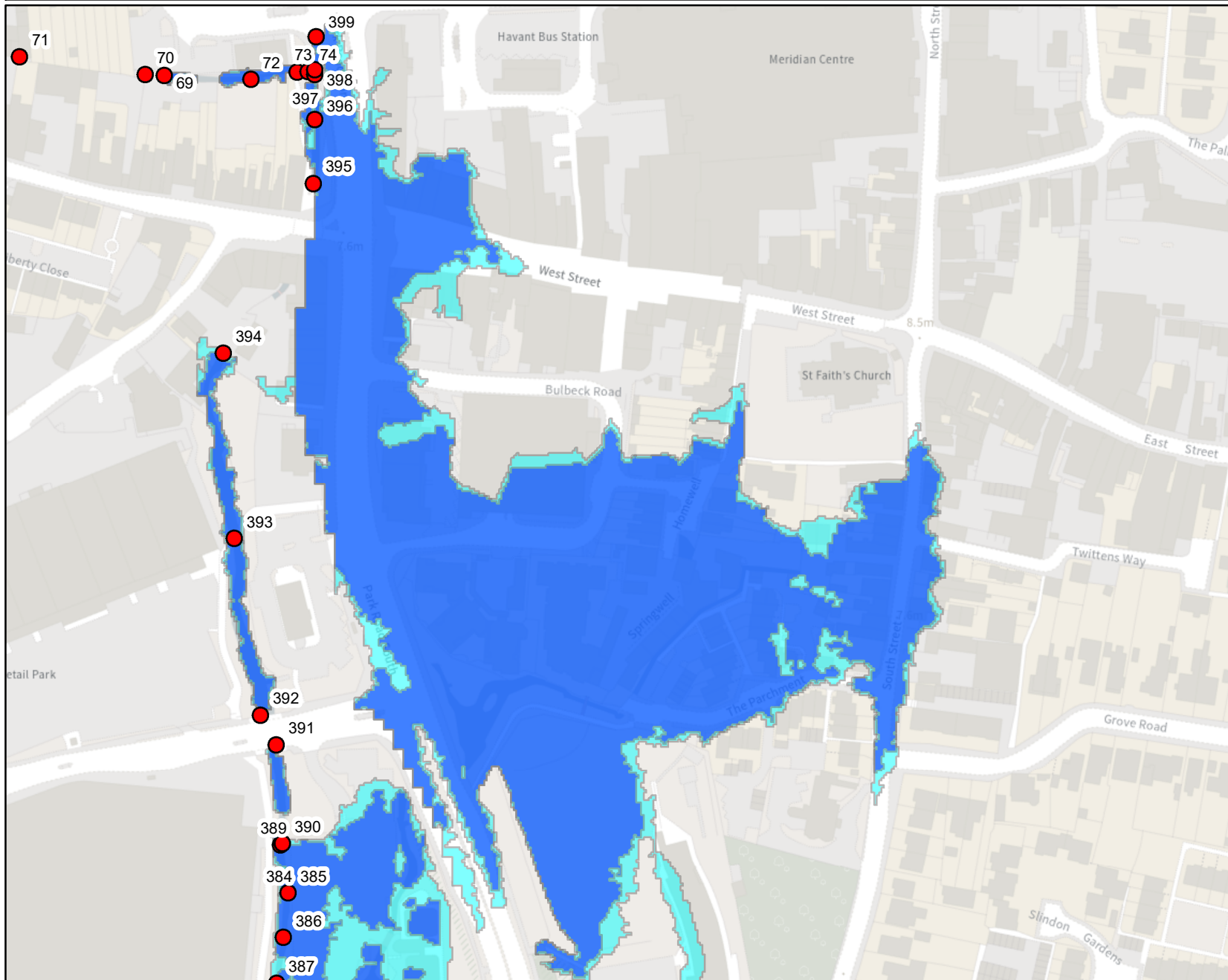
Scale
1:2500

Created
18 Sep 2022 8:38

-  Selected point
-  Flood zone 3
-  Flood zone 3: areas benefiting from flood defences
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Water storage area


