

REPORT

NPPF Flood Risk Assessment

174 Southwood Road, Hayling Island, Havant,
Hampshire PO11 9QL

Client: Sarah Lawson and Ivan Snell

Reference: 6799-AEA-ZZ-XX-RP-Z-2500

Status: S4/P01.04

Date: 22 June 2023

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- [1] Ministry of Housing, Communities & Local Government, “National Planning Policy Framework,” 20 July 2021. [Online]. Available: <https://www.gov.uk/government/publications/national-planning-policy-framework--2>.
- [2] The National Archives, “The Flood Risk Regulations 2009,” 01 04 2013. [Online]. Available: <https://www.legislation.gov.uk/uksi/2009/3042/regulation/20>.
- [3] Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government, “Guidance Flood risk and coastal change,” 25 August 2022. [Online]. Available: <https://www.gov.uk/guidance/flood-risk-and-coastal-change>.
- [4] Department for Environment, Food & Rural Affairs, “Sustainable drainage systems: non-statutory technical standards,” 23 March 2015. [Online]. Available: <https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards>.
- [5] HM Government, “Guidance: Preparing a flood risk assessment: standing advice,” DEFRA and Environment Agency, 01 March 2019. [Online]. Available: <https://www.gov.uk/guidance/flood-risk-assessment-standing-advice>.
- [6] Department for Environment, Food & Rural Affairs, “Reservoir flood maps published,” 16 12 2010. [Online]. Available: <https://www.gov.uk/government/news/reservoir-flood-maps-published>.
- [7] Legislation.gov.uk, “Water Industry Act 1999,” 2022. [Online]. Available: <https://www.legislation.gov.uk/ukpga/1999/9/contents>.
- [8] Legislation.gov.uk, “Directive 2000/60/EC of European Parliament and of the Council,” 2000. [Online]. Available: <https://www.legislation.gov.uk/eudr/2000/60/contents>.
- [9] European Parliament and of the Council, “Directive 2007/60/EC on the assessment and management of flood risks,” 23 11 2007. [Online]. Available: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32007L0060>.
- [10] Legislation.gov.uk, “The Flood Risk Regulations 2009,” 2009. [Online]. Available: <https://www.legislation.gov.uk/uksi/2009/3042/contents>.
- [11] Legislation.gov.uk, “Flood and Water Management Act 2010,” 2010. [Online]. Available: <https://www.legislation.gov.uk/ukpga/2010/29/contents>.
- [12] Gov.uk, “Building Regulations and Approved Documents index,” 10 08 2021. [Online]. Available: <https://www.gov.uk/guidance/building-regulations-and-approved-documents-index>.
- [13] Legislation.gov.uk, “The Town and Country Planning (Development Management Procedure) (England) Order 2015,” 2015. [Online]. Available: <https://www.legislation.gov.uk/uksi/2015/595/contents/made>.
- [14] British Standards, “BS EN 752:2017 Drain and sewer systems outside buildings - sewer system management,” 10 2019. [Online]. Available: <https://www.thenbs.com/PublicationIndex/documents/details?DocID=327686>.
- [15] Gov.uk, “Sustainable drainage systems: non-statutory technical standards,” 23 03 2015. [Online]. Available: <https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards>.
- [16] Gov.uk, “Guidance, Flood risk and coastal change,” 20 08 2021. [Online]. Available: <https://www.gov.uk/guidance/flood-risk-and-coastal-change>.
- [17] Ciria, “The SuDS Manual (C753F),” 12 2015. [Online]. Available: <https://www.ciria.org/ItemDetail?iProductCode=C753F&Category=FREEPUBS>.

- [18] Water.org.uk, "Sector Guidance in relation to the adoption of sewerage assets by sewerage companies in England," 25 10 2019. [Online]. Available: <https://www.water.org.uk/wp-content/uploads/2020/02/Sewerage-Sector-Guidance-v1-251019.pdf>.
- [19] Environment Agency & Department for Environment, Food and Rural Affairs, "Preparing a flood risk assessment: standing advice," 08 02 2022. [Online]. Available: <https://www.gov.uk/guidance/flood-risk-assessment-standing-advice>.
- [20] Environment Agency, "Guidance; Flood risk assessments: climate change allowances," 06 10 2021. [Online]. Available: <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>.
- [21] Local Government Association, "Local Government Association," [Online]. Available: <https://www.local.gov.uk/topics/severe-weather/flooding/local-flood-risk-management/managing-flood-risk-roles-and>.
- [22] Association of Drainage Authorities, "Internal Drainage Boards Map," [Online]. Available: <https://www.ada.org.uk/idb-map/>.
- [23] H. Udale-Clarke, "Flood Risk Assessment Guidance for New Development Phase 2, FD2320/TR2," Department for Environment Food and Rural Affairs, London, 2005.
- [24] G. G. S. W. a. H. U.-C. Suresh Surendran, "Supplementary Note on Flood Hazard Ratings and Thresholds for Development Planning and Control Purpose - Clarification of the Table 13.1 of FD2320/TR3 and Figure 32 of FD2321/TR1," Environment Agency & HR Wallingford, 2008.
- [25] HR Wallingford, "uksuds.com," 2022. [Online]. Available: <https://www.uksuds.com/>.

1 Executive Summary

Royal HaskoningDHV has been appointed by Sarah Lawson and Ivan Snell to undertake a National Planning Policy Framework (NPPF) [1] compliant Flood Risk Assessment (FRA) for the Development Proposals located at 174 Southwood Road, Hayling Island, Havant, Hampshire, PO11 9QL.

It is understood that the Development Proposals are for the demolition of the existing dwelling and the construction of a new replacement dwelling

According to the Planning Practice Guidance on Flood Risk and Coastal Change, the Development Proposals would be classified as a Minor Development.

According to Annex 3 of the NPPF, the Development Proposal's Vulnerability Classification is "More Vulnerable", which consists of the following uses:

"Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels."

The key findings of the Flood Risk Assessment are as follows:

- The Application Site is situated in Flood Zone 3, and is approximately 20m north of the English Channel, along the southern sea frontage on Hayling Island.
- Based on the current activities of the East Solent Coastal Partners (ESCP), the Standard of Protection is being maintained to the 1 in 200 year standard. Therefore, under normal operational conditions, the Proposed Development would be protected from tidal flood events up to and including the 1 in 200 year event.
- Detailed flood level information provided by the Environment Agency, provides a 1 in 200 year tidal flood level of 4.65mAOD. Allowing for the future predicted impacts of climate change, sea levels could (increasing sea levels by 1.2m) could result in a future 1 in 200 year tidal flood level, including for climate change of 5.85m AOD.
- The proposed development has raised the ground floor level to 5.00mAOD, which is as high as can be achieved, given other architectural constraints. No sleeping accommodation will be provided on the ground floor. Sleeping accommodation is to be provided at first floor level (Finished Floor Level 7.73mAOD) which will be 1.88m above the predicted 1 in 200 year with climate change flood level.
- A Flood Evacuation route to Hayling United Reformed Church, within Flood Zone 1, has been recommended. This evacuation route is approximately 3.01km (1.90 miles) in length. If no evacuation is possible before the onset of floodwaters, safe refuge can be provided onsite, post-development, via the internal stairwell, with safe internal refuge provided at first floor level
- Site occupiers shall sign up to the Environment Agency Flood Warning and Alert Service, and the Met Office Weather Warnings notifications, in order to inform of the risk of flooding and need for evacuation.

By increasing the Finished Floor Level of the ground floor, this will reduce the impacts of tidal flooding, compared to the current dwelling, by reducing predicted flood depths by 0.75m within the property.

A summary of the flood risk for the Application Site for each source of flood risk is presented as Table 1 (Flood Risk Overview), overleaf.

The Flood Risk Assessment has been undertaken in accordance with the requirements of the NPPF and it can be demonstrated that the Development Proposals are compatible with the predicted flood risk, including climate change allowance over the development lifetime.

It should be noted that the Development Proposals are not predicted to increase the risk of flooding to others over the development lifetime. Consequently, it is concluded that, with regards to the flood risk requirements of the NPPF, the Development Proposals are acceptable.

Flood Risk Overview

Table 1: Flood Risk Overview

Criteria	Summary
Site Setting	
Site Address	174 Southwood Road, Hayling Island, Havant, Hampshire
Local Authority (ONS)	Havant District Council
Client Name	Sarah Lawson and Ivan Snell
Redline Site Boundary	358m ²
Ordnance Survey Grid Reference	474,293mE, 98,100 mN
Fluvial Climate Change Catchment Area	East Hampshire
Development Classification	
Major or Minor Development?	Minor Development under the Town and Country Planning Act of 2015 This is since the development proposal is for the replacement of an existing dwelling, which is less than 10 new dwellings.
Vulnerability Classification	More Vulnerable
Development Proposals	It is understood that the Development Proposals are for the demolition of the existing dwelling and the construction of a new replacement dwelling.
Sequential Test	Given the nature of the Development Proposals, being for the construction of a replacement residential dwelling. The development is considered like for like, and therefore should not be required to implement the Sequential Test. Given the site is situated in Flood Zone 3a and is considered as being "More Vulnerable" then it is necessary to apply the Exception Test.
Exception Test	The development proposals will enable the provision of a replacement dwelling that will be more resilient to present day flood risk, and to the predicted impacts of climate change over its 100 year lifespan.
Site Parameters	
Topographic Levels (LiDAR)	Average Topographic Level: 4.00mAOD
Ordinary Watercourses (within 500m)	According to the CEH Rivers data, there is an Ordinary Watercourse situated approximately 350m to the east of the Application Site.
Main Rivers (within 500m)	According to the Environment Agency, Statutory Main River data, there are no Main Rivers within 500m of the Application Site. The English Channel is situated approximately 20m to the south of the southern site boundary.
BGS Hydrogeological Setting	Aquifers in which flow is virtually all through fractures and other discontinuities: Moderately productive aquifer
BGS Lithology	Superficial Geology: Storm Beach deposits formed of gravel. Bedrock Geology: Wittering formation, formed of sand silt and clay.
Intrusive Onsite Ground Investigations	No intrusive ground investigations have been completed onsite to date.
Flood Risk	
Historic Records	The rear garden to the south of the Application Site is shown to have flooded in the December 1981 and November 2005 flood events. The carriageway and footway of Southwood Road is shown to have flooded in these events, and in the March 2008 event. The Client has advised that the rear garden has flooded in 2013.
Flood Map for Planning Classification	Flood Zone 3a The Environment Agency mapping indicates this is not an area that benefits from the presence of flood defences. The Environment Agency Flood Defences map shows the presence of defences in the form of an embankment on the southern border of the Application Site, with an effective crest level of 5.60mAOD. The Standard of Protection of these defences and asset condition is unknown. However the Eastern Solent Coastal Partnership have, undertaken beach reinforcement works to provide a Standard of Protection in this area up to the 1 in 200 year tidal flood event.

Criteria	Summary
Tidal Flood Levels	1 in 200: 4.65mAOD at node 4. 1 in 1,000: 4.66mAOD 1 in 200 +CC 2125: 5.85mAOD 1 in 1,000 +CC 2125: 5.86mAOD
Tidal Flood Discussion	Under current conditions the ESCP flood management would prevent the Application Site from flooding for events up to the 1 in 200 year standard. Therefore, the development proposals have been designed so that sleeping accommodation is raised above the predicted design flood level, to account for a failure of the defences or the predicted impacts of climate change exceeding the capacity of the existing flood defence arrangements. Given the flood level, and the mitigation measures recommended, the risk of flooding from tidal levels is considered to be relatively low.
Fluvial Flood Discussion	The dominant source of flooding onsite is shown to be from tidal sources. Given the location of the Application Site, on the southern coastal frontage of Hayling Island, away from any Environment Agency Main Rivers, the risk of flooding from fluvial sources is considered to be low.
Fluvial Flood Mitigation	No mitigation measures against fluvial flooding are considered necessary.
Surface Water Flood Risk	1 in 30: None 1 in 100: None 1 in 1,000: None Based on the Environment Agency's risk of flooding from surface water mapping the Application Site is classified as being at very low risk of flooding from surface water.
Surface Water Flood Discussion	The Development Proposals are shown to remain unaffected by surface water flooding in the Low Risk (1 in 1,000 year) surface water flood event. The risk of flooding from surface water sources is therefore considered to be very low.
Surface Water Flood Mitigation	On the basis that the Application Site is shown to remain unaffected by surface water flooding in the Low Risk (1 in 1,000 year), it will not be necessary to include further mitigation measures within the development's design.
Groundwater Flood Risk	British Geological Survey Susceptibility to Groundwater Flooding map: Risk of flooding below the surface (medium risk). Given the nature of the development, being completely above the ground surface, the risk of flooding from groundwater sources is considered to be low.
Sewer Flooding Risk	No sewer flood records were available in the SFRA, or from Southern Water at the time of writing.
Sewer Flooding Mitigation	Adopting a precautionary approach to the potential for sewer flooding or other events that exceed the design standard of infrastructure, appropriate mitigation measures should be included in the design of all new buildings and, where practicable, in the refurbishment or change of use of existing buildings.
Residual Risk: Flood Defence Breach	Flood Defence Breach: The Application Site is indicated not to be located in an area that benefits from the presence of flood defences according to the Flood Map for Planning However, there are tidal flood defences operated and maintained by the ESCP. As these are not directly Environment Agency assets, breach modelling data is not available. Due to the close proximity of the Site to the sea, if the flood defences were to fail the resultant breach flood flows are likely to be similar to the predicted peak tidal levels. Therefore, adopting a precautionary approach
Residual Risk: Reservoir Failure	Predicted Flood Depth: None The Environment Agency risk of reservoir flooding indicates that the Application Site is not at risk as a result of a modelled reservoir failure.
Canal Failure	According to the CEH Canals data, there are no canals within 500m of the site, therefore there is no residual risk of flooding from canal breach.
Flood Emergency Response Plan (FERP)	
Is a FERP required?	Though the Application Site is shown to be at risk from tidal flooding, this classification ignores the presence of the ESCP flood defences. Given the nature of the development proposals being for a replacement dwelling, an emergency evacuation route to South Hayling Reformed Church has been identified and is recommended, if evacuation is possible before the onset of floodwaters.

Criteria	Summary
Offsite Impacts	
Floodplain Displacement	As the Application Site is not shown to be at risk from fluvial flooding, floodplain displacement is unlikely to occur. Therefore, floodplain compensation is not required.
Future Flood Related Permits / Licences	
Access for maintenance of watercourses	It is recommended that an 8m access route is provided for maintenance of watercourses, including culverted watercourses. The site is not within 500m of an Environment Agency Main River, or within 300m of an Ordinary Watercourse. Therefore, the Development Proposals should not impede access to watercourses.
Flood Risk Activity Permit	A Flood Risk Activity Permit is unlikely to be required, since the proposed dwelling is not within 16m of the embankment flood defences which run along the southern boundary of the Application Site.
Ordinary Watercourse Consent	The Application Site is not situated within 300m of an Ordinary Watercourse. Therefore, no Ordinary Watercourse Consent is required.
Public Sewer Licence	Any works within 3m of a public sewer and any new connections shall require the consent of the Public Sewer Authority. Should public sewers be found to cross the Application Site, discussions with the Public Sewer Authority will be necessary to determine if easements or build over agreements are required.

2 Introduction

2.1 Overview

Royal HaskoningDHV has been appointed by Sarah Lawson and Ivan Snell to undertake a National Planning Policy Framework (NPPF) [1] compliant Flood Risk Assessment (FRA) for the Development Proposals located at 174 Southwood Road, Hayling Island, Havant, Hampshire PO11 9QL. The site will hereafter be referred to as the Application Site.

The purpose of this assessment is to demonstrate that the Development Proposals can be satisfactorily accommodated without worsening flood risk for the area and without placing the development itself at risk of flooding. This assessment has been written in accordance with national guidance provided within the NPPF, the Planning Practice Guidance on Flood risk and coastal change [2], DEFRA's National Standards for Sustainable Drainage [3], and local guidance and policy documents.

This report relies on information provided by third parties, either because of a direct request for information or through reviewing their published information (usually from internet sources from Government Agencies or established institutions).

The guidance documents and National Planning Policy are also periodically updated. This document has been based on the published guidance at the time of writing.

This document should be periodically reviewed to establish if third party data has been updated or if guidance or legislation has changed. A new appraisal should be undertaken to confirm if the conclusions of this document are still valid.

This document is based on thresholds of risk as outlined in the Flood Risk Regulations [4]; however, risk tolerance is often subjective and individuals may, in some circumstances, require a higher level of flood protection than that required through the guidance.

Please note, where a product or system is referred to in this report, they are provided as an example of the type of product that could be utilised. It is for the contractor to confirm its suitability and to discuss directly with the manufacturer the specific form of installation required.

2.2 Site Location and Description

The Application Site is located at Ordnance Survey grid reference 474293 mE, 98100 mN, and the red line boundary includes an area of 358 m² (0.04Ha), as indicated on Figure 1.

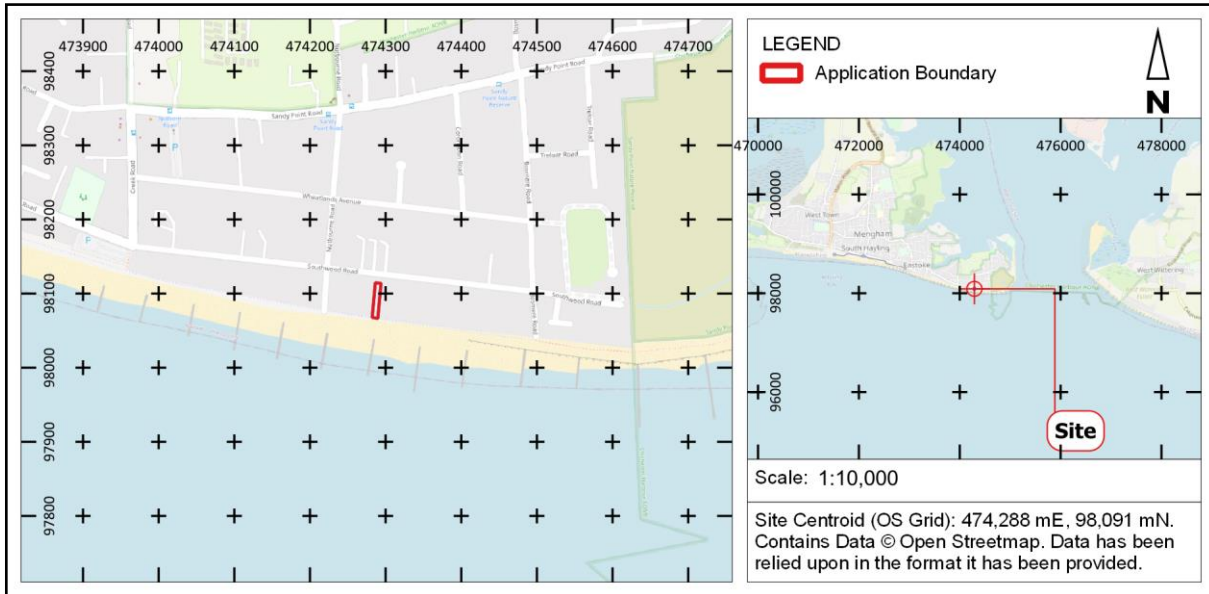


Figure 1: Site Location Plan (Source: Ordnance Survey).

2.3 Current Site Usage

The Application Site is currently a residential use, formed of an existing residential dwelling, driveway and garden areas, as shown in Figure 2.

