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## **Flood Risk Assessment**

for

Land at Marine Drive,  
Goring, Sussex

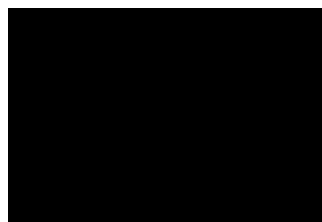
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**FOR AND ON BEHALF OF STEPHEN WILSON PARTNERSHIP**

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## **1 INTRODUCTION AND BRIEF**

### **1.1 Introduction and Brief**

- 1.1.1 This report has been produced to assess the flood risk to and the potential for increased flood risk from the proposed development situated at Marine Drive, Goring.
- 1.1.2 This document has been produced in accordance with current best practice and recommendations and guidance set out in the Nation Planning Policy Framework (NPPF).
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## 2 EXISTING SITE CONDITIONS

### 2.1 Location

- 2.1.1 The site is located at Marine Drive, Goring, Sussex. The figure below shows the site in its current context.



Figure 2.1 – Site Location – Approximate Site Boundary Shown in Red.

- 2.1.2 The existing site areas can be summarised as follows:

|                        |                          |
|------------------------|--------------------------|
| Total Site Area:       | <u>TBC m<sup>2</sup></u> |
| Total Impermeable Area | <u>0 m<sup>2</sup></u>   |

### 2.2 Site Topography

- 2.2.1 The centre of the site may be located by the National Grid Reference 510439, 101747. No topographical survey has been undertaken at the time of writing.
- 2.2.2 A review of Lidar information show that the existing site levels are between 5.3mAOD and 5.8mAOD.
- 2.2.3 A review of Sewer Records (Appendix 3), show separate foul and surface water public sewers located in the public highway around the site.

### 2.3 Site Geology

- 2.3.1 The British Geological Survey (BGS) map shows that the site is underlain by Lewes Nodular Chalk Formation. Superficial deposits are shown to be present on the mapping in the form of River Terrace Deposits.
- 2.3.2 At the time of writing no intrusive ground investigation works had been carried out.

### 3 PROPOSED DEVELOPMENT

#### 3.1 Proposals

- 3.1.1 The proposed development involves the construction of a residential nursing home, housing and a café. The figure below shows the current proposals.

Proposals to be provided

Figure 3.1 – Proposed Plan

- 3.1.2 The proposed impermeable areas are summarised as follows:

|                         |                          |
|-------------------------|--------------------------|
| Proposed Roof Area:     | TBC m <sup>2</sup>       |
| Proposed Hard Standing: | TBC m <sup>2</sup>       |
| Total Impermeable Area: | <u>TBC m<sup>2</sup></u> |

- 3.1.3 Development proposals can be found in Appendix 1.

## **4 FLOOD RISK**

Flooding can occur from a range of individual or a combination of sources that include fluvial (main river), tidal (sea), land, groundwater, sewers infrastructure, reservoirs, and other artificial sources.

The Environment Agency website includes Flood Maps which can be referred to for planning purposes in order to identify the flood risk from three different sources, for a particular development site. There are two different colours shown on the flood map.

- Dark blue identifies areas that could be affected by flooding from either rivers or the sea if there were no defences. These are classified as flood zone 3. Flood Zone 3 comprises land assessed as having a 0.5% (1 in 200) or greater chance of flooding by the sea or a 1% (1 in 100) or greater chance of flooding from rivers, in any one year.
- Light blue identifies areas that could be affected by flooding from either rivers or the sea. These are classified as Flood Zone 2. Flood Zone 2 comprises land assessed as having a 0.01% (1 in 1000) or greater chance of flooding, in any one year.

These two coloured areas show the extent of the natural flood plain in the absence of flood defence or other man-made structures. Areas outside of the blue areas are classified as Flood Zone 1. Flood Zone 1 comprises land assessed as having a <0.01% (1 in 1000) probability of river or sea flooding. Therefore, the risk of flooding from fluvial or tidal sources is considered to be negligible.

Each potential source of flooding has been considered in further details below.