0 20 40 60m

1D Modelled Flood Levels Centred on Grid Ref: 471819, 106184 - Created 7 Sept 2022



Legend

- Lavant & Hermitage 1D Levels
- Lavant & Hermitage 100Yr (Flood Zone 3)
- Lavant & Hermitage 1000Yr (Flood Zone 2)

Flood Map Areas (assuming no defences)

Flood Zone 3

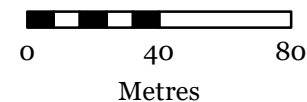
Shows the area that could be affected by flooding:
- from the sea with an 1 in 200 or greater chance of happening each year.
- or from a river with a 1 in 100 or greater chance of happening each year.

Flood Zone 2

Shows the extent of an extreme flood from rivers of the sea with up to a 1 in 1000 chance of occurring each year.

1:2,298 *

*when printed at A4.



Water Levels for 13-15 South Street

ID	Easting	Northing	100yr Level	100yr Level No Dam	1000yr Level	1000yr Level No Dam
69	471487	106361	7.645	0.736	7.696	0.831
70	471479	106362	7.528	0.736	7.566	0.831
71	471428	106369	7.038	0.736	7.071	0.831
72	471522	106360	7.718	0.736	7.773	0.831
73	471541	106363	7.75	0.736	7.8	0.831
74	471546	106363	7.774	0.736	7.825	0.831
384	471538	106028	6.269	4.829	6.539	8.951
385	471538	106028	6.269	4.835	6.539	8.963
386	471536	106009	6.162	4.851	6.517	9.141
389	471534	106047	6.328	4.812	6.574	8.956
390	471535	106048	6.33	4.778	6.576	8.61
391	471533	106088	6.453	3.57	6.615	6.007
392	471526	106100	6.463	3.427	6.65	5.866
393	471516	106172	6.968	3.343	7.129	5.269
394	471511	106248	7.687	1.018	7.808	1.018
395	471548	106317	7.781	1.018	7.837	1.018
396	471548	106343	7.784	1.018	7.838	1.018
397	471548	106362	7.776	1.035	7.826	1.035
398	471548	106364	7.776	1.369	7.826	1.469
399	471549	106377	7.793	1.369	7.842	1.47

* Levels in metres above Ordnance Datum Newlyn



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PLANNING APPLICATION RESPONSE OF PLANNING POLICY

Application No:	APP/23/00193
Site Address:	11-15 South Street, Havant, PO9 1BU
Development:	Part demolition and part redevelopment of existing buildings and change of use from Class A2, B1(c) and B8 to C3 use with the construction of 7 town house dwellings and 10 apartments at land to the rear of 11, 13 and 15 South Street, Havant.
Case Officer:	AM
Comments by:	JB
Date of Comments:	5 October 2023

NOTE: Policy comments were previously offered on 22 May 2023. This note offers updated comments on flood risk only following the applicants' submission of a sequential test.

Previously, policy comments had highlighted that based on the latest Environment Agency mapping, the South Street frontage is at risk of flooding, and that a site specific Flood Risk Assessment (FRA) and a sequential test are therefore required.

The applicant has acknowledged the requirement for a sequential test and has submitted a report documenting their search for alternative sites. That report seeks to show that no suitable alternative sites are available anywhere in the borough, and that therefore the sequential test is passed, and that the exception test is also satisfied.

The applicant was advised in pre-application discussions that the Council's guidance on the sequential test suggests areas of search for different development scenarios. In recognition of Havant town centre's regeneration needs, it is suggested that the area of search may be limited to the Havant town centre regeneration area as defined by policy CS6 of the Local Plan. That guidance was updated in March 2023 giving further detailed reasoning:

The Borough's town centres and the Hayling Island Seafront are areas whose vitality is key for the economic wellbeing of the whole Borough. The seafront and large parts of Havant town centre in particular are at risk of flooding. As individual sites are brought forward for redevelopment to achieve wider regeneration aims, it is acknowledged that there may be sequentially preferable sites. However, since the purpose of such redevelopment is regeneration, it would not be appropriate to seek to direct these developments elsewhere. Therefore, in areas covered by an adopted regeneration driven policy / strategy / masterplan, the sequential test will be applied at site level or group of site level only. The applicant should show how avoidance of risk has been considered in the design and layout of the proposed development and wider regeneration plans.

