



**78 SOUTHWOOD ROAD,  
HAYLING ISLAND**

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**FLOOD RISK ASSESSMENT**

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For

Mr N. Bending  
78 Southwood Road  
Hayling Island  
PO11 9QF

***May 2014***

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HAYLING ISLAND**

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## EXECUTIVE SUMMARY

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This Flood Risk Assessment was commissioned by Mr N. Bending, referred to hereafter as ‘the client’. The Flood Risk Assessment has been prepared to support a planning application for the replacement of an existing dwelling off Southwood Road.

The site is in an area identified as having a ‘very low’ to ‘low’ probability of flooding, the Environment Agency’s flood mapping data identifies that the site is located within Flood Zones 1 and 2. The NPPF requires that planning applications for development proposals located within or in close proximity to Flood Zone 2 be accompanied by a Flood Risk Assessment. The residential nature of the development proposals means the classification of the site is ‘more vulnerable’ from the NPPF Table 2 and this is considered an appropriate development type within Flood Zones 1 and 2.

The site is also identified in the Local Development Framework which states that the site is within the regeneration area, specifically Core Strategy 6.4 (Regeneration of the Borough with reference to South Hayling). The focus being on the seafront boardwalk; the diversity and quality of the properties fronting this area will be of some importance.

As the proposed development is within Flood Zones 1 and 2 and in close proximity to the coast it is proposed that a minimum Finished Floor Level (FFL) be set. The proposed minimum Finished Floor Level should be set at 5.800mAOD, 325mm above the existing FFL (5.475mAOD) and 390mm above the sea wall (5.410mAOD) along the southern boundary.

It is highly recommended that residents sign up to the EA’s Flood Warning Service. This will allow valuable advanced warning of any impending flood and will allow safe evacuation from Hayling Island to the mainland. Langstone Bridge via the A3023 is the primary means of access/egress from the island to Havant. No formal Evacuation Plan has been prepared as this is the only vehicular access to and from the island to Havant over Langstone Bridge with multiple routes between the dwelling and the Bridge. If evacuation is not possible then the property itself will allow safe refuge.

The Flood Risk Assessment has reviewed all sources of flood risk to both the proposed development and to the existing adjacent development as a result of the proposals, including; fluvial, tidal, pluvial, groundwater, sewers and flooding from artificial sources.

Consultation with Hampshire County Council highlighted that the site is located within an area susceptible to groundwater flooding however they have no record of flooding in the immediate vicinity of site. The council have also reviewed their Flood Maps for Surface Water (FMfSW) created using both the 1 in 30 and 1 in 200 year annual probability events, the FMfSW separate the level of flood risk into areas that could experience flooding in excess of 100mm and 300mm. Based on this mapping the council have concluded that the site is unlikely to be affected by surface water flooding for the 1 in 30 and 1 in 200 year annual probability of flooding.

Based on the ground conditions identified above, it can be considered that infiltration drainage is unlikely to provide a suitable means of surface water disposal for the flows generated by the proposed development. If infiltration is to be pursued as a possible method of surface water drainage then further investigation is advised, with soakaway testing to BRE365 in specific locations where infiltration may be feasible. It is proposed that the flows generated by the development continue to discharge to the public sewer network, mimicking the pre-development scenario.

This report has been prepared in consultation with the relevant interested parties and incorporates their comments where possible. The Flood Risk Assessment is considered to be commensurate with the development proposals and in summary, the development can be considered appropriate in accordance with the NPPF.

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## Specialist Software

- Flood Estimation Handbook FEH CD-ROM (v.3.0) – *Determination of Catchment Descriptors and depths of rainfall*
- MicroDrainage WinDES (v.12.6.1) – *Calculation of Greenfield run-off rates IH124/ICP-SUDS, Greenfield run-off volumes, rates of rainfall and stormwater storage estimates*

## Abbreviations & Acronyms

|      |                               |       |                                          |
|------|-------------------------------|-------|------------------------------------------|
| AEP  | Annual Exceedance Probability | LPA   | Local Planning Authority                 |
| BGL  | Below Ground Level            | mAOD  | Metres Above Ordnance Datum              |
| BGS  | British Geological Survey     | NGR   | National Grid Reference                  |
| CC   | Climate Change                | NPPF  | National Planning Policy Framework       |
| EA   | Environment Agency            | NSRI  | National Soil Resource Institute         |
| FEH  | Flood Estimation Handbook     | OS    | Ordnance Survey                          |
| FRA  | Flood Risk Assessment         | QSE   | Quick Storage Estimate                   |
| FZ   | Flood Zone                    | SFRA  | Strategic Flood Risk Assessment          |
| Ha   | Hectare                       | SuDS  | Sustainable Urban Drainage Systems       |
| HCC  | Hampshire County Council      | SW    | Southern Water                           |
| HBC  | Havant Borough Council        | TWL   | Top Water Level                          |
| IDB  | Internal Drainage Board       | UKCIP | United Kingdom Climate Impacts Programme |
| LLFA | Lead Local Flood Authority    |       |                                          |

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## 1.0 INTRODUCTION

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### 1.1 Planning Policy Context

- 1.1.1 All forms of flooding and their impact on the natural and built environment are material planning considerations. The National Planning Policy Framework (NPPF) sets out the Government's objectives for the planning system, and how planning should facilitate and promote sustainable patterns of development, avoiding flood risk and accommodating the impacts of climate change.
- 1.1.2 Government policy with respect to development in flood risk areas is contained within the NPPF and the supporting Technical Guidance.
- 1.1.3 The development is 'residential' in its nature and as such is classified as 'more vulnerable' in *Table 1: Flood Risk Vulnerability Classification* within the Technical Guidance to the National Planning Policy Framework, *Table 2: Flood Risk Vulnerability and Flood Zone 'Compatibility'* within the NPPF confirms that this type of land use is appropriate for Flood Zones 1 and 2.

### 1.2 Site Context

- 1.2.1 The Flood Risk Assessment has been prepared to support a planning application for the replacement of an existing dwelling off Southwood Road.