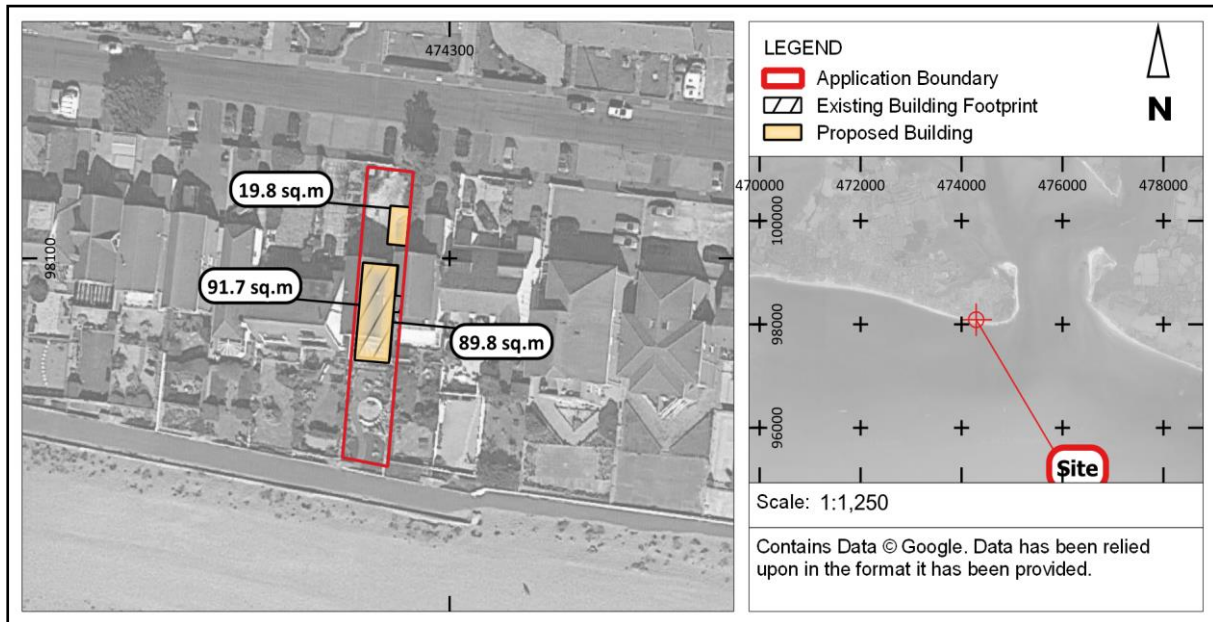


Figure 2: Aerial Photograph (Source: Google).

2.4 Development Proposals

It is understood that the proposed development is for the demolition of the existing dwelling and the construction of a new replacement dwelling, hereafter referred to as the Development Proposals.

As the development proposals are for residential usage, the Flood Risk and Coastal Change Planning Policy Guidance, requires a life-span of 100 years to be assessed.

2.5 Development Size Classification

In accordance with the Planning Practice Guidance on Flood Risk and Coastal Change [2], the Development Proposals would be classified as a Minor Development under the Town and Country Planning Act. This is on the basis that the Development Proposals are for the demolition of the existing and construction of a single new replacement dwelling, which could be considered as like for like. Construction of less than 10 dwellings is considered as a Minor Development under the Town and Country Planning Act.

3 Scope of Assessment

Under Section 14 of the NPPF, a Flood Risk Assessment (FRA) is required for Development Proposals which meet any of the following conditions:

- i. Development in Flood Zones 2 and 3.
- ii. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more;
- iii. Land which has been identified by the Environment Agency as having critical drainage problems;
- iv. Land identified in a strategic flood risk assessment as being at increased flood risk in future; or,
- v. Land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.

The NPPF states that a FRA needs to consider the risk of flooding to a property or site and demonstrate that the site will be safe over its lifetime (including identification of appropriate mitigation measures). The FRA also needs to demonstrate that the proposals will not increase flood risk to others. The sources of flooding that need to be assessed are as follows:

- i. **Fluvial (River) flooding.** When flows within watercourses exceed the capacity of the watercourse, causing out of bank flows and resulting in flooding of adjacent areas.
- ii. **Groundwater flooding.** Usually, the result of prolonged wet weather, causing groundwater levels to rise sufficiently to either emerge at surface or to cause flooding of below ground infrastructure, such as basements.
- iii. **Pluvial (Surface Water) flooding.** When rainfall causes overland flow rates and volumes which exceed the capacity of the drainage network, causing flooding to land that is normally dry.
- iv. **Tidal flooding.** When high tide events overtop the shoreline to cause flooding to land behind. This is usually the result of a combination of high tide events and storm surges.

As well as considering the risk of flooding from these primary sources, a FRA needs to consider the potential impact of a failure of flood defence or reservoir infrastructure; however, as the likelihood of these types of flooding are much lower, they are known as “residual risks”. The residual flood risks to be considered are:

- i. **Reservoir failure.** Although the likelihood of reservoir failure resulting in widespread flooding is extremely low¹ [5], the consequences of such an event need to be considered to inform appropriate emergency planning.
- ii. **Flood defence failure.** The consequence of a failure of part of a flood defence could result in the rapid release of water in an area that would otherwise not be at risk of flooding. If such an event were to occur, there could be very little warning time and therefore it is unlikely that prior evacuation from an area at risk could be achieved.

¹ Environment Minister Richard Benyon said: “While the risk of a reservoir failure is extremely low the safety of the public must remain our top priority and where there is even a small risk we need to make sure that we are prepared.”

3 Relevant Policy and Guidance

This Flood Risk Assessment has been developed in accordance with the guidance and legislation set out in the below documents:

3.1 National Policy

- Water Industry Act (1999) [6]
- EU Water Framework Directive (2000) [7]
- EU Floods Directive (2007) [8]
- The Flood Risk Regulations (2009) [9]
- Flood and Water Management Act (2010) [10]
- The Building Regulations, Part H (2015) [11]
- Town and Country Planning, Development Management Procedure, (England) Order (2015) [12]
- British Standards, Drain and sewer systems outside buildings (BS EN 752:2017) [13]
- National Planning Policy Framework (NPPF, 2021) [1]

3.2 National Guidance

- Non-statutory Sustainable Drainage Technical Standards (2015, 2021) [14]
- Flood Risk and Coastal Change Planning Practice Guidance (PPG, 2022) [15]
- CiRIA SuDS Manual (C753, 2015) [16]
- Sector Guidance in relation to the adoption of sewerage assets by sewerage companies in England (October 2019) [17]
- Preparing a Flood Risk Assessment: Standing Advice, Environment Agency and DEFRA (2022) [18]
- Flood Risk Assessments: Climate Change Allowances, Environment Agency (2022) [19]

4 Sequential & Exception Testing

4.1 Sequential Test Definition

The NPPF Flood Risk Sequential Test is used to establish whether there are any other sites at a lower flood risk that would be available for the Development Proposals.

Wherever possible, development must be directed to a site with the lowest flood risk. Paragraph 023 Reference ID: 7-023-20220825 states:

*This means avoiding, so far as possible, development in **current and future medium and high** flood risk areas considering all sources of flooding including areas at risk of surface water flooding.*

The aim of the Sequential Test is to located development in areas at little or no risk of flooding from any source. This approach limits reliance on flood management and mitigation measures, such as flood defences, flood warnings and property level resilience features.

4.2 Exception Test Definition

The NPPF sets out the two criteria for the Exception Test at paragraph 164 to 165. It makes it clear that both elements need to be satisfied for a development to pass the Exception Test. The criteria are as follows:

“a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and

b) the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.”

4.3 Sequential & Exception Test Outcome

Using the principles of the Sequential Test outlined above, the Development Proposals are classed as ‘More Vulnerable’. The Application Site is located within Flood Zone 3a (as defined by the Environment Agency) and therefore, under the NPPF, would be required to pass the Exception Test.

For the Exception Test to be passed, the proposed development must meet both parts of the following criteria:

The existing use of the Application Site is for a single residential dwelling. Post-development, the use of the Application Site will remain for a single residential dwelling. The Development Proposals are therefore considered to be like for like, and should not require the application of the Sequential or Exception Test, as the land use will remain the same.

5 Climate Change Allowances

The Environment Agency published guidance on climate change allowances for Flood Risk Assessments in February 2016, with the latest update in June 2022 [19].

The current Environment Agency climate change allowances are classified on how likely that scenario is predicted to occur, based on percentile of the scenario.

An allowance based on the 70th percentile is exceeded by 30% of the projections in the range. At the 95th percentile it is exceeded by 5% of the projections in the range.

For these allowances it is important you do not use a single percentile out of context. For example, while the 70th percentile is the higher central estimate, it does not represent the full range of likely futures. Using this percentile on its own may cause you to under-adapt to climate change.

Given the site's location, the dominant source of flooding here is from tidal sources. There is also a level of flood risk from surface water source. Therefore, allowances for tidal and surface water flooding are detailed herein.

5.1 Tidal Climate Change Allowances

Tidal Climate Change Allowances are determined by the predicted increase in sea levels. These are determined by regional variations, which are based on the River Basin District under consideration. The sea level rise allowances are reproduced as Table 2 below, with the relevant River Basin District for the Application Site highlighted in bold.

The Application Site is located in Southeast area of England. The 2125 Higher Central Climate Change allowance for sea level rise total until 2125 is 1.2m.

Table 2: Sea level allowances by area for each epoch in mm per year.

Area of England	Allowance	2000 to 2035 (mm)	2036 to 2065 (mm)	2066 to 2095 (mm)	2096 to 2125 (mm)	Cumulative rise 2000 to 2125 (metres)
South east	Higher central	5.7 (200)	8.7 (261)	11.6 (348)	13.1 (393)	1.20
South east	Upper end	6.9 (242)	11.3 (339)	15.8 (474)	18.2 (546)	1.60

Based on a 1981 to 2000 baseline, the total sea level rise for each epoch is in brackets

5.2 Surface Water Climate Change Allowances

Surface Water Climate Change Allowances are determined by the predicted increase in peak rainfall intensity. These are determined by regional variations, which are based on the management catchments. Management catchments are sub-catchments of river basin districts. An excerpt of the management catchment map is provided in Figure 3, indicating which sub-catchment the Application Site is located within.

The Application Site is located in the East Hampshire management catchment, climate change allowances are based on a 1981 to 2000 baseline. The 2070, 100 Year Upper End Climate Change allowance for peak rainfall intensity is 45%

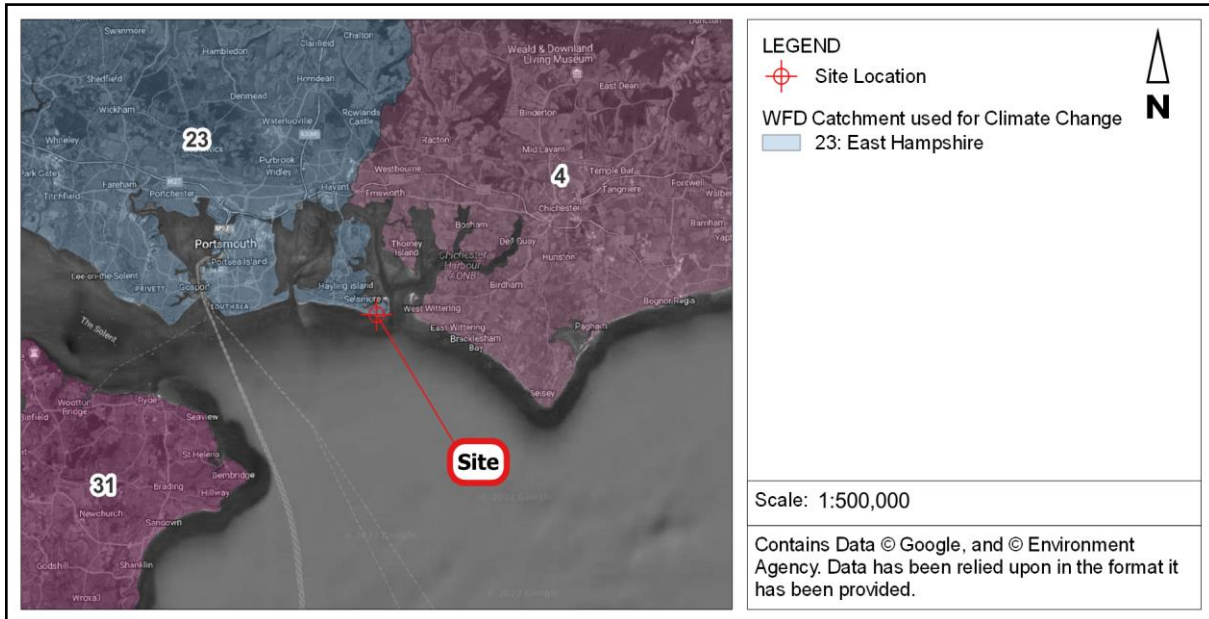


Figure 3: Management Catchments (excerpt) (Source: EA).

Table 3 presents the Peak Rainfall Intensity climate change allowances.

The guidance also sets out which climate change allowance should be used for different development lifetimes [20]. This guidance is outlined below:

Development with a lifetime beyond 2100

This includes development proposed in applications or local plan allocations.

For flood risk assessments and strategic flood risk assessments assess the upper end allowances. You must do this for both the 1% and 3.3% annual exceedance probability events for the 2070s epoch (2061 to 2125).

Design your development so that for the upper end allowance in the 1% annual exceedance probability event:

- there is no increase in flood risk elsewhere
- your development will be safe from surface water flooding

Development with a lifetime of between 2061 and 2100

For development with a lifetime between 2061 and 2100 take the same approach but use the central allowance for the 2070s epoch (2061 to 2125).

Development with a lifetime up to 2060

For development with a lifetime up to 2060, take the same approach but use the central allowance for the 2050s epoch (2022 to 2060).

Exceptions

In some locations the allowance for the 2050s epoch is higher than that for the 2070s epoch. If so, and development has a lifetime beyond 2061, use the higher of the two allowances.

The Application Site is located in the East Hampshire management catchment, climate change allowances are based on a 1981 to 2000 baseline. The 2070, 100 Year Upper End Climate Change allowance for peak rainfall intensity is 45%

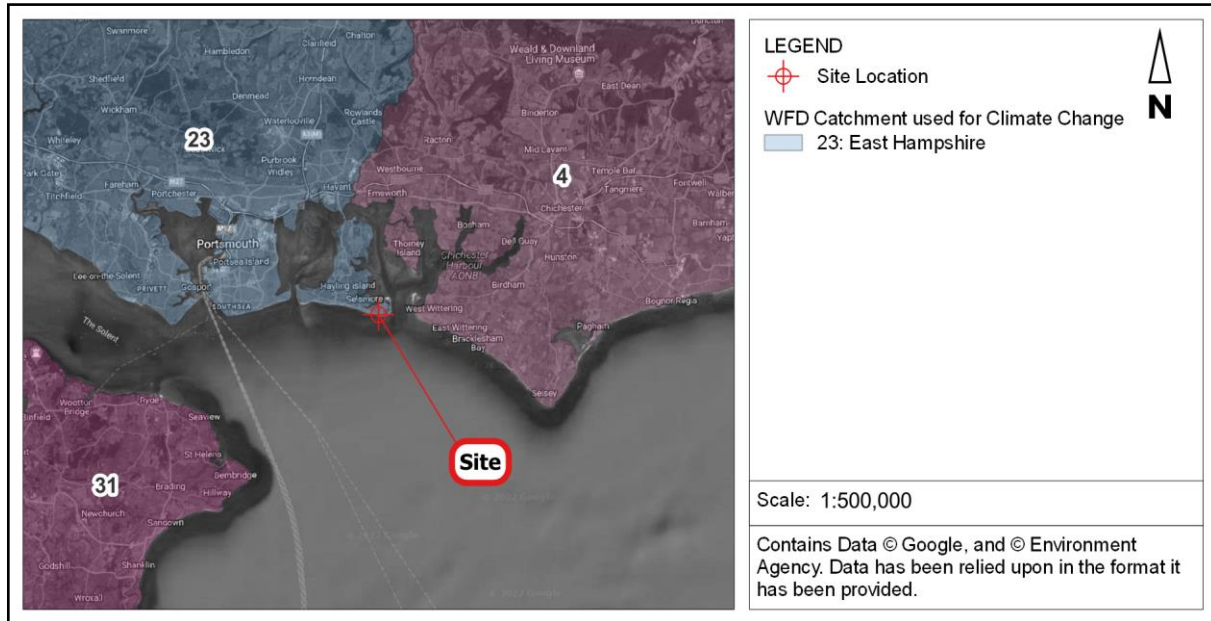


Figure 3: Management Catchments (excerpt) (Source: EA).

Table 3: Peak rainfall intensity allowance in small catchments

Management catchment name	2050s central for 30yr RP	2050s upper end for 30yr RP	2050s central for 100yr RP	2050s upper end for 100yr RP	2070s central for 30yr RP	2070s upper end for 30yr RP	2070s central for 100yr RP	2070s upper end for 100yr RP
East Hampshire	20%	35%	20%	40%	25%	30%	25%	45%

Small catchments are less than 5km² or urban drainage catchments (based on a 1961 to 1990 baseline)

6 Stakeholder Engagement

6.1 Environment Agency

The Environment Agency has a strategic overview of all sources of flooding and coastal erosion (as defined in the Flood and Water Management Act 2010 [10]).

It is also responsible for flood and coastal erosion risk management activities on main rivers and the coast, regulating reservoir safety, and working in partnership with the Met Office to provide flood forecasts and warnings. It must also look for opportunities to maintain and improve the environment for people and wildlife while carrying out all of its duties. [21]

An enquiry email was sent to the Environment Agency, Solent and South Downs Office, for flood risk data on 21st July 2022. A response with a Product 4 dataset was received, including flood extents and flood levels from the East Solent Coastal Model (2018).

7 Site Topography

Ground levels within the Application Site have been determined by reviewing Environment Agency 1m LiDAR data. On average, the ground levels are 4.00m AOD, with the lowest and highest topographic levels at 3.40m AOD and 4.70m AOD respectively (see Figure 4).

