



**12 WITTERING ROAD,
HAYLING ISLAND**

FLOOD RISK ASSESSMENT



For

Yeates Design LLP
74 Clerkenwell Road
London
EC1M 5QA



MAY 2013

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**12 WITTERING ROAD,
HAYLING ISLAND**

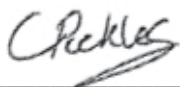
FLOOD RISK ASSESSMENT

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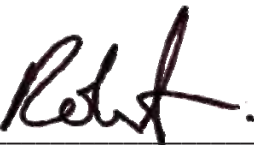
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EXECUTIVE SUMMARY

This Flood Risk Assessment was commissioned by Yeates Design LLP, 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 Wittering Road.

The site is in an area identified as having a 'low' probability of flooding on the Environment Agency's flood mapping data identifies that the site is located within Flood Zone 1, but is in close proximity to Flood Zone 2 and 3. The NPPF only requires that planning applications for development proposals of 1 hectare or greater in Flood Zone 1 should be accompanied by a Flood Risk assessment; however to achieve the requirements of the Code for Sustainable Homes (SUR1 and SUR2) a Flood Risk Assessment has been undertaken. The residential nature of the development proposals means the classification of the site is 'more vulnerable' from NPPF Table 2.

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.

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. The proposals include the introduction of sustainable Drainage Systems (SUDS) in the form of permeable surfaces will provide numerous benefits and will assist in reducing the runoff and peak discharge of surface water flows from the development.

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.

This report is considered to satisfy the Flood Risk Assessment requirements of SUR1 and SUR2 of the Code for Sustainable Homes as required by BRE.

CONTENTS

Document Tracking Sheet	iii
EXECUTIVE SUMMARY	v
Figures & Tables	7
Specialist Software	7
Abbreviations & Acronyms	7
1.0 INTRODUCTION	8
1.1 Planning Policy Context	8
1.2 Site Context	8
1.3 Consultation	8
2.0 EXISTING SITE SITUATION	9
2.1 Location	9
2.2 Existing and Historical Land Use	9
3.0 DEVELOPMENT PROPOSALS	10
3.1 Nature of the development	10
4.0 SOURCES OF FLOOD RISK	11
4.1 Fluvial Flood Risk	11
4.2 Tidal Flood Risk	11
4.3 Artificial Sources of Flood Risk	11
4.4 Pluvial Flood Risk	12
4.5 Groundwater Flood Risk	12
4.6 Sewer Flood Risk	13
4.7 Strategic Flood Risk Assessment (SFRA) Information	13
4.8 Historical and Anecdotal Flooding Information	13
4.9 Flood Risk Vulnerability Classification and Flood Zone Compatibility	13
4.10 Mitigation Measures	13
4.11 Residual Risks	14
5.0 SURFACE WATER MANAGEMENT	15
5.1 Pre-development Surface Water Run-off	15
5.2 Post-development Surface Water Run-off	15
5.3 Sustainable Drainage Systems (SuDS)	15
5.4 Methods of Surface Water Management	16
5.5 Discharge via Infiltration	16
5.6 Discharge to Watercourse	17
5.7 Discharge to Sewer	17
5.8 Climate Change	17
6.0 FOUL WATER MANAGEMENT	19
7.0 SUMMARY AND CONCLUSIONS	20
8.0 RECOMMENDATIONS	22
BIBLIOGRAPHY & REFERENCES	23
APPENDIX A: LOCATION PLAN	25
APPENDIX B: PROPOSED PLANNING LAYOUT	27
APPENDIX C: EA FLOODING INFORMATION & CORRESPONDENCE	29

APPENDIX D:	FEH CATCHMENT DATA & DESCRIPTORS	31
APPENDIX E:	NPPF TECHNICAL GUIDANCE EXTRACTS.....	33
APPENDIX F:	WATER COMPANY RECORDS & CORRESPONDENCE	35
APPENDIX G:	LA CORRESPONDENCE	37
APPENDIX H:	SURFACE WATER RUN-OFF CALCULATIONS.....	39
APPENDIX I:	STORMWATER STORAGE ESTIMATES.....	41
APPENDIX J:	SFRA INFORMATION	43
APPENDIX K:	NOTES OF LIMITATION	45

Figures & Tables

Figure 1: Aerial Photograph of site (Google Maps 2013).....	9
Figure 2: Planning Layout Extract (Yeates Design & Architecture 2013).....	10
Figure 3: Flood Zone Map Extract (Environment Agency 2013)	11
Figure 4: Reservoir Flood Map Extract (Environment Agency 2013).....	12

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		

1.0 INTRODUCTION

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 NPPF only requires that planning applications for development proposals of 1 hectare or greater in Flood Zone 1 should be accompanied by a Flood Risk Assessment; however to achieve the requirements of the Code for Sustainable Homes (SUR1 and SUR2) a Flood Risk Assessment has been undertaken.

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.

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 C).
- 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 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 F).

2.0 EXISTING SITE SITUATION

2.1 Location

- 2.1.1 The development is accessed off Wittering Road, Hayling Island. The Ordnance Survey National Grid Reference (OS NGR) for the site is 474882 (Easting), 98706 (Northing) and the nearest postcode is PO11 9SP. The site location plan is shown in Appendix A.
- 2.1.2 The site is bounded; to the north by Bracklesham Bay, to the east by residential dwellings off Wittering Road with Bracklesham Road Beyond, to the south by Wittering Road and residential dwellings off Wittering Road and to the west by further residential dwellings off Wittering Road.
- 2.1.3 The total site area is approximately 923m², the site is considered to be 40% impermeable (determined from the proposed layout and aerial photographs) for the purposes of determining the pre-development surface water run-off.



Figure 1: Aerial Photograph of site (Google Maps 2013)
Birds Eye view of the proposed development area

2.2 Existing and Historical Land Use

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

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 923m² and is considered to be 40% impermeable; the proposed impermeable area of the development will be reduced slightly to approximately 45% of the total site area, however the external areas of hardstanding proposed are permeable paving.