## 4.1 Tidal and Fluvial Flooding

- 4.1.1 A review of the Environment Agency online mapping tool has identified that the development site is mostly situated in Flood Zone 1. The boundary of the site has been identified as to being in Flood Zone 2 and 3.



Figure 4.1 – Extract of the Environment Agency's online Flood Risk Map.

- 4.1.2 Flood Zone 1 comprises land assessed as having a <0.01% (1 in 1000) probability of river or sea flooding.
- 4.1.3 The Environment Agency flood risk map for planning can be found in appendix 2.
- 4.1.4 A review of the available mapping indicated that there are no rivers in close proximity to the Site, therefore it can be concluded that any recorded flood zone designations are the result of flooding from the sea.
- 4.1.5 As the flood risk map for planning has identified that the site boundary is in Flood Zone 2 & 3, a request to the Environment Agency for detailed flood risk information was made.
- 4.1.6 The detailed flood risk information showed that the highest flood level is 5.30mAOD at the 1in200 at 2070 event. It is noted that flood events with a greater climate change factor have a lower flood level. The Environment Agency explained that the flood model was sensitive to the combination of different parameters such as wave height. Their explanation can be found in appendix 2.
- 4.1.7 It should be noted that the flood risk model from the Environment Agency was produced in 2012 and since then the climate change factors used in the model have been updated. The updated flood risk modelling to reflect these changes in climate change is underway but is not available at the time of writing this report. However, the highest recorded flood level is based on a flood event less than the extreme event. As a result, it is anticipated that once the flood risk model is updated, any change in the maximum flood level will be insignificant, if there was a change at all.
- 4.1.8 Due to the proximity of the sea, further modelling outcomes are likely to be closely aligned to the extreme sea level heights. This residual risk of flooding from the sea is discussed further in section 4.2.
- 4.1.9 It is therefore considered that the risk from fluvial flooding is low, and tidal flooding is low to medium.

## **4.2 Future flooding from the sea (Residual Risk)**

- 4.2.1 It has been considered that future flooding from the sea would be a residual risk. The current coastal flood and erosion management strategy available (2010-2020) states that the current standard of protection will be sustained by raising defences over time as sea levels rise. Therefore, it can be considered that the rising sea levels from climate change will not become a direct flood risk. However, there would still be a residual risk from the defences becoming overtopped or breached.
- 4.2.2 A review of the extreme sea levels found online from the Environment Agency show that the sea level for the 1in200 event would be 4.090mAOD at the base year 2017.
- 4.2.3 With sea level rise due to the effect of climate change, an additional factor must be added to account for the lifetime of the development. The expected lifetime of the development is 100years, therefore a sea level rise factor for up to 2125 must be considered.
- 4.2.4 Using the current sea level rise factors from the Environment Agency, it is expected that the sea level would rise by 1.503m to the year 2125.
- 4.2.5 Therefore, the sea level at the 1in200 year event is expected to be 5.593mAOD.
- 4.2.6 The H++ allowances from the Environment Agency have not been considered as it is considered that the proposals do not change existing settlement patterns.
- 4.2.7 It is therefore considered that the residual flood risk is medium.

### 4.3 Flooding from the Land

- 4.3.1 Intense rainfall, often short duration, that is unable to soak into the ground or enter a drainage system can quickly run off the land and result in localised flooding. Local topography and buildings can influence the direction and depth of flow. It is inevitable that as a result of extreme rainfall, the capacities of existing sewers, surface water attenuation features and other drainage systems will be exceeded on occasion.
- 4.3.2 The Environment Agency website provides surface water flood risk information based on the information provided by the lead local flood authority. This highlights the areas at risk from surface water flooding from overland flows.



Figure 4.2 – Extract of the Environment Agency's online Flood Risk Map.

- 4.3.3 It can be seen from the figure above that the development site is at risk of flooding from overland flows. The flood risk areas are shown as being along parts of the boundary on all sides.
- 4.3.4 Away from the site boundary, there are no areas shown to have an identifiable surface water flood risk.
- 4.3.5 Therefore, the risk of flooding from overland flows is considered to be low to medium.
- 4.3.6 An overlay of the surface water flood risk provided by the Environment Agency on to the site can be found in appendix 4.