While the South Street area is not specifically identified in council policy as an area in need of regeneration, it does fall within the boundary of the defined town centre through Policy CS4 and regeneration policy CS6. Overall, from a policy perspective I am satisfied that the redevelopment of this site has the potential to contribute to the regeneration aims in the town centre, and therefore the guidance previously given to the applicant that the search area may be limited to the town centre remains valid.

The applicant's submitted sequential test documentation does not focus on the town centre and instead has attempted to review the whole borough. Given the above discussion, I will not comment in detail on the applicant's search, save to note that

- Appropriate sources of information on sites have been used
- The document does not facilitate an easy review of the sites rejected, as only those sites assessed further area presented. It is therefore not possible, for example, to see what sites have been rejected because they are considered to be at greater or equal risk of flooding, or considered to be too large or small to accommodate the proposal.

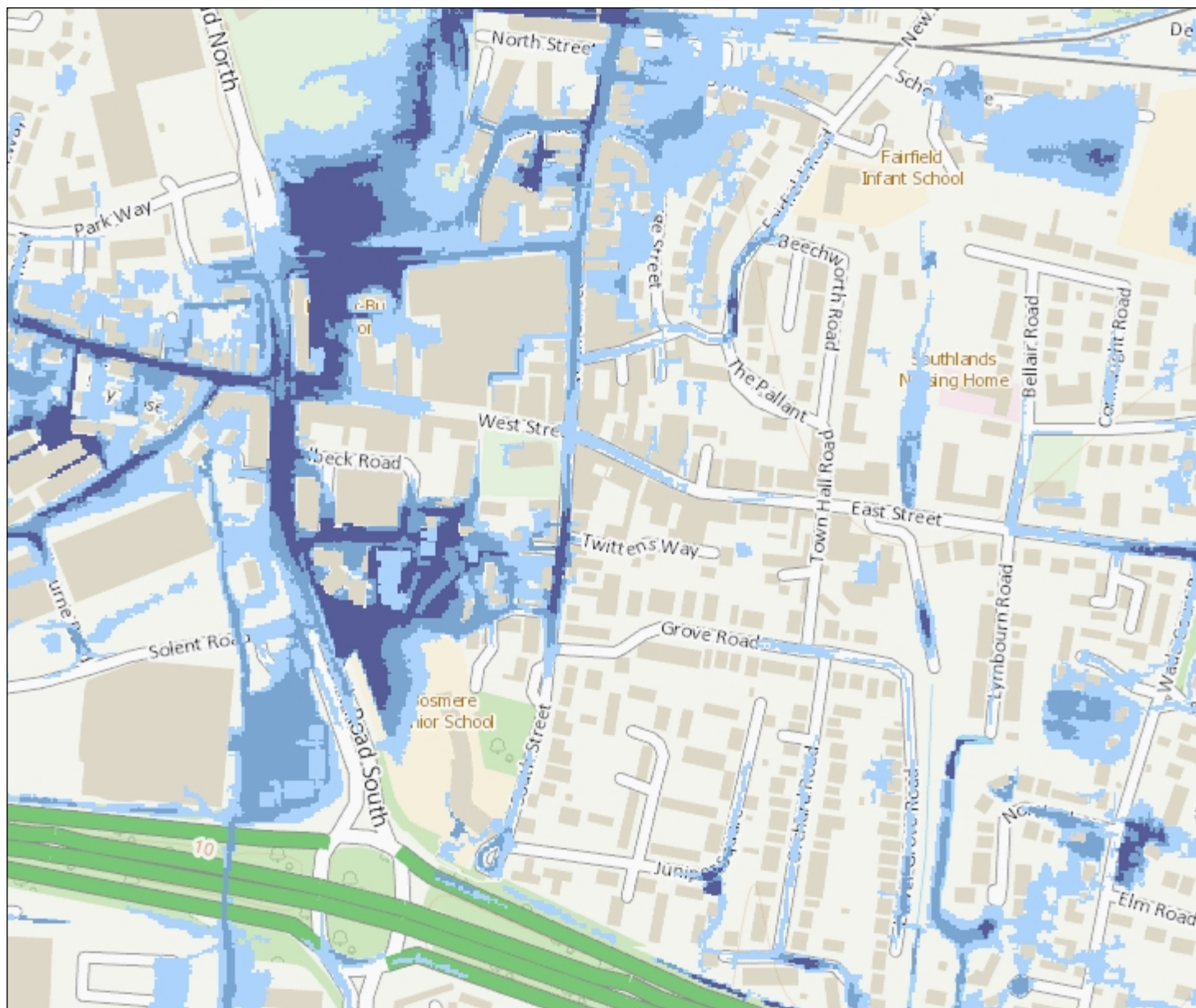
A review of town centre sites by the applicant is not before the Council for review. However, I have reviewed available flood risk mapping in the town centre, together with potentially suitable and available sites for the proposed development (by reference to allocations and call for sites submissions made in 2022) and am satisfied that there are no available alternative sites at lower risk for flooding. This also takes into account the fact that only a small part of the site is at risk. Overall, I am satisfied that the sequential test can be passed for this proposal.