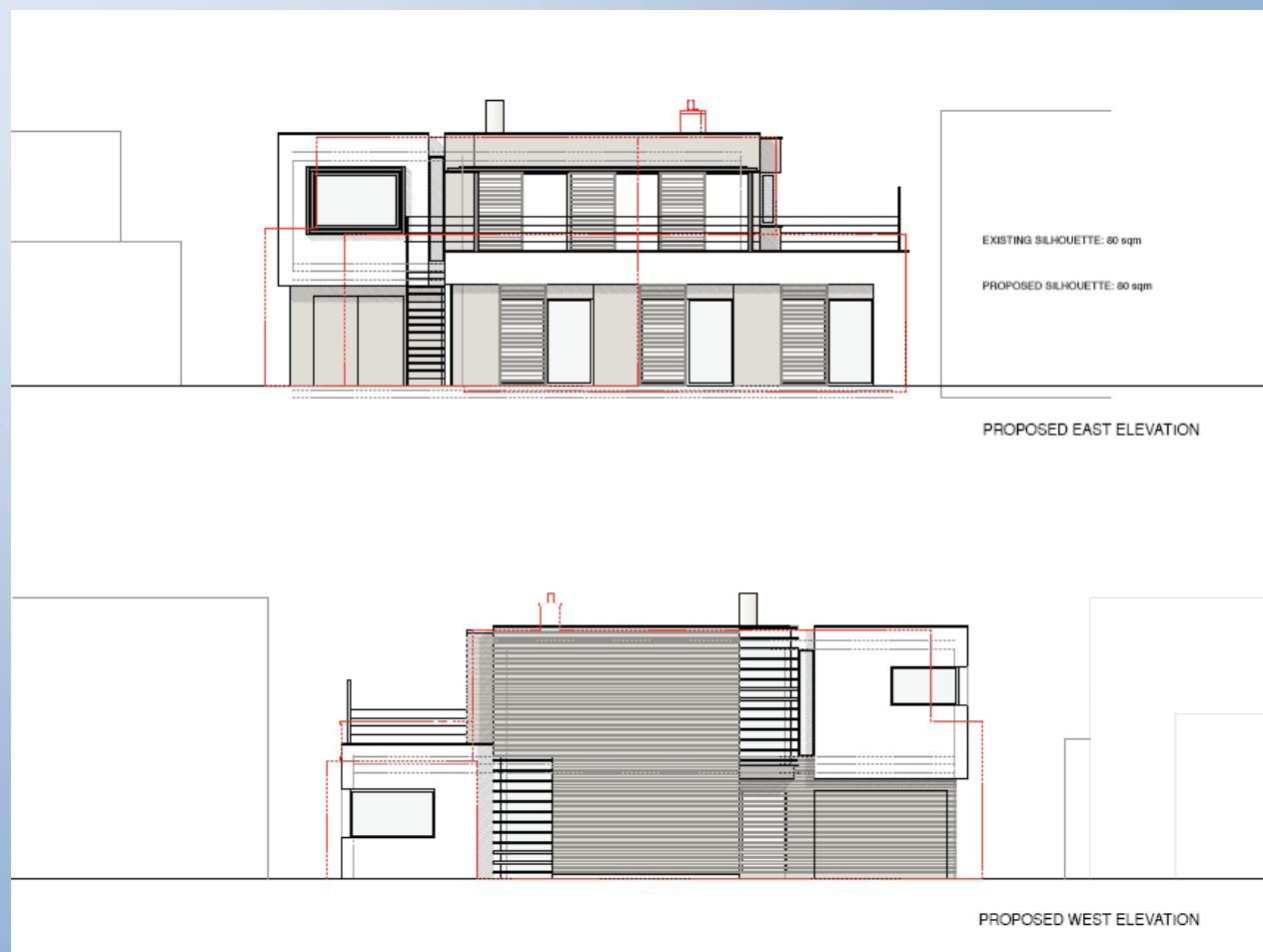
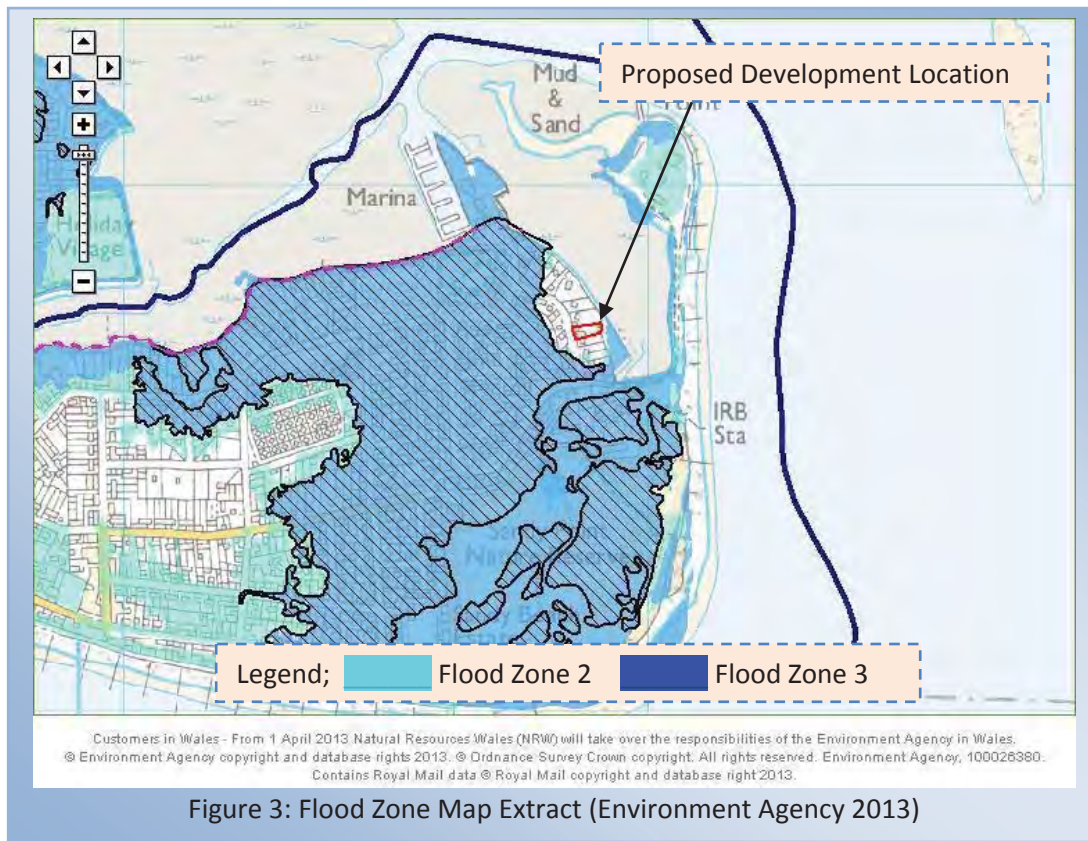


Figure 2: Planning Layout Extract (Yeates Design & Architecture 2013)

4.0 SOURCES OF FLOOD RISK

4.1 Fluvial 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 3 (below).
- 4.1.2 Examination of the Flood Map shows that the site is located within Flood Zone 1, however it is within close proximity to Flood Zones 2 and 3; Appendix C shows the online flood map and statement in full.



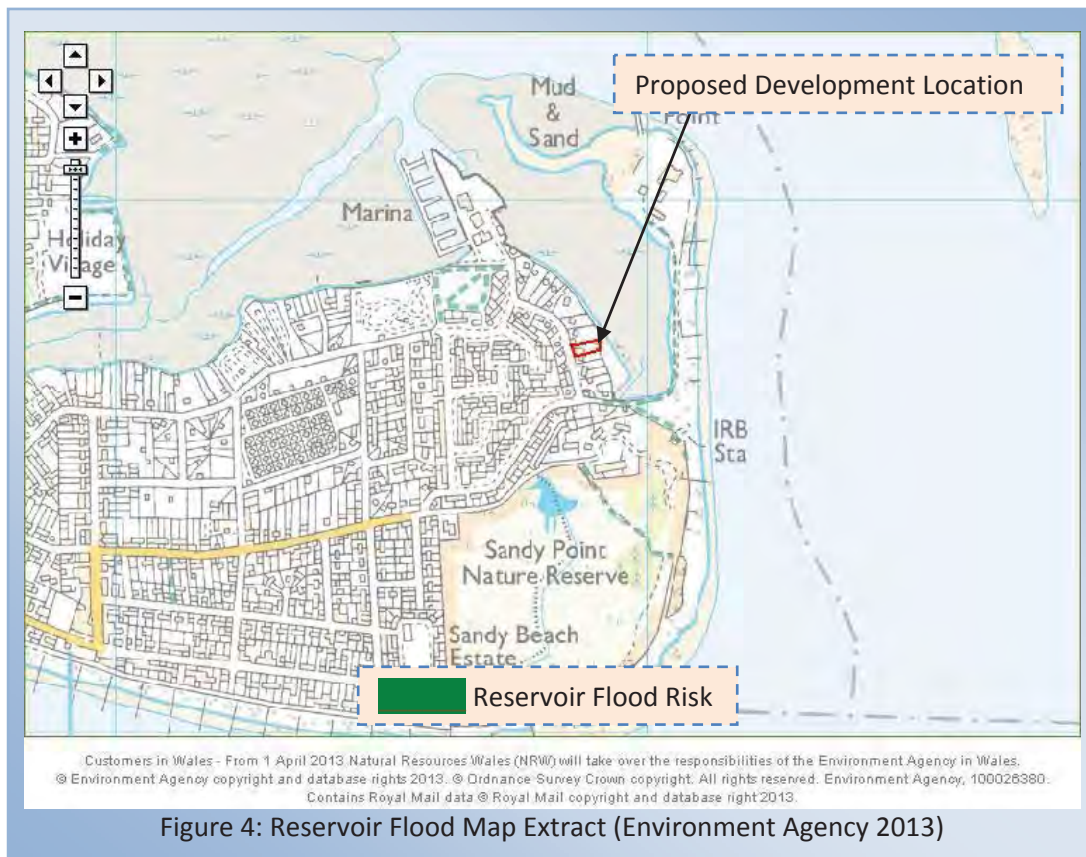
4.2 Tidal Flood Risk

- 4.2.1 Due to the site location it is potentially at risk of flooding from tidal sources the site itself is located in Flood Zone 1 but the local surrounding area is considered to be with in Flood Zones 2 and 3.

4.3 Artificial Sources of Flood Risk

- 4.3.1 Due to the site location and elevation relative to any artificial bodies of water such as reservoirs or canals the risk of flooding from this source is considered low. Figure 4 on the following page shows an extract of the EA's online Reservoir flood map; Appendix C shows the EA's reservoir flood map in full.

- 4.3.2 There are no canals within the immediate vicinity of the proposed development that present a flood risk to the site.



4.4 Pluvial Flood Risk

- 4.4.1 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.
- 4.4.2 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 hardstanding.
- 4.4.3 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.