#### **4.4 Flooding from Groundwater**

- 4.4.1 Groundwater flooding occurs when water levels in the ground rise above surface level. It is most likely to occur in low lying areas underlain by aquifers. These may be extensive regional aquifers, such as chalk, or may be localised sands and gravels.
- 4.4.2 Water levels below the ground rise during the wet winter months and fall again in the summer as the water flows out towards rivers. In very wet winters, water level rise may lead to flooding or normally dry land. Groundwater flooding can sometimes take weeks or months to dissipate because groundwater flows are much slower than surface flows.
- 4.4.3 The existing site appears to be mostly flat but falls away to the boundary on all sides and should groundwater levels rise enough to cause flooding, flood waters would follow the existing topography of the site and flow towards the boundary away from the development site.
- 4.4.4 SWP has interpreted from the current SFRA mapping which shows that groundwater level could rise up to 0.5m below ground level for the entire site.
- 4.4.5 SWP could not find any indication or evidence of an increased flood risk from groundwater. Therefore, the risk of flooding from groundwater is considered to be low to medium.
- 4.4.6 It is proposed that groundwater monitoring should take place over winter to record the level of groundwater to further determine if groundwater could constitute a different flood risk than the one currently determined.

#### **4.5 Flooding from Sewers, Highways and Private Drains**

- 4.5.1 In urbanised areas, rainwater is frequently drained to surface water or combined water sewers. Flooding can occur when the sewer is overwhelmed by heavy rainfall, becomes blocked or has inadequate capacity. Flood waters will either follow overland exceedance routes or be stored at surface level until they are able to drain away. When this happens to combined sewers there is a risk of land or property being contaminated with raw sewerage.
- 4.5.2 A review of public sewer records identified the presence of several sewers around the site under Marine Drive and Amberley Drive.
- 4.5.3 A copy of the sewer records can be found in appendix 3.
- 4.5.4 Should flooding occur from the existing drains, flood water will follow the existing topography and flow away from the development.
- 4.5.5 The design of the proposed foul and surface water drainage system serving the new development will look to maintain the run-off from the developed site to pre-development levels so that flood risk is not increased. A maintenance plan will be produced to ensure the risk of flooding of the proposed drainage system remains low.
- 4.5.6 Therefore, the risk of flooding from sewers, highway drainage and private drains is considered to be low.

## 4.6 Flooding from Reservoirs and other Artificial Sources

- 4.6.1 Non-natural or artificial sources of flooding can include reservoirs, canals, and lakes, where water is retained above natural ground level. Reservoir or canal flooding can occur as a result of the facility being overwhelmed and or as a result of dam or bank failure. The latter can happen suddenly resulting in rapidly flowing, deep water that can cause significant threat to life and major property damage.



Figure 4.3 – Extract of the Environment Agency's online Flood Risk Map.

- 4.6.2 There are no canals or private/publicly owned bodies of water in close proximity to the site. Therefore, the risk of flooding from reservoirs and other artificial sources is considered to be low.

#### **4.7 Adur & Worthing Strategic Flood Risk Assessment**

- 4.7.1 A Strategic Flood Risk Assessment (SFRA) has been produced by JBA Consulting, dated July 2024, for Adur District Council & Worthing Borough Council. This SFRA provides details of the flood risk throughout Adur & Worthing. The SFRA and accompanying maps provide the following information about the site. However, it should be noted that the information provided may only be representative of the situation at the time the SFRA was prepared.
- 4.7.2 The SFRA has identified that the site is situated within Flood Zone 1.
- 4.7.3 The SFRA identifies that the site is in an area of concern for groundwater flooding. Mapping found in the appendix shows that groundwater levels are between 0.5m and 5.0m below the ground surface.
- 4.7.4 The SFRA identifies that the site has not had a recorded incident of flooding. It should be noted that although there is no record, it does not mean flooding may have happened previously.

