

**LAND WEST OF HORNDEAN ROAD
EMSWORTH, HAMPSHIRE**

**Flood Risk Assessment &
Preliminary Surface Water Drainage Strategy**

**Project No. 13-016
April 2014**

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**C&A Consulting Engineers
Office 19 - Hart House
Priestley Road
Basingstoke
Hampshire
RG24 9PU
Tel: 01256 630830
Fax: 01256 324943
enquiries@c-a.uk.com**

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1.0 INTRODUCTION

- 1.1 Charles & Associates Consulting Engineers Ltd (C&A) have been appointed by Chidden Farms (CF) to prepare a Flood Risk Assessment (FRA) for the proposed development of land west of Horndean Road, Emsworth within the Borough of Havant and County of Hampshire, hereafter referred to as 'the site'. The location is shown diagrammatically on **Figure 1**.

Purpose

- 1.2 The site is being promoted for residential development through the Havant Borough Council Local Plan (Allocations), dated October 2013, and is currently a preferred site within the Local Plan (LP). This has included extensive consultation with the local community, Havant and Parish Councils.
- 1.3 CF now wish to submit a planning application in line with the original strategic promotion. This application is to be outline in nature and include a scheme to satisfy the draft policy UE13 and DM25 related to managing flood risk in Emsworth and the Environment Agency (EA) suggested Flood Alleviation Schemes related to these policies.
- 1.4 With this in mind this FRA has been prepared as a means of demonstrating that flooding and drainage issues would not constrain the development of the site. With further evidence provided to confirm that the proposed 'Wetland' adjacent to the development boundary will satisfy LP Policies UE13 and DM25 accordingly.
- 1.5 This study therefore considers two distinct areas of flooding. The first related to the site and in particular, the impact of the proposed residential development on the risk of flooding elsewhere. Furthermore, it confirms the site's sustainability credentials in terms of Sustainable Urban Drainage (SuDs).

- 1.6 In terms of surface water drainage and potential for flooding, it examines the sites suitability in planning policy terms and physical characteristics to allow suggested solutions to deal with drainage in the developed state, thus ensuring the site is drained in a sustainable manner while not affecting the surrounding area.
- 1.7 The second relates to the provision of a suitable, 'Non Development' related, flood attenuation scheme that forms an element of the Emsworth Flood Alleviation identified in the Councils evidence base for the LP (Allocations). This is to be provided for flood alleviation improvements to the Village as a whole, not the development site itself.
- 1.8 The provisions of the National Planning Policy Framework (NPPF) have been considered in preparing the Flood Risk Assessment, together with The Flood & Water Management Act 2010 (TFWMA). In addition attention has also been paid to the Technical Guidance of the National Planning Practise Guidance (NPPG) In addition policies within the Core Strategy and emerging LP(Allocations) have also been addressed.
- 1.9 Flood maps published by the Environment Agency and further information provided by the Agency indicate that the site lies partly within Flood Zones 1, 2 & 3 'Low, medium and high probability flood risk area', from for fluvial sources, as defined by Table 1 of NPPF. Correspondence from the EA is provided within **Appendix A** and shown diagrammatically on **Figure 4**.

Report Limitations

- 1.10 The findings, recommendations and conclusions of this report are based on information obtained from a variety of external sources which are understood to be reputable. However, C&A Consulting Engineers cannot guarantee the authenticity or reliability of any data and/or records provided by third parties.

2.0 SITE LOCATION & DETAILS

- 2.1 The site is located within the village of Emsworth to the west of Horndean Road. It is bordered by Southleigh Road to the north and agricultural fields to the west and partly south. With the remainder of the southern boundary and eastern boundary backing onto residential housing. West Brook passes through the site from north to south along the western development edge. **Refer Figure 1** for location details.
- 2.2 The existing land use is that of an arable field, currently under agricultural use. The developable area of the site covers approximately 5.4 Ha. This report focuses on the land for which a proposed scheme of up to 140 residential dwellings and associated infrastructure, not the proposed recreational/open space areas as these will be unaffected in run-off terms.
- 2.3 In addition it focuses on the provision of the Emsworth Flood Alleviation requirements.