However, as the applicant also accepts, the proposal is a 'more vulnerable' use as classified by the PPG, and therefore the exception test must also be passed. The applicant seeks to demonstrate that the exception test is passed. They do so largely by reference to their FRA, concluding that on site mitigation measures are proposed which manage any risk. However, I note that the Environment Agency maintain an objection, raising questions about the applicant's FRA. The LLFA have also requested further information. Until these concerns are addressed, it is not possible for it to be concluded that development will be safe for its lifetime and that part b) of the sequential test is passed.

With regard to part a) – that the development would provide wider sustainability benefits to the community that outweigh the flood risk – the applicant has provided little evidence of this, merely stating that *'the site is within a highly sustainable location adjacent to existing settlements but within a portion of land which, if developed, would create minimal impacts of existing settlements, and built form. If this development was to be built on allocated land, this would impact the Council's housing figures'*. This is not considered sufficient to address part a) of the exception test. While, even in the absence of strong arguments by the applicant, I accept that the regeneration of the site factors into this part of the test, the test will only be passed if the scheme contributes substantially more than a straightforward residential development. On this site, benefits might include a substantial betterment in run off rates as compared the existing development, outstanding design that makes a positive contribution the conservation area, measures to address biodiversity and climate change, etc. These examples are not prescriptive or exclusive, but it remains for the applicant to demonstrate that the scheme indeed provides wider sustainability benefits to the community that outweigh the flood risk.

Overall, it is not considered that the scheme passes the exception test at this stage.

Risk of flooding from Surface Water Centred on South Street - Created 7 Sept 2022



1: 5,000

0 Metres 125



Likelihood of flooding from Surface Water

- High ($\geq 3.3\%$)
- Medium (3.3% - 1%)
- Low (1% - 0.1%)
- Very Low

Likelihood of flooding from Surface Water

- High: Greater than or equal to 3.3% (1 in 30) chance in any given year
- Medium: Less than 3.3% (1 in 30) but greater than or equal to 1% (1 in 100) chance in any given year
- Low: Less than 1% (1 in 100) but greater than or equal to 0.1% (1 in 1,000) chance in any given year
- Very Low: Less than 0.1% (1 in 1,000) chance in any given year

This information is shown on the Risk of Flooding from Surface Water map on GOV.UK.