4.5 Groundwater Flood Risk

- 4.5.1 In general terms groundwater flooding can occur from three main sources: - raised water tables, seepage and percolation and groundwater recovery or rebound.

- 4.5.2 If groundwater levels are naturally close to the surface then this can present a flood risk during times of intense rainfall. No groundwater flood risk has been identified during consultation with the various interested parties.
- 4.5.3 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.
- 4.5.4 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.

4.6 Sewer Flood Risk

- 4.6.1 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.
- 4.6.2 Consultation with various parties has not identified any existing sewer flood risk issues or historical flooding of the immediate site area.

4.7 Strategic Flood Risk Assessment (SFRA) Information

- 4.7.1 The SFRA indicates that the site is not located within functional floodplain and there are no specific flood risks to the development area.

4.8 Historical and Anecdotal Flooding Information

- 4.8.1 An Internet based search for flooding events did not recall any historical flooding in the immediate site area.
- 4.8.2 Consultation with various interested parties also failed to highlight any historical flooding to the development area.

4.9 Flood Risk Vulnerability Classification and Flood Zone Compatibility

- 4.9.1 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 Zone 1.

4.10 Mitigation Measures

- 4.10.1 Although the proposed development is within Flood Zone 1 it is proposed that a minimum Finished Floor Level (FFL) be set in view of the close proximity to Flood Zone 2 and 3. The

proposed minimum Finished Floor Level should be set a minimum of 600mm above the existing ground level to minimise the risk of overland flows impacting the proposed development.

- 4.10.2 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.
- 4.10.3 As with any development 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.
- 4.10.4 To minimise the flood risk to neighboring development 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.

4.11 Residual Risks

- 4.11.1 The development is accessible for emergency access and egress during times of extreme flooding as the floodplain does not extend into the proposed development.
- 4.11.2 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.
- 4.11.3 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.
- 4.11.4 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.

5.0 SURFACE WATER MANAGEMENT

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 both Brownfield; the total area of the site is 923m² (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 1.5l/s based on an area of 923m².
- 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 36m³; 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 means that there will be an increase in the impermeable area of the site to approximately 410m²(45%), resulting in an increase 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 410m², approximately 45% of the total development area; however it is proposed that the external areas of hardstanding be pervious to reduce this figure.
- 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 35.8m³; 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 exact type of SuDS will be determined at the detailed design stage; however the proposals include the introduction of sustainable Drainage Systems (SUDS) in the form of permeable surfaces will provide numerous benefits and will assist in reducing the runoff and peak discharge of surface water flows from the development.

5.4 Methods of Surface Water Management

- 5.4.1 At present the site is Brownfield; the total site area is 923m² and is considered to be 40% impermeable.
- 5.4.2 The proposed impermeable area of the development is approximately 45% 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: *London Clay Formation - Clay, Silt And Sand. Sedimentary Bedrock formed approximately 34 to 55 million years ago in the Palaeogene Period. Local environment previously dominated by deep seas.*

Setting: *Deep seas. These rocks were formed in deep seas from infrequent slurries of shallow water sediments which were then redeposited as graded beds.*

1:50 000 scale superficial deposits description: *Beach and Tidal Flat Deposits (Undifferentiated) - Clay, Silt, Sand and Gravel. Superficial Deposits formed up to 2 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.*

- 5.5.3 The National Soil Resources Institute (NSRI) indicates that the nature of the soil is likely to be; loamy with naturally high ground water; drainage is considered impeded.
- 5.5.3 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. 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 to the public sewer network, mimicking the pre-development scenario.
- 5.7.3 The pre-developed peak rate of run-off is calculated to be approximately 1.5l/s, the post-development peak rate of run-off is calculated to be 1.5l/s; however the introduction of permeable paving to the external areas of hardstanding reduces this peak rate of run-off to 1.3l/s.
- 5.7.4 Restricting the surface water discharge to 5l/s generates a storage requirement during periods of intense rainfall. The resultant stormwater storage requirement for the 1 in 1 year return period storm event with a restricted discharge rate of 5l/s and an impermeable area of 410m² is approximately between 0m³ and 0.4m³.
- 5.7.5 The resultant storage requirement for the 1 in 30 year return period storm event with a restricted discharge rate of 5l/s and an impermeable area of 410m² is approximately between 1.1m³ and 4.6m³. It is proposed that the attenuated flows for these storm events be stored within traditional below ground sewer systems.
- 5.7.6 The resultant storage requirement for the 1 in 100 year return period storm event plus a 30% allowance for Climate Change with a restricted discharge rate of 5l/s and an impermeable area of 410m² is approximately between 6.1m³ and 12m³.

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.
- 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.

6.0 FOUL WATER MANAGEMENT

- 6.1 At present the foul water flows, are understood discharge to the public sewer network.
- 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).
- 6.3 It is proposed that the foul water generated by the development continue to be discharged to the public sewer network via the existing connection.

7.0 SUMMARY AND CONCLUSIONS

- 7.1 The Flood Risk Assessment has been prepared to support an outline planning application for the replacement of an existing dwelling off Wittering Road.
- 7.2 The site is in an area identified as having a 'low' probability of flooding on the Environment Agency Flood Map and is located in Flood Zone 1; but is within close proximity to Flood Zone 2 and 3.
- 7.3 NPPF only requires that planning applications for development proposals of 1 hectare or greater in Flood Zone 1 should be accompanied by a Flood Risk Assessment; however to achieve the requirements of the Code for Sustainable Homes (SUR1 and SUR2) a Flood Risk Assessment has been undertaken.
- 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. Consultation with various interested parties also failed to highlight any historical flooding in or adjacent to the proposed development area.
- 7.6 As a result of the relatively low flood risk from all of the sources reviewed, the principle focus of the Flood Risk Assessment is on the effective management of surface water drainage.
- 7.7 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. It may be possible to use infiltration as a part solution; however soakaway testing to BRE365 in specific locations where this may be practical will be required to determine feasibility.
- 7.8 It is proposed that the flows generated by the development continue to discharge to the public sewer network, mimicking the pre-development scenario. The proposals include the introduction of sustainable Drainage Systems (SUDS) in the form of permeable surfaces will provide numerous benefits and will assist in reducing the runoff and peak discharge of surface water flows from the development.
- 7.9 Restricting the surface water discharge to 5l/s generates a storage requirement during periods of intense rainfall. The resultant stormwater storage requirement for the 1 in 1 year return period storm event with a restricted discharge rate of 5l/s and an impermeable area of 410m² is approximately between 0m³ and 0.4m³.
- 7.10 The resultant storage requirement for the 1 in 30 year return period storm event with a restricted discharge rate of 5l/s and an impermeable area of 410m² is approximately between 1.1m³ and 4.6m³.
- 7.11 The resultant storage requirement for the 1 in 100 year return period storm event plus a 30% allowance for Climate Change with a restricted discharge rate of 5l/s and an impermeable area of 410m² is approximately between 6.1m³ and 12m³.

- 7.12 The development is accessible for emergency access and egress during times of extreme flooding as the floodplain does not extend into the development area.
- 7.13 As with any drainage system blockages within either the foul or surface water sewer systems have the potential to cause flooding or disruption.
- 7.14 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, and is considered to satisfy the Flood Risk Assessment requirements of SUR1 and SUR2 of the Code for Sustainable Homes as required by BRE.

8.0 RECOMMENDATIONS

- 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 Any overland flows generated by the proposed development must be directed away from the adjacent existing buildings; safe avenues of overland flow are advised.

BIBLIOGRAPHY & REFERENCES

CIRIA 522: Sustainable urban drainage systems – design manual for England and Wales (2000).
CIRIA 523: Sustainable urban drainage systems – best practice manual (2001).
CIRIA 609: Sustainable drainage systems. Hydraulic, structural and water quality advice (2004).
CIRIA 624: Development and flood risk – guidance for the construction industry (2004).
CIRIA 635: Designing for exceedance in urban drainage: Good practice (2006).
CIRIA 644: Building Greener (2007).
CIRIA 697: The SUDS manual (2007).
Flood Risk to People – Phase 2 (FD2321/TR2), DEFRA and the Environment Agency (2006).
Flood estimation for small catchments: Institute of Hydrology Report No.124, NERC (1994).
Flood Estimation Handbook, Centre for Ecology and Hydrology (1999).
National Planning Policy Framework (NPPF), CLG (2012).
Planning Policy Statement 25: Development and Flood Risk (2006).
Sewers for Adoption 7th Edition, WRc (2012).
Technical Guidance to the National Planning Policy Framework, CLG (2012).