Topography & Existing Drainage

- 2.4 The topography of the site falls from 11.5 m OHD at the proposed access of Southleigh Road to 8m OHD where West Brook leaves the site in the south adjacent to the existing residential boundary. It also falls from 9.5 m OHD to east toward West Brook before rising again at West Brook toward the agricultural field.
- 2.5 West Brook enters the site from the west approximately 20 m from the northern boundary before turning north south to the southern boundary. It varies in depth from 1 to 2 metres with 1 in 1 side slopes.

- 2.6 A large pond exists to the east of the site adjacent to Jingles B & B Hotel. This pond appears to accept surface water flows from Horndean Road and discharges via a headwall into the West Brook
- 2.7 A 600 mm diameter Southern Water surface water sewer crosses the site from the north discharging via a headwall to West Brook at the change of direction of West Brook confirmed above. This has been confirmed via Southern Water public sewer records. In addition a number of agricultural land drains which cross the western agricultural field also discharge to the West Brook via outlet pipes. These pipes are believed to be between 600 and 1000mm deep.
- 2.8 A full topographic survey has been undertaken which confirms the visual survey accordingly. The presence of the West Brook and pond will assist in preparing a Sustainable Urban Drainage solution for disposal of surface water drainage on site where ever they drain to as flows can be regulated to greenfield run-off to ensure downstream areas are not disadvantaged. Refer **Figure 2** for topographical details.

Geology

- 2.9 A review of the British Geological Society's records which has confirmed that the superficial geology is River Terrace Deposits of Sand Silt & Clay of varying depths followed by head deposits of gravelly clay and finally a bedrock of clay silt and sand. Clearly the clay/silt has very low potential for infiltration As such an intrusive investigation was carried out which confirmed that the site topsoil was made ground to 350mm followed by a layer of silty clayey gravel to 650mm thick founding on London Clay. Infiltration potential was reviewed and is supported by the infiltration test results within the geotechnical report. However infiltration rates were found to be poor. Refer **Appendix F** for extract of Geotechnical Report.

- 2.10 As such there is no potential to utilise infiltration techniques on the site. Therefore SuDs techniques explained later within this report do not include infiltration.

Vulnerability classification

- 2.11 With reference to Table 2 of NPPF, the proposed residential dwellings would be considered as a 'More Vulnerable' use. By virtue of the site being partially within each of Flood Zone's 1, 2 & 3 classification the site is only suitable for residential development if it passes the Sequential Test and Exceptions Tests set out in the NPPG guidance.

Groundwater

- 2.12 Review of the Environment Agency's (EA) records has confirmed that the site is underlain by a Secondary 'A' Aquifer within the high gravel/clay however it is also designated unproductive due to the London Clay. Secondary Aquifers are designated by the EA as:

"Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers"

- 2.13 Importantly EA records confirm that the site does not fall within a ground water protection zone area. Refer **Appendix A** for EA records on Ground Water. In addition no recorded groundwater flooding has been noted by the EA or Hampshire County Council (HCC).
- 2.14 In addition the intrusive geotechnical survey did not encounter ground water at the time of the testing in November 2013.

- 2.15 Historic observations by the land owner have however suggested that in times of extreme rainfall events such as those experienced in 2007, the ground became water logged by a mixture of waters backing up on the West Brook and ground waters becoming trapped between the London Clay and Gravel/Clay layers eventually dissipating away via West Brook.

Local Policy Documents

- 2.16 This FRA has been prepared with due regard to the '*Strategic Flood Risk Assessment*' (SFRA) prepared by Atkins in 2007 for the Urban South Hampshire Partnership which formed part of Havant Borough Council's evidence base for their Core Strategy which was adopted in March 2011. The Adopted 'Core Strategy', sets out the policies and aims for the Borough until 2026.
- 2.17 This SFRA has been further supplemented by the '*Strategic Flood Risk Assessment Supplement - Incorporating Sequential and Exception Tests*' for the emerging Local Plan (Allocations) and '*Emsworth Flood Risk Strategy*' which also support the Boroughs emerging Local Plan (Allocations). This document also confirms the site is suitable for development.
- 2.18 It is intended to provide up to 140 dwellings and associated infrastructure on the site. The site is conducive to utilising a number of Sustainable Urban Drainage techniques and, subject to, ground raising and flood compensation provision will not flood in a 1 in 100 year event plus climate change. In addition all run-off will be controlled at source to greenfield rates.
- 2.19 Furthermore, in cooperation with the Environment Agency, the West Brook element of the Village wide Flood Alleviation Schemes will be delivered by a legal mechanism with the Developer of the site. As required under the emerging LP policies UE13 and DM25.