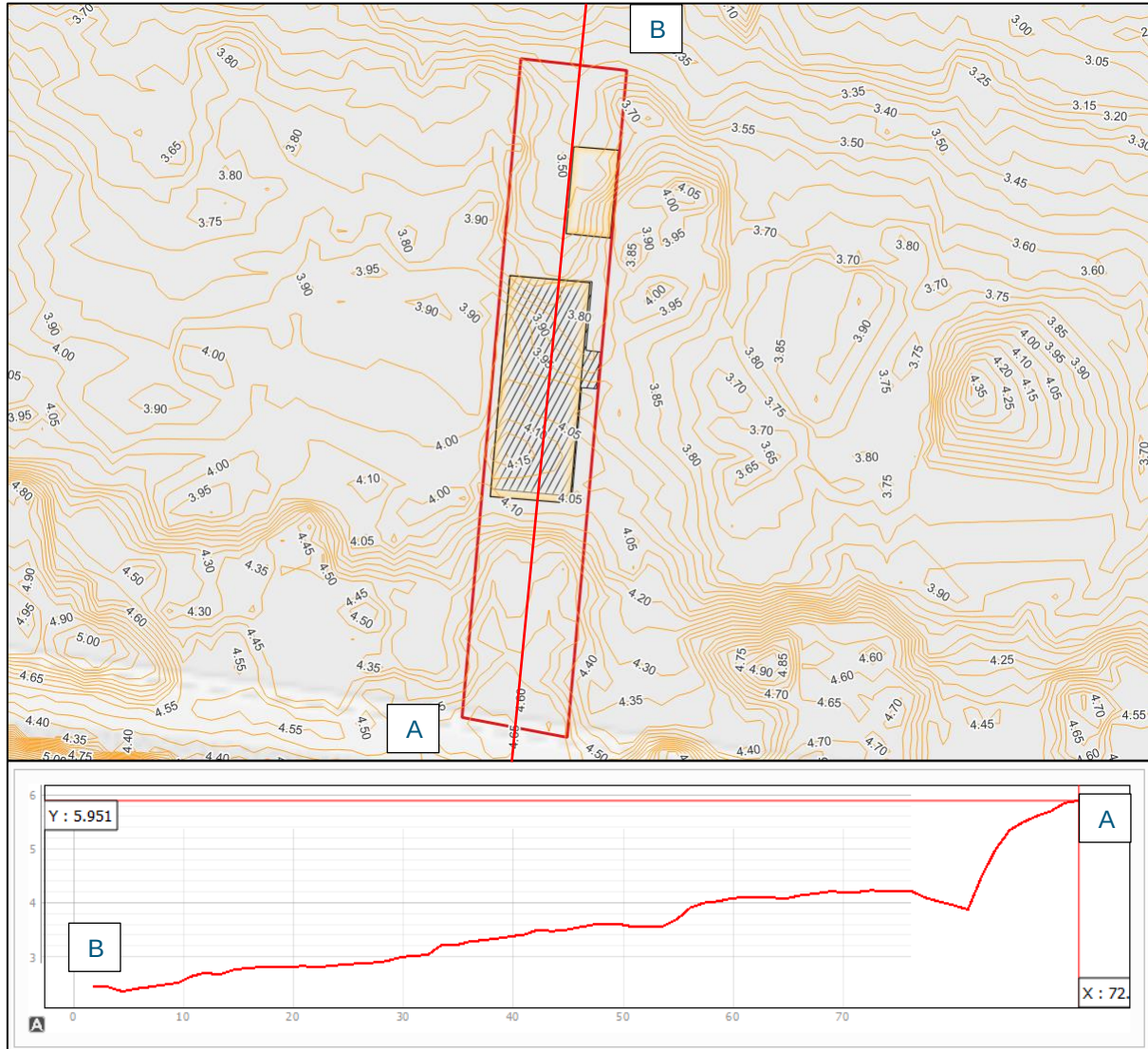


Figure 4: Site topography and cross section (taken from north to south across the site and surrounding areas. (Source: Environment Agency).

8 Site Hydrology

8.1.1 Ordinary Watercourses

According to the CEH Rivers data, there is an Ordinary Watercourse situated approximately 350m to the east of the Application Site (see Figure 5).

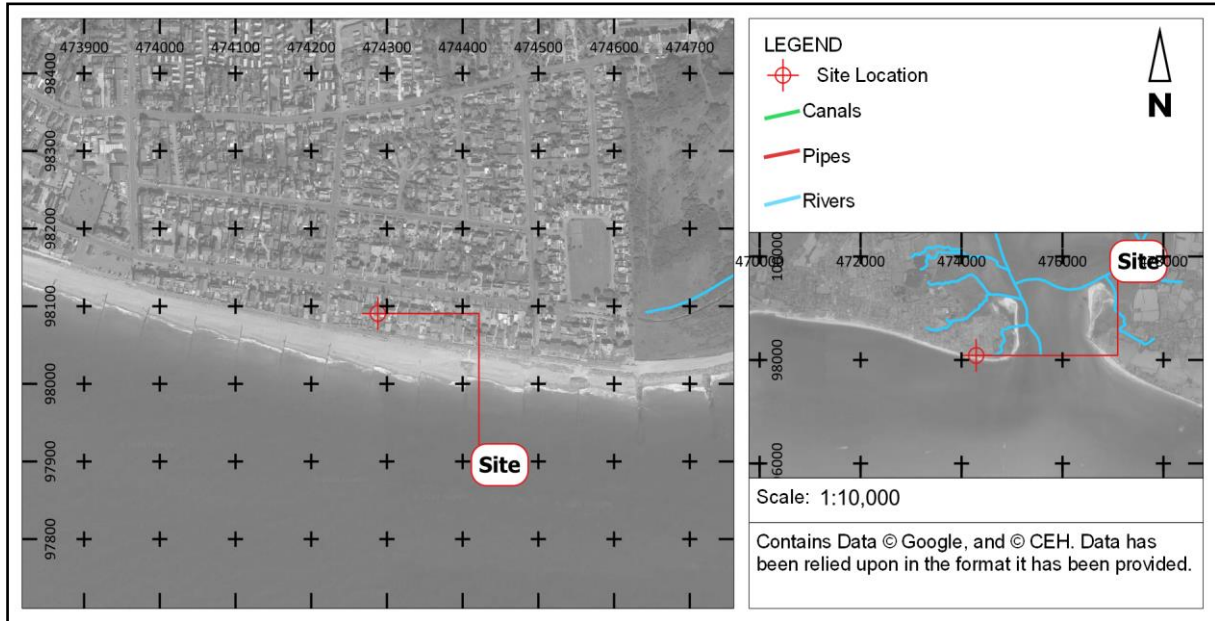


Figure 5: Ordinary Watercourses (Source: CEH).

9 Ground Conditions

9.1 BGS Hydrogeological Setting

According to the BGS Hydrogeological Setting data, the Application Site is classified as:

Aquifers in which flow is virtually all through fractures and other discontinuities: Moderately productive aquifer

It should be noted however that due to the coastal location, and the relatively low resolution of Figure 6, the Application Site may appear to be shown in a different hydrogeological setting.

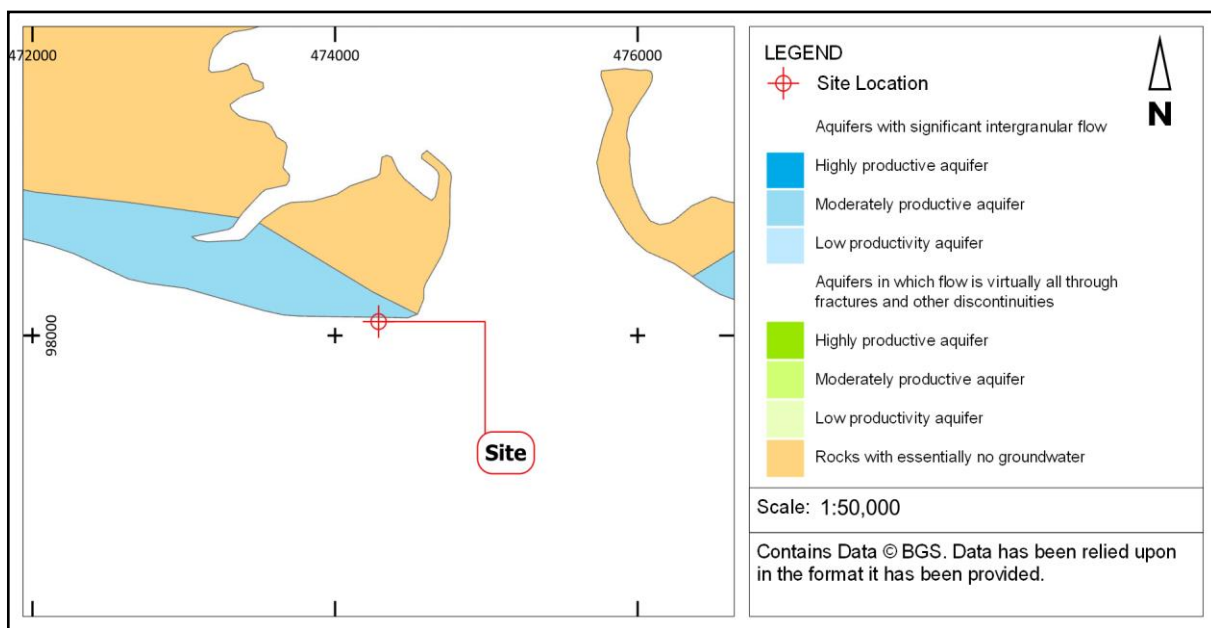


Figure 6: BGS Hydrogeological Setting (Source: Environment Agency; British Geological Survey).

10 Development Compatibility with Flood Zone

10.1 Development Vulnerability Classification

The vulnerability classifications are summarised in Table 4 (below) and this identifies that the Development Proposals are classed as **More Vulnerable**, as highlighted below.

Table 4: Annex 3 of the NPPF, Flood risk vulnerability classification

Classification	Description
Essential infrastructure	Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. 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. Wind turbines.
Highly vulnerable	Police and ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding. Emergency dispersal points. Basement dwellings. Caravans, mobile homes and park homes intended for permanent residential use. 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. Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. Buildings used for dwelling houses , student halls of residence, drinking establishments, nightclubs and hotels. Non-residential uses for health services, nurseries and educational establishments. Landfill* and sites used for waste management facilities for hazardous waste. 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. 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. Land and buildings used for agriculture and forestry. Waste treatment (except landfill* and hazardous waste facilities). Minerals working and processing (except for sand and gravel working). Water treatment works which do not need to remain operational during times of flood. Sewage treatment works, if adequate measures to control pollution and manage sewage during flooding events are in place.
Water-compatible development	Flood control infrastructure. Water transmission infrastructure and pumping stations. Sewage transmission infrastructure and pumping stations. Sand and gravel working. Docks, marinas and wharves. Navigation facilities. Ministry of Defence installations. Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. Water-based recreation (excluding sleeping accommodation). Lifeguard and coastguard stations. Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

10.2 Flood Zone Classification

The Environment Agency Flood Map for Planning (see Figure 7) demonstrates that the Development Proposals are located in areas defined as Flood Zone 3.

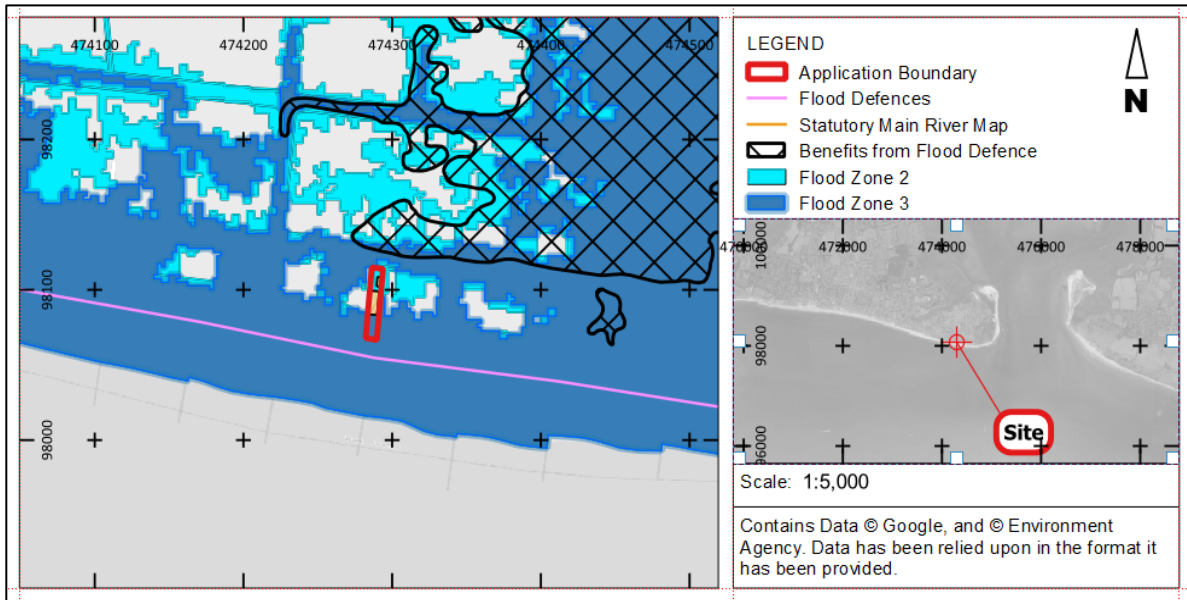


Figure 7: Environment Agency Flood Map for Planning (Source: Environment Agency).

Table 2 of the Planning Practice Guidance on Flood Risk and Coastal Change [2], reproduced in Table 5, presents the flood zone definitions.

Table 5: Flood Risk and Coastal Change, Table 1

Flood Zone	Description
1	Low Probability. This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).
2	Medium Probability. This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% to 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% to 0.1%) in any year.
3a	High Probability. This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.
3b	The Functional Floodplain. This zone comprises land where water has to flow or be stored in times of flood. SFRA's should identify this Flood Zone (land which would flood with an annual probability of 1 in 30 (3.3%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the EA, including water conveyance routes).

The Planning Practice Guidance on Flood Risk and Coastal Change (078 Reference ID: 7-078-20220825) describes exceptions to the functional floodplain (Flood Zone 3b), as follows;

“areas which would naturally flood, but which are prevented from doing so by existing defences and infrastructure or solid buildings, will not normally be identified as functional floodplain.”

10.3 Flood Zone & Vulnerability Compatibility

The NPPF Sequential Test: Flood Risk Vulnerability and Flood Zone 'Compatibility' Table 3 is summarised below as Table 6.

Table 6: The Sequential Test: Flood Risk Vulnerability and Flood Zone Incompatibility' Table as specified by NPPF.

	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Flood Zone 1	Appropriate	Appropriate	Appropriate	Appropriate	Appropriate
Flood Zone 2	Appropriate	Exception Test Required	Appropriate	Appropriate	Appropriate
Flood Zone 3a	Exception Test Required	Not Appropriate	Exception Test Required	Appropriate	Appropriate
Flood Zone 3b (Functional Floodplain)	Exception Test Required	Not Appropriate	Not Appropriate	Not Appropriate	Appropriate

Given the Application Site is located within Flood Zone 3a and the Development Proposals are for a More Vulnerable development, under the NPPF, the Development Proposals are considered appropriate and require consideration of the Exception Test.

However, the Development Proposals are for the construction of a replacement dwelling and as such are considered to be a like for like replacement. Therefore, the Development Proposals should be exempt from the need to undertake the Sequential Test, as the proposed land use is already established.

11 Flood Risk: Historic Records

11.1 Assessment Methodology

In order to assess if the Application Site has previously been affected by flooding, the following data sources have been inspected:

- Environment Agency Historic Flood Maps
- Environment Agency Recorded Flood Outlines
- Strategic Flood Risk Assessment.

If these sources of data do not return any records of flooding, it is concluded that the Application Site has not been recorded as having flooded.

11.2 Recorded Flooding

The Environment Agency publishes records of historic flooding² and this data has been reviewed (see Figure 8). The Application Site is shown to have experienced flooding in the past, however this is limited to the garden areas to the rear of the Application Site. This has been confirmed by the Client who has stated that the garden has previously flooded.

The Historic Flood Extent map provided by the Environment Agency (AEA reference 6110) shows that this flooding occurred in the November 2005 and December 1981 events. Flooding was also recorded on the carriageway and footway of 174 Southwood Road in these events, and during the March 2008 event (see Figure 9).

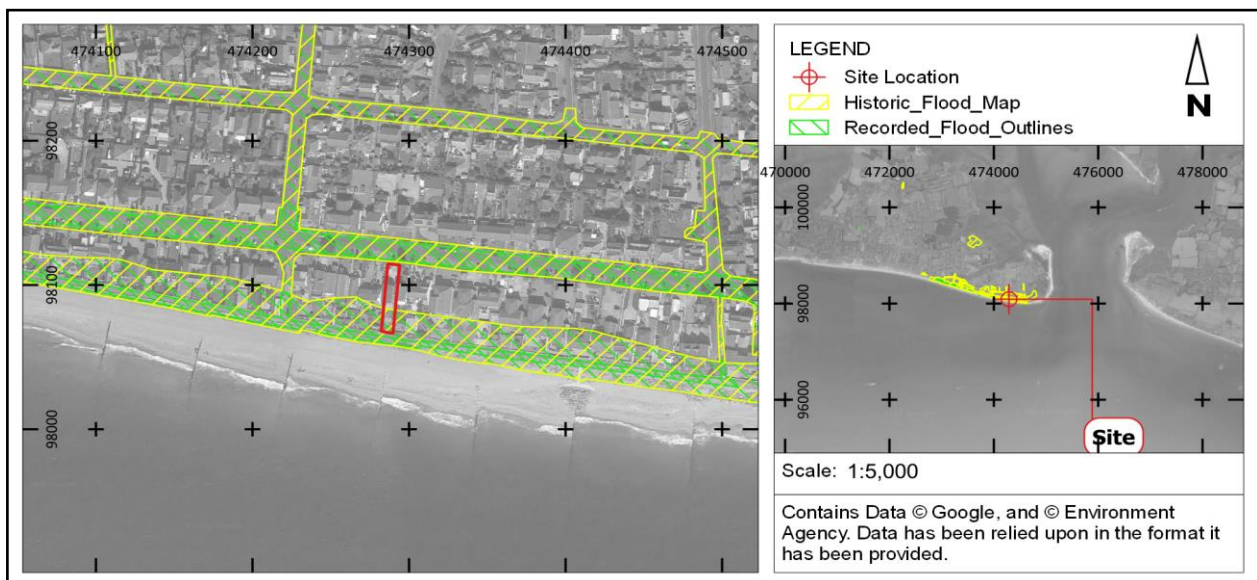


Figure 8: EA Historic and Recorded Flood Outlines (Source: Environment Agency).

² [Historic Flood Map - data.gov.uk](https://data.gov.uk)

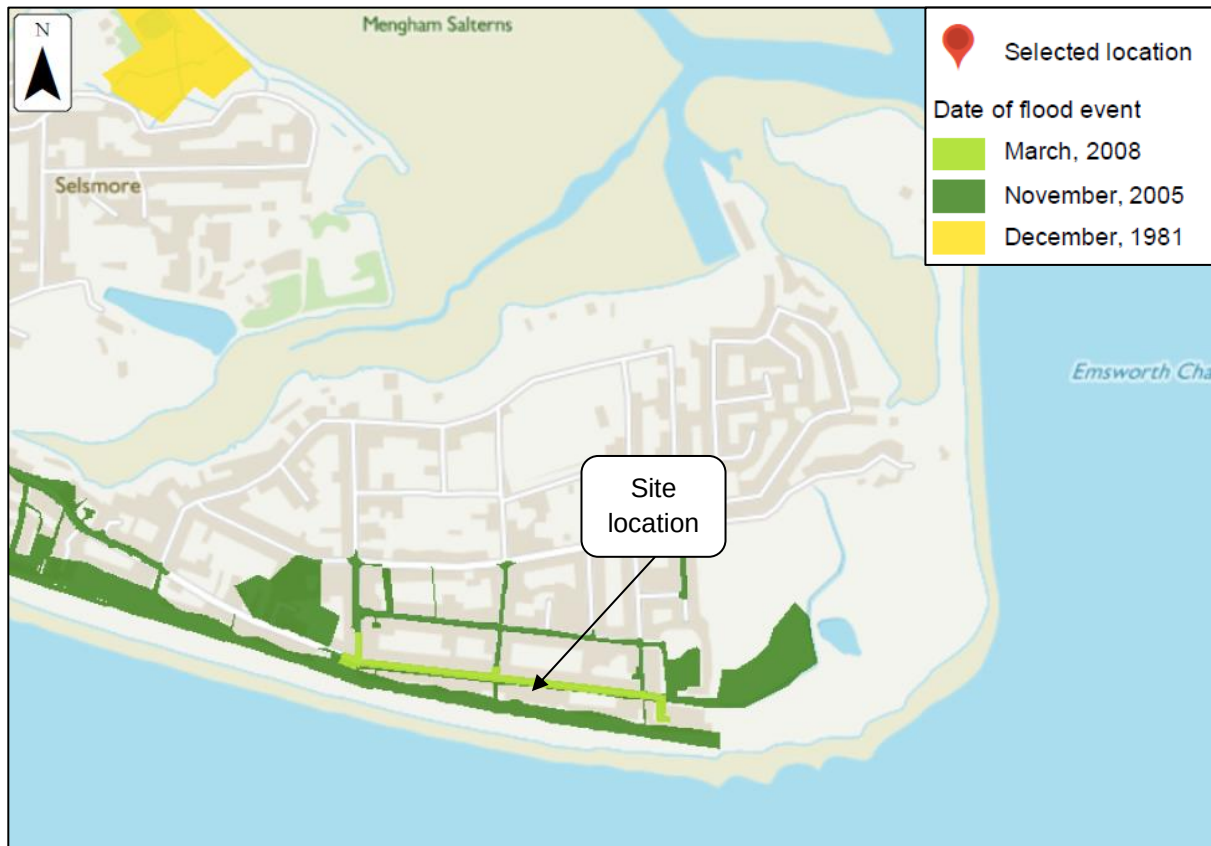


Figure 9: Historic Flooding map (Source: Environment Agency)

11.3 Site Owner Recorded Flooding

The site owner has provided details of flooding having affected the Application Site, but only the garden has reported to have flooded.