Web-based references

Bingmaps – <http://www.bing.com/Maps/>
British Geological Survey – <http://www.bgs.ac.uk/opengeoscience/home.html>
Chronology of British Hydrological Events – www.dundee.ac.uk/
CIRIA – <http://www.ciria.org/>
Cranfield University – <http://www.landis.org.uk/soilscapes/>
Environment Agency – www.environment-agency.gov.uk/
FloodProBE – <http://www.floodprobe.eu/>
Flood Forum – <http://www.floodforum.org.uk/>
Flood London – <http://www.floodlondon.com/>
Flood Resilience Group – <http://www.floodresiliencgroup.org/frg/>
Google Maps – <http://maps.google.co.uk/>
London Resilience – <http://www.londonprepared.gov.uk/>
Shire Group of IDB's – <http://www.shiregroup-idbs.gov.uk/default.asp>
Streetmap – <http://www.streetmap.co.uk/>
US Army Corps of Engineers – <http://www.hec.usace.army.mil/software/hec-ras/>
Watertight International – <http://www.watertightinternational.com/>

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APPENDIX A: LOCATION PLAN

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LOCATION PLAN

12 WITTERING ROAD, HAYLING ISLAND



OS X (Easting)	474882
OS Y (Northing)	98706
Nearest Post Code	PO11 9SP
Lat (WGS84)	N50:46:59 (50.783103)
Long (WGS84)	W0:56:21 (-0.939173)
LR	SZ748987
mX	-104548
mY	6549891

APPENDIX B: PROPOSED PLANNING LAYOUT

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**Yates
Design+Architecture**

74 Clerkenwell Road
London EC3M 5NL

Tel: 020 7251 6667
www.yatesdesign.co.uk

**12 WITTERING ROAD
HAYLING ISLAND PO11 9SP**

**Visuals of Proposed
East Elevation**

DATE: 1.100@A3, 1.50@A1

DATE: APRIL 2013

NO. DIM/BY

DRAWING STATUS: FOR TENDER

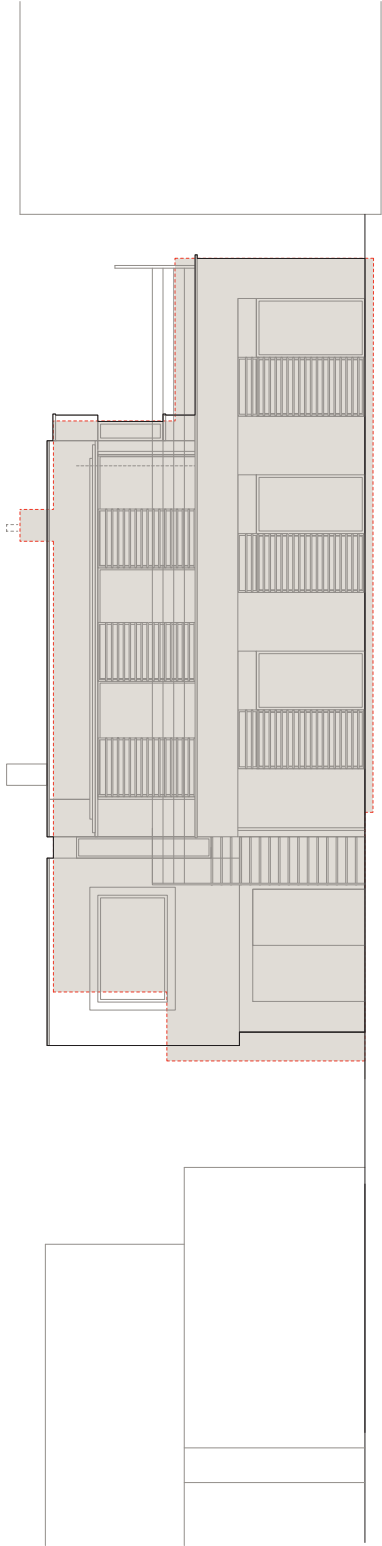
PLANNING FOR CONSTRUCTION



PROPOSED WEST ELEVATION

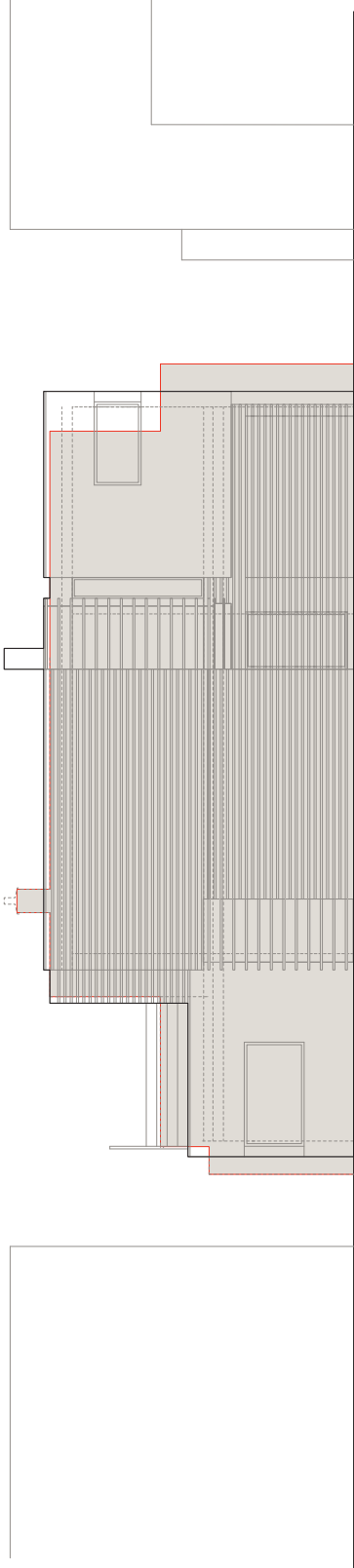
		 Yeates Design+Architecture 74 Clerkenwell Road London EC1M 5NL tel: 020 7251 6667 www.yeatesdesign.co.uk	PROJECT : 12 WITTERING ROAD HAYLING ISLAND PO11 9SP	DRAWING: Visuals of Proposed West Elevation	SCALE : 1:100@A3, 1:50@A1	DATE : APRIL 2013	DWG NO. 528/P/012	DWN BY : ☐	DRAWING STATUS : ☐ FOR TENDER ☐ FOR PLANNING ☐ FOR CONSTRUCTION
--	--	--	--	--	--------------------------------------	------------------------------	------------------------------	--	---

OUTLINE OF EXISTING HOUSE TO BE DEMOLISHED	
REV A Replacing existing with new house APR 2013	
Y Yeates Design+Architecture 74 Clerkenwell Road London EC1M 5NL tel: 020 7251 6667 www.yeatesdesign.co.uk	
PROJECT : 12 WITTERING ROAD HAYLING ISLAND PO11 9SP	
DRAWING : Silhouette of Existing and Proposed Elevations	
SCALE : 1:100@A3, 1:50@A1	
DATE : APRIL 2013	
DWG NO. 528/P/011 A	
DWN BY :	
DRAWING STATUS : FOR TENDER FOR PLANNING FOR CONSTRUCTION	