- 2.20 This ensures that policy and guidance such as that required under the emerging Local Plan (Allocations) Policy UE13 and DM25, Adopted Core Strategy Policies CS11, 15 and 21, National Planning Policies and the Flood & Surface Water Management Act 2010 are all met and satisfied.
- 2.21 The site has been recognised by both the EA and the Local Planning Authority, through their evidence base, as being suitable for development subject to confirming that the built form of the development is not placed within flood plain. The provision of the ground level raising on the development area and flood compensation areas on a like for like level, to the west of the development boundary have been allowed for and confirm that the site can be developed.

Sequential Test and Exception Test

- 2.22 NPPF & TFWMA requires that at all stages of planning a Sequential Test is completed with the aim of steering new development to areas at the lowest probability of flooding. The Sequential Test would normally be completed by the Local Planning Authority (LPA) to inform the preparation of the Local Development Framework (LDF).
- 2.23 NPPF indicates that where a Sequential Test has not been applied by the Local Authority, evidence will need to be gathered. The onus for provision of evidence demonstrating the successful application of the Sequential Test for the site falls to the developer or promoter of the site. It is noted that a Strategic Flood Risk Assessment has been prepared for the Core Strategy and has informed the evidence base, however this is not site specific. That said further evidence has been provided in the form of the Strategic Flood Risk Assessment Supplement - Incorporating Sequential and Exception Tests.
- 2.24 This evidence confirms the sites credentials for development via a positive result in the Sequential Test which assures its continued progress through the planning system in terms of flood risk.

2.25 With respect to the Exception Test. This test should only be applied as set out in NPPF Table 3 following application of the Sequential Test. In this case the Sequential Test Has been deemed to be passed by virtue of sections 2.22 & 2.23 above. It is therefore now necessary to show that both elements of the test, as set out in paragraph 102 of NPPF can be satisfied. That being:

- *it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared; and*
- *a site-specific flood risk assessment must demonstrate that 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.*

Both elements of the test will have to be passed for development to be allocated or permitted.

2.26 As residential development has already been identified within the Council's evidence base as having passed the Sequential Test and is to be located within revised Flood Zone. By virtue of the provision of ground level raising above historic flood levels, together with flood compensation being provided for this loss of flood plain, the site is deemed to have also passed the required Exception Test. As it will be designated as being totally within Flood Zone 1 for the life time of the development. Refer Section 6.0 for development proposals.

2.27 While a positive outcome, it must not be forgotten that in the development of the site it must be demonstrated that the development will be safe and will not increase the risk of flooding to other areas. It is also necessary to expand on how the site will be removed from flood plain and flood compensation mitigation is achieved. This is set out from Section 3 to 5 of this report. Section 6 explains the preliminary strategy

surface water to be implemented. Sections 7 & 8 discuss Flood Management and Offsite Impact and finally Section 9 discusses the West Brook Flood Alleviation Scheme, that while not needed to support the development is a policy requirement to provide flood relief to the Village of Emsworth by assisting in reducing existing flooding issues.

3.0 DEFINITION OF THE FLOOD HAZARD

Sources of flooding:

3.1 NPPF identifies six potential sources of flooding that require investigation:

- Flooding from rivers or fluvial flooding;
- Flooding from the sea or tidal flooding;
- Flooding from land;
- Flooding from groundwater;
- Flooding from sewers; and
- Flooding from reservoirs, canals, and other artificial sources.

Flooding from rivers of fluvial flooding

3.2 As stated above, the site has water course within it. That being the West Brook running north to south along the development boundary.

3.3 There are historic records of flooding on or downstream of the site, . This is confirmed by the Environment Agency's flood maps, enclosed at **Appendix A** and **Figure 4**. Together with a number of Planning Authority and EA commissioned studies for the area of Emsworth. The most up to date of these being:

- The Strategic Flood Risk Assessment' (SFRA) prepared by Atkins in 2007 for the Urban South Hampshire Partnership;

- Strategic Flood Risk Assessment Supplement - Incorporating Sequential and Exception Tests for the emerging Local Plan (Allocations) October 2013;
- Emsworth Flood Risk Strategy October 2013.

3.4 All of the documents identified above confirm that a proportion of the site falls within Flood Zones 1,2 & 3.

3.5 It is therefore important to comply with the Exception Test identified within section 2.24 & 2.25 above. By providing mitigation measures.