12 Flood Risk: Tidal Flooding

12.1 Tidal Flooding Definition

Tidal flooding results from a combination of high tides and stormy conditions. If low atmospheric pressure coincides with a high tide, a tidal surge may happen, which can cause serious flooding.

12.2 Assessment Methodology

To determine the flood risk from tidal sources, a Product 4 dataset from the EA's East Solent Coastal Model (2018) has been analysed for the Application Site. This Product 4 dataset includes flood extents, levels and depths, taken from 4 nodes across the Application Site (see Appendix B). None of the nodes provided are centred on the proposed dwelling.

12.3 Post Development Tidal Flood Risk

Much of the area proposed for the replacement dwelling is shown to remain unaffected by tidal flooding in the present day 1 in 200 year tidal flood event, however much of the external areas to the rear of the Development Proposals are shown to be affected in this event, according to the Flood Extent map in Appendix B.

The flood levels and depths provided within the Product 4 dataset for the Application Site are presented in Table 7.

The nodal flood levels table provided by the Environment Agency however show highly variable flood levels across the Application Site, with the flood mechanism being tidal flood risk.

Data provided by the Environment Agency predicts a 1 in 200 year flood level of 3.32mAOD, and a 1 in 1,000 flood level of 3.55mAOD. However, the detailed flood mapping provided by the Environment Agency, indicates flood levels of up to 4.65m AOD at the point closest to the sea, with no risk of flooding predicted towards the point nearest to Southwood Road. Similarly, the 1 in 1,000 year flood level predicted on site, nearest to the sea is 4.66m AOD, unusually, the predicted flood levels vary by only 10mm between the different return period events. The difference between the tidal flood levels and the onshore flood level is likely attributed to the offshore flood levels being static water levels, and the onshore including allowances for wave overtopping etc.

The Environment Agency have advised that the predicted climate change flood levels they have provided, are based on an out-of-date dataset and therefore need to be updated. Consequently, a 1.2m climate change allowance has been added to the present-day values to determine the predicted flood level at the Application Site. Consequently, the 2125 predicted 1 in 1,000 year flood level is 5.85m AOD (4.65 + 1.2).

The topographic survey provided in Appendix B indicates that the ground levels around the existing dwelling are at approximately 4.0mAOD. However, the proposals are to raise the proposed ground floor, with a finished floor level to 5.0mAOD, which is as high as the building can be raised due to wider architectural constraints. Table 7 summarises the flood levels and the impacts on the development over time. The conclusions are that mitigation measures will be required, to support the safe occupancy of the dwelling over the life-time of the development, based on the predicted impacts of climate change and the reliance on active interventions in maintaining the local flood defence assets.

Table 7: Environment Agency 2018 Coastal Design Sea Levels

Baseline Tidal Flood Risk	1 in 200 RP (Medium Risk)	1 in 1,000 RP (Low Risk)	1 in 200 RP +Climate Change (+1.2m)	1 in 1,000 RP +Climate Change (+1.2m)
Coastal Design Sea Level	4.65mAOD (node 4)	4.66mAOD (node 4)	5.85mAOD (node 4)	5.86mAOD (node 4)
Lowest Ground Floor Level for the proposed dwelling (according to the development plans)	5.0mAOD			
Predicted Flood Depth within the proposed dwelling (no mitigation)	None	None	0.85m	0.86m
ESCP Flood Defence Level	5.60m AOD		Not yet funded	
At risk of tidal flooding?	No – benefits from flood defences		Yes, current flood defence options up to the year 2125 are not set aside for funding. The policy objective is for the flood defences to Hold the Line – but it is not certain if this maintaining the current standard of protection, or holding at the current level. Consequently, for the purposes of assessment, it needs to be assumed that the flood defences may not provide adequate protection over the life-time of the development.	
Design Flood Level for sleeping accommodation (including 0.6m freeboard)	n/a		6.45mAOD (2.5m above current ground levels)	

12.4 Mitigation Measures

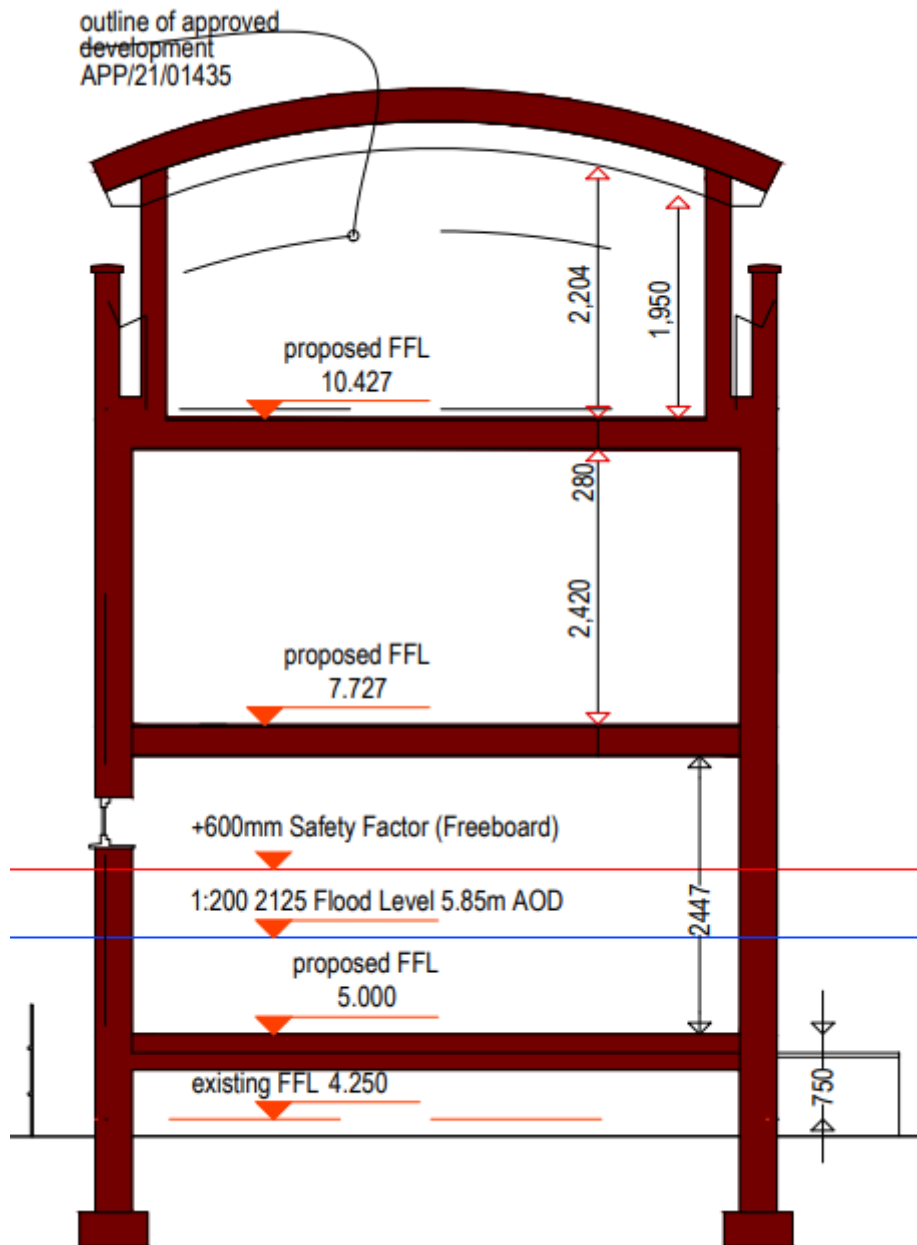
The Application Site is identified as being at risk of tidal flooding. Mitigation measures are as such considered necessary. These mitigation measures include:

- Setting internal first floor Finished Floor Levels (FFLs) more than 600mm above the design tidal flood level (5.86mAOD) at 6.46mAOD, to enable sleeping accommodation to be safely provided.
- No sleeping quarters are to be located on the ground floor.
- Damp proof membrane should be incorporated into the design of the building to minimise the passage of water.
- Use of MDF carpentry (skirting, architrave, built in storage) to be avoided at ground floor level.
- All electrical services to run from ceilings at ground floor (if possible).
- Air brick protection at ground floor level.
- A high level damp barrier should be installed just below the underside of the first floor, floor, to prevent flood waters from wicking up into the building above.
- The development proposals will raise the ground floor finished floor level by approximately 1m above existing ground levels, which will improve its flood resistance.
- Adoption of a Flood Warning and Emergency Plan.

Due to the planning constraint on the height of buildings, it is not practicable to raise the ground floor level above the 2125 1:200 tidal flood level. The client (who will be the occupier of the building) has been made aware of the internal flood risk due to extreme tidal flooding in 2125. However, for the proposed dwelling to

be viable for the clients needs, and to comply with roof height restrictions, the risk has been acknowledged. Furthermore, based on current flood defence provisions in the area, the development would not be at risk of the present day 1:1,000 year tidal flood risk. Figure 10 provides an illustration of the predicted flood level for 2125 for a 1:200 year tidal event, against the proposed finished floor levels.

Figure 10: Proposed Dwelling Cross-Section with 1:200, 2125 Flood Level.



Adopting an adaptive approach, for the 1:200 tidal flood level, it is worth considering the predicted Higher Central Climate Change increases over a range of climate change epochs, based on ESCP maintaining the current Flood Defence Level of 5.60m AOD.

- Present Day: 4.65m AOD (lower than tidal flood defences, therefore defended)
- 2035: 4.85m AOD (lower than tidal flood defences, therefore defended)

- 2065: 5.11m AOD (lower than tidal flood defences, therefore defended)
- 2095: 5.46 m AOD (lower than tidal flood defences, therefore defended)
- 2125: 5.85 m AOD (higher than tidal flood defences, therefore not defended, unless further interventions are implemented)

Therefore, if the development installed flood defences for the future 1:200 flood level, these defences would not be required (assuming ESCP continue to maintain the existing) until the 2096 to 2125 epoch.

Furthermore, there has been consideration of the use of a flood resistant wall around the perimeter of the dwelling to replace the existing boundary wall with a crest level of at least 5.85mAOD, which is equivalent to the predicted 2125 1:200 flood level. The constriction of the wall, should include the ability to further increase its height to provide required Freeboard should the climate change impacts be more severe than currently predicted. Based on the proposed FFL of 5.0m the top of the wall, would be 0.85m above the ground floor level, which has been considered as a reasonable compromise between flood resilience and maintaining the properties views of the sea. Adopting an adaptive approach, and assuming the existing flood defences continue to be maintained by ESCP, the new flood wall around the perimeter of the development, would not be required, for the predicted flood risk, until the mid 2090's.

12.5 Residual Risk of Tidal Flooding

Given the site is at moderate risk of flooding from tidal sources, without any mitigation measures, there is a moderate residual risk of tidal flooding.

The Application Site is not shown to benefit from the presence of defences by the Flood Map for Planning (see Figure 7). However, the Environment Agency Asset Management Tool shows the presence of a flood defence in the form of an embankment with an actual crest level of 5.60mAOD, which is confirmed by the ESCP published plan up to 2022. Therefore, there is a residual risk of this being breached or overtopped during storms, however, as the beach is actively managed this risk is considered to be nominal. Furthermore, the inclusion of mitigation measures within the building, and the use of an adaptive approach to flood risk, will enable the building to be safely occupied, over the lifetime of the development.

12.6 Assessed Tidal Flood Risk

Considering the impacts of climate change, mitigation measures and the other factors discussed above, the assessed tidal flood risk over the development lifespan is relatively low.

13 Flood Risk: Fluvial Flooding

13.1 Fluvial Flooding Definition

River flooding occurs when a watercourse cannot cope with the water draining into it from the surrounding land. This can happen, for example, when heavy rain falls on an already waterlogged catchment.

13.2 Assessed Fluvial Flood Risk

The Environment Agency's fluvial flood level information has not been provided as part of the data request. This is on the basis that the dominant source of flooding is from tidal sources. The closest Environment Agency Main River and Ordinary Watercourse are over 500m and approximately 300m away respectively.

The risk of flooding from fluvial sources is as such considered to be very low.

14 Flood Risk: Surface Water Flooding

14.1 Surface Water Flooding Definition

Surface water flooding occurs when heavy rainfall overwhelms the drainage capacity of the local area. It is difficult to predict and pinpoint.

14.2 Assessment Methodology

In order to determine the flood risk from surface water sources, the Environment Agency surface water flood map has been inspected.

14.3 Baseline Surface Water Flood Risk

The Environment Agency Risk of Flooding from Surface Water map shows the site to be at “Very Low” risk of flooding from surface water sources (see Figure 11).

The Environment Agency Low Risk (1 in 1,000 year) surface water flood depth map shows the entire Application Site remains unaffected by surface water flooding in this event (see Figure 12). Parts of the carriageway of 174 Southwood Road to the east of the Application Site are shown to experience flood depths of up to 300mm in this event.

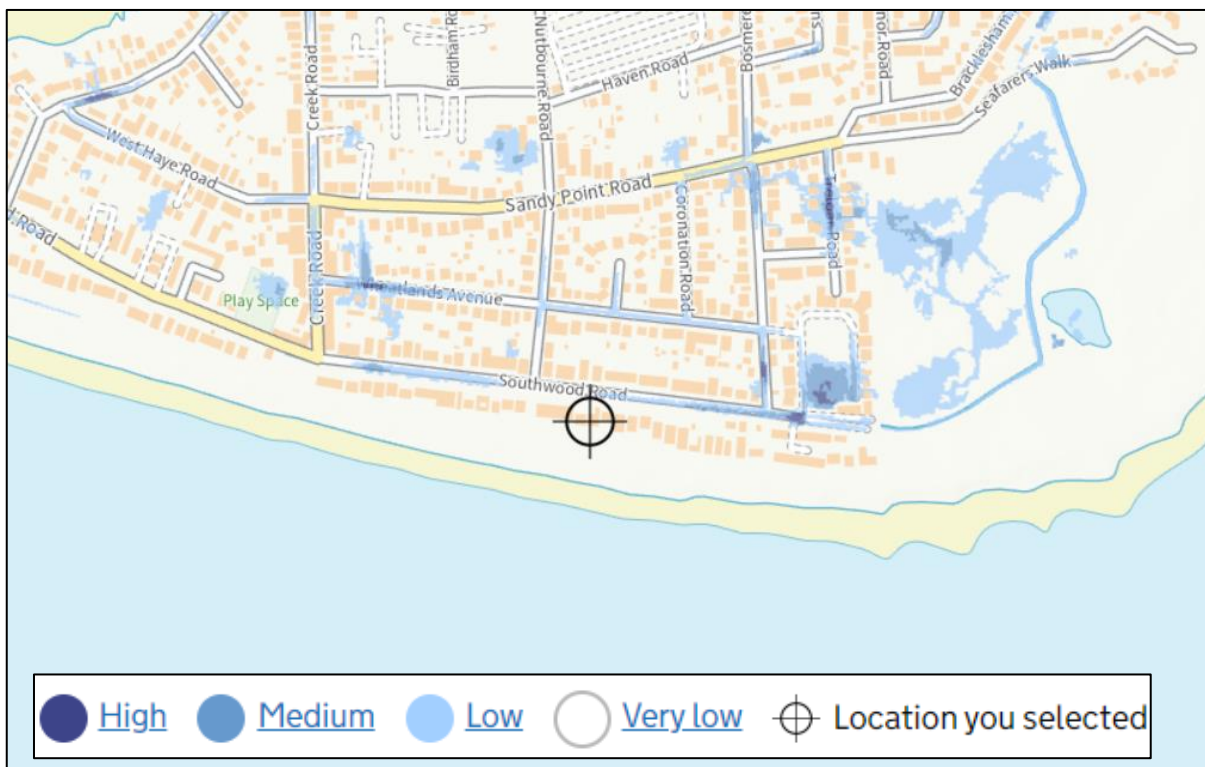


Figure 11: Surface Water Flood Risk map (Source: Environment Agency).

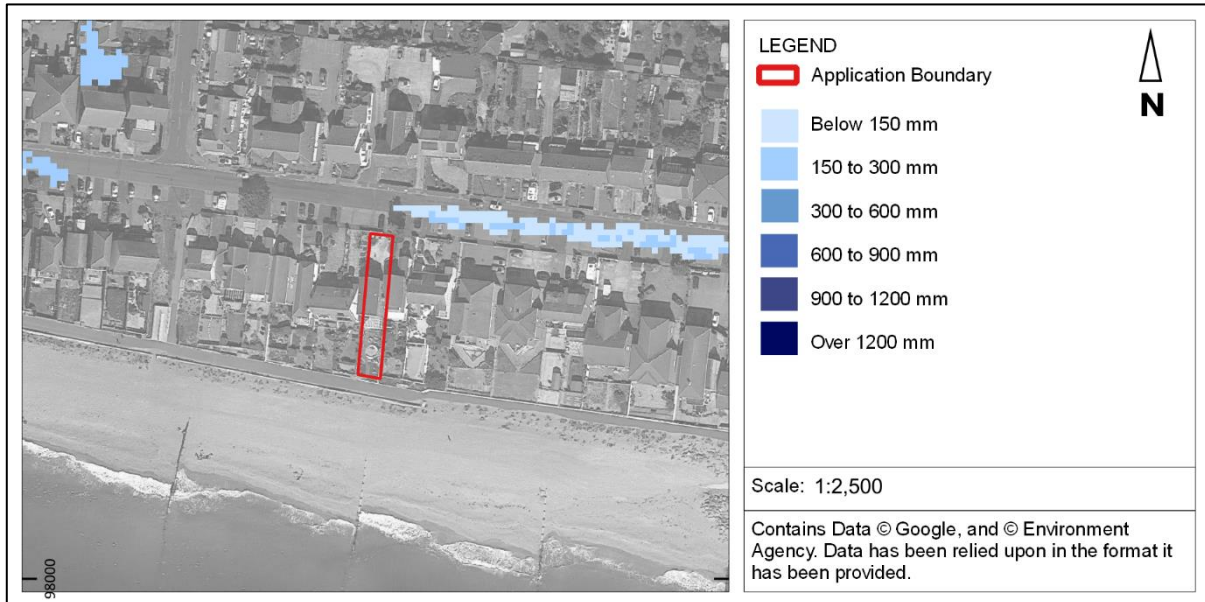


Figure 12: Environment Agency Low Risk Surface Water Flood Depth map (Source: Environment Agency).