PROPOSED EAST ELEVATION WITH EXISTING OUTLINE

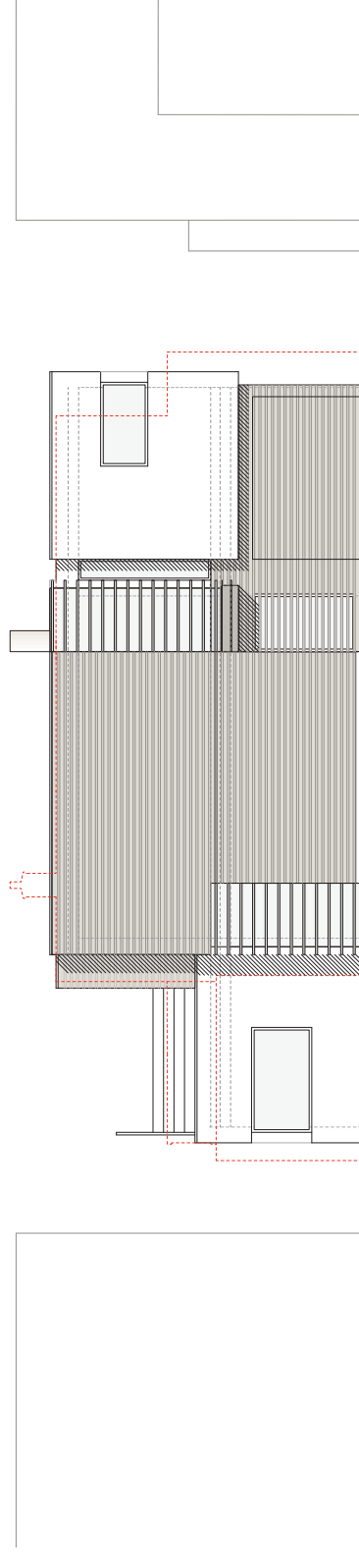
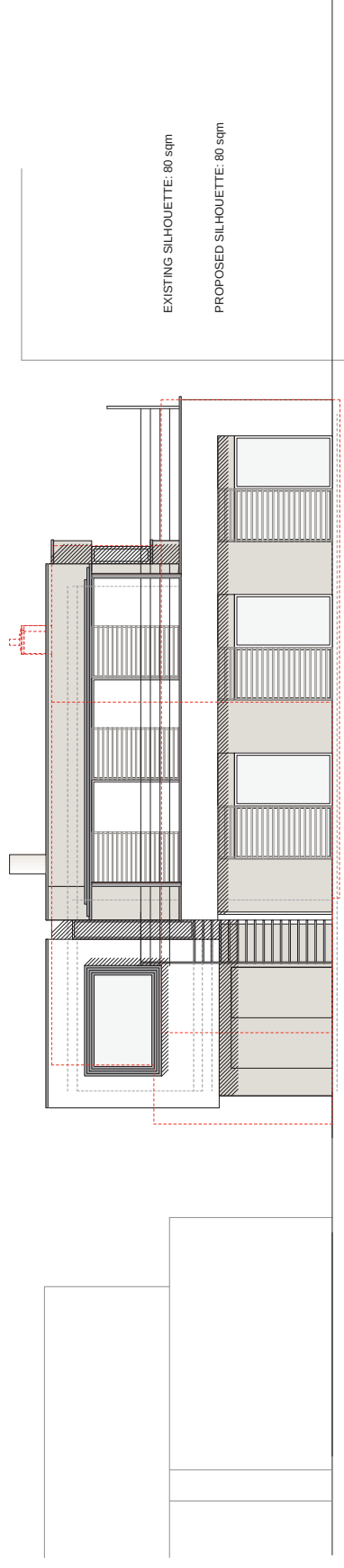
SILHOUETTE CALCULATIONS:
EXISTING SILHOUETTE: 79.9 sqm
PROPOSED SILHOUETTE: 79.0 sqm



PROPOSED EAST ELEVATION WITH EXISTING OUTLINE

SILHOUETTE CALCULATIONS:
EXISTING SILHOUETTE: 80.5 sqm
PROPOSED SILHOUETTE: 79.5 sqm





REV A
Replacing existing with new house

**Yeates
Design+Architecture**
74 Clerkenwell Road
London EC1M 5NL
tel: 020 7251 6667
www.yeatesdesign.co.uk

PROJECT : 12 WITTING ROAD
HAYLING ISLAND PO11 9SP

DRAWING : Proposed Elevations - Sheet 1

SCALE : 1:100@A3, 1:50@A1

DATE: APRIL 2013

DWG NO.

528/P/010

DWN BY :

A

DRAWING STATUS : ☐ FOR TENDER ☐ FOR CONSTRUCTION
☐ FOR PLANNING ☐

OUTLINE PREVIOUSLY
PROPOSED EXTENSION
OUTLINE DEMOLITION
OF EXISTING HOUSE

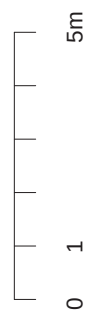
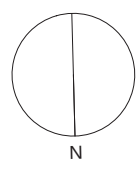
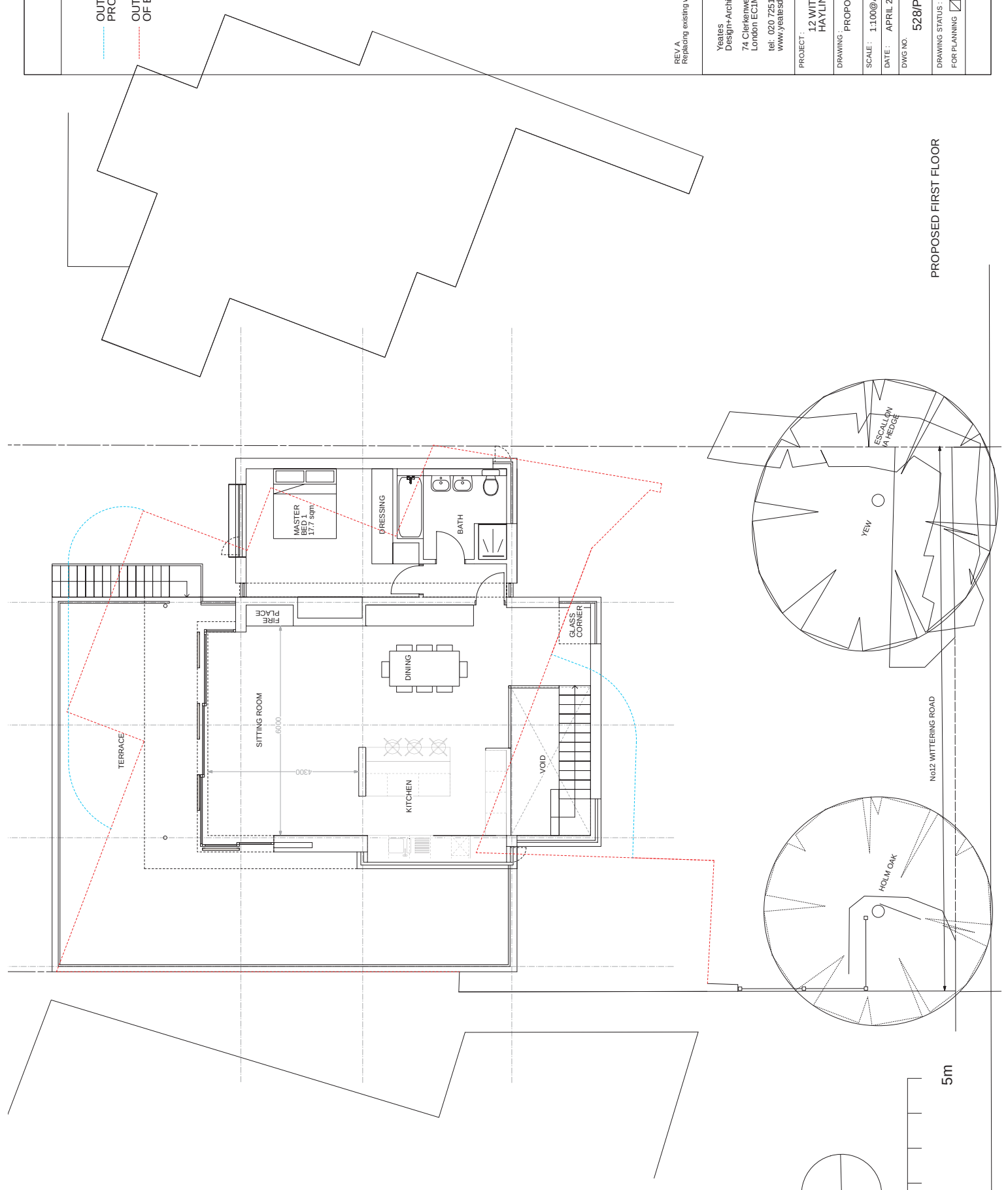
REV A
Replacing existing with new house
APR 2013

Yeates
Design+Architecture
74 Clerkenwell Road
London EC1M 5NL
tel: 020 7251 6667
www.yeatesdesign.co.uk

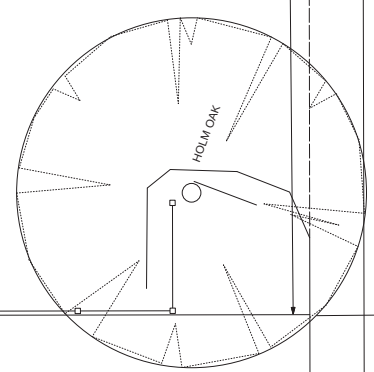
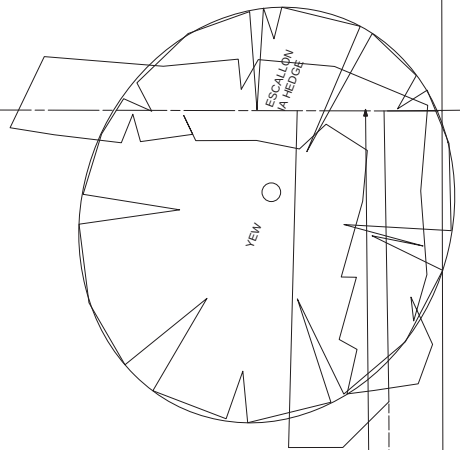
PROJECT :
12 WITTERING ROAD
HAYLING ISLAND PO11 9SP
DRAWING :
PROPOSED FIRST FLOOR

SCALE :
1:100@A3, 1:50@A1
DATE :
APRIL 2013
DWG NO.
528/P/007
DWN BY :
A

DRAWING STATUS :
FOR TENDER
FOR PLANNING
FOR CONSTRUCTION



PROPOSED FIRST FLOOR



No12 WITTERING ROAD

APPENDIX C: EA FLOODING INFORMATION & CORRESPONDENCE

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Enter a postcode or place name:

Other topics for this area...