3.6 It is intended to provide mitigation to enable development by removing the development site from the existing Zones 2 & 3 flood plains. This will be achieved by raising ground levels above that of the 1 in 100 (Flood Zone 1) and 1in 1000 (Flood Zone 2). Flood Levels have been provided by the EA and vary from 9.26 to 9.56 for Flood Zone 3 and 9.33 to 9.61 for Flood Zone 2. This information is provided within **Appendix A**.

3.7 As such earthworks drawings and calculations have been prepared which provide new ground levels raised above the Flood Zone 2 flood levels which in this case is the worst case scenario. Flood storage volumes required to be compensated for, have been calculated to be 12,000 cubic metres.

3.8 To provide the 12,000 cubic meters of flood compensation ground levels have been reduced on the western edge of the proposed Emsworth Flood Alleviation Wetland, discussed in Section 9. This reduced level land area provides a like for like level compensation from the development area with a further 1500 cubic meters equating to 13,500 cubic meters in volume. Refer **Appendix E** for details.

- 3.9 As such the development site will be raised above current flood levels reassigning it fully to Flood Zone 1 and compensated for to the west. As such the risk of fluvial flooding has been negated.

Flooding from the Sea or tidal flooding

- 3.10 The site is remote from the coast and at an elevation of between 11.5 m AOD and 8 m AOD. As such no flooding from the sea or tidal flooding can occur.

Flooding from Land

- 3.11 With reference to **Figure 2**, the site contours confirms that the catchment falls to the West Brook as does the majority of the agricultural land to the west before it reaches the water shed to Nore Stream.
- 3.12 Land drains currently exist on the agricultural fields to the west which discharge to West Brook and will continue to do so in the future. Albeit with West Brook relocated into the proposed wetland, refer section 9. It is not envisaged that these will affect the development site due to the introduction of the flood compensation area and wetland.
- 3.13 It is of note that there is a significant 'out of boundary' catchment to the north that could give rise to significant overland flows to West Brook but **not** the development site

Flooding from sewers

- 3.14 There are surface water sewers on site but it is not intended to connect into this existing public system. There are no foul sewers that cross the site, all new foul pipe networks will be independent to any surface water drainage and will be offered for adoption to Southern Water.

Flooding from groundwater

- 3.15 The site is underlain by a Secondary 'A' Aquifer within the Sandgate formation. Secondary Aquifers are designated by the EA as:

"Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers"

- 3.16 Importantly EA records confirm that the site does not fall within a ground water protection zone area. Refer **Appendix A** for EA records on Ground Water. In addition no recorded groundwater flooding has been noted by Hampshire County Council (HCC).
- 3.17 In addition the EA has confirmed that there has been no record of historic ground water flooding on the site. Refer **Appendix A & F**. it is our opinion that ground water flooding is not a problem on the site.
- 3.18 As such, the risk of groundwater flooding is not considered significant and has not been considered further.

Flooding from reservoirs, canals and other artificial sources

- 3.19 Reference to the Streetmap website indicates there are no notable artificial sources in the vicinity of the site that could give rise to a flood risk. Flooding from reservoirs, canals and other artificial sources has therefore not been considered further.

4.0 PROBABILITY OF FLOODING

Flood Zone

- 4.1 Flood maps published by the Environment Agency and further information provided by the Agency indicate that the site lies partly within Flood Zones 1, 2 & 3 'Low, medium and high probability flood risk area', from for fluvial sources, as defined by Table 1 of NPPF. Correspondence from the Environment Agency is provided within **Appendix A** and shown diagrammatically on **Figure 4**.
- 4.2 Section 3.0 above confirms how this mixture of Flood Zones is dealt with to bring the development site wholly within Flood Zone 1.

Strategic Flood Risk Assessment

- 4.2 A 'Strategic Flood Risk Assessment' (SFRA) has been prepared by Atkins in 2007 for the Urban South Hampshire Partnership which formed part of Havant Borough Council's evidence.
- 4.3 This SFRA has been further supplemented by the 'Strategic Flood Risk Assessment Supplement - Incorporating Sequential and Exception Tests' for the emerging Local Plan (Allocations) and 'Emsworth Flood Risk Strategy' which also support the Boroughs emerging Local Plan (Allocations). This document also confirms the site is suitable for development.