14.4 With Climate Change Surface Water Flood Risk

The current Environment Agency surface water flood risk maps currently do not incorporate predicted climate change allowances. However, due to the predicted increases in peak rainfall intensity, it is likely that surface water flood depths will increase over the lifetime of the development.

14.5 Mitigation Measures

On the basis that the Application Site is not predicted to be at risk from surface water flooding, no further mitigation measures against surface water flooding are required.

14.6 Assessed Surface Water Flood Risk

Considering the impacts of climate change and the other factors discussed above, the assessed surface water flood risk over the development lifespan is considered to be very low.

15 Flood Risk: Groundwater Flooding

15.1 Groundwater Flooding Definition

Groundwater flooding is the emergence of groundwater at the ground surface or into subsurface voids or structures, 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 most commonly occurs in unconfined aquifers; either major aquifers from which considerable amounts of water can be discharged or in shallow permeable sediments. Flooding locations are typically near areas of natural groundwater discharge, such as river valleys and spring lines.

15.2 Assessment Methodology

The British Geological Survey's (BGS) Areas Susceptible to Groundwater Flooding (AStGW) dataset has been used to determine the groundwater flood risk to the Development Proposals. This mapping has four categories:

- Unaffected (Very Low Risk);
- Limited potential for groundwater flooding to occur (Low Risk);
- Potential for groundwater flooding of property situated below ground level (Medium Risk);
- Potential for groundwater flooding to occur at surface (High Risk).

15.3 Baseline Groundwater Flood Risk

By reviewing the British Geological Survey AStGW mapping, the groundwater flood risk to the Development Proposals is classified as having potential for groundwater flooding of property situated below ground level (Medium Risk) (see Figure 13).

Therefore, given the nature of the existing use on the Application Site, the risk of groundwater flooding is considered to be very low.

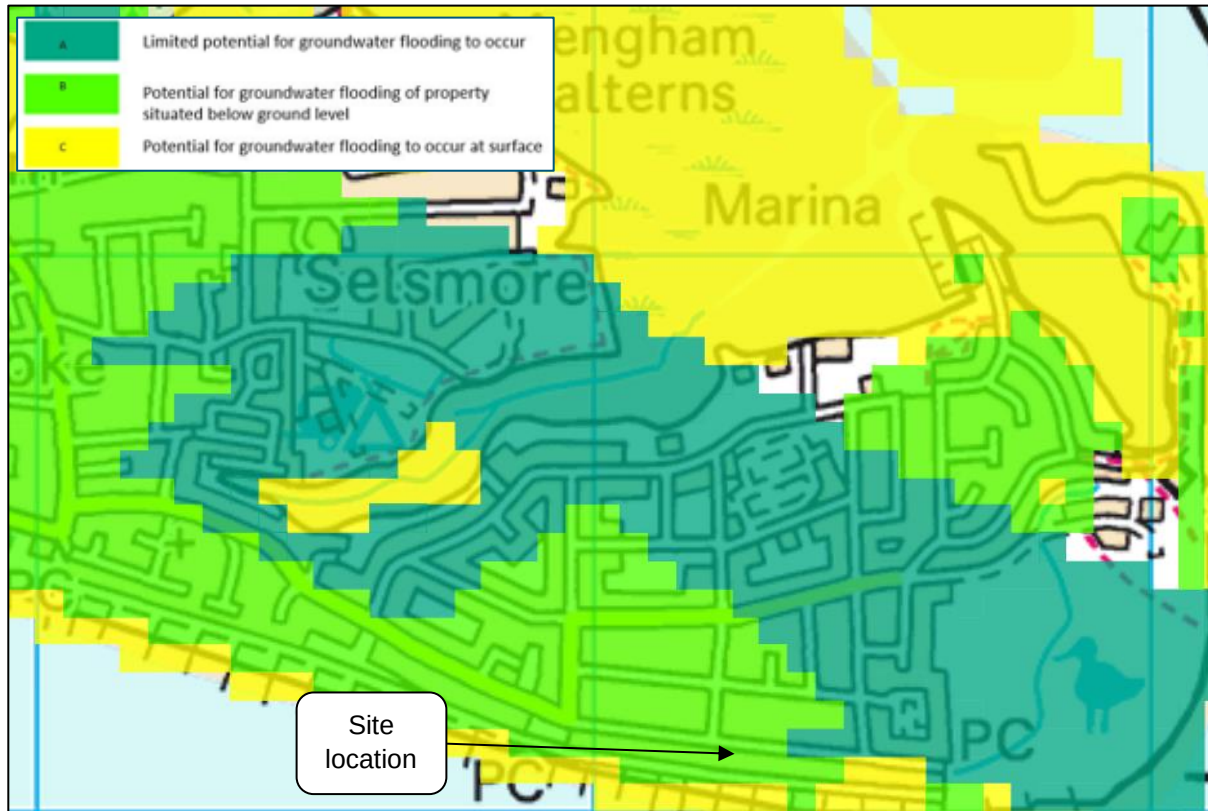


Figure 13: BGS Susceptibility to Groundwater Flooding map (Source: Environment Agency; British Geological Survey).

15.4 Post Development Groundwater Flood Risk

The site is situated in an area classified as having “Potential for groundwater flooding of property situated below ground level” by the BGS Susceptibility to Groundwater Flooding map. Given that internal ground floor FFLs will be raised between 0.30m and 0.62m above the existing ground level, in order to mitigate against tidal flood risk, the risk of flooding from groundwater sources is relatively low.

15.5 With Climate Change Groundwater Flood Risk

According to the UK Groundwater Forum³, the effects of the predicted impacts of climate change may include:

- a long term decline in groundwater storage;
- increased frequency and severity of groundwater droughts;
- increased frequency and severity of groundwater-related floods;
- mobilisation of pollutants due to seasonally high water tables;
- saline intrusion in coastal aquifers, due to sea level rise and resource reduction.

These impacts cannot be locally managed and would need a catchment wide resource management plan to mitigate the risks.

³ Groundwater Resources and Climate Change, http://www.groundwateruk.org/Groundwater_resources_climate_change.aspx#:~:text=The%20effects%20of%20climate%20change,the%20UK%20therefore%20may%20include%3A&text=increased%20frequency%20and%20severity%20of,to%20seasonally%20high%20water%20tables

15.6 Mitigation Measures

As the Application Site is not identified as being at risk of groundwater flooding, no specific mitigation measures are considered necessary. Furthermore, the raising of the ground floor level will provide additional protection to the dwelling against the risk of groundwater flooding.

15.7 Assessed Groundwater Flood Risk

Considering the impacts of climate change and the other factors discussed above, the assessed groundwater flood risk over the development lifespan is very low.

16 Flood Risk: Sewer Flooding

16.1 Sewer Flooding Definition

Sewer flooding occurs when sewers are overwhelmed by heavy rainfall or when they become blocked or fail. The likelihood of flooding depends on the capacity of the local sewerage system. Land and property can be flooded with water contaminated with raw sewage as a result. Rivers can also become polluted by sewer overflows.

16.2 Assessment Methodology

A review of survey sewer asset records and the PUSH SFRA (2016) has been undertaken to determine if the Application Site is located in proximity of a public sewer system or has a recorded history of sewer flooding within 250m of the Application Site.

16.3 Baseline Sewer Flood Risk

The PUSH SFRA Update (2016) Southern Water Observed Flooding Map indicates that the Application Site is located approximately 300m west and 450m southwest of the nearest recorded incident of historic sewer flooding (see Figure 14).

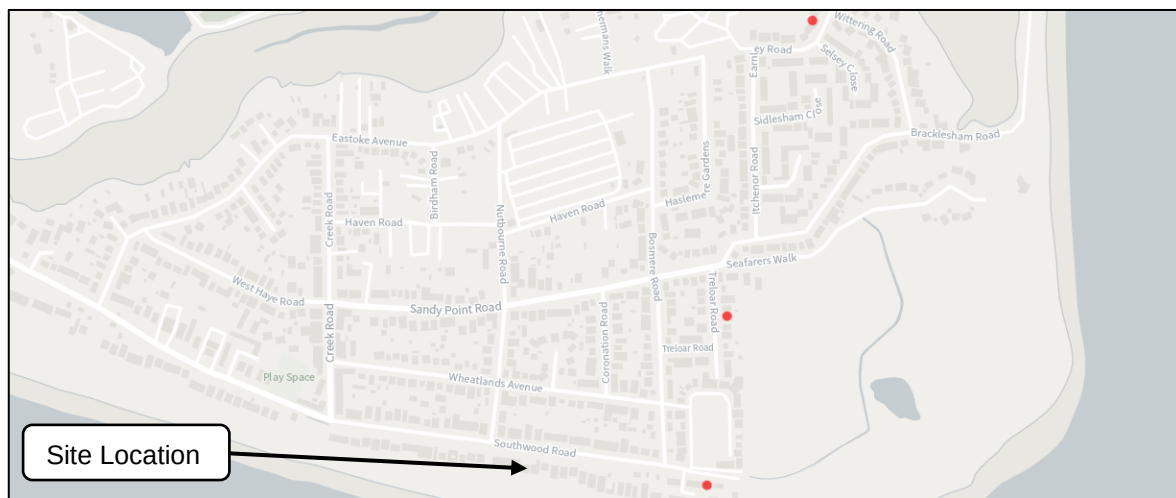


Figure 14 Southern Water Sewer Asset Record. (Source: PUSH SFRA 2016)

16.4 Post Development Sewer Flood Risk

If changes to the foul sewer system are proposed then consent from the public sewer authority will be required prior to occupation of the Development Proposals. This will require formal written consent and the public sewer authority would be required to undertake appropriate works where necessary.

16.5 With Climate Change Sewer Flood Risk

Current climate change predictions are for changes in rainfall profile and water availability, which are likely to alter the demands on the public sewer network. As far as practicable within the Development Proposals, opportunities for water reuse and to restrict surface water discharges have been considered.

16.6 Mitigation Measures

To minimise the potential for sewer flooding, foul and surface water sewer systems should be kept separate and non-return valves or similar protection measures should be installed, to prevent the public sewers from surcharging into the lateral drains serving properties.

Where possible, the FFLs of new buildings should be set at least 150mm above the surrounding ground level, and landscaping and ground levels should be designed to fall away from buildings, especially doorways and other points of access. Considering the placement of the Application Site in Flood Zone 3a, the ground floor FFLs are to be set at no lower than 5.0mAOD, approximately 1.0m above the highest ground level, according to EA 1m LiDAR levels.

16.7 Residual Risk of Sewer Flooding

Based on the assessment of sewer flood risk above and taking into consideration the mitigation measures, the residual sewer flood risk is very low.

16.8 Assessed Sewer Flood Risk

Considering the impacts of climate change and the other factors discussed above, the assessed sewer flood risk over the development lifespan is very low.

17 Residual Flood Risk

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

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

17.1 Flood Defence Breach

17.1.1 Flood Defence Breach Definition

The consequence of a failure of part of a flood defence could result in the rapid release of water in an area that would otherwise not be at risk of flooding. If such an event were to occur, there could be very little warning time. Therefore, it is unlikely that prior evacuation from an area at risk could be achieved.

17.1.2 Assessment Methodology

In some areas, the Environment Agency or other Risk Management Authorities have undertaken specific flood defence breach modelling. In such instances, this data is used to assess the residual risk of flooding.

17.1.3 Flood Defence Breach Analysis

The Application Site is not in an area that benefits from flood defences according to the Flood Map for Planning. The Environment Agency Asset Management Catalogue and Defences Map provided in their Product 4 dataset, shows that the Application Site does appear to benefit from the presence of flood defences in the wider area around the southern and south-eastern coastal frontage of Hayling Island. Based on the information in the ESCP report, the flood defences are maintained to a level of 5.6mAOD, which is above the present day 1 in 1,000 flood level for the site. However, should the flood defences fail the risk of tidal inundation at the Application Site is high, and given the proximity of the Site to the flood defences, it is anticipated that the breach flood level is likely to be similar to the level predicted by the Environment Agency's undefended flood model. The risk of tidal breach flooding has been managed by locating all sleeping accommodation at the first floor level, and raising the building finished floor levels as high as practicable for the ground floor residential use.

17.2 Reservoir Failure

17.2.1 Reservoir Flooding Definition

The emergency response of a partial structural failure of the Toddbrook Reservoir (2019) indicates the level of significance attached to the potential consequences of a dam failure. The response to the Toddbrook Reservoir incident and evacuation of residents within the potential hazard area demonstrates that reasonable and co-ordinated steps can be taken to manage the residual risk of reservoir flooding.

In the unlikely event that a reservoir dam was to fail, a large volume of water would escape at once, with little or no warning. According to the Environment Agency, there has been no loss of life in the UK from reservoir flooding since 1925.

All large reservoirs must be inspected and supervised by reservoir panel engineers, as detailed by the enforcement authority for the Reservoirs Act 1975 in England. The Environment Agency are responsible for ensuring that reservoirs are inspected regularly and to ensure that essential safety work is carried out.

As reservoir flooding is unlikely and the modelled flood depths are based on the worst-case scenario, flooding from this source may be considered as a relatively low risk. Through the management of the risks via the Reservoirs Act 1975 and the work of the Environment Agency, the risk of reservoir flooding can be considered to have been reduced to as low a level as practical.

17.2.2 Assessment Methodology

The Environment Agency has published mapping that indicates whether an area is at risk of reservoir flooding under two conditions:

- 1 When river levels are normal;
- 2 When there is also flooding from the rivers.

17.2.3 Reservoir Flood Risk Analysis

The Environment Agency risk of reservoir flooding indicates that the Application Site is not at risk as a result of a modelled reservoir failure (see Figure 15).

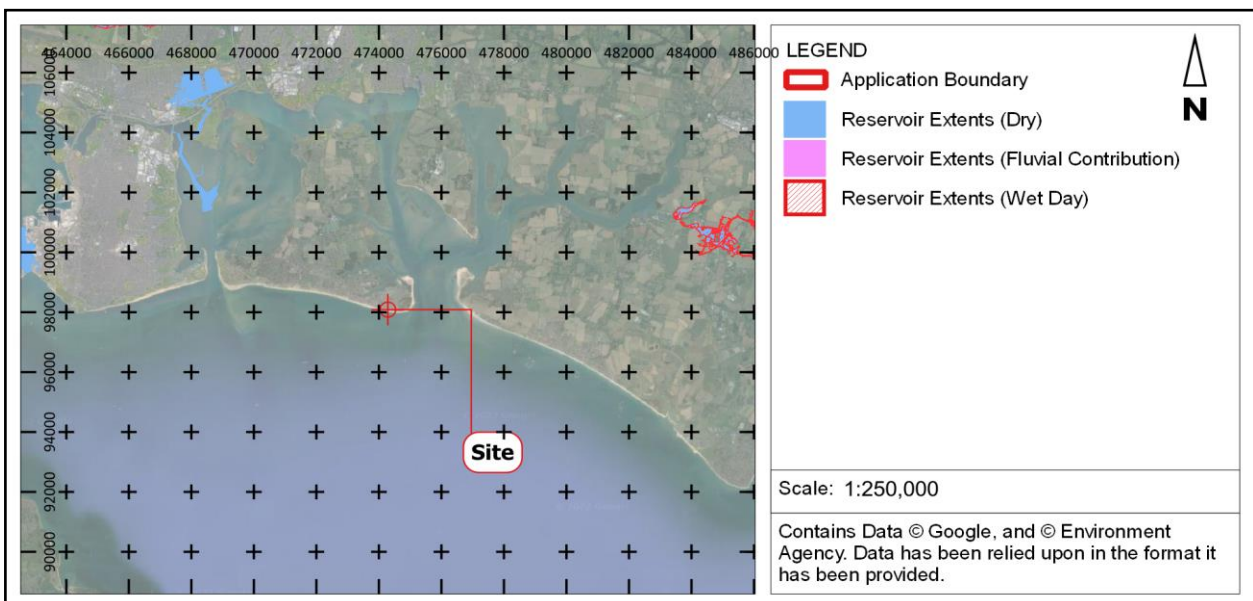


Figure 15: Environment Agency, Risk of Reservoir Flooding (Source: Environment Agency).

17.3 Canal Failure

Canal failure could result in flooding if a section of raised canal, either on an embankment or on a viaduct, was to fail.

As the Application Site is not within 1km of a raised canal, it is considered that the residual risk of canal flooding is low.

18 Flood Warning Service and Evacuation Plan

18.1.1 Environment Agency Flood Warning Service

The Environment Agency provides a flood warning service and operates a flood forecasting and warning service for areas at risk of flooding from rivers or the sea. This is a free 24-hour service operating 365 days of the year and relies on direct or live observation of rainfall, river levels, tide levels, bespoke in-house predictive models, rainfall radar data and information from the UK Met Office. The Environment Agency operate a Flood Information service which identifies whether any flood warnings or alerts have been issued for a specific postcode or place in England or Wales: <https://flood-warning-information.service.gov.uk/>.

The Environment Agency also operate a 5 day county-wide forecast in relation to flood risk. It is recommended that this service is regularly checked to safeguard occupants / residents and make them aware of any possible risks: <https://flood-warning-information.service.gov.uk/5-day-flood-risk>.

The following flood alerts and flood warnings are available from the Environment Agency and are relevant to the Application Site:

- South Hayling and South Eastoke seafront (quick dial code: 316021)

The Application Site is located within a flood alert and flood warning area and, as a minimum, it is recommended that these warnings should be subscribed to and acted upon, as appropriate: <https://www.gov.uk/sign-up-for-flood-warnings>.

The Application Site should be linked to the Environment Agency's flood warning service so that when the Environment Agency issues a flood alert or warning, the service would send an automated warning message to the appropriate contact (i.e. Site Manager). Flood warnings and alerts are provided by phone, email or text.

18.1.2 Met Office weather warnings

In addition to the Environment Agency flood warning service, it is recommended that the site occupiers also subscribe to weather warnings from the Met Office. These provide an indication of when weather warnings (e.g. extreme rainfall) are forecast and enable appropriate action to be taken.

The Met Office issues weather warnings up to 5 days in advance, through the National Severe Weather Warning Service, when severe weather has the potential to bring impacts to the UK. It is also possible to stay up to date with weather warnings through the Met Office app (available on both android and apple), social media (twitter, Facebook) or email alerts. More information can be found at <https://www.metoffice.gov.uk/weather/guides/warnings>.

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

18.1.3 Flood management and evacuation procedures

Environment Agency flood warnings and Met Office weather warning should be used to set evacuation triggers. Site occupiers should sign up to receive flood warnings from the Environment Agency. There are three levels of flood warning:

- Flood alert (be prepared to act)
- Flood warning (act)
- Severe flood warning (seek emergency refuge within building).

Flood Alerts are issued more frequently than Flood Warnings. The Met Office website states that Flood Alerts could be issued between 2 hours and 2 days in advance of flooding, while Flood Warnings are issued between half an hour to one day in advance of flooding.

It is recommended upon receipt of a Flood Alert, that residents prepare for potential flood evacuation.

Upon receipt of a Flood Warning it is proposed to evacuate the Application Site, as this should provide sufficient warning to enable evacuation before flood waters reach the evacuation route.

If a Severe flood warning is received, without prior warning, emergency refuge within the upper floors of the building should be undertaken.