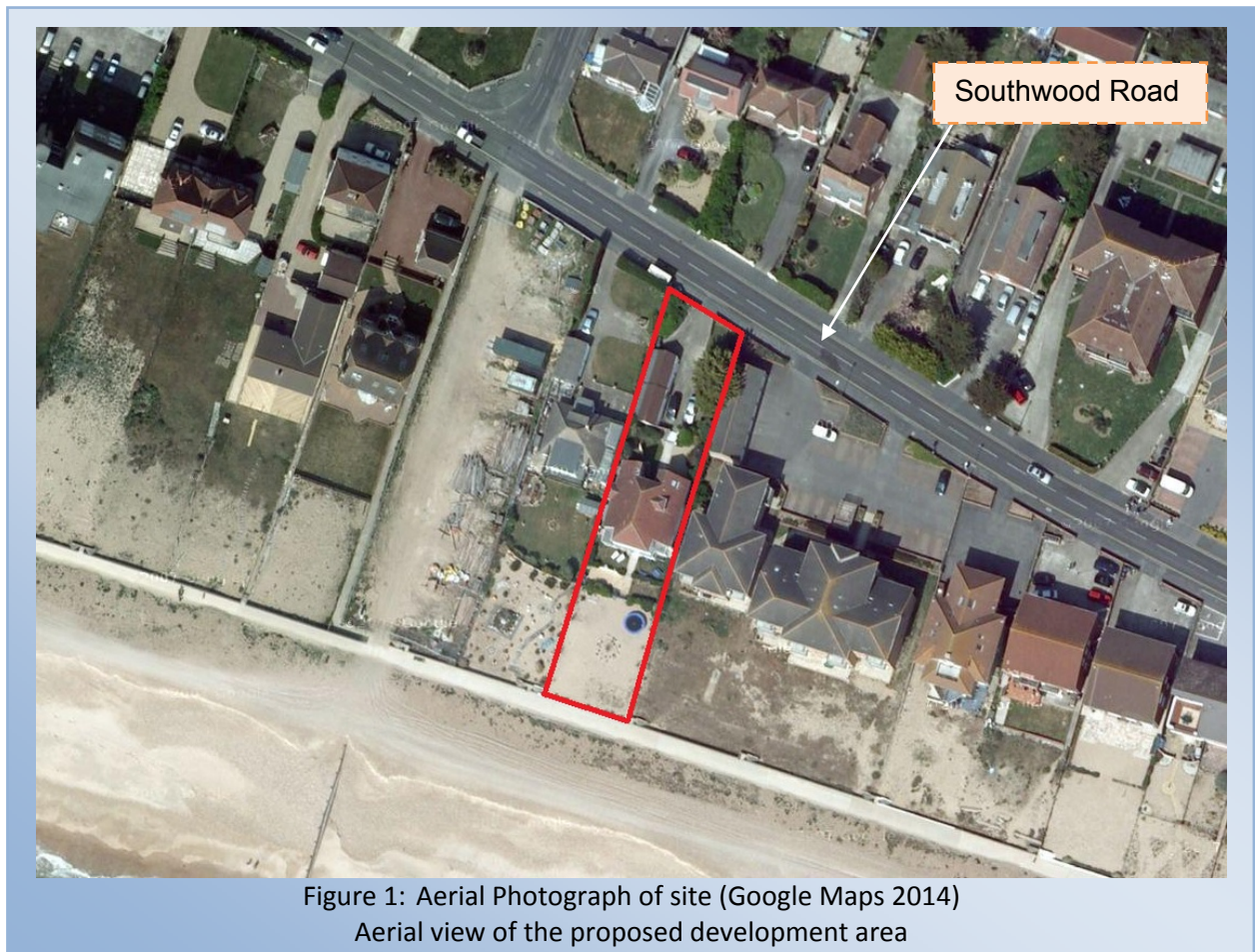
### 1.3 Consultation

- 1.3.1 The preparation of this report has been undertaken in consultation with the following interested parties; Hampshire County Council (HCC), Havant Borough Council, the Environment Agency (EA) and Southern Water (SW).
- 1.3.2 The Local Planning Authority (LPA), Havant Borough Council, will make the final decision with regard to any planning permission. Hampshire County Council acts as the Lead Local Flood Authority (LLFA). The NPPF advises that the LPA should consult with the Environment Agency who will provide advice and guidance on flood issues at a strategic level and in relation to planning applications.
- 1.3.3 The Environment Agency was contacted to discuss the nature and extent of information to be provided in this Flood Risk Assessment (FRA) and for any background knowledge of flood risk specific to the site (correspondence is included in Appendix D).
- 1.3.4 Southern Water Developer Services were contacted to discuss whether SW have any historical flooding issues in the area or any background knowledge on flood risk specific to the site (correspondence is included in Appendix G).
- 1.3.5 Hampshire County Council and Havant Borough Council were contacted to discuss the nature and extent of information to be provided in this Flood Risk Assessment (FRA) and for any background knowledge of flood risk specific to the site (correspondence is included in Appendix H).

## 2.0 EXISTING SITE SITUATION

### 2.1 Location

- 2.1.1 The development is accessed off Southwood Road, Hayling Island. The Ordnance Survey National Grid Reference (OS NGR) for the site is 473779 (Easting), 98204 (Northing) and the nearest postcode is PO11 9QF. The site location plan is shown in Appendix A.
- 2.1.2 The site is bounded; to the north by Southwood Road with residential housing beyond, to the east by residential dwellings off Southwood Road, to the south by the promenade, to the west by further residential dwellings and council depot off Southwood Road.
- 2.1.3 The total site area is approximately 1063m<sup>2</sup>, the site is considered to be 46% impermeable (determined from the topographic survey and aerial photographs) for the purposes of determining the pre-development surface water run-off.

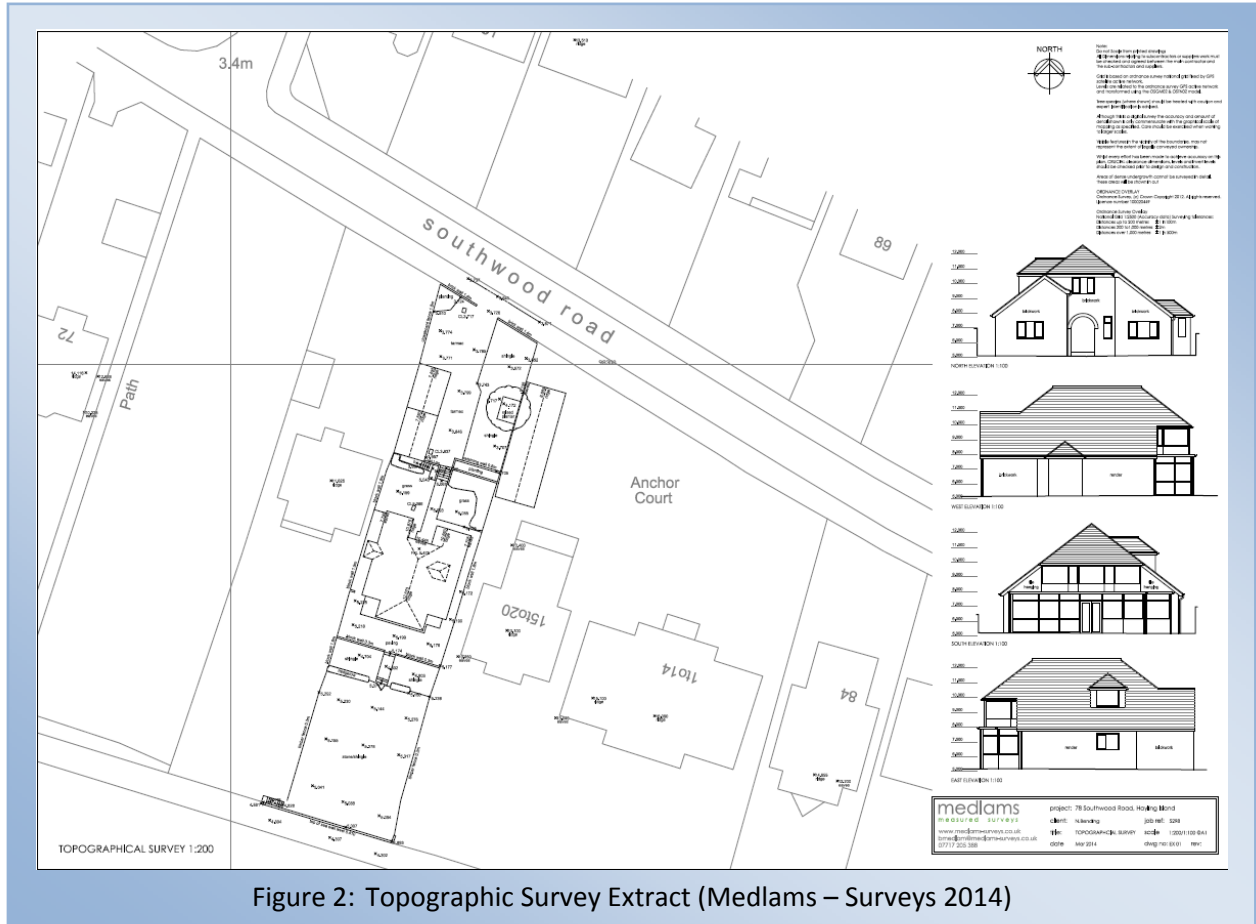


### 2.2 Existing and Historical Land Use

- 2.2.1 At present the site consists of an existing residential detached property fronting Southwood Road with garden to the rear. No former historical land use of the site has been identified.

## 2.3 Topography

- 2.3.1 The site entrance is at a similar level to Southwood Road (3.737mAOD), the levels along the drive up to the property range from 3.726mAOD in the north to 3.837mAOD in the south, the site then steps up to 5.093mAOD and is generally level from the front of the existing property (5.119mAOD) to the southern boundary (5.088mAOD).



## 3.0 DEVELOPMENT PROPOSALS

### 3.1 Nature of the development

- 3.1.1 The Flood Risk Assessment has been prepared to support a planning application for the replacement of an existing dwelling.
- 3.1.2 The pertinent planning drawings are included in Appendix B; an extract of the development proposal is shown in figure 2 (below).
- 3.1.3 The total site area is approximately 1063m<sup>2</sup>, the site is considered to be 46% impermeable; proposed impermeable area of the development will decrease slightly too approximately 463m<sup>2</sup> (44%) of the total site area.