Run-off

- 4.4 The existing rate of run-off from the site has been estimated using The SuDS Manual, CIRIA C697 (2007) in accordance with IH Report 124, flood estimation for small catchments (Marshall and Bayliss, 1994). The pro-rata method on the size of catchment detailed in Table 4.2 in The SuDS Manual, CIRIA C697 (2007) has been used for the 5.4 ha part of the overall site that is to be developed. The analysis has been

completed using the Source Control module of WinDes using the following parameters:

AREA (AREA DRAINED)	5.4 ha	Recommended the SuDs Manual . Pro-rate flows by area of the site
SAAR (STANDARD AVERAGE ANNUAL RAINFALL)	782 mm	Obtained from WINDES
SOIL (PARAMETER REPRESENTING THE PERMEABILITY OF THE SUB SOLIDS)	0.4	This has been taken as a value to reflect the Impermeable London Clay underlying the site.
REGION (FSR REGION REPRESENTING REGIONAL GROWTH CURVE)	7	The site lies within region

4.5 The analysis provides an estimate for QBAR (the mean annual flood) of 17.40 ls^{-1} for a 5.4 ha site. The Q100 flow, the 1 in 100 year run-off from a 5.4 ha site, is 55.70 ls.

4.6 It is intended to attenuate all flows from the site to greenfield run-off rates at various locations to the relocated West Brook within the wetland area. This is provided in more detail within Section 6.0.

5 EFFECT OF CLIMATE CHANGE

Climate Change

- 5.5 Based on the most recent advice on climate change reported in NPPG, peak rainfall intensity, sea level, peak river flow, offshore wind speed and extreme wave heights are all expected to increase in the future. It is recommended that considerations for future climate change are included in Flood Risk Assessments for proposed developments.
- 5.6 EA modelling identifying this potential, for the increase as such all dwellings will remain located in Flood Zone 1 provided new ground levels are reached and maintained. Together with the proposed flood compensation. Therefore the development will not be affected by the impact of climate change.
- 5.7 The site is likely to be subject to increases in rainfall intensity of 30% over the lifetime of the development that will place additional pressure on surface water drainage infrastructure. Therefore, the sustainable drainage system that will serve the proposed development has been designed to cater for the 1 in 100 year plus 30% rainfall event.

6 PRELIMINARY DEVELOPMENT PROPOSALS

Preliminary Development Layout

- 6.1 The development of the site will provide up to 140 residential dwellings and associated infrastructure as shown by the preliminary master plan at **Appendix B**.
- 6.2 It is intended to relocate the West Brook to be the low flow channel within the Wetland area, extend and reinstate the existing piped drainage from the Southern Water Pipeline, the existing pond outfall and finally the existing land drainage to recreate the current status quo.
- 6.3 Areas of the existing West Brook not utilised for tree preservation will be filled in and sympathetically landscaped.
- 6.4 Due to the impermeable nature of the bedrock (i.e. London Clay) it is not possible to employ infiltration techniques on the site. As such, the intent is to utilise control at source via the use of swales/depression areas and porous paving with storage beneath. This would then be connected to a positive pipe network that will eventually discharge to the relocated West Brook/Wetland at Greenfield Run-off rates. The pipe network element will be offered for adoption by Southern Water Ltd
- 6.5 Drawings and calculations are provided in **Appendix C & D** respectively these confirm the following:
- All flows will be cleansed either, via the use of the porous paving/swales/local depressions themselves. In addition pipe networks will utilize trapped gullies and oil/petrol interceptors, if appropriate before discharging to the watercourse;
 - All development flows will be controlled at source to Greenfield Run-off rates;

- 1 in 100 year plus climate change of 30% will be regulated to Greenfield Run-off rates via attenuation either in porous paving within private carparking/driveway areas or within suitably landscaped swales and local grassed depressions within the open space areas of between 200 and 300 mm deep;
- While the swales will act as surface water conveyance conduits for all storm events the depressions will only hold water at the 1 in 100 year plus climate change storm event;
- All ground levels will be above the current EA flood levels provided in Appendix A, but ranging from 9.33 to 9.61m AOD;
- Housing finished Floor Levels will be set 150mm above this to provide an additional factor of safety;
- The existing Southern Water surface water sewer entering the site from the north will be diverted, following agreement with Southern Water, into the proposed road network, before discharging to the realigned West Brook. As will the outfall pipe from the existing pond within the site itself, as indicated on drawing **13-016-SK01 within Appendix E;**
- It is not intended to utilise these existing diverted pipes for development flow.