18.1.4 Evacuation routes and designated evacuation points

It is necessary to identify a flood evacuation route from the Application Site. It is recommended that evacuation is inland, away from the coastal frontage watercourse and towards designated evacuation points located in Flood Zone 1. Wherever possible, temporary relocation to a friends or family's home outside of Flood Zone 3 is recommended, as this would reduce the pressure on the emergency services.

The proposed evacuation route is shown in Figure 16, from the Application Site to Hayling Island Reformed Church. Upon leaving 174 Southwood Road, occupants should turn left to head west for approximately 70m, before turning right onto Nutbourne Road to head north for approximately 200m. At the Junction with Sandy Point Road, occupants should turn left to head west along Sandy Point Road and then Westhaye road for approximately 600m.

At the junction with Eaststoke Avenue, occupants should turn left to head southwest for approximately 100m. At the junction with Southwood Road, they should turn right to head west for approximately 625m. At the junction with Rails Lane, occupants should turn right to head northwards for approximately 700m before turning left at the junction with Selmore Road, continuing a further 600m westwards along Selmore Road, before turning right onto Seagrove Road, and immediately left onto Hollow Lane.

Turning right shortly after turning onto Hollow Lane, brings the site occupants to Hayling Island United Reformed Church. This location is considerably within Flood Zone 1 and may provide refuge. As the route is approximately 3.00km in length it is recommended that evacuation is made by motorised vehicle, and before the onset of floodwater, as soon as a flood warning or severe flood warning is given for the area.

It should be noted, that while the Application Site is situated in Flood Zone 3a, the proposed evacuation route passes through two separate areas of Flood Zone 1, both approximately 600m in diameter, before passing through smaller areas of Flood Zone 2 and 3. The proposed evacuation route ends in neither of the two earlier areas of Flood Zone 1, since they include a lack of suitable evacuation locations, such as schools, churches and community halls where facilities may be available. The proposed evacuation route does pass relatively close to a community hall and a church in the early and mid-part of the evacuation route, namely St Andrews Church East Stoke and East Stoke Community Centre, however, these are both situated in Flood Zones 2 and 3 respectively and are therefore not considered suitable as refuge locations. The considerably larger area of Flood Zone 1, in which the evacuation route is proposed to end, includes 3 churches, a community centre and 3 schools all of which may potentially be used as refuge centres. Evacuation to this area of Flood Zone 1 therefore provides a greater range of refuge opportunities.

An alternative to this route could be provided by seeking refuge in a residential dwelling situated in either the first or second area of Flood Zone 1, along the proposed evacuation route. This could be possible if there are any friends or associates of the residents of 174 Southwood Road living in these areas.

Evacuation by this or any route is not recommended after the onset of flood waters. Refuge should be sought on the upper floors of the proposed dwelling if this is the case.

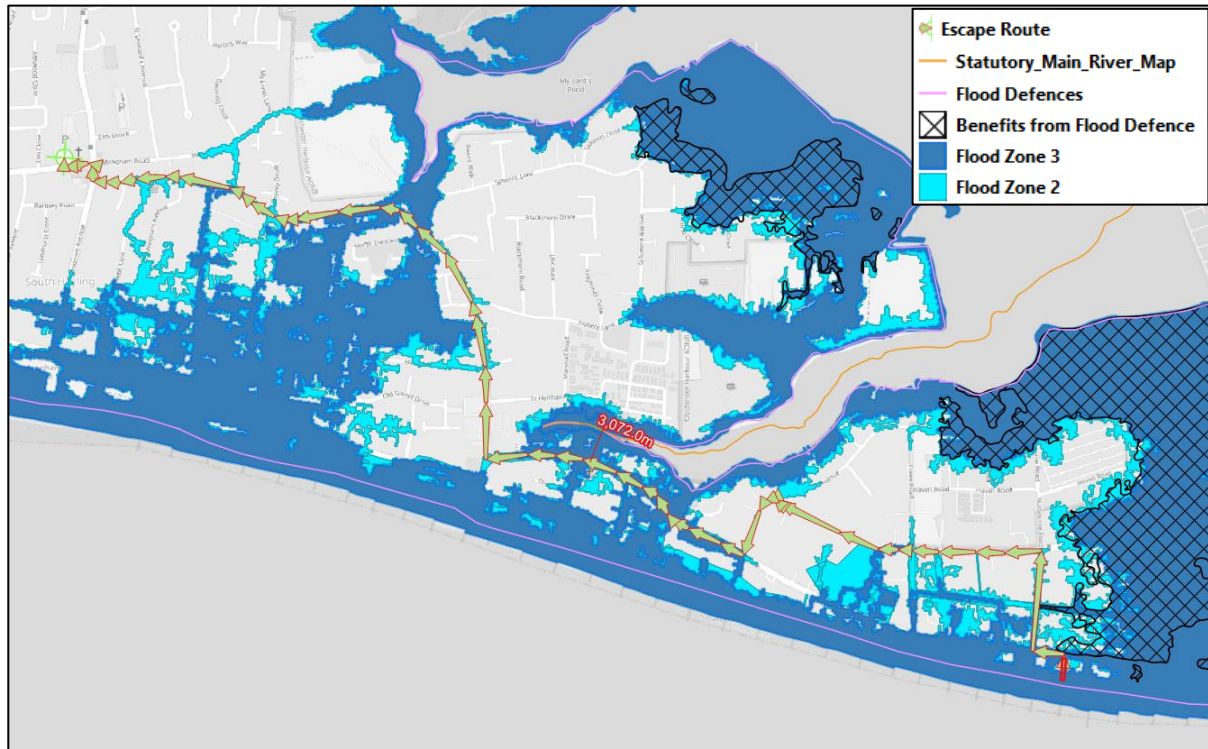


Figure 16: Flood Evacuation route from the site to South Hayling Reformed Church (Source: Environment Agency)

19 Off Site Impacts

19.1 Floodplain displacement

The Application Site is located within tidal Flood Zone 3 and under the NPPF:

“Where flood storage from any source of flooding is to be lost as a result of development, on-site level-for-level compensatory storage, accounting for the predicted impacts of climate change over the lifetime of the development, should be provided... 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”

Given that the dominant source of flooding to the Application Site is tidal, there is no requirement to provide compensatory flood storage.

The Development Proposals are not predicted to impact groundwater flows, and as such will not alter the groundwater flood risk in the area.

19.2 Surface Water runoff

The existing dwelling currently consists of paving in the front garden or yard area, this is to the front and north of the existing two storey residential dwelling. There is a paved pathway around the eastern side of the dwelling, leading to a rear garden consisting of paved patio area and garden.

It should be noted that the Development Proposals will result in minimal changes in surface water runoff as there is little or no change in the impermeable surface area. Any additional built footprint will be onto areas which are considered impermeable for the existing dwelling.

It should also be noted however, that any additional runoff generated from the increase in hardstanding area of the site should be restricted to greenfield runoff rates if practicable.

It is however recommended, that the site developer investigates the ability to incorporate Sustainable Drainage Systems (SuDS) as part of the Development Proposals. Accordingly, post development there is scope for the runoff rate to be limited to that of the existing scenario or further reduced.

Where possible surface water arising at the site should be discharged directly to the sea, as this will reduce the demands on the surface water sewer network. This could be achieved by high level guttering, directing surface water along the top of a boundary wall, and to discharge to the coast.

20 Recommendations

20.1 Flood Resilient Construction Techniques

The Development Proposals are to be constructed in line with the current best practice for construction within an area at risk of flooding as set out in CLG 2007 'Improving the Flood Performance of New Buildings'. A summary of these is detailed below.

Damp Proof Membranes (d.p.m.) should be included in any design to minimise the passage of water through ground floors. Impermeable polythene membranes should be at least 1200 gauge to minimise ripping. Effective methods of joining membrane sections are overlaps of 300mm, and also taping (mastic tape with an overlap of 50mm minimum). Care should be taken not to stretch the membrane in order to retain a waterproof layer.

Windows and patio doors are vulnerable to flood water and similar measures to those used for doors should be taken. Special care should be taken to ensure adequate sealing of any PVC window/door sills to the fabric of the house. Of particular concern would be excessive water pressure on the glazing of patio doors. Double glazing conforming to the relevant standards would in principle adequately resist the pressures generated by flood waters provided they were specified to withstand the depth of water predicted. Given, the predicted depths of flood water at the site, for the with climate change scenario, there is a risk that glass panels or doors could breach, if they are not adequately maintained or inadvertently replaced with underperforming materials. Normal building structures including glazing, can withstand up to 600mm of static water. Long term, (without other mitigation measures) the predicted depth of water could impact the structural integrity of building elements, that are not adequately resistant to the predicted depth of water.

Doors: sealed PVC external framed doors should be used and, where the use of wooden doors is a preferred option, all effort should be made to ensure a good fit and seal to their frames. Hollow core timber internal doors should not be used.

Drainage services: Non-return valves are recommended in the drainage system to prevent back-flow of diluted sewage in situations where there is an identified risk of the foul sewer surcharging. Maintenance of these valves is important to ensure their continued effectiveness.

Based on the findings of this assessment, it is recommended that the Development Proposals should incorporate the following mitigation measures:

- Waterproof materials and damp-proof membrane to be utilised in the construction of the dwelling.
- Non-return valves on sewers to be installed separately on the foul and surface water systems, to prevent back-flow and “self-flooding”.
- Exterior ventilation outlets, utility points and air bricks to be fitted with removeable waterproof covers.
- All new plumbing insulation to be of closed-cell design.
- Internal access to the upper storey of the property is to be maintained for the lifespan of the development, all sleeping is to be located on the upper floors.
- Back-up power and water provisions should be included in the upper floors, to support the use of the building in the event of a flood occurring either beyond the design standard, or as a result of a failure of the existing flood defences.
- Any new sewer connection created as part of the Development Proposals should be first agreed with the local sewer provider and fitted with non-return valves to mitigate the risk of sewer flooding.

- The site owner and / or residents should sign up to the Environment Agency Flood Alert/Warning Service and have an evacuation plan.
- Maintenance responsibilities should clearly identify which assets would be private and which would be public;
- Manhole / Inspection chamber covers to be secured; and
- Anti-syphon fitted to all toilets.
- Water sensors should be located around the perimeter of the property to detect if flood waters have encroached into the property, these should be set at 4.2m AOD, to provide a 300mm freeboard to the proposed ground floor finished floor level. Should these sensors raise an alarm, the occupiers of the building should seek refuge at first floor level, and a visual inspection of the flood risk should be taken from the first floor level to determine the potential hazard and cause of flooding. If the cause is the result of a failure of the shingle flood defences, this should be reported as an Emergency to the Environment Agency.

Furthermore, longer term there should be the consideration of the use of a flood resistant wall around the perimeter of the dwelling to replace the existing boundary wall with a crest level of at least 5.85mAOD, which is equivalent to the predicted 2125 1:200 flood level. The wall should be constructed to enable the future vertical extension, to provide the required Freeboard Level, or to allow for further increases in flood level due to increased climate change impacts. Based on the proposed FFL of 4.5m the top of the wall, would be 1.35m above the ground floor level, which has been considered as a reasonable compromise between flood resilience and maintaining the properties views of the sea.

20.1.1 Safe Access and Egress

No flood hazard levels for the design tidal flood event have been provided at the time of writing. It is however recommended that given the flood depths onsite, and in the surrounding area, that occupants do not try to enter or leave the proposed dwelling during the design tidal flood event. Safe refuge is recommended as being taken on the upper floor of the proposed dwelling if safe evacuation cannot be made before the onset of flood waters.

20.1.2 Flood Risk Activity Permit

Any works within 8m of a fluvial Main River or 16m of a tidal watercourse will require an Environment Agency Flood Risk Activity Permit (FRAP). These are usually obtained post planning, once the detailed design of the proposed activities has been developed to a substantially complete status, including method statements for the proposed works to be undertaken.

The Development Proposals are situated more than 16m away from the nearest Environment Agency tidal flood defence, comprising the embankment between the end of the garden at 174 Southwood Road, and the South Hayling Island beach front. The Development Proposals therefore should not require a FRAP. However, the construction of a flood wall around the perimeter of the property may require a FRAP, and will need to be designed to withstand the water and wave pressure associated with the 1:200, 2125 design flood.

20.1.3 Sewer Connection

Any new sewer connection to the public sewer should be agreed with the Public Sewer Authority, prior to starting work on site.

21 Conclusions

Royal HaskoningDHV has been appointed by Sarah Lawson and Ivan Snell to undertake a National Planning Policy Framework (NPPF) [1] compliant Flood Risk Assessment (FRA) for the Development Proposals located at 174 Southwood Road, Hayling Island, Havant, Hampshire, PO11 9QL.

It is understood that the Development Proposals are for the demolition of the existing dwelling and the construction of a new replacement dwelling

According to the Planning Practice Guidance on Flood Risk and Coastal Change, the Development Proposals would be classified as a Minor Development.

According to Annex 3 of the NPPF, the Development Proposal's Vulnerability Classification is "More Vulnerable", which consists of the following uses:

"Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels."

The key findings of the Flood Risk Assessment are as follows:

- The Application Site is situated in Flood Zone 3, and is approximately 20m north of the English Channel, along the southern sea frontage on Hayling Island.
- Based on the current activities of the East Solent Coastal Partners (ESCP), the Standard of Protection is being maintained to the 1 in 200 year standard. Therefore, under normal operational conditions, the Proposed Development would be protected from tidal flood events up to and including the 1 in 200 year event.
- Detailed flood level information provided by the Environment Agency, provides a 1 in 200 year tidal flood level of 4.65mAOD. Allowing for the future predicted impacts of climate change, sea levels could (increasing sea levels by 1.2m) could result in a future 1 in 200 year tidal flood level, including for climate change of 5.85m AOD.
- The proposed development has raised the ground floor level to 5.00mAOD, which is as high as can be achieved, given other architectural constraints. No sleeping accommodation will be provided on the ground floor. Sleeping accommodation is to be provided at first floor level (Finished Floor Level 7.73mAOD) which will be 1.88m above the predicted 1 in 200 year with climate change flood level.
- These proposals represent an improvement to the flood resilience of the existing dwelling located at the site.
- A Flood Evacuation route to Hayling United Reformed Church, within Flood Zone 1, has been recommended. This evacuation route is approximately 3.01km (1.90 miles) in length. If no evacuation is possible before the onset of floodwaters, safe refuge can be provided onsite, post-development, via the internal stairwell, with safe internal refuge provided at first floor level
- Site occupiers shall sign up to the Environment Agency Flood Warning and Alert Service, and the Met Office Weather Warnings notifications, in order to inform of the risk of flooding and need for evacuation.

The Flood Risk Assessment has been undertaken in accordance with the requirements of the NPPF and it can be demonstrated that the Development Proposals are compatible with the predicted flood risk, including climate change allowance over the development lifetime.

It should be noted that the Development Proposals are not predicted to increase the risk of flooding to others over the development lifetime. Consequently, it is concluded that, with regards to the flood risk requirements of the NPPF, the Development Proposals are acceptable