#### **4.8 Arun Strategic Flood Risk Assessment**

- 4.8.1 Due to the position of the site on the boundary of the area Adur and Worthing Strategic Flood Risk Assessment, a review of the Arun Strategic Flood Risk Assessment has been deemed necessary.
- 4.8.2 A Strategic Flood Risk Assessment (SFRA) has been produced by JBA Consulting, dated November 2016, for Arun District Council. This SFRA provides details of the flood risk throughout the local council district of Arun. It should be noted that the information provided may only be representative of the situation at the time the SFRA was prepared.
- 4.8.3 The Arun SFRA provided no additional useful information on the flood risk to the site.

#### **4.9 Historic Flooding**

- 4.9.1 In both strategic flood risk assessments, historic flooding was not identified. However, that does not mean that the site has not flooded in the past with it not being recorded.
- 4.9.2 SWP was provided with video drone footage by the client from winter 2023. The drone footage showed flooding to the south and west of the site. No flooding on site was identified. Snips from the footage are shown below.



Figure 4.4 – Snip of drone footage showing flooding to the south



Figure 4.5 – Snip of drone footage showing flooding to the west

#### **4.10 Flood Risk Summary**

4.10.1 The potential flood risk to the proposed development site has been summarised below:

- |                                    |                    |
|------------------------------------|--------------------|
| • Fluvial flood risk               | Low Risk           |
| • Tidal flood risk                 | Low to Medium Risk |
| • Residual Tidal Flood Risk        | Medium Risk        |
| • Flooding from the land           | Low to Medium Risk |
| • Flooding from groundwater        | Low to Medium Risk |
| • Flooding from sewers             | Low Risk           |
| • Flooding from drainage           | Low Risk           |
| • Flooding from artificial sources | Low Risk           |

4.10.2 Having considered the potential sources of flooding, most have been identified as having a low risk to the development site. It is believed the main risk of flooding to the site, would be from sources of surface water flooding.

4.10.3 Flood risk mitigation methods to limit the impact of flooding are discussed further in section 6. The flood risk mitigation methods will seek to keep the development safe from flooding over its lifetime.

## **5 SEQUENTIAL TEST**

- 5.1.1 The aim of the sequential test is to locate development in areas with the lowest risk of flooding from any source. Where reasonably available sites are available with a lower flood risk, the development on the site with a higher flood risk should not be permitted.
- 5.1.2 SWP has considered that the site has risk of flooding from extreme tidal events in the future. The risk of this occurring is considered to be medium.
- 5.1.3 To define the catchment area of the sequential test, SWP have considered this to be of Ferring and Goring. Considering a Worthing Borough Council wide catchment would not be appropriate due to the proposed position of the site on the local authority boundary. As such, the catchment should be across the neighbouring town and village of Goring (Worthing) and Ferring (Arun) which are the settlements surrounding the site which would benefit from opportunities provided by the development.
- 5.1.4 SWP have reviewed the following documents as a basis for assessing the available sites:
- Strategic Housing Land Availability Assessment (SHLAA) Update – Worthing (December 2020)
  - Housing and Economic Land Availability Assessment (HELLA) – Arun (December 2021)
  - Adur & Worthing Level 2 Strategic Flood Risk Assessment (July 2020)
  - Arun District Council Strategic Flood Risk Assessment Level 2 (November 2016)
  - Flood Risk Sequential & Exceptions Test – Submission Draft Worthing Local Plan – Worthing Local Plan 2020-2036 (January 2021)
- 5.1.5 SWP has reviewed all documents, and it can be considered that there are no reasonably available sites for a similar development within Goring or Ferring with a lower flood risk.
- 5.1.6 Therefore, it can be considered that the site has passed the sequential test as there are no reasonable available sites with a lower flood risk and the proposals should be acceptable.
- 5.1.7 It should be noted that SWP has not had any dialogue with the local authority to determine the area of search for the sequential test.
- 5.1.8 After the sequential test is completed, it has been assessed if the vulnerability classification of the proposals is suitable for the flood zone the site is situated in, as per the National Planning Policy Framework.
- 5.1.9 Following the information located in *Annex 3: Flood risk vulnerability classification* of the National Planning Policy Framework, the development is considered to be more vulnerable. The development involves the construction of a residential nursing home, housing and a café. After review of the detailed flood risk information from the Environment Agency, it can be seen that the site is located in Flood Zone 1 and 2.
- 5.1.10 Using Table 2 of the sequential test, it can be seen that 'more vulnerable' classification is allowed in a Flood Zone 1 and 2. Table 2 is shown as below.