7 MANAGEMENT MEASURES

Flood Risk Management Measures

- 7.1 NPPG & the Practice Guide require that the safety of people and the proposed development be considered against each source of flooding identified in Section 3.
- 7.2 The residential development is to be located within reconfigured Flood Zone 1 and therefore, even with the potential for climate change, properties will not be at risk of fluvial flooding.
- 7.3 A preliminary drainage strategy incorporating sustainable urban drainage (SuDs) has been provided to manage the increase in run-off from the site over the lifetime of the development such that it will not place properties at risk of surface water flooding.
- 7.4 The inclusion of Flood Compensation and the Emsworth Flood Alleviation Wetland identified in Section 9 further reduces the risk of flooding to the site and importantly the surrounding area.
- 7.5 The flood risk to the proposed development and surrounding area as a consequence of the development is therefore considered to be low and no specific flood risk management measures will be required.

8 OFF SITE IMPACTS

Flood Risk elsewhere

- 8.1 As the proposed development is located entirely within a new Flood Zone 1 designation, it will not have any adverse impact on the flood risk to others by virtue of obstruction to flood flows or the reduction of flood plain storage.

Surface Water Management

- 8.2 NPPG, Paragraph F6 states:-

“Surface water arising from a developed site should, as far as is practicable, be managed in a sustainable manner to mimic the surface water flows arising from the site prior to the proposed development, while reducing the flood risk to the site itself and elsewhere, taking climate change into account.”

- 8.3 The development plans with the indicative surface water drainage solutions provided confirms that the site can be drained in a sustainable manner. The drainage proposals are presented within Section 6 above.
- 8.4 To reduce the run-off from the developed site to that of the undeveloped site requires peak flows to be attenuated to greenfield run-off levels using sustainable drainage measures (SuDS). In the form of infiltration techniques to the relocated West Brook. Which in addition will ensure the wetland and retained elements of the old West Brook receive water for ecological reasons.

9.0 Emsworth Flood Alleviation Wetlands

- 9.1 Emerging policy DM25 'Flood Risk in Emsworth' requires all development to have due regard to the existing Flood Risk of Emsworth itself:

'Planning permission will be granted for developments within the Emsworth urban area boundary that can demonstrate how post development run-off has been reduced by the greatest percentage rates and volumes that are possible in the context of cost, technical feasibility and viability.'

Planning permission will be granted for developments within the Emsworth urban area boundary of greater than 1 hectare that are supported by on-site sustainable drainage systems.

New developments that fall within the Emsworth urban area boundary; and/or has an impact on the flood risk of the areas within the Emsworth urban area boundary may be required to make a contribution towards the Emsworth Flood Alleviation Scheme (FAS)'

- 9.2 The development site is in a unique position to provide a proportion of the Emsworth Flood Alleviation Scheme (FAS) by virtue of its proximity to the West Brook and the single landownership.
- 9.3 The Environment Agency have previously identified a flood attenuation scheme on or adjacent to the West Brook to form part of the overall FAS for Emsworth.
- 9.4 This is reinforced within the emerging LP policy UE13, which the following bullet points address the FAS:

- *Flood Risk Assessment, including detailed fluvial modelling. □
Reduce green field run-off rates and on-site SuDS (Policy DM25)*
- *The design, layout and construction of the development should consider how it can make a positive contribution to the delivery of the Emsworth Flood Alleviation Scheme*
- *Help delivery the Emsworth Flood Alleviation Scheme through a physical and or financial contribution, to the agreement of the Environment Agency*

9.5 Items 1 and 2 above are addressed within the FRA by providing a Sustainable Urban Drainage Management Train, together with reducing development run-off to greenfield discharge rates.

9.6 Item 3 above is provided for by the provision of a new ecological Wetland as detailed within **Appendix E**.

9.7 In summary it is intended to relocate West Brook to form the focal point of the Wetland. West Brook will continue to perform the vital function of conveying water, however it will now be utilised to perform the dual function of providing the base for a new wetland that will form part of the Emsworth FAS.

9.8 The shape and storage capacity of the wetland has been agreed with the Environment Agency to ensure that it can hold between 18,000 and 20,000 cubic meters of storage to assist in the flood protection of the existing built up area downstream of the development site. **Refer Appendix F.**

9.9 Importantly no additional development flow, save that of greenfield run-off, has been taken account of within this capacity. requirement.