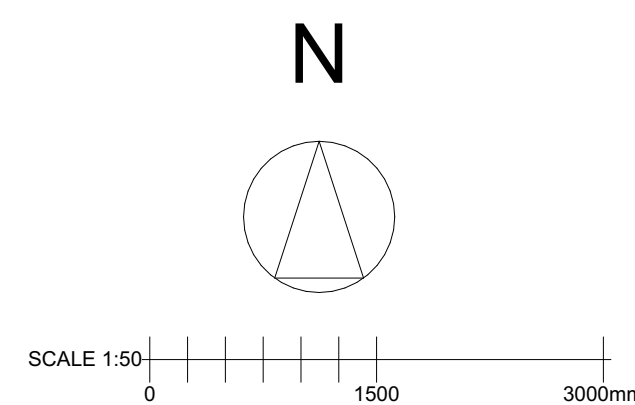
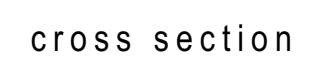
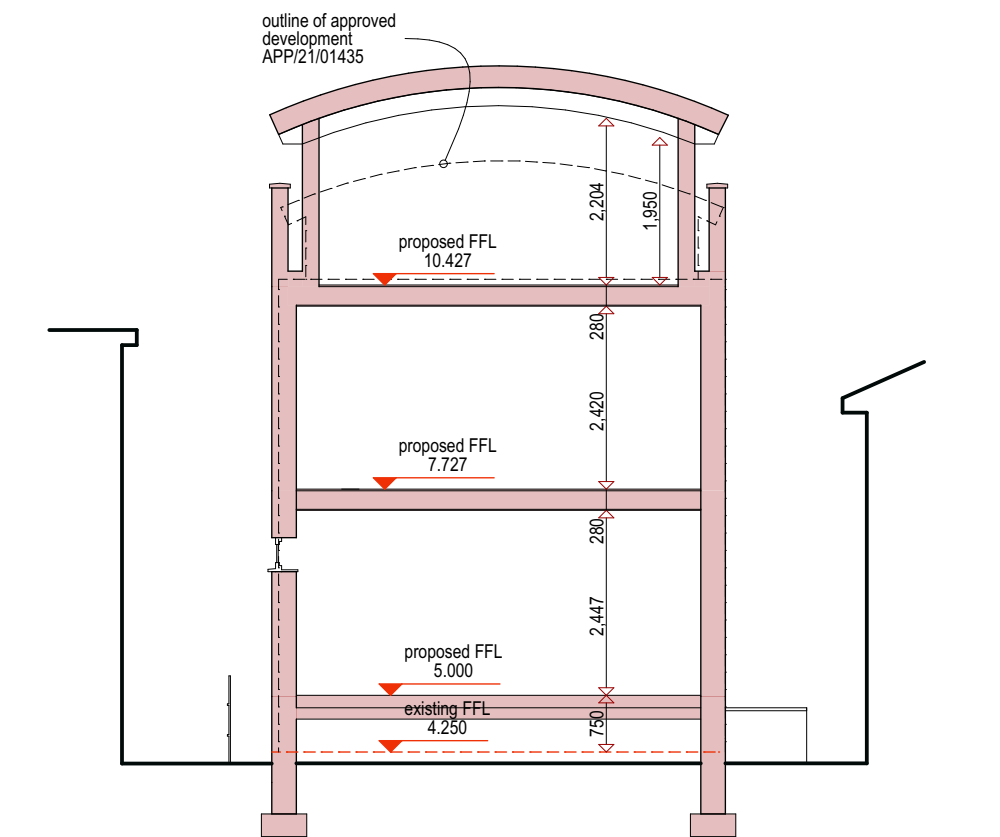
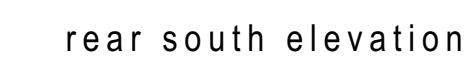
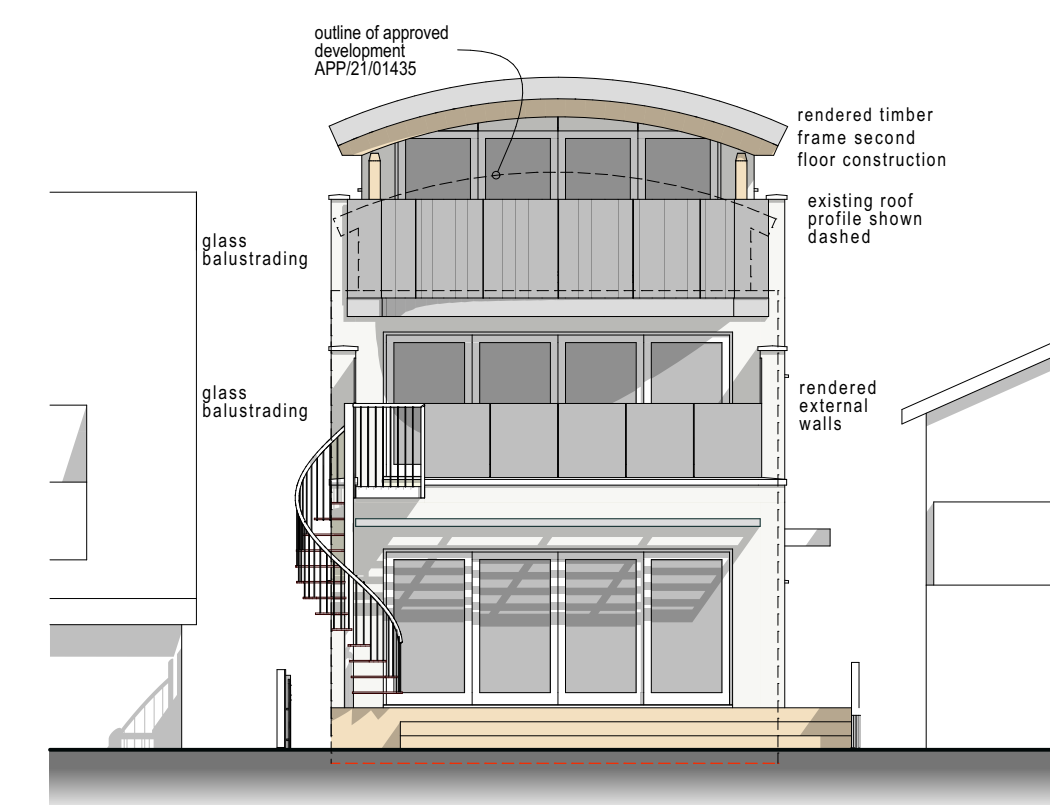
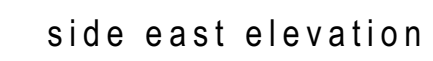
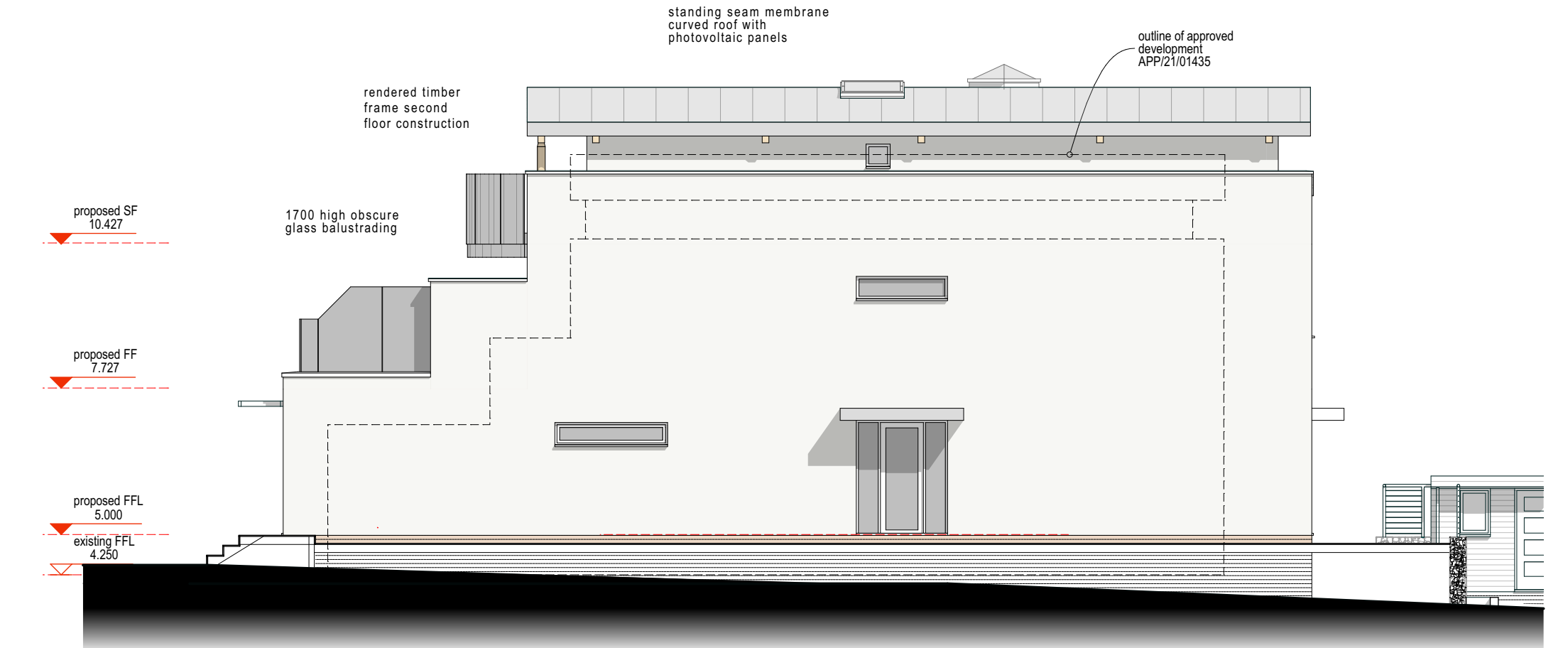
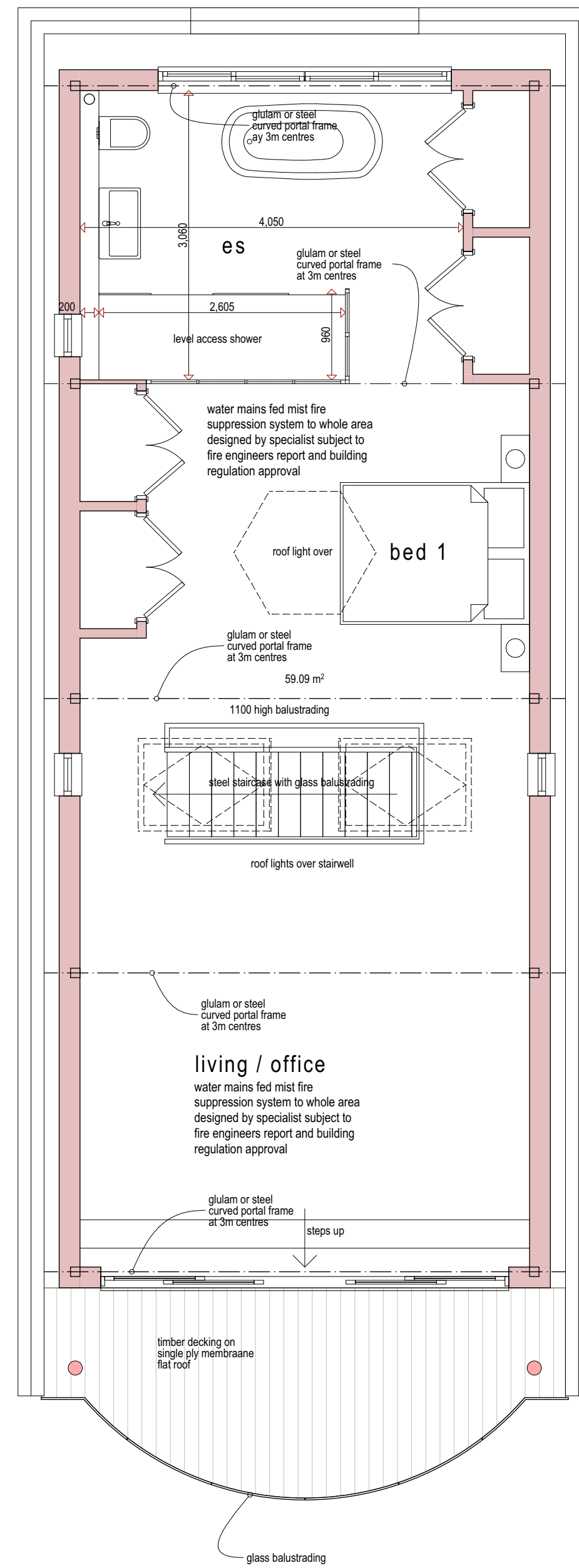
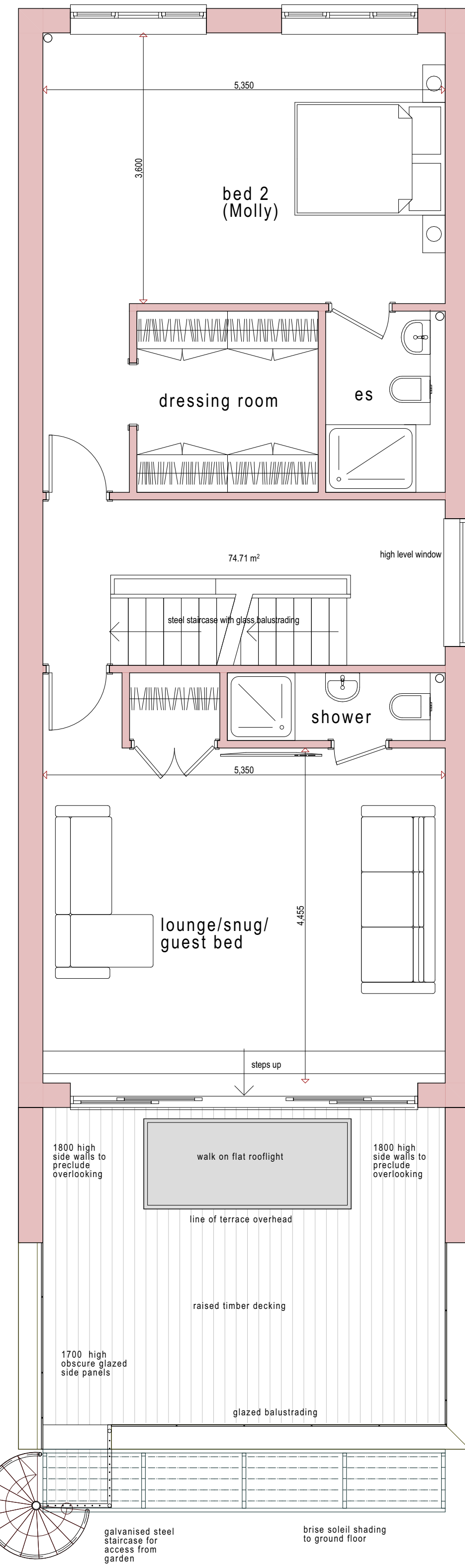
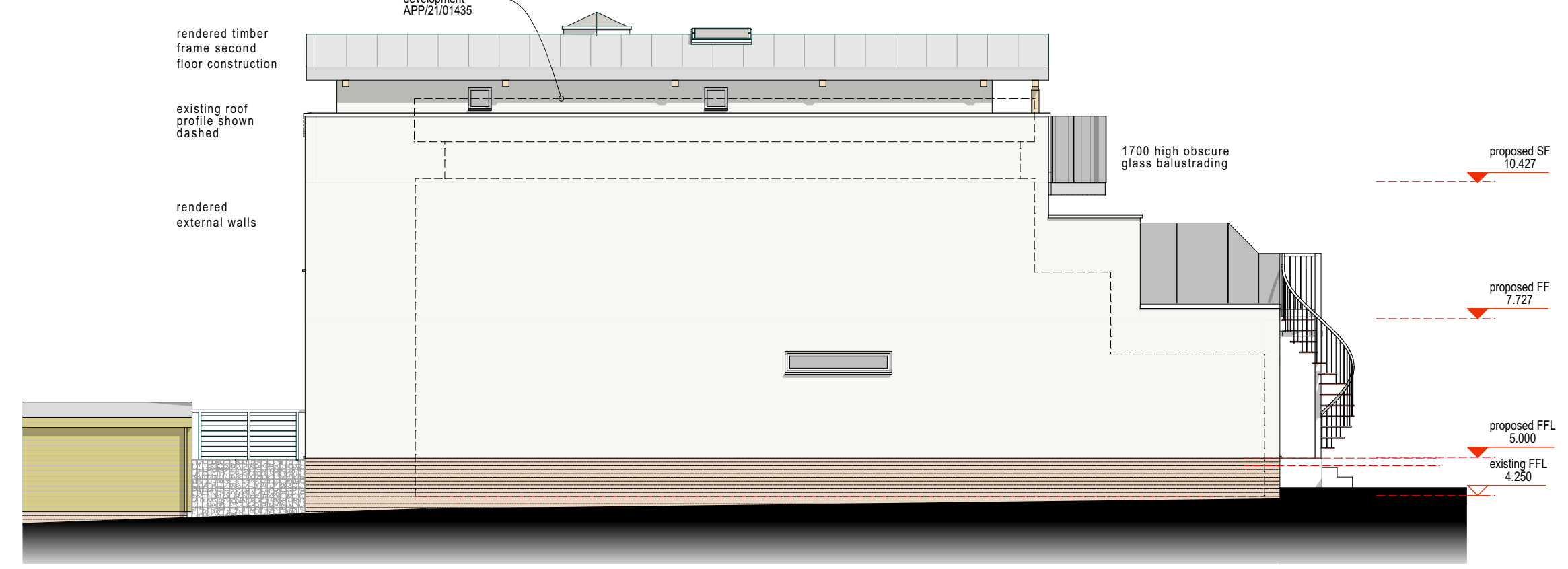
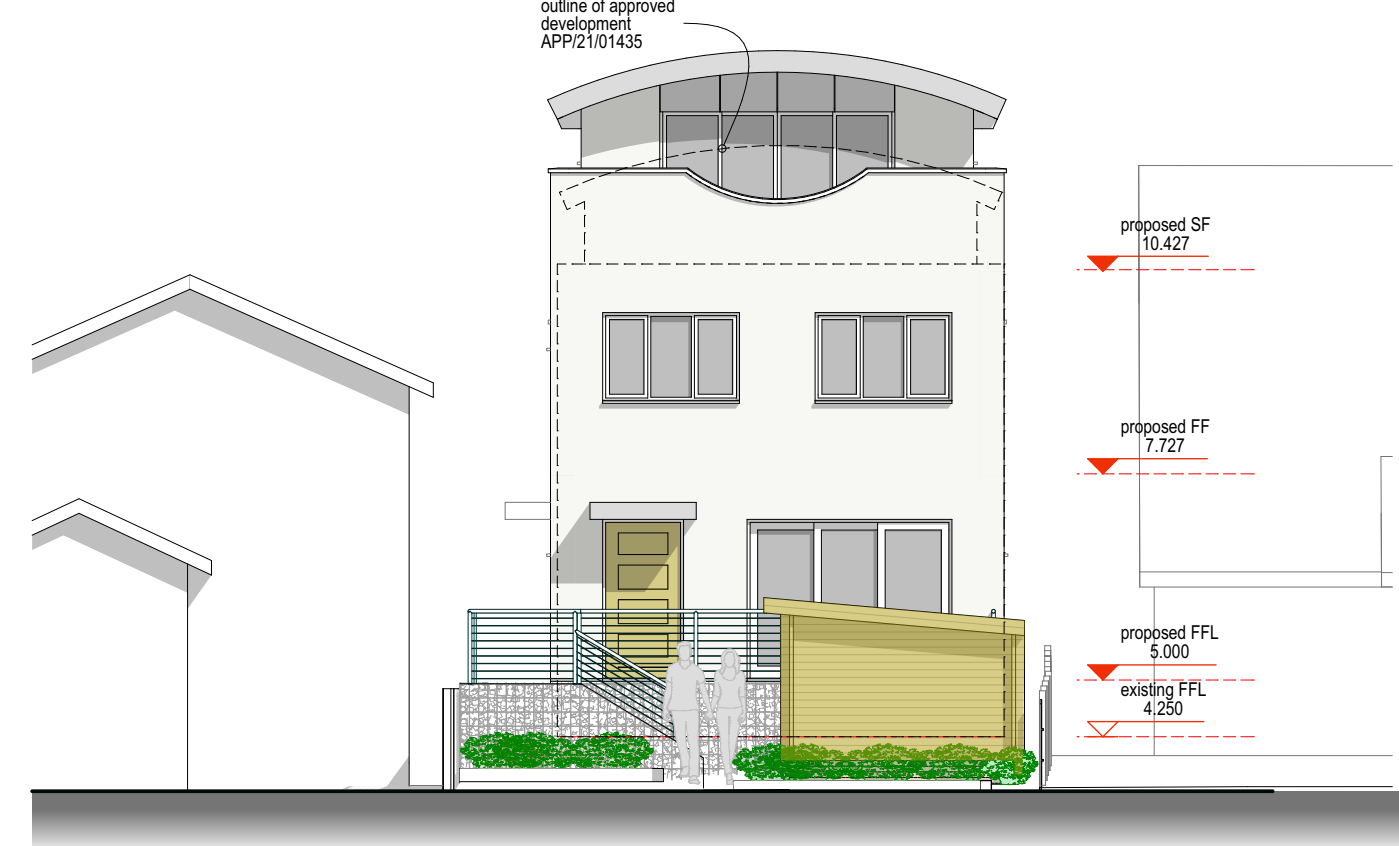
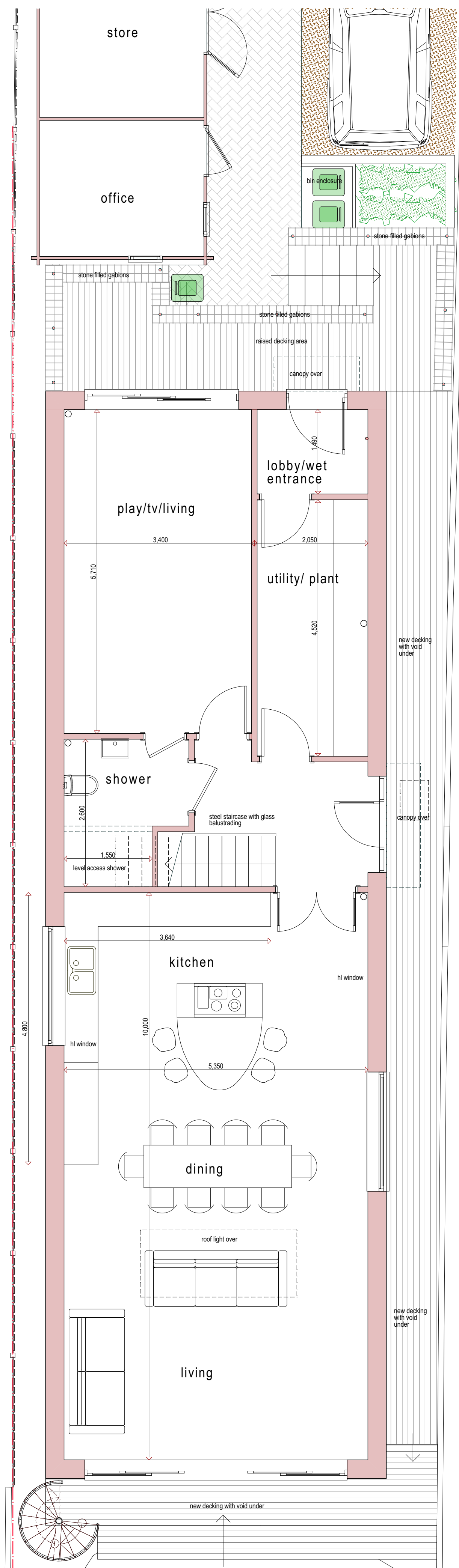
Glossary