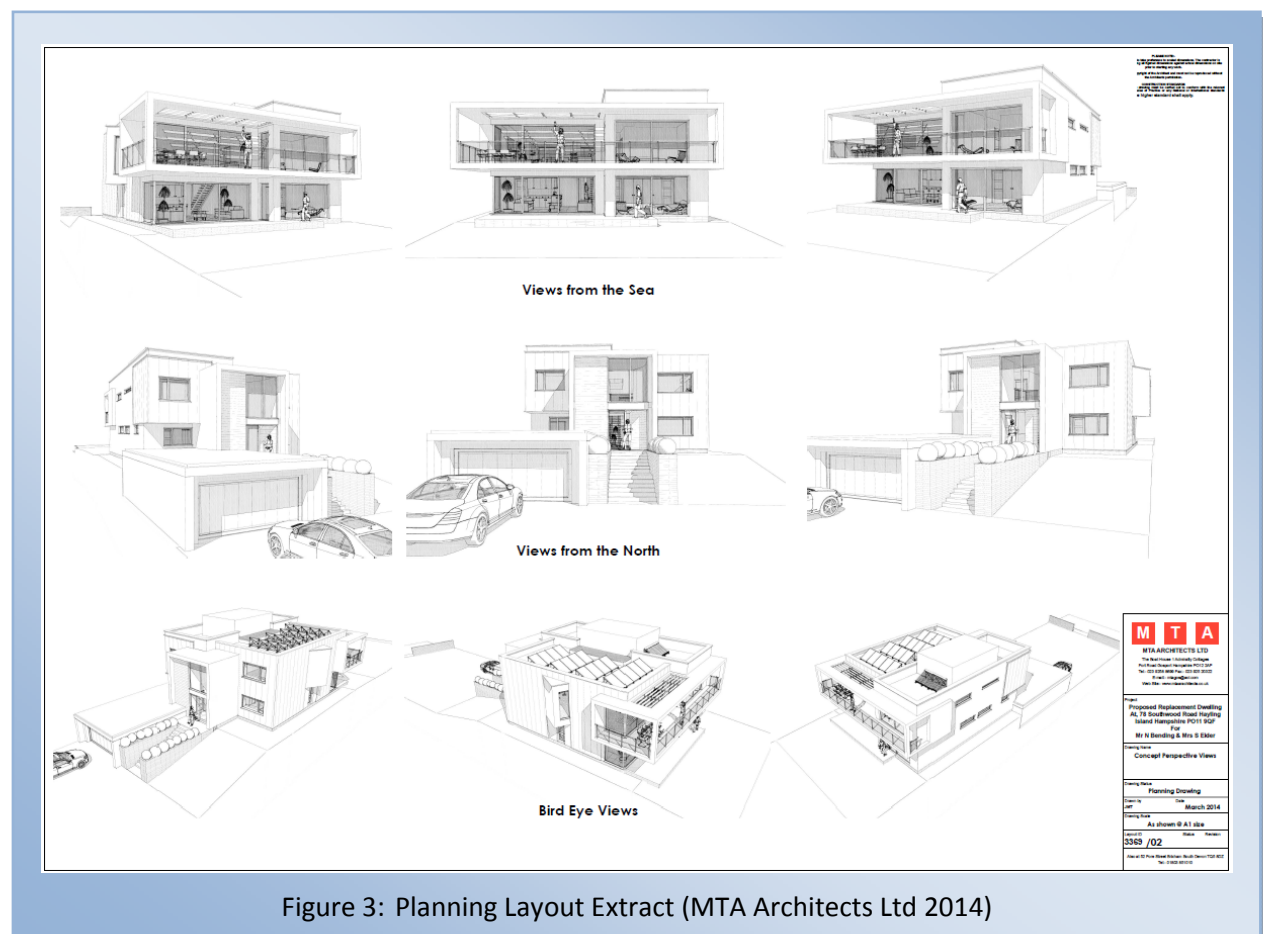
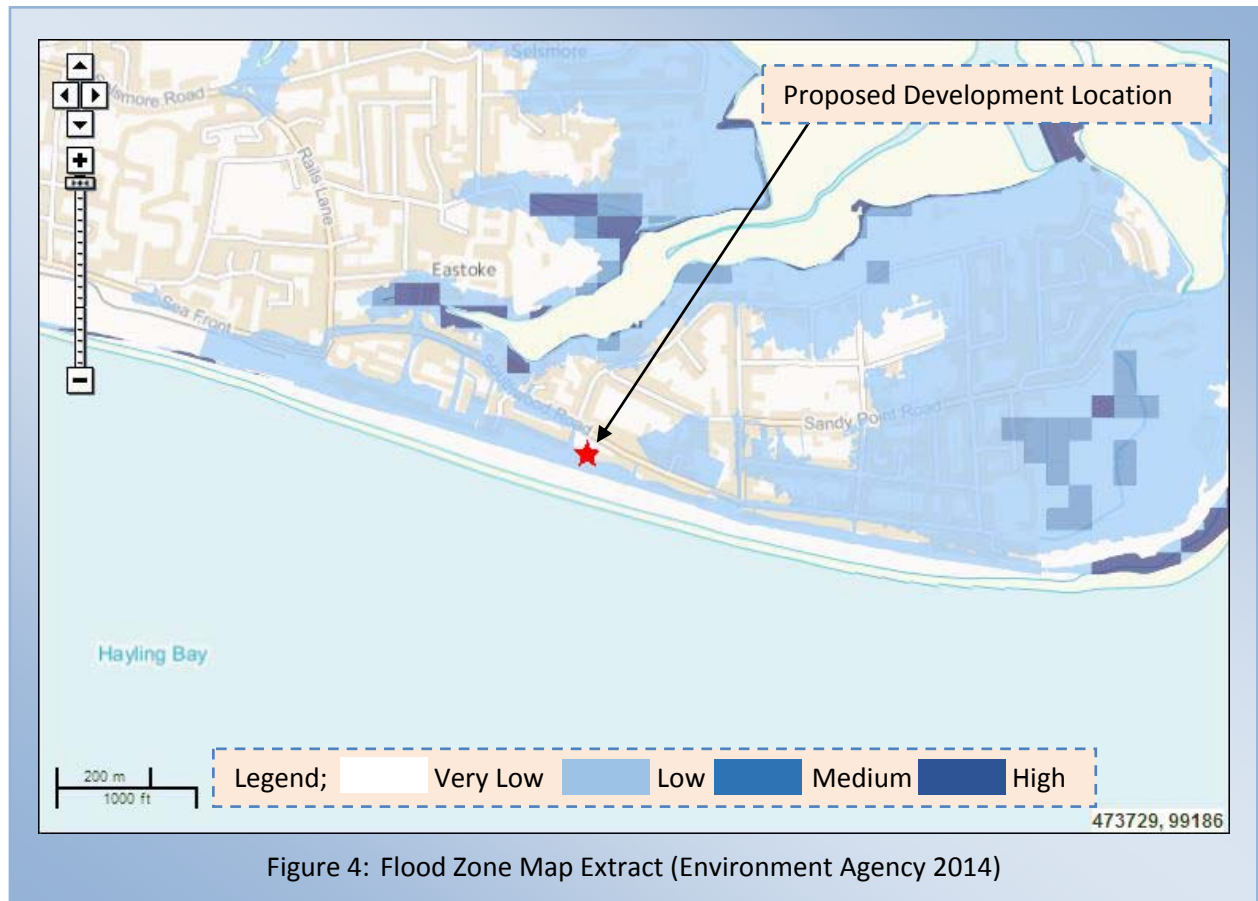


Figure 3: Planning Layout Extract (MTA Architects Ltd 2014)

## 4.0 SOURCES OF FLOOD RISK

### 4.1 Fluvial & Tidal Flood Risk

- 4.1.1 Information relating to the flood risk at the site has been obtained from the Environment Agency's (EA) website and online Flood Map, an extract of which is shown in Figure 4 (below).