Use of Environment Agency Information for Flood Risk Assessments

Important

The Environment Agency are keen to work with partners to enable development which is resilient to flooding for its lifetime and provides wider benefits to communities. If you have requested this information to help inform a development proposal, then we recommend engaging with us as early as possible by using the pre-application form available from our website:

<https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion>

We recognise the value of early engagement in development planning decisions. This allows complex issues to be discussed, innovative solutions to be developed that both enables new development and protects existing communities. Such engagement can often avoid delays in the planning process following planning application submission, by reaching agreements up-front. We offer a charged pre-application advice service for applicants who wish to discuss a development proposal.

We can also provide a preliminary opinion for free which will identify environmental constraints related to our responsibilities including flooding, waste, land contamination, water quality, biodiversity, navigation, pollution, water resources, foul drainage or Environmental Impact Assessment.

In preparing your planning application submission, you should refer to the Environment Agency's Flood Risk Standing Advice and the Planning Practice Guidance for information about what flood risk assessment is needed for new development in the different Flood Zones. This information can be accessed via:

<https://www.gov.uk/flood-risk-assessment-standing-advice>
<http://planningguidance.planningportal.gov.uk/>

You should also consult the Strategic Flood Risk Assessment or other relevant materials produced by your local planning authority.

You should note that:

1. Information supplied by the Environment Agency may be used to assist in producing a Flood Risk Assessment (FRA) where one is required, but does not constitute such an assessment on its own.
2. This information covers flood risk from main rivers and the sea, and you will need to consider other potential sources of flooding, such as groundwater or surface water runoff. Information produced by the local planning authority referred to above may assist here.
3. Where a planning application requires an FRA and this is not submitted or is deficient, the Environment Agency may raise an objection.

APPENDIX 3 - FLOOD COMPENSATION CALCULATIONS

FLOOD STORAGE CALCULATIONS ARE BASED ON A DESIGN FLOOD LEVEL OF 8.60m AOD FOR THE 1 IN 100 YEAR PLUS CLIMATE CHANGE (AS ADVISED BY THE EA).

FLOOD STORAGE CALCULATIONS ARE BASED OFF OF SITE SURVEY J. BROTHERTON & PARTNERS SURVEY (REFERENCE Z2110 DATED 22.02.22). LEVELS TAKEN TO ORDNANCE DATUM.

FLOOD STORAGE VOLUMES IN THE EXISTING CASE HAVE BEEN CALCULATED BY CONVERTING THE SITE SURVEY TO A DIGITAL TERRAIN MODEL, THEN UNDERTAKING A VOLUMETRIC DIFFERENCE CALCULATIONS BETWEEN THE EXISTING (DTM) AND DESIGN FLOOD LEVEL OF +8.60m AOD APPLIED UNIFORMLY ACROSS THE SITE.