Term	Definition
AEP	Annual Exceedance Probability is the probability of a rainfall or tidal event occurring within any one year. For example, an event of a 100 year return period has an AEP of 1:100 or 1%.
Flood Defences	Artificial structures maintained to a set operational level designed to protect land people and property from Tidal and Fluvial flood sources to an established chance of happening in any year threshold.
Flood Source: Fluvial (River)	When flows within watercourses exceed the capacity of the watercourse causing out of bank flows.
Flood Source: Groundwater	Groundwater flooding is usually the result of prolonged wet weather causing groundwater levels to rise sufficiently to either emerge at surface or to cause flooding of below ground infrastructure, such as basements.
Flood Source: Surface water	When rainfall causes overland flows which exceed the capacity of the drainage network, causing flooding to land that is normally dry.
Flood Source: Tidal	When high tide events overtop the shoreline to cause flooding to land behind.
Flood Zone 1	Low Probability. Land defined as having a less than 1:1,000 annual probability of flooding from tidal and fluvial sources.
Flood Zone 2	Medium Probability. Land defined as having a risk of fluvial flooding between 1:100 annual probability and 1:1,000 annual probability. Or Land defined as having a risk of tidal flooding between 1:200 annual probability and 1:1,000 annual probability.
Flood Zone 3 (A)	High Probability. Land defined as having a fluvial risk of 1:100 annual probability or greater. Or a tidal risk of 1:200 annual probability or greater.
Flood Zone 3 (B)	Functional Floodplain. Defined by SFRA's as areas where floodwater is stored during lower AEP events, typically the 1:30 annual probability.
Flood Zone Map	The Environment Agency has produced a mapping data set which covers England and provides the general extents of Flood Zones 1, 2, and 3. However the national data set available online does not differentiate between Flood Zone 3 (A) and 3 (B).
Freeboard	In flood risk management Freeboard is a term used to identify the vertical difference between the design flood level, and the design height of any flood mitigation measures. For instance if a pond had bank heights of 9.0m and the water level was at 8.6m the freeboard would be 0.4m (9.0-8.6)
LiDAR	"Light Detection and Ranging (LiDAR) is an airborne mapping technique, which uses a laser to measure the distance between the aircraft and the ground. Up to 500,000 measurements per second are made of the ground, allowing highly detailed terrain models to be generated at spatial resolutions of between 25cm and 2 metres." EA LiDAR
Major Development	Means development involving any one or more of the following: - the winning and working of minerals or the use of land for mineral-working deposits - waste development - the provision of dwellinghouses where – - the number of dwellinghouses to be provided is 10 or more; or - the development is to be carried out on a site having an area of 0.5 hectares or more and is not known whether the development falls within sub-paragraph I(i) - the provision of a building or buildings where the floor space to be created by the development is 1,000 square metres or more; or - development carried out on a site having an area of 1 hectare or more.
Non-Major Development	'Non major development' is any development falling below the above thresholds but excluding minor development. For example, a planning application for 8 dwellings an office building creating 750 square metres of floor space, or a development with a site area of 0.4 hectares.

Term	Definition
Main River	Defined on the Main River map and relate to rivers on which the Environment Agency have powers to carry out flood defence works.
Minor Development	Minor non-residential extensions: industrial/commercial/leisure etc extensions with a footprint less than 250 square metres. Alterations: development that does not increase the size of buildings e.g. alterations to external appearance. Householder development: For example; sheds, garages, games rooms etc within the curtilage of the existing dwelling, in addition to physical extensions to the existing dwelling itself. This definition excludes any Development Proposals that would create a separate dwelling within the curtilage of the existing dwelling e.g. subdivision of houses into flats. Paragraph: 051 Reference ID: 7-051-20220825, Revision date: 25 08 2022 https://www.gov.uk/guidance/flood-risk-and-coastal-change#minor-development-to-flood-risk
m AOD	Metres Above Ordnance Datum
OS	Ordnance Survey
Ordinary Watercourse	A watercourse which does not form part of a Main River, works on Ordinary Watercourses usually require consent from either the Lead Local Flood Authority, or the Internal Drainage Board (where one exists).
Qbar	Qbar is the mean annual maximum flow rate, for a catchment which has an equivalent return period of 1 in 2.3 years
Return Period	The return period of a flood might be 100 years; otherwise expressed as its probability of occurring being 1 in 100, or 1% in any one year. If a flood with such a return period occurs, then this does not mean the next will occur in about one hundred years' time - instead, it means that, in any given year, there is a 1% chance that it will happen, regardless of when the last similar event was. Or, put differently, it is 10 times less likely to occur than a flood with a return period of 10 years (or a probability of 10%).
Standard of Protection (SoP)	Engineered defences usually have a standard of protection (SoP), which is the return period of a flood event against which the defence should be effective.
SuDS	Sustainable Drainage Systems, which are designed to manage surface water flows in order to mimic the Greenfield run-off from an undeveloped site.
Urban Creep	Urban creep is the conversion of permeable surfaces to impermeable over time e.g. surfacing of front gardens to provide additional parking spaces, extensions to existing buildings, creation of large patio areas.

Appendix

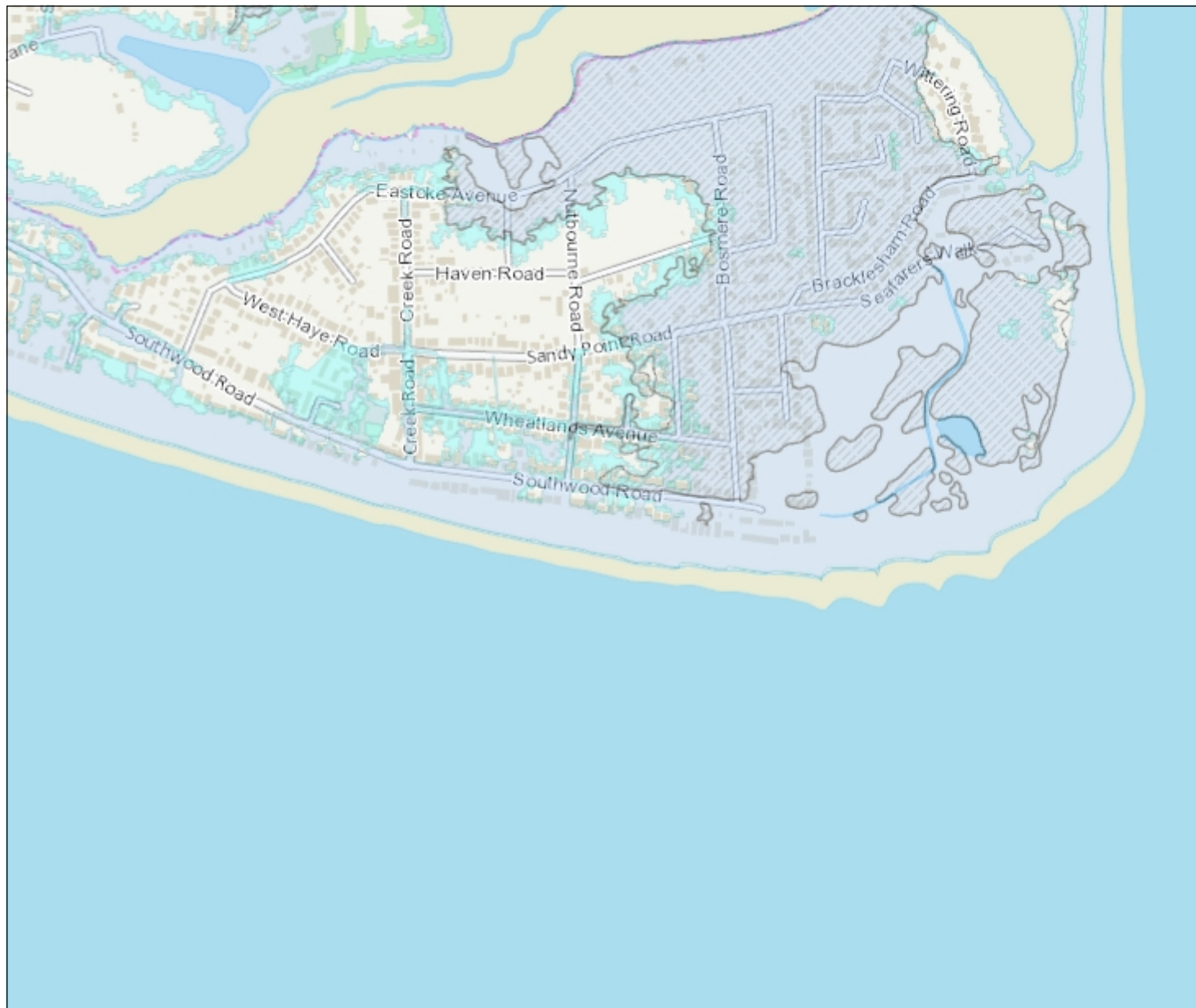
A. Development Proposals



Appendix

B. Third Party Data

Flood Map for Planning (Rivers and Sea) - Centred on Southwood Road, Hayling Island - Created 24 August 2022



1: 10,000

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Flood Map for Planning (Rivers & Sea)

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

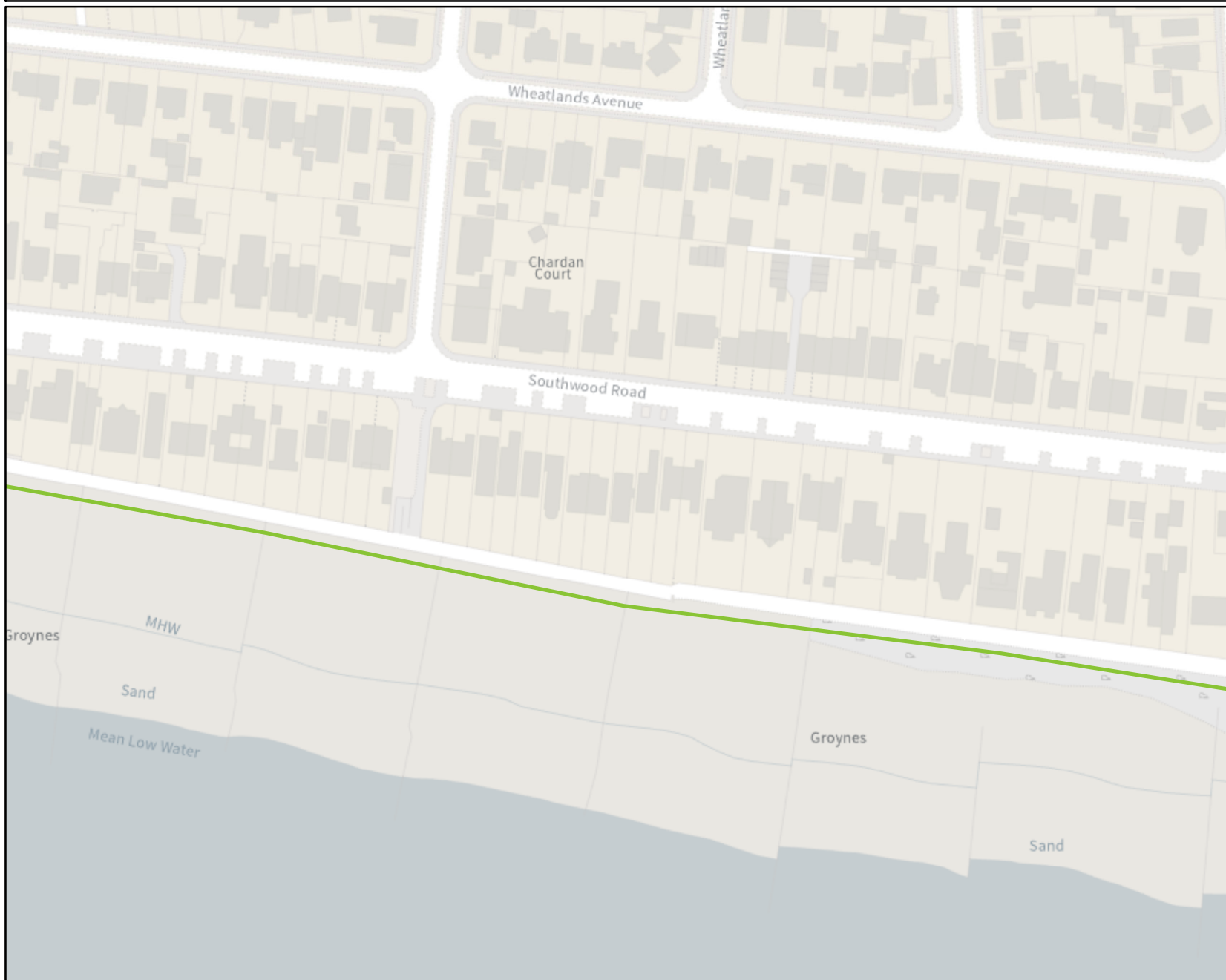
Flood Map Areas (assuming no defences)

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.

Defence Map Centred on Southwood Road, PO11 9QL - Created 24 August 2022



Legend

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*when printed at A4.



Metres

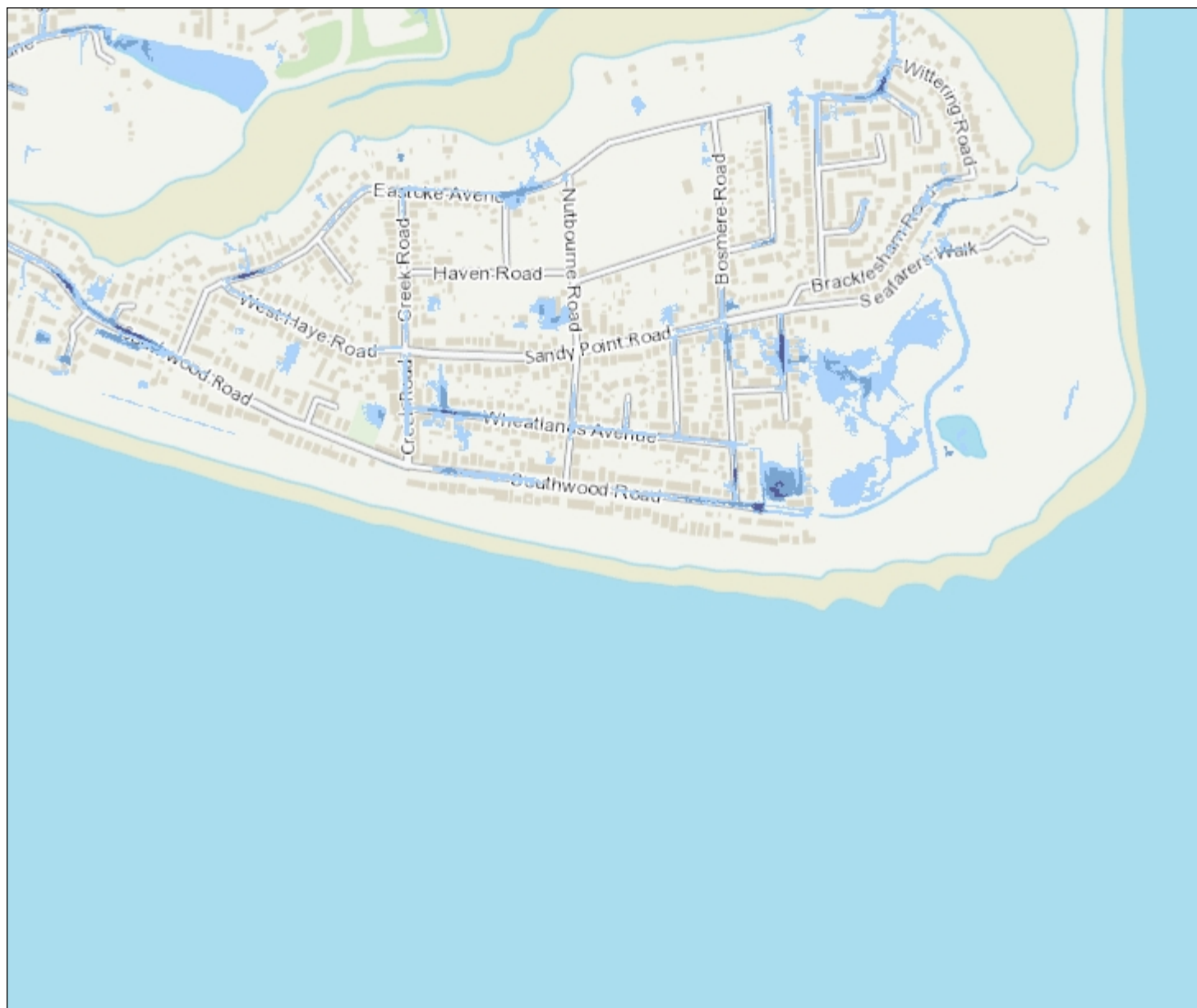


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Asset ID	Asset sub-type	Length	Maintainer	Current condition	Design Standard of Protection (Years)	Date of last inspection
470251	Embankment	1905.26	Unknown	No Data	No Data	28/03/2022

Risk of flooding from Surface Water - Centred on Southwood Road, Hayling Island - Created 24 August 2022



1: 10,000

0 Metres 250



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.

Levels Map Centred on Southwood Road, PO11 9QL - Created 24 August 2022



Legend

 Location_Point

Water Depth

Value

 High : 26.817
Low : 1.93721e-06

Ground Level

Value

 High : 12.384
Low : -2.66

1:800

*when printed at A4.


0 10 20
Metres



Water Depths & Levels for Southwood Road, PO11 9QL

Point	Water Surface Level (mAOD*)		Ground Level	Water Depth (metres)	
	0.5% Annual Probability/1 in 200 Year Present Day (Flood Zone 3)	0.1% Annual Probability/1 in 1000 Year Present Day (Flood Zone 2)		0.5% Annual Probability/1 in 200 Year Present Day (Flood Zone 3)	0.1% Annual Probability/1 in 1000 Year Present Day (Flood Zone 2)
1	No Data	3.49	3.47	No Data	0.02
2	No Data	3.59	3.58	No Data	0.01
3	4.53	4.55	4.51	0.02	0.04
4	4.65	4.66	4.65	0.001	0.005

* Levels in metres above Ordnance Datum Newlyn

CC Levels Map Centred on Southwood Road, PO11 9QL - Created 24 August 2022



Legend

 Location_Point

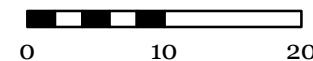
Water Depth

Value
 High : 27.5609
Low : 4.15804e-06



1:553

*when printed at A4.



Metres



Water Depths & Levels for Southwood Road, PO11 9QL

Point	Water Surface Level (mAOD*)				Ground Level	Water Depth (metres)			
	0.5% Annual Probability/ 1 in 200 Year (2065)	0.5% Annual Probability/ 1 in 200 Year (2115)	0.1% Annual Probability/ 1 in 1000 Year (2065)	0.1% Annual Probability/ 1 in 1000 Year (2115)		0.5% Annual Probability/ 1 in 200 Year (2065)	0.5% Annual Probability/ 1 in 200 Year (2115)	0.1% Annual Probability/ 1 in 1000 Year (2065)	0.1% Annual Probability/ 1 in 1000 Year (2115)
1	3.64	4.07	3.79	4.26	3.47	0.17	0.60	0.32	0.79
2	3.63	4.05	3.78	4.24	3.58	0.05	0.47	0.20	0.66
3	4.55	4.60	4.58	4.64	4.51	0.04	0.09	0.07	0.13
4	No Data	4.66	No Data	4.71	4.65	No Data	0.01	No Data	0.06

* Levels in metres above Ordnance Datum Newlyn