- 9.10 Existing field drains, the existing pond outfall and the Southern Water sewer outfall will all be reinstated to the new location of the West Brook to ensure the existing surface water regime is not disrupted.
- 9.11 The drawings provided within **Appendix E**, confirm that the cut and fill exercise has achieved the storage requirement without the need to provide a major earth dam effect at the downstream outfall for the West Brook. Additional work is required during the full modelling stage, to confirm the exact requirements for the outfall structure, however the principle of the wetland has been determined.
- 9.12 This will not only provide an element of the Emsworth FAS, but also a valuable ecological habitat

10.0 RESIDUAL RISKS

Residual flood risk

- 10.1 As the site's residential properties will be built in the redesignated Flood Zone 1 they will not be at significant risk of flooding, even with allowance for climate change.
- 10.2 Extreme rainfall events are generally predictable but by their nature predictions are based on probability and thus subject to uncertainty. Therefore an unquantifiable residual risk remains that events exceeding those predicted may occur, notably surcharging or blockage of sewers or gullies.
- 10.3 If the drainage system is overwhelmed either by a storm event with a magnitude greater than that designed for, or due to a blockage, the finished site levels will be designed to ensure that there is no risk of floodwaters ponding to a significant depth. In addition the overland flow path for any such exceedance storm event will be designed to take overland flow to open space areas such as the village green.

Management

- 10.4 The public drainage systems serving the proposed development will be managed either by the highways adopting authorities such as Hampshire County Council or Southern Water Ltd. For any additional SuDs element of the scheme Hampshire County Council, as required under the FWMA as the lead Local Flood Authority, should the FWMA come into force before the planning permission has been granted. Should this not be the case, a management company would be employed to maintain the SuDs element of the system.

11.0 CONCLUSIONS & RECOMMENDATIONS

Background

- 11.1 This report has been commissioned to assess the risk to, and the impact of, a proposed development of the land west of Horndean Road. It is proposed to provide up to 140 residential dwellings on the site. The proposed residential development is considered as a 'More Vulnerable' when utilising Table 2 of NPPG.
- 11.2 The entire site will lie within a new Zone 1 'Low Probability' flood area as defined by Table 1 of NPPG, once flood compensation works are undertaken. This indicates that the site has less than 1 in 1000 (<0.1%) annual probability of flooding from river or the sea. In assessing the flood risk, the impacts of climate change have been considered for the lifetime of the proposed development and considered acceptable.

Sequential and Exception tests

- 11.3 The Sequential and Exception tests have been applied and deemed to have been passed.

Ground Water Protection

- 11.4 The site is underlain by London Clay and is over a minor non-productive aquifer but not within a ground water protection zone. As such the risk of ground water flooding is negligible.

Flood Risk Management

- 11.5 As the proposed residential development will lie within Flood Zone 1, the risk of flooding from all sources is assessed to be low and the safety of people is considered acceptable in all foreseeable flooding events. No specific flood management measures beyond that of maintenance are considered to be necessary.

Offsite Impacts

- 11.6 The Outline Drainage Strategy set out in this assessment identifies an option for the management of surface water run-off using sustainable drainage techniques. The proposed development will not increase the flood risk elsewhere.

Residual Risks

- 11.7 A residual risk remains that an event exceeding the design parameters used for the drainage system may occur, or part of the drainage system may fail due to a blockage. However, in these circumstances, the general topography of the site would convey floodwaters away from the development and the provision of the flood compensation/Emsworth Flood Alleviation Wetland will assist in helping reduce flooding to the south.

Recommendations

- 11.8 Due to the positive outcome of this Flood Risk Assessment there we see no reason why the site should not continue through the planning process and be approved for residential development in terms of flood risk.

REFERENCES

- Department for Communities and Local Government, 2012 National Planning Policy Framework.
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- The SuDS Manual, CIRIA C697 (2007)
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- Urban South Hampshire Partnership Strategic Flood Risk Assessment 2007.
- Strategic Flood Risk Assessment Supplement - Incorporating Sequential and Exception Tests for the emerging Local Plan (Allocations) October 2013;
- Emsworth Flood Risk Strategy October 2013
- Havant Borough Council Core Strategy
- Havant Borough Councils Local Plan (Allocations)
- British Geological Survey, Geology of Britain viewer:
http://maps.bgs.ac.uk/geologyviewer_google/googleviewer.html
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