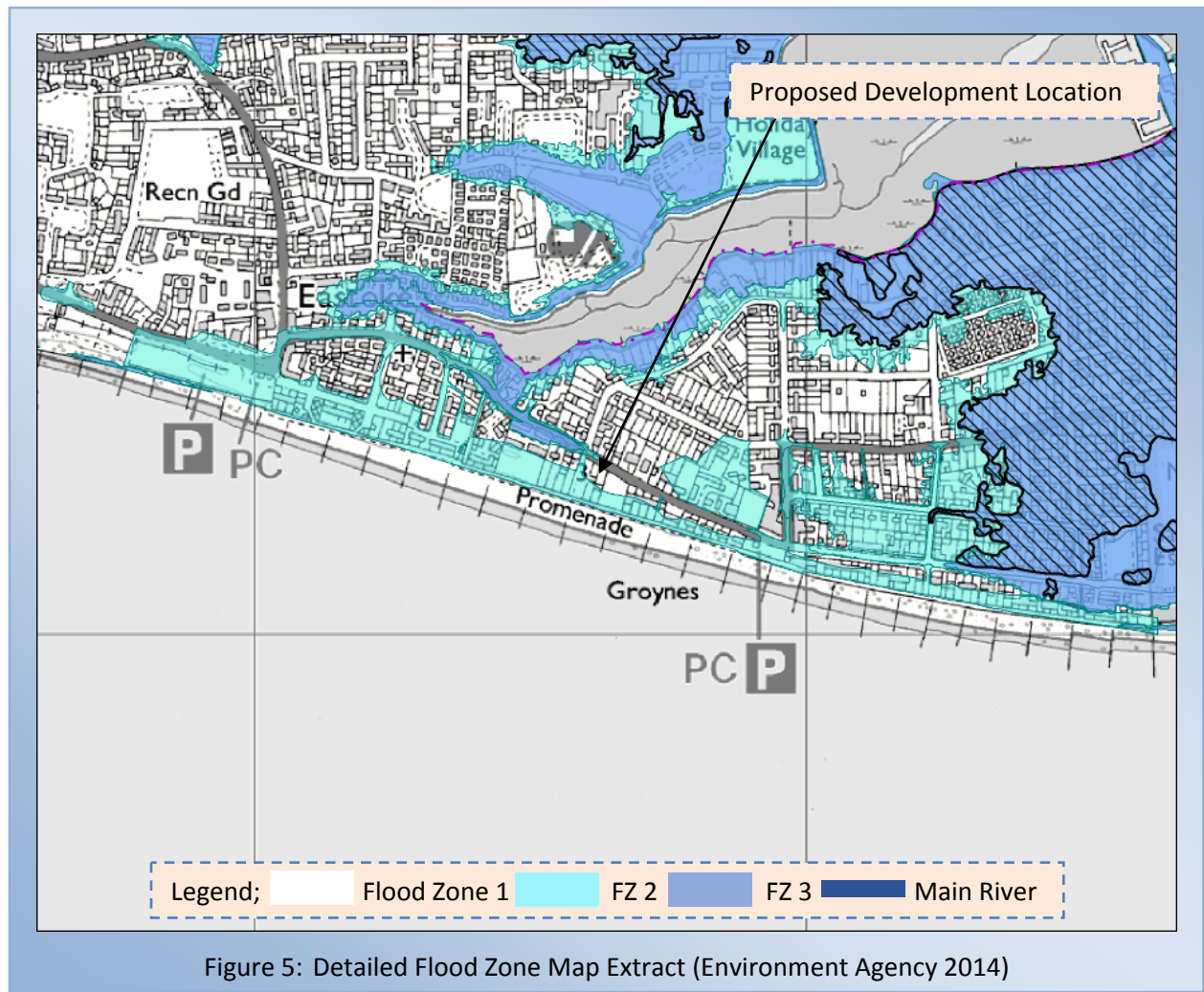


#### ***Fluvial Flooding***

- 4.1.2 The development is considered to be at 'very low' risk of flooding from fluvial sources as there are no watercourses in close proximity to site.

#### ***Tidal Flooding***

- 4.1.3 Examination of the EA's Online Flood Map shows that the site is considered to be at 'very low' to 'low' risk of tidal flooding.
- 4.1.4 The Environment Agency have been able to provide a more detailed Flood Zone plan (Figure 5 subsequent page, also included in Appendix D) which shows the site is located within Flood Zones 1 and 2. The EA have also provided tidal water levels data during the 0.5%AEP (1 in 200yr) event and the 0.1%AEP (1 in 1000yr) event (Table 1 subsequent page).



4.1.5 Figure 5 (above) indicates that the site is located in Flood Zones 1 and 2 with the existing building located within Flood Zone 2 (an area which may have a 0.1% chance of flooding annually (1 in 1000)), ignoring the presence and effect of any defences.

4.1.6 The Environment Agency were able to provide tidal water levels data for the 200yr and 1000yr storm events, included in Table 1 (below).

| Year | Tide Level (mAOD*)                                               |                                                                   |
|------|------------------------------------------------------------------|-------------------------------------------------------------------|
|      | 0.5% annual exceedance probability /1 in 200 Year (Flood Zone 3) | 0.1% annual exceedance probability /1 in 1000 Year (Flood Zone 2) |
|      | Uncertainty: +/- 0.3m                                            | Uncertainty: +/- 0.6m                                             |
| 2010 | 3.3                                                              | 3.5                                                               |
| 2070 | 3.8                                                              | 4.0                                                               |
| 2115 | 4.4                                                              | 4.6                                                               |

\*Levels in metres above Ordinance Datum Newlyn

(Based on Data from 2008 base data and projected for climate change)

Table 1: Flood Levels Extract (Environment Agency 2014)

- 4.1.7 The development area is protected by sea wall adjacent to the southern boundary. Details of the defences are highlighted in SFRA map extracts included in Appendix J.
- 4.1.8 The PUSH SFRA Map Set indicates that the development is located within an area which benefits from flood defences (see Figure 6 below). One of these defences is located along the southern boundary in the form of a sea wall with a crest level of 5.410mAOD (taken from the Topographic survey).



Figure 6: SFRA Defences Map Extract

### ***Overtopping***

- 4.1.9 Based on the Sea Wall crest level of 5.410mAOD and a top water level of 4.4mAOD (with a +/- 0.3m uncertainty range) during the 1 in 200yr 2115 event, no overtopping is likely to occur.
- 4.1.10 The peak flood level expected during the 1 in 1000yr 2115 event (4.6mAOD with a +/- 0.6m uncertainty range) is also unlikely to overtop the sea wall.

### ***Breach***

- 4.1.11 The site entrance is at a similar level to Southwood Road (3.737mAOD), the level along the drive up to the property is approximately 3.837mAOD, the site then steps up to 5.093mAOD and is generally level from the front of the existing property (5.119mAOD) to the southern boundary (5.088mAOD).
- 4.1.12 The potential peak flood level on site during the 0.5%AEP (1 in 200 year - 2115) event is approximately 863mm on the drive/site entrance, no flooding is expected to the rear of the property.
- 4.1.13 The potential peak flood levels on site during the 0.1%AEP (1 in 1000 year - 2115) event are approximately 1.363m on the drive/site entrance and approximately 112mm to the rear of the property.

- 4.1.14 The primary mitigation measure is the setting of a minimum Finished Floor Level of the proposed dwelling to a minimum level of 5.800m AOD; this is 325mm above the existing FFL (5.475m AOD) and 390mm above the sea wall (5.410m AOD) along the southern boundary.

#### ***Strategic Flood Risk Assessment (SFRA)***

- 4.1.15 Havant Borough Councils have produced a PUSH SFRA Map Set which indicates the impact of various flood events, hazards and details of structures and investment. (Relevant mapping is included in Appendix J)
- 4.1.16 Figure 7 (below) shows the Danger from Breaching Map during the 1 in 1000yr event (defended), this map shows that the site is considered to be at very low risk of a breach in defences.