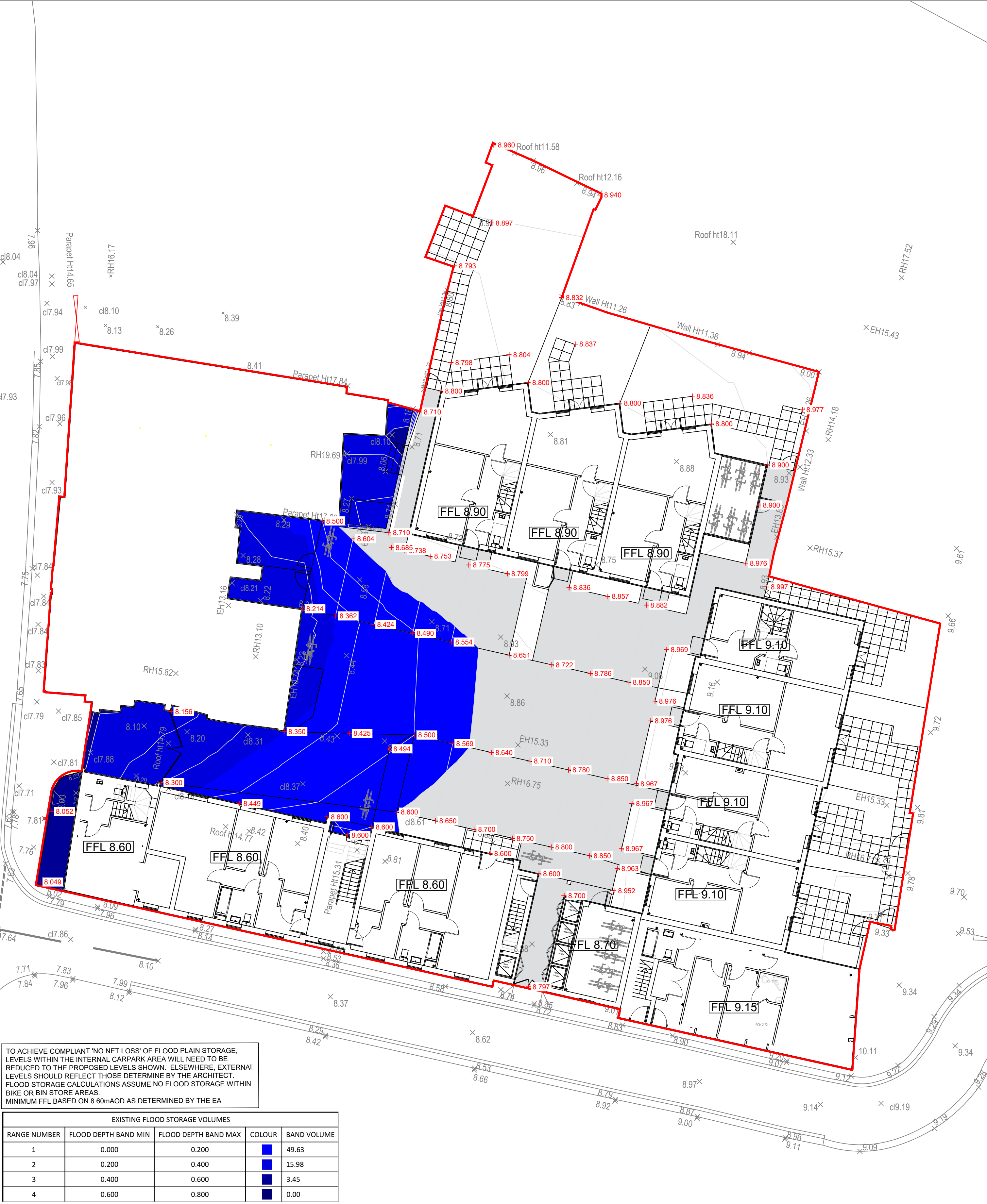
SIMILARLY, FLOOD STORAGE VOLUMES IN THE POST DEVELOPMENT SCENARIO HAVE BEEN CALCULATED BY MODELLING THE PROPOSED SURFACE, WITH ADJUSTED SITE LEVELS TO ACHIEVE NO NET LOSS, AND TAKING A VOLUMETRIC DIFFERENCE BETWEEN THE PROPOSED DTM AND THE DESIGN FLOOD LEVEL.

FLOOD STORAGE AREA BASED ON THE REDLINE BOUNDARY, WITH AN AREA OF 1933m².

WHERE SITE LEVEL DATA HAS NOT BEEN PROVIDED, LEVELS HAVE GENERALLY BE EXTRAPOLATED BETWEEN THE CLOSEST KNOWN POINTS.



FLOOD STORAGE EXTENTS AND VOLUMES IN THE PRE-DEVELOPMENT SCENARIO
TOTAL FLOOD STORAGE PROVIDED IN THE PRE-DEVELOPMENT SCENARIO = 60.12m³



FLOOD STORAGE EXTENTS AND VOLUMES IN THE POST-DEVELOPMENT SCENARIO
TOTAL FLOOD STORAGE PROVIDED IN THE POST-DEVELOPMENT SCENARIO = 60.54m³

ISSUE	DATE	DESCRIPTION