Risk of Flooding from Rivers and Sea

Go

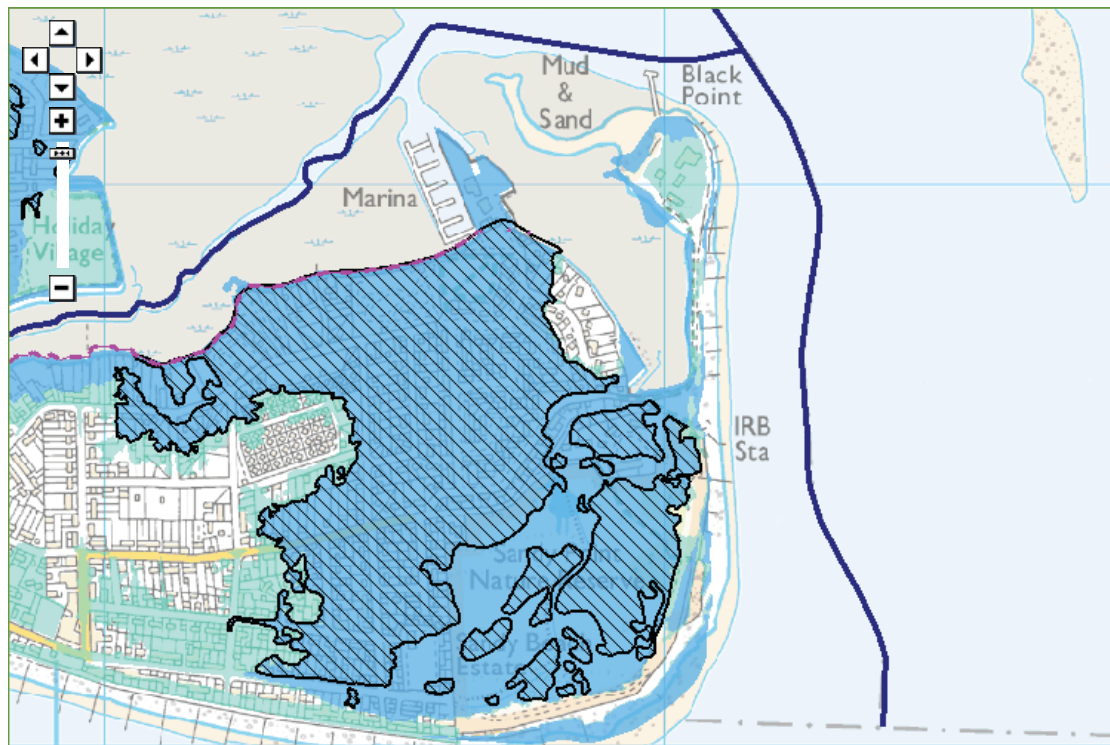
Map legend

Click on the map to see what is the Risk of Flooding at a particular location.

☒ Flood Maps [i](#)

- Flooding from rivers or sea without defences
- Extent of extreme flood
- Flood defences (Not all may be shown*)
- Areas benefiting from flood defences (Not all may be shown*)
- Main rivers

Map of X: 474,825; Y: 98,654 at scale 1:10,000

[Data search](#)[Text only version](#)

Customers in Wales - From 1 April 2013 Natural Resources Wales (NRW) will take over the responsibilities of the Environment Agency in Wales.
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 Contains Royal Mail data © Royal Mail copyright and database right 2013.
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Flood Map – Information Warnings

Manchester Ship Canal

Flood Mapping of the Manchester Ship Canal in Trafford, Salford and Warrington was updated 9 August 2012 as a result of a judgment of the High Court. The judgment concluded that the Ship Canal sluice gates should not be regarded as 'formal' flood defences and that our decision to map the Ship Canal flood zones as if the sluice gates were closed was unlawful. We have applied to the Court of Appeal to appeal against this judgment, and we will keep this caveat updated. For further information please contact the Environment Agency on 03708 506 506.

*** Legend Information:** Flood defences and the areas benefiting from them are gradually being added through updates. Please contact your [local environment agency office](#) for further details.

More about flooding:

Understanding the flood map

A more detailed explanation to help you understand the flood map shown above.

Current flood warnings

We provide flood warnings online 24 hours a day. Find out the current flood warning status in your local area.

Flood map - your questions answered

Answers to commonly asked questions about the flood map.



Interactive Maps

Flood Risk for X:474880, Y:98714

Be prepared

We do not have an assessment of flood risk for the area which you have selected. This may be because the area selected is outside the floodplain. It could also be because we have been unable to assess the likelihood of flooding for this area because we did not have sufficient information (this applies to fewer than 1% of the properties in England and Wales in the flood outline)

For a fuller explanation of flood likelihood, [click here](#).

Be aware:

Our maps only cover flooding from rivers and the sea. Flooding can occur at any time and in any place from sources such as rising ground water levels, burst water mains, road drains, run-off from hillsides, sewer overflows etc.

[Click here](#) to find out more.

To find out how to be prepared for all types of flooding go to our [Floodline](#) pages or call Floodline on tel: 0845 988 1188.

The information on the likelihood of flooding is not intended to be used by people applying for planning permission for new developments. To find out how the Flood Map can help when planning a new development, [click here](#).

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Author: The Environment Agency | WIYBY.SUPPORT@environment-agency.gov.uk
Last updated: 16th April 2013

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© Environment Agency 2013



Enter a postcode or place name:

Other topics for this area...

Risk of Flooding from Reservoirs

PO11 9SP

Go

Risk of Flooding from Reservoirs

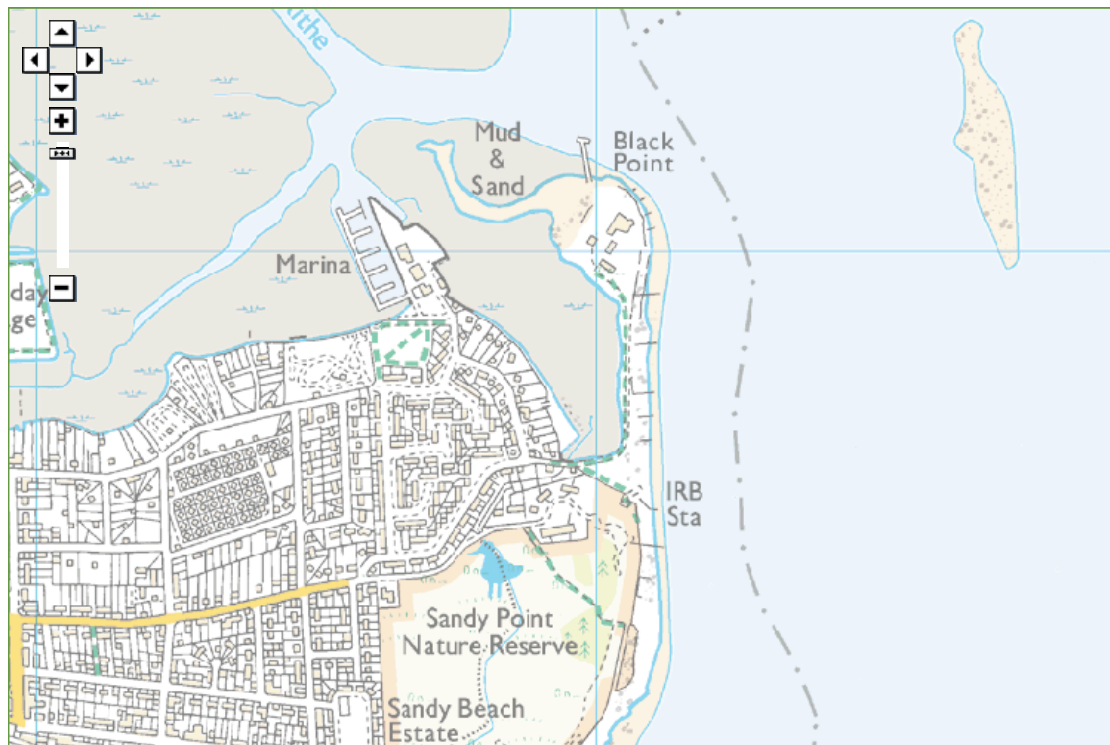
Map legend

Click within the extent of flooding to see which reservoirs affect this area

☒ Risk of Flooding from Reservoirs

Maximum extent of flooding

PO11 9SP at scale 1:10,000

[Data search](#)[Text only version](#)

Customers in Wales - From 1 April 2013 Natural Resources Wales (NRW) will take over the responsibilities of the Environment Agency in Wales.
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 Contains Royal Mail data © Royal Mail copyright and database right 2013.
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Find out more:

This map shows the largest area that might be flooded if a reservoir were to fail and release the water it holds. Since this is a prediction of a worst case scenario, it's unlikely that any actual flood would be this large.