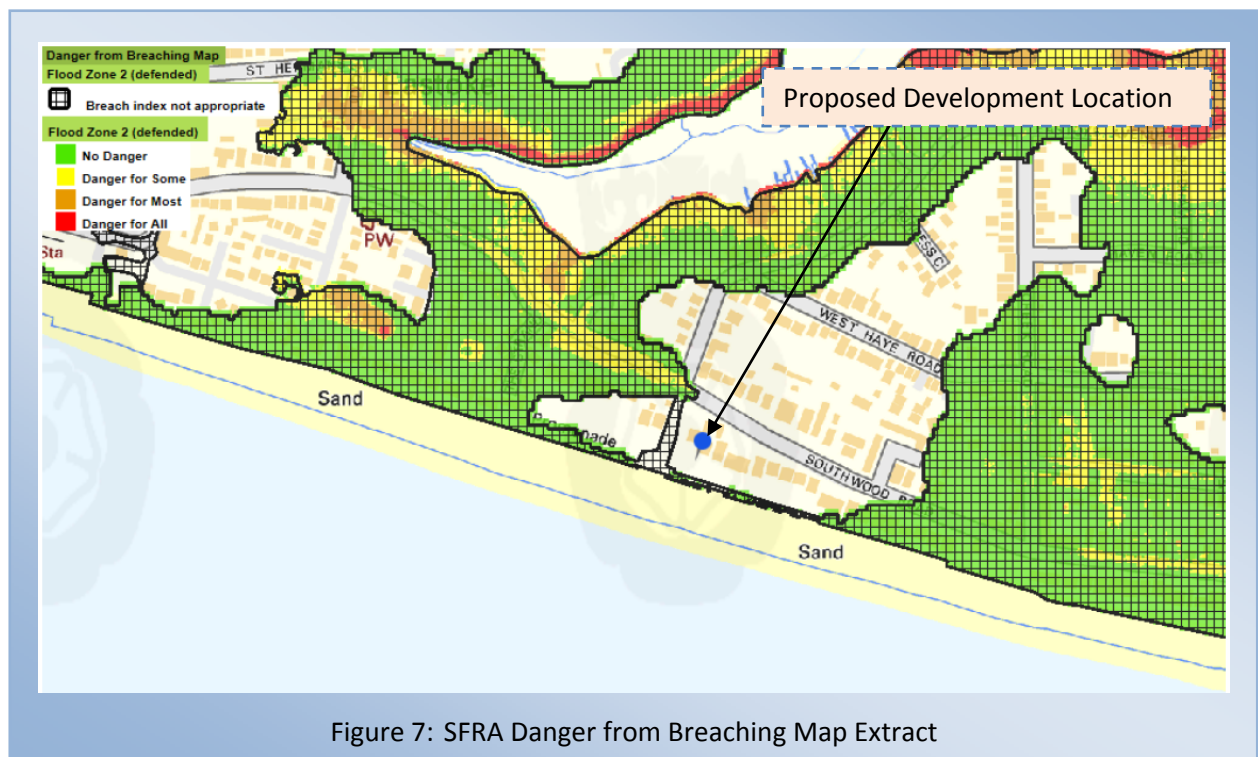


Figure 7: SFRA Danger from Breaching Map Extract

- 4.1.17 The site is not shown to be within Tidal Flood Zones 2 or 3 when Climate Change is applied to year 2025 and 2055.
- 4.1.18 Tidal FZ2 does encroach on to the northern half of site (the drive and site entrance) and isolates the development during times of flooding, when Climate Change is applied for the year 2085 and 2115.
- 4.1.19 The Wave Energy Maps show that the moderate Wave Energy Frontage is located along the southern boundary and that the site is beyond the low Wave Energy Frontage, however historic wave overtopping from events in 1989 are shown to have impacted on the proposed development area.
- 4.1.20 There are two defences protecting site, one to the southern boundary and one some 235m to the north. Both of these existing defences are considered to have a crest/tide protection in excess of the 1000 year event (present day).

- 4.1.21 Mapping indicating investment to provide 200 year event crest/tide protection for the present day flood events shows that there is to be no investment to the defences along the southern boundary and to the defences to the north. The crest/tide level of the southern boundary defence is considered to offer in excess of the 1000 year event protection for the present day flood events.

The potential investment to provide crest/tide 200 year event protection for 2115 climate change event is considered to be 'none' for the defence along the southern boundary and 'low' for the defence to the north. The crest/tide level of the southern boundary defence is considered to offer in excess of the 1000 year event protection in 2115, however the defences to the north are considered to offer less 20 year event protection in 2115.

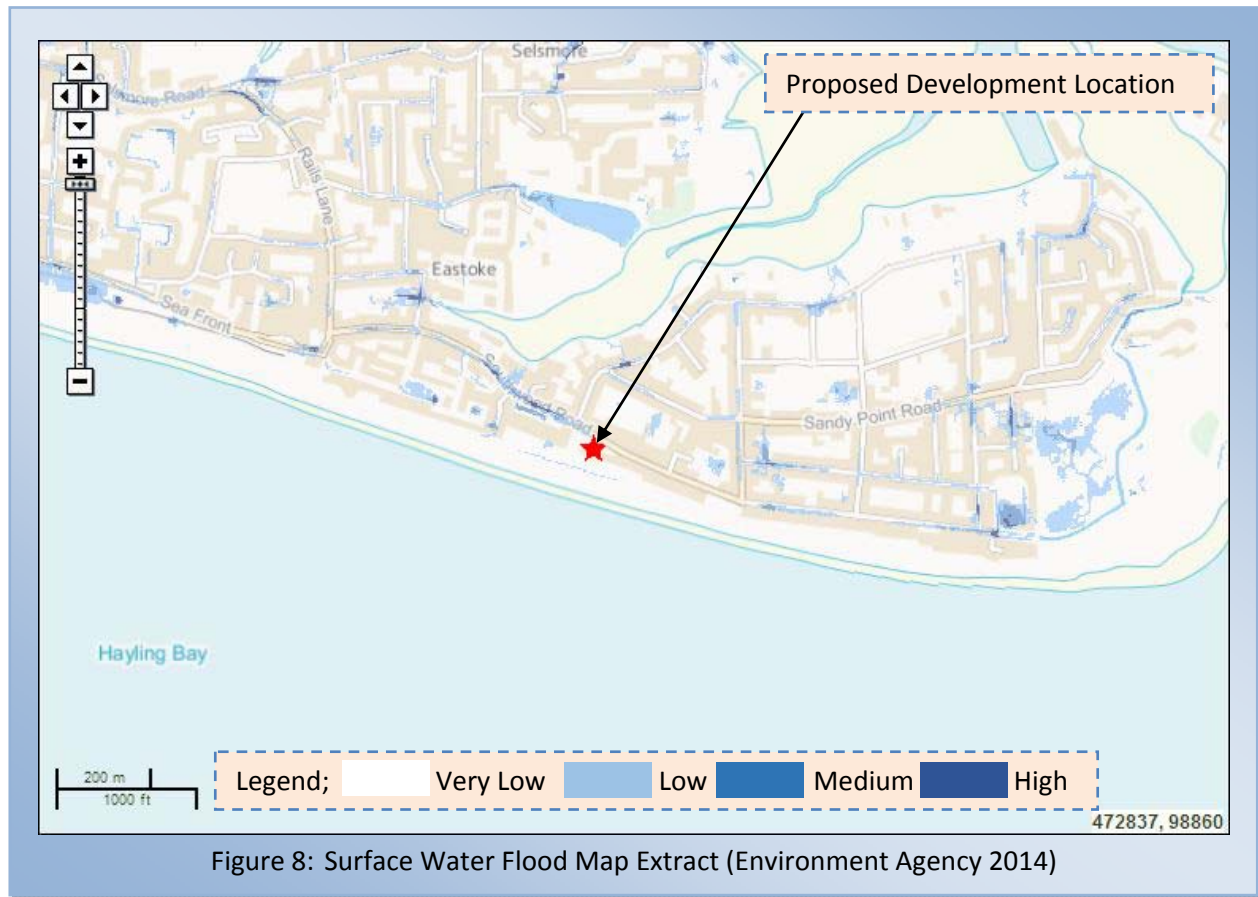
- 4.1.22 Although the site lies partially within Flood Zone 2 and may be adversely affected by climate change, the presence of the existing sea defences reduce this risk, especially when there is the potential for investment to improve defences in the area. It must be acknowledged that some residual risk exists from a breach or overtopping of the defences it is considered that the measures discussed within this report would adequately mitigate this risk.
- 4.1.23 There are a large number of existing residential dwellings on Hayling Island that fall fully within Flood Zone 2 and also a significant number in Flood Zone 3 and therefore it is likely that defences in the area will be maintained to a high standard.

#### ***Flood Zone Classification***

- 4.1.24 Examination of the Flood Map shows that the site is located within Flood Zones 1 and 2, and is summarised to be at 'very low' to 'low' risk (refer to Appendix F for details); Appendix D shows the online flood map and statement in full.
- 4.1.25 The development is 'residential' in its nature and as such is classified as 'more vulnerable' in *Table 1: Flood Risk Vulnerability Classification* within the Technical Guidance to the National Planning Policy Framework, *Table 2: Flood Risk Vulnerability and Flood Zone 'Compatibility'* within the NPPF confirms that this type of land use is appropriate for Flood Zones 1 and 2.