| <b>Flood Zones</b> | <b>Flood Risk Vulnerability Classification</b> |                         |                         |                 |                  |
|--------------------|------------------------------------------------|-------------------------|-------------------------|-----------------|------------------|
|                    | Essential infrastructure                       | Highly vulnerable       | More vulnerable         | Less vulnerable | Water compatible |
| Zone 1             | ✓                                              | ✓                       | ✓                       | ✓               | ✓                |
| Zone 2             | ✓                                              | Exception Test required | ✓                       | ✓               | ✓                |
| Zone 3a †          | Exception Test required †                      | <b>X</b>                | Exception Test required | ✓               | ✓                |
| Zone 3b *          | Exception Test required *                      | <b>X</b>                | <b>X</b>                | <b>X</b>        | ✓ *              |

Table 2 – Flood risk vulnerability and flood zone ‘incompatibility’

5.1.11 From the table above, it can be seen that the development is considered that the development can be made safe throughout its lifetime.

5.1.12 The exception test is not required.

## **6 FLOOD RISK MITIGATION**

- 6.1.1 The site has been identified as being at risk of flooding, therefore it is prudent that mitigation in the proposals is included to lower the risk to the development.
- 6.1.2 The highest flood risk level that could affect the site has been identified as the residual flood risk. Therefore, the design flood risk level should be 5.593mAOD.
- 6.1.3 The SFRA states that the finished flood level should be 300mm above the design flood level. However, an additional allowance of 300mm should be included due to the proximity to the sea. Therefore, the total freeboard above the design flood level should be 600mm.
- 6.1.4 Therefore, the finished flood level must be 6.193mAOD and above for all residential properties.
- 6.1.5 The raised finished flood levels should mitigate against all sources of flooding, such that the overall flood risk to the development is now low.
- 6.1.6 It should be noted that raising land is acceptable mitigation against tidal flooding as it will not increase flood rise elsewhere. However, where surface water flood risk is identified, no land raising should occur as this may increase flood risk elsewhere.
- 6.1.7 Residents should sign up to flood warning system with the Environment Agency. The flood warning system will be able to inform residents when a flood event is likely to occur with sufficient warning for them to prepare.
- 6.1.8 A formal flood evacuation plan should not be required, as residents should be able to remain in place until the water levels have receded. Due to the nature of the flooding, the flood event will last for a short period of time.
- 6.1.9 The design of the proposed surface water drainage system serving the new development and landscaping will look to reduce the risk of flooding.

## **7 CONCLUSIONS**

7.1.1 This report has concluded the following:

- The proposed development involves the construction of a residential nursing home, housing and a café.
- A review of the Environment Agency online mapping tool has identified that the development site is situated in Flood Zone 1, 2 & 3. However, a further review of the detailed flood risk information has identified that the site is located in flood zone 1 & 2, with flood zone 3 located outside the boundary.
- The site is protected from tidal flooding by the beach for at least the 1in200 tidal event. The latest available shoreline management plans state that the defence level will rise to afford the same standard of protection as sea levels rise.
- Having considered the potential sources of flooding, most have been identified as having a low risk to the development site. It is believed the main risk of flooding to the site, would be a residual tidal risk from wave overtopping and a tidal breach.
- Therefore, it is proposed with allowances included, that the minimum finished floor level of the development shall be 6.193mAOD.
- The sequential test was undertaken, and it can be considered that the proposals pass the test due to the lack of available developable space elsewhere with a lower flood risk.
- It should be noted that this Flood Risk Assessment has been written based on the proposals flood risk compliance with the National Planning Policy Framework only. Other planning and policy matter not involving flood risk have not been considered within this report.