Remember - reservoir flooding is extremely unlikely. There has been no loss of life in the UK from reservoir flooding since 1925. Since then reservoir safety legislation has been introduced to make sure [reservoirs are well maintained](#).

Please note that only flood maps for large reservoirs are displayed. Flood maps are not displayed for smaller reservoirs or for reservoirs commissioned after reservoir mapping began in spring 2009. The reservoir flood maps also don't give any information about how likely any area is to be flooded.

If your property is within the green highlighted area, then you could be affected by reservoir flooding. To find out more about the reservoirs that could cause this flooding, click on the map within the green highlighted area. You will find the name and ownership details of the reservoirs that could cause flooding in your area.

If you want to find out about local emergency plans you should [contact the local authority](#) responsible for that emergency plan but be aware that these reservoir flood plans may take some time to develop. You can find out which local authority to contact by clicking on the map.

[Reservoir flooding](#)[Guidance for people living near reservoirs](#)[Your questions answered](#)[Who to contact](#)

Chris Pickles

From: SSD Enquiries [SSDEnquiries@environment-agency.gov.uk]
Sent: 07 May 2013 15:19
To: Chris Pickles
Subject: (SSD/906/LT) 130427/DT04 FW: 12 Wittering Road, Hayling Island
 Dear Christopher,

Thank you for your enquiry.

A product 4 will cost £50 (excluding VAT.)

This will include:

A site centred map zoomed to your point of interest, showing:

- Ordnance Survey 1:25k colour raster base mapping;
- Flood Zone 2 and Flood Zone 3;
- Relevant model node locations and unique identifiers (for cross referencing to the water levels, depths and flows table);
- Model(s) extents;
- FRA site boundary (where a suitable GIS layer is supplied);
- Flood defence locations (where available/relevant) and unique identifiers;
- Flood Map areas benefiting from defences (where available/relevant);
- Flood Map flood storage areas (where available/relevant);
- Historic flood events outlines (where available/relevant, not the Historic Flood Map) and unique identifiers;
- Statutory (Sealed) Main River (where available within map extents);
- Bank top ePlanning tool; and
- A table showing:
 - i) model node X/Y coordinate locations, unique identifiers, levels, flows and JFLOW depths;
 - ii) Flood defence locations unique identifiers and attributes;
 - iii) Historic flood events outlines unique identifiers and attributes; and
 - iv) local flood history data (where available/relevant).

Please advise us which product you require and look at the following site to ensure that the product you require is suitable for your site <http://www.environment-agency.gov.uk/research/planning/93498.aspx>

If I can provide any further assistance, please do not hesitate to contact me.

We would be really grateful if you could spare five minutes to help us improve our service. Please click on the link below and fill in our survey – we use every piece of feedback we receive:
<http://www.surveymonkey.com/link/453a2>

Yours sincerely

Luke Thompson
Customers & Engagement Officer
 The Environment Agency - South East (Solent and South Downs Area)
Telephone: 01903 832064
Email: ssdenquiries@environment-agency.gov.uk
Write: Guildbourne House, Chatsworth Road, Worthing, West Sussex, BN11 1LD

From: Chris Pickles [mailto:Chris.Pickles@betts-associates.co.uk]
Sent: 26 April 2013 08:18
To: Enquiries, Unit
Subject: 12 Wittering Road, Hayling Island

To whom it may concern,

12 Wittering Road, Hayling Island, PO11 9SP

Please could you provide product 4. In addition, please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment for the above site (location plan attached), including details of historical flooding; this would be greatly appreciated.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind regards

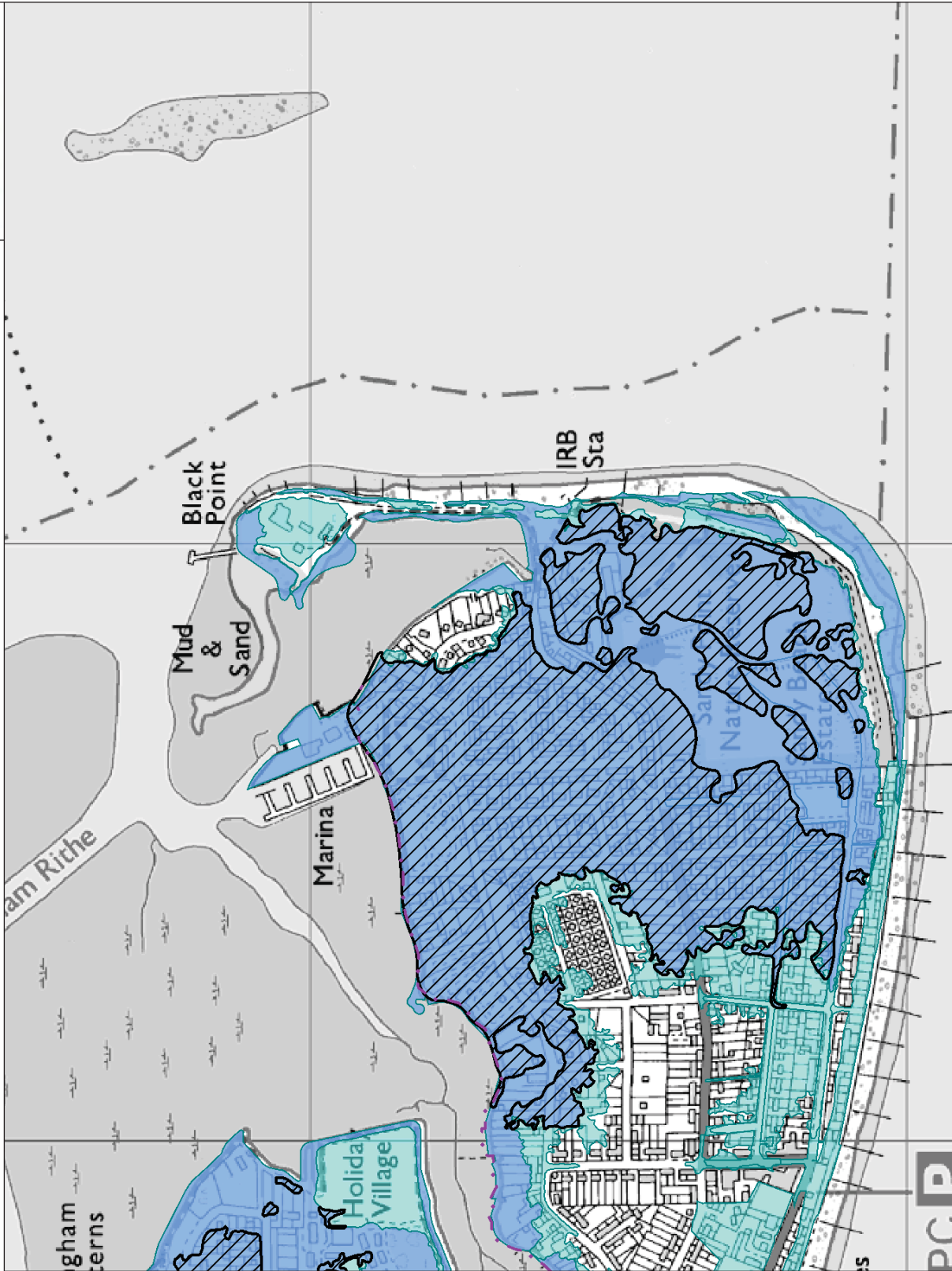
Christopher Pickles
 Engineering Technician