## **4.2 Surface Water Flood Risk**

- 4.2.1 Surface Water flooding occurs when rainwater is unable to drain away through the normal drainage systems or soak into the ground, but lies on or flows over the ground instead. The blue shading on Figure 8 (subsequent page) shows the varying risk of flooding from surface water.
- 4.2.2 The proposed development area is within an area considered to be at 'Very Low' flood risk from surface water. The PUSH SFRA maps also indicate that the dwelling is not within an area considered to be susceptible to surface water flooding.



### ***Sewers***

- 4.2.2 In urban areas, rainwater is frequently drained into surface water sewers or sewers containing both surface and waste water known as 'combined sewers'. Foul water flooding often occurs in areas prone to overland flow and can result when the sewer is overwhelmed by heavy rainfall and will continue until the water drains away. It can also occur when the sewer becomes blocked or is of inadequate capacity, this could lead to there being a high risk of internal property flooding with contaminated water.
- 4.2.3 Consultation with various parties has not identified any existing sewer flood risk issues or historical flooding of the immediate site area.

### ***Overland Run-off (Pluvial)***

- 4.2.4 Intense rainfall that is unable to soak into the ground or enter drainage systems can run-off land and result in flooding. Local topography and the land use can have a strong influence on the direction and depth of flow. Large catchment areas are particularly prone to this type of flooding. The volume and rate of overland flow from land can be exacerbated if development increases the percentage of impermeable area.
- 4.2.5 The topography of the development and surrounding area means there is little likelihood of significant flows impacting on the proposed development or on land and property adjacent to the development. The only flows that are likely to be present on site are from direct rainfall on areas of hard standing; however the PUSH SFRA Map indicates that the dwelling is potentially at 'very high' risk of overland flow. This will to an extent be mitigated by elevating the property relative to the surrounding area, with levels also falling away from the proposed dwelling.

- 4.2.6 Any overland flows generated by the proposed development must be carefully controlled; safe avenues of overland flow away from the existing and proposed dwellings are advised.

### **4.3 Groundwater Flood Risk**

- 4.3.1 In general terms groundwater flooding can occur from three main sources: - raised water tables, seepage and percolation and groundwater recovery or rebound.
- 4.3.2 If groundwater levels are naturally close to the surface then this can present a flood risk during times of intense rainfall. The PUSH SFRA map shows the dwelling to be located in an area where groundwater vulnerability is indicated to be 'minor' and no historical groundwater flooding is indicated.
- 4.3.3 Seepage and percolation occur where embankments above ground level hold water. In these cases water travels through the embankment material and emerges on the opposite side of the embankment. At present there are no reported problems with groundwater flooding.
- 4.3.4 Groundwater recovery / rebound occurs where the water table has been artificially depressed by abstraction. When the abstraction stops the water table makes a recovery to its original level. There is the potential for groundwater flooding in low lying areas where groundwater levels have been depressed below their pre-pumping conditions, where these were at or close to ground level. As with the seepage scenario the likelihood of flooding from this source is low.

### **4.4 Artificial Sources of Flood Risk**

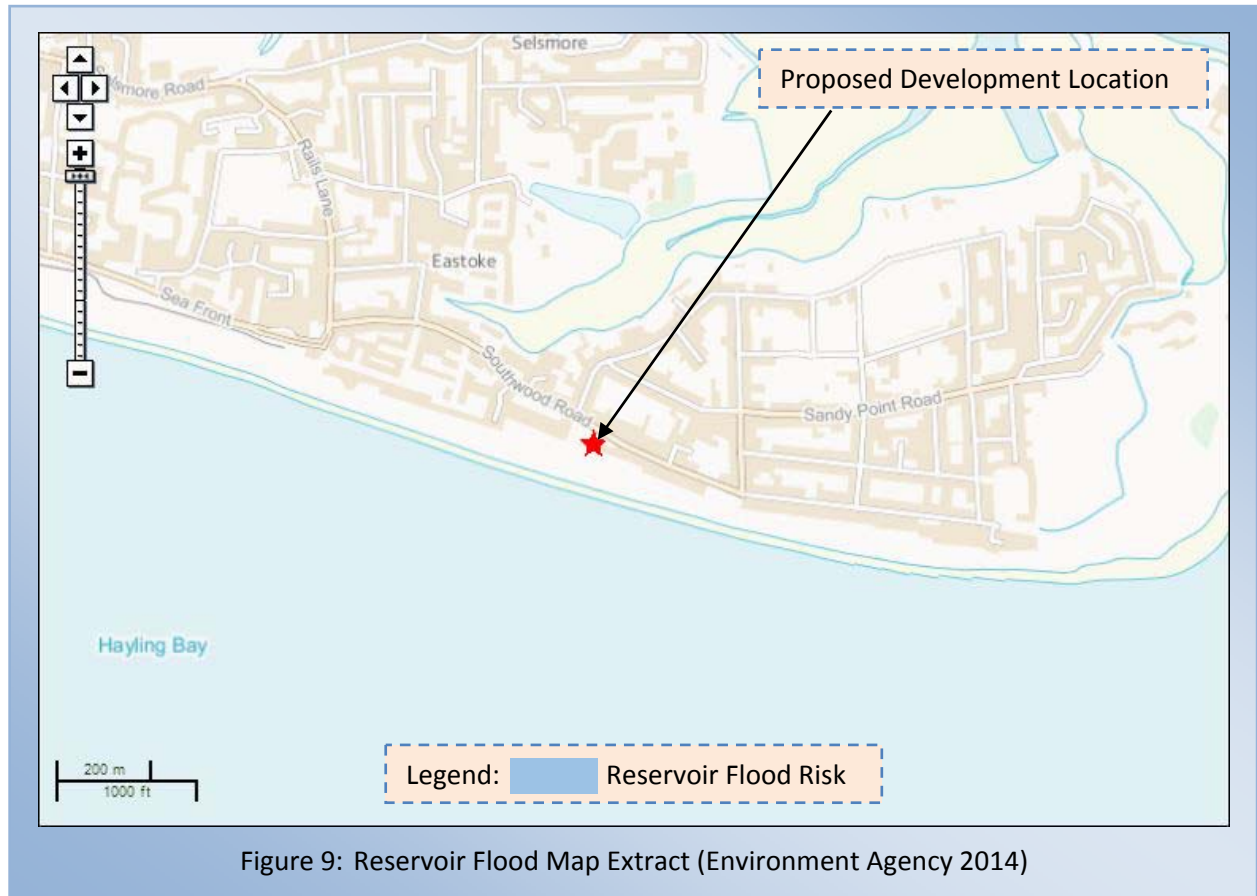
- 4.4.1 Figure 8 (subsequent page) shows an extract of the EA's online Reservoir flood map; Appendix D shows the EA's reservoir flood map in full.

#### ***Reservoirs***

- 4.4.2 Due to the site location and elevation relative to any reservoirs the risk of flooding from this source is considered low; as indicated in Figure 9 (subsequent page).
- 4.4.3 It should be noted that the risk of catastrophic failure of any reservoir is considered to be very low, as reservoirs are such major assets; it is understood that there are appropriate maintenance regimes and regular reviews undertaken confirming integrity of the embankments.

#### ***Canals***

- 4.4.4 There are no canals within the immediate vicinity of the proposed development, as such the risk from this source is considered to be 'very low'.



## 4.5 Historical Flooding

- 4.5.1 An Internet based search for flooding events did not recall any historical flooding in the immediate site area.
- 4.5.2 Consultation with Hampshire County Council highlighted that the site is located within an area susceptible to groundwater flooding however they have no record of flooding in the immediate vicinity of site. The council have also reviewed there Flood Maps for Surface Water (FMfSW) created using both the 1 in 30 and 1 in 200 year annual probability events, the FMfSW separate the level of flood risk into areas that could experience flooding in excess of 100mm and 300mm. Based on this mapping the council have concluded that the site is unlikely to be affected by surface water flooding for the 1 in 30 and 1 in 200 year annual probability of flooding.
- 4.5.3 The Environment Agency have provided a Flood Incident Report (included in Appendix D) produced by Havant Borough Council following events in November 2005. Flooding occurred as a result of high tides and large Atlantic swells overtopping the most vulnerable defences on the southern frontage of the Eastoke Peninsula. This resulted in several temporary road closures (approximately 4 hours) due to ponding of flood water which was unable to drain via surface water drainage system until the tide levels in Chichester Harbour lowered sufficiently. It is understood that during this event only a small number of residential properties experienced internal flooding.
- 4.5.4 The frequency of flood incidents and scale of damage has been significantly reduced since the implementation of a Beach Replenishment/Nourishment Scheme and the Council has been committed to exercising its permissive powers under the Coast Protection Act to manage this

risk further details are included within Appendix D. However, it should be remembered that there will always be a risk to people residing in such locations.