Betts Associates Ltd

-

14/05/2013

(SSD/906/LT) Flood Map centred on 12 Wittering Road. Produced 14/05/2013



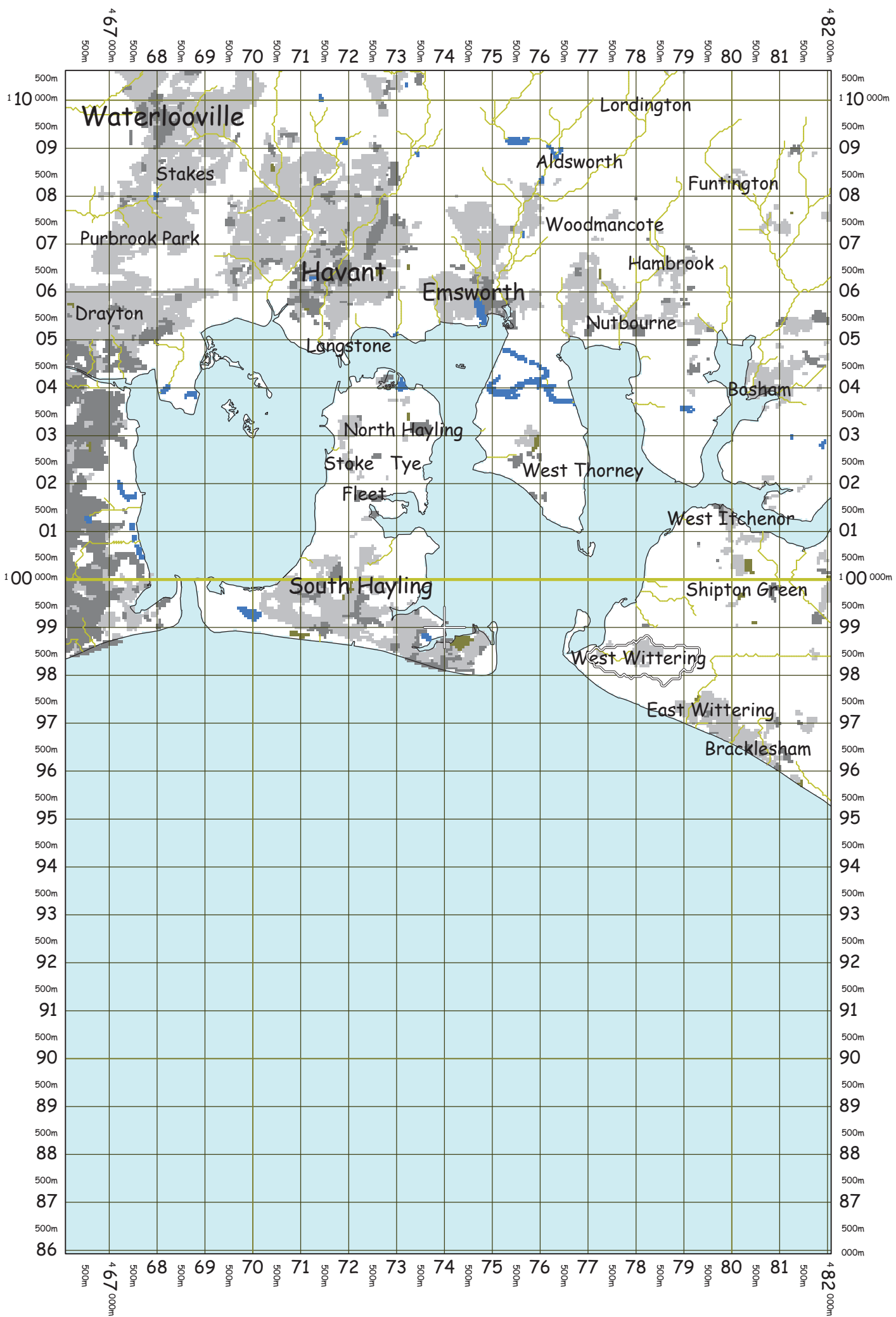
- Legend**
- Flood Map - Defences
 - Areas Benefiting from Flood Defences
 - Flood Map - Flood Storage Areas
 - Flood Map - Flood Zone 3
 - Flood Map - Flood Zone 2



0 95 190 285 m.

APPENDIX D: FEH CATCHMENT DATA & DESCRIPTORS

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VERSION	FEH CD-ROM	Version	3	exported at	14:29:08 GMT	Fri 26-Apr-13
CATCHMENT	GB	477150	98550	SZ 77150 98550		
AREA		1.38				
ALTBAR		4				
ASPBAR		286				
ASPVAR		0.36				
BFIHOST		0.695				
DPLBAR		1.47				
DPSBAR		4.5				
FARL		1				
LDP		3.12				
PROPWET		0.34				
RMED-1H		9.2				
RMED-1D		33.7				
RMED-2D		42.2				
SAAR		680				
SAAR4170		705				
SPRHOST		29.52				
URBCONC1990		0.445				
URBEXT1990		0.098				
URBLOC1990		0.883				
C		-0.026				
D1		0.422				
D2		0.26887				
D3		0.38551				
E		0.30738				
F		2.27328				
C(1 km)		-0.027				
D1(1 km)		0.429				
D2(1 km)		0.268				
D3(1 km)		0.382				
E(1 km)		0.309				
F(1 km)		2.244				

DESIGN RAINFALL DEPTHS

Calculate : Design rainfall for

☒ catchment 477150 98550 [SZ 77150 98550]
☐ 1 km grid point 474000 99000 [SZ 74000 99000]
☐ Manually entered values for a point

Area : 1.3775 km²

C : -0.02600 D3 : 0.38551
D1 : 0.42200 E : 0.30738
D2 : 0.26887 F : 2.27328

Duration : 6 Hours ☐ Fixed
☒ Sliding

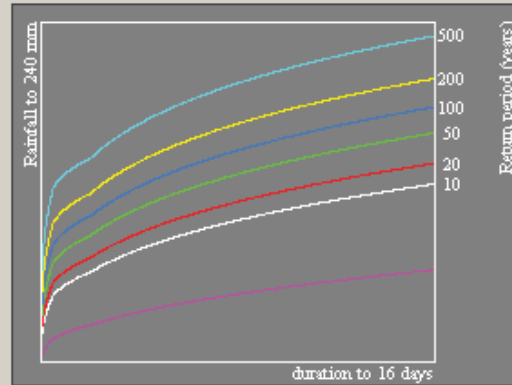
Return period : 1.0004 Years ☒ AM
☐ POT

Rainfall depth 11.8209 mm

Calculate... Export... Cancel

 An areal reduction factor of 0.977 has been applied to a point rainfall of 12.1 mm to yield a catchment design rainfall of 11.8 mm.





Calculate : Design rainfall for

☒ catchment 477150 98550 [SZ 77150 98550]
☐ 1 km grid point 474000 99000 [SZ 74000 99000]
☐ Manually entered values for a point

Area : 1.3775 km²

C : -0.02600 D3 : 0.38551
D1 : 0.42200 E : 0.30738
D2 : 0.26887 F : 2.27328

Duration : 6 Hours ☐ Fixed
☒ Sliding

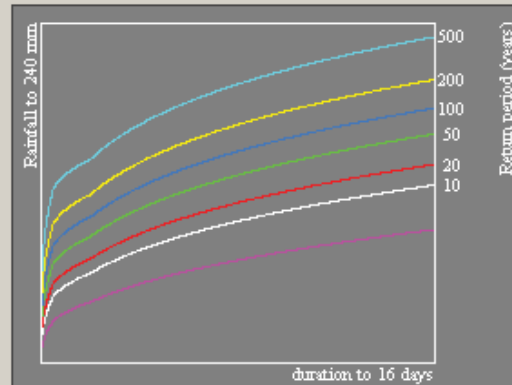
Return period : 2.0 Years ☒ AM
☐ POT

Rainfall depth 22.2418 mm

Calculate... Export... Cancel

 An areal reduction factor of 0.977 has been applied to a point rainfall of 22.8 mm to yield a catchment design rainfall of 22.2 mm.





Calculate : Design rainfall for

☒ catchment 477150 98550 [SZ 77150 98550]
☐ 1 km grid point 474000 99000 [SZ 74000 99000]
☐ Manually entered values for a point

Area : 1.3775 km²

C : -0.02600 D3 : 0.38551
 D1 : 0.42200 E : 0.30738
 D2 : 0.26887 F : 2.27328

Duration : 6 Hours ☐ Fixed ☒ Sliding