- 4.5.3 Review of the Strategic Flood Risk Assessment (SFRA) PUSH mapping highlighted events in 1989 which resulted in flooding of the rear garden. Recent storm events in late 2013 resulted in similar flooding of the rear garden but no flood waters encroached into the existing dwelling; some mapping information has been included within Appendix I indicating this.

## **4.6 Flood Risk Mitigation Measures & Residual Risks**

- 4.6.1 As the development is located in flood zones 1 and 2, and in close proximity to the coast it is proposed that a minimum Finished Floor Level be set.

### ***Mitigation Measures***

- 4.6.2 It is proposed that a minimum Finished Floor Level (FFL) should be set as the site is located within Flood Zones 1 and 2, and in close proximity to the coast. Therefore it is proposed that a minimum Finished Floor Level should be set at 5.800mAOD, 325mm above the existing FFL (5.475mAOD) and 390mm above the sea wall (5.410mAOD) along the southern boundary.
- 4.6.3 As the proposed development is 2 storeys the 1<sup>st</sup> floor can provide a place of safe refuge in the event of an extreme flood event.
- 4.6.4 Defending ground floor openings can be achieved by using temporary barriers, non-return valves and wet-proofing. Temporary barriers consist of moveable flood defences which can be fitted into doorways and/or windows. The permanent fixings required to install the temporary defence should be discrete and keep architectural impact to a minimum. Any other opening such as air bricks and vents can either be fitted with temporary covers or non-return valves.
- 4.6.5 Wet-proofing of the interior design reduces the damage caused by flooding and ideal should include; electrical circuitry installed at higher level with power cable being carried down from the ceiling rather than up from the floor. In addition using water-resistant materials for floors, walls and fixtures will minimise damage should any internal flooding occur.
- 4.6.6 Non-return flap valves on the private drainage system to prevent internal flooding should also be installed; these should be regularly maintained to avoid blockage.
- 4.6.7 As with any development it is also advised that external levels fall away from property to minimise the flood risk from a variety of sources.
- 4.6.8 Overland flows generated by the proposed development must be carefully controlled; safe avenues of overland flow away from any existing and proposed buildings are advised.
- 4.6.9 To minimise the flood risk to the proposed dwellings and neighboring property it is proposed that surface water run-off generated by the proposed development be managed effectively and ideally with the peak rates of run-off being restricted to the equivalent of the pre-development situation.
- 4.6.10 It is highly recommended that the EA's Flood Warning Service is signed up to. This will allow valuable advanced warning of any impending flood and will allow safe evacuation from Hayling Island to the mainland. Langstone Bridge via the A3023 is the primary means of access/egress from the island to Havant. No formal Evacuation Plan has been prepared as there is only the

singular vehicular access to and from the island to Havant over Langstone Bridge with multiple routes between the dwelling and the Bridge. If evacuation is not possible then the property itself will allow safe refuge.

#### ***Residual Risks***

- 4.6.11 The development and its drainage systems should be designed to cope with intense storm events up to and including the 100 year return period rainfall event with an allowance for Climate Change (CC). If an extreme rainfall event exceeds the design criteria for the drainage system it is likely that there will be some overland flows that are unable to enter the system, it is important that these potential overland flows are catered for within the proposed planning layout in the event that the capacity of the drainage system is exceeded.
- 4.6.12 Any overland flows generated by the proposed development must be carefully controlled; safe avenues of overland flow away from the existing and proposed dwelling are advised.
- 4.6.13 As with any drainage system blockages within either the foul or surface water system have the potential to cause flooding or disruption. It is important that should any drainage systems not be offered for adoption to either the Water Company or the Local Authority then an appropriate maintenance regime be scheduled with an appropriate management company for these private drainage systems.

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## 5.0 SURFACE WATER MANAGEMENT

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### 5.1 Pre-development Surface Water Run-off

- 5.1.1 For the purposes of determining the existing rate of surface water run-off the site is considered to be Brownfield; the total area of the site is 1063m<sup>2</sup> (metres squared).
- 5.1.2 The surface water run-off rates have been calculated using the Modified Rational Method and rainfall catchment characteristics from the Flood Estimation Handbook (FEH), details of which are included Appendix H.
- 5.1.3 The existing impermeable area of site generates a peak run-off rate of 1.9l/s based on an area of 487m<sup>2</sup>.
- 5.1.4 The approximate surface water run-off volume generated by the total site area based on the 1 in 100 year return period storm event is 46.8m<sup>3</sup>; estimated using the FEH rainfall catchment characteristics (6hr duration event).

### 5.2 Post-development Surface Water Run-off

- 5.2.1 The residential nature of the development proposals and sustainable approach being adopted means that there will be a reduction in the impermeable area of the site, resulting in a reduction in both the volume and the peak rate of surface water run-off if flows are unrestricted.
- 5.2.2 The proposed impermeable area will be approximately 463m<sup>2</sup>, approximately 44% of the total development area.
- 5.2.3 The approximate surface water run-off volume generated by the whole site area based on the 1 in 100 year return period storm event with a 30% allowance for climate change is 40.1m<sup>3</sup>; estimated using the FEH rainfall catchment characteristics (6hr duration event).

### 5.3 Sustainable Drainage Systems (SuDS)

- 5.3.1 In accordance with the NPPF, Sustainable Drainage Systems (SuDS) should be specified wherever possible to manage surface water. This in turn reduces the burden downstream on both watercourses and sewerage systems.
- 5.3.2 SuDS have the ability to address three core objectives; water quantity, water quality and amenity value. With the appropriate system specified, all three core objectives can be satisfied. Where possible, peak surface water discharge rates to watercourses and sewers should be reduced.
- 5.3.3 Preference should always be given to SuDS over the traditional methods of buried sewers wherever possible and practical. Runoff from car parking areas and roads could be conveyed through swales, permeable pavements, bio-retention areas and petrol interceptors to provide a degree of treatment before flows are carried to public sewers.

- 5.3.4 Opportunities should be taken to provide soft landscaping where at all possible on site to assist in minimising surface water run-off. Added benefits include biodiversity and visual enhancements.
- 5.3.5 The inclusion of SUDs (i.e. water harvesting, permeable paving) in the design of the site would ensure that the development would not increase the risk of flooding elsewhere.

## 5.4 Methods of Surface Water Management

- 5.4.1 At present the site is Brownfield; the total site area is 1063m<sup>2</sup> and is considered to be 46% impermeable.
- 5.4.2 The proposed impermeable area of the development is approximately 44% of the total site area.
- 5.4.3 There are three methods that have been reviewed for the management and discharge of surface water detailed below; these may be applied individually or collectively to form a complete strategy. They should be applied in the order of priority listed below.
- Discharge via infiltration
  - Discharge to watercourse
  - Discharge to sewerage system

## 5.5 Discharge via Infiltration

- 5.5.1 Any impermeable areas that can drain to soakaway or an alternative method of infiltration would significantly improve the sustainability of any surface water systems.
- 5.5.2 The British Geology Survey (BGS) mapping data indicates that ground conditions are as follows: -

**1:50 000 scale bedrock geology description:** *Wittering Formation - Sand, Silt and Clay. Sedimentary Bedrock formed approximately 40 to 56 million years ago in the Palaeogene Period. Local environment previously dominated by shallow seas.*

**Setting:** *shallow seas. These rocks were formed in shallow seas with mainly siliciclastic sediments (comprising of fragments or clasts of silicate minerals) deposited as mud, silt, sand and gravel.*

**1:50 000 scale superficial deposits description:** *Storm Beach Deposits - Gravel. Superficial Deposits formed up to 3 million years ago in the Quaternary Period. Local environment previously dominated by shorelines.*

**Setting:** *shorelines. These rocks were formed in shoreline environments with sediments deposited in beaches and barrier islands.*

- 5.2.3 The National Soil Resources Institute (NSRI) indicates that the site is located in a classification of, 'wet, acid meadows and woodland'. Drainage is considered to be impeded.
- 5.2.4 Based upon the infiltration constraints above it is unlikely that infiltration drainage will be a suitable method of surface water discharge for the proposed development. If infiltration is to be pursued as a possible method of surface water drainage then further investigation is advised, with soakaway testing to BRE365 in specific locations where infiltration may be feasible.

## **5.6 Discharge to Watercourse**

- 5.6.1 There is no watercourse in close proximity to the development that would provide a suitable outfall for the surface water flows generated by the proposed development.

## **5.7 Discharge to Sewer**

- 5.7.1 At present the existing development is understood to discharge to the existing sewer network.
- 5.7.2 It is proposed that the flows generated by the development continue to discharge via the existing connections to the public sewer network, mimicking the pre-development scenario.

## **5.8 Climate Change**

- 5.8.1 There are indications that the climate in the UK is changing significantly and it is widely believed that the nature of climate change will vary greatly by region. Current expert opinion indicates the likelihood that future climate change would produce more frequent short duration and high intensity rainfall events with the addition of more frequent periods of long duration rainfall.
- 5.8.2 The NPPF Technical Guidance Table 5 states that the recommended national precautionary sensitivity ranges for increase of peak rainfall intensity is 30% until 2115. It is widely believed that the impact of climate change means there is likely to be a long term increase in the average sea levels, with an expectation that sea levels will rise gradually.
- 5.8.3 An increase in flood water levels means that future flooding events will occur more frequently and will have a greater impact.
- 5.8.4 Any increase in the level of flood risk to the proposed development from climate change is likely to be related to the increase in rainfall intensity and duration and its impact upon the surface water drainage system or from rising sea levels due to its coastal location.
- 5.8.5 Climate Change should be accounted for within the design and it is recommended that an increase in peak rainfall intensity of 30% is allowed for.

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## 6.0 FOUL WATER MANAGEMENT

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- 6.1 It is proposed that foul water flows will discharge via the existing connections to the public sewer network. The existing foul drainage infrastructure will be re-used as much as feasibly possible subject to condition and capacity analysis.
- 6.2 Based on the proposals for the construction of a single replacement dwelling the approximate peak foul water flows generated by the residential development are approximately 0.05l/s. This is based on 4000 litres per dwelling per 24 hours; the guidance contained within Sewers for Adoption (SfA).

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## 7.0 SUMMARY AND CONCLUSIONS

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- 7.1 The Flood Risk Assessment has been prepared to support an outline planning application for the replacement of an existing dwelling off Southwood Road.
- 7.2 The preparation of this report has been undertaken in consultation with the following interested parties; Havant Borough Council, Hampshire County Council, the Environment Agency and Southern Water.
- 7.3 The residential nature of the development proposals means the classification of the site is 'more vulnerable' from the NPPF Table 2 and this is considered an appropriate development type within Flood Zones 1 and 2.
- 7.4 The Flood Risk Assessment (FRA) has reviewed all sources of flood risk to both the proposed development and to the existing adjacent development as a result of the proposals, including; fluvial, tidal, pluvial, groundwater, sewers and flooding from artificial sources.
- 7.5 An Internet based search for flooding events did not recall any historical flooding in the immediate site area. Review of the SFRA PUSH mapping revealed that the rear of the development was affected by tidal flooding in 1989.
- 7.6 The Environment Agency have provided a Flood Incident Report produced by Havant Borough Council following events in November 2005 (included in Appendix D). The frequency of similar flood incidents and scale of damage has been significantly reduced since the implementation of a Beach Replenishment/Nourishment Scheme and the Council has been committed to exercising its permissive powers under the Coast Protection Act to manage this risk, further details are included within Appendix D. However, it should be remembered that there will always be a risk to people residing in such locations.
- 7.7 Consultation with Hampshire County Council highlighted that the site is located within an area susceptible to groundwater flooding however they have no record of flooding in the immediate vicinity of site. The council have also reviewed their Flood Maps for Surface Water (FMfSW) created using both the 1 in 30 and 1 in 200 year annual probability events, the FMfSW separate the level of flood risk into areas that could experience flooding in excess of 100mm and 300mm. Based on this mapping the council have concluded that the site is unlikely to be affected by surface water flooding for the 1 in 30 and 1 in 200 year annual probability of flooding.
- 7.8 It is proposed that a minimum Finished Floor Level (FFL) should be set as the site is located within Flood Zones 1 and 2, and in close proximity to the coast. Therefore it is proposed that a minimum Finished Floor Level should be set at 5.800mAOD, 325mm above the existing FFL (5.475mAOD) and 390mm above the sea wall (5.410mAOD) along the southern boundary.
- 7.9 There are a large number of existing residential dwellings on Hayling Island that fall fully within Flood Zone 2 and also a significant number in Flood Zone 3 and it is likely, that defences will be maintained to a high standard. Not to allow the replacement of an existing home on the edge of Flood Zone 2 would send out a message of no confidence in the security from flooding of these existing homes.

- 7.9 Based on the ground conditions identified, it can be considered that infiltration drainage is unlikely to provide a suitable means of surface water disposal for the flows generated by the proposed development.
- 7.10 It is proposed that the flows generated by the development continue to discharge to the public sewer network, mimicking the pre-development scenario. Due to the reduction of surface water run-off due to the reduction in impermeable area, it is proposed that the flows generated by the development continue to discharge via the existing connections to the public sewer network.
- 7.11 It is highly recommended that the EA's Flood Warning Service is signed up to. This will allow valuable advanced warning of any impending flood that will allow safe evacuation from Hayling Island to the mainland. Langstone Bridge via the A3023 is the primary means of access/egress from the island to Havant. No formal Evacuation Plan has been prepared as there is only the singular vehicular access to and from the island to Havant over Langstone Bridge with multiple routes between the dwelling and the Bridge. If evacuation is not possible then the property itself will allow safe refuge.
- 7.12 As with any drainage system blockages within either the foul or surface water sewer systems have the potential to cause flooding or disruption.
- 7.13 The Flood Risk Assessment is considered to be commensurate with the development proposals and in summary, the development can be considered appropriate in accordance with the NPPF.

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## 8.0 RECOMMENDATIONS

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- 8.1 Opportunities should be taken to provide soft landscaping where at all possible on site to assist in minimising surface water run-off. Added benefits include biodiversity and visual enhancements.
- 8.2 Any overland flows generated by the proposed development must be directed away from residential properties; safe avenues of overland flow are advised.
- 8.3 The proposed onsite surface water drainage system will still need to be sized to cater for storm events up to and including the 100 year return period storm event with a 30% allowance for climate change.
- 8.4 As with any development it is also advised that external levels fall away from property to minimise the flood risk from a variety of sources.
- 8.5 It is proposed that a minimum Finished Floor Level should be set at 5.800mAOD, 325mm above the existing FFL and 390mm above the adjacent sea wall.

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## **APPENDIX A: LOCATION PLAN**

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## **APPENDIX B: TOPOGRAPHIC SURVEY**

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## **APPENDIX C:    PROPOSED PLANNING LAYOUT**

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## **APPENDIX D: EA INFORMATION & CORRESPONDENCE**

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## **APPENDIX E: FEH CATCHMENT DATA & DESCRIPTORS**

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## **APPENDIX F: SURFACE WATER RUN-OFF CALCULATIONS**

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## **APPENDIX G: NPPF EXTRACTS**

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## **APPENDIX H: SOUTHERN WATER CORRESPONDENCE**

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## **APPENDIX I: LPA/LLFA CORRESPONDENCE**

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## **APPENDIX K:    ESCP CORRESPONDENCE**

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## **APPENDIX L:     NOTES OF LIMITATION**

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The data essentially comprised a study of available documented information from various sources together with discussions with relevant authorities and other interested parties. There may also be circumstances at the site that are not documented. The information reviewed is not exhaustive and has been accepted in good faith as providing representative and true data pertaining to site conditions. If additional information becomes available which might impact our conclusions, we request the opportunity to review the information, reassess the potential concerns and modify our opinion if warranted.

It should be noted that any risks identified in this report are perceived risks based on the available information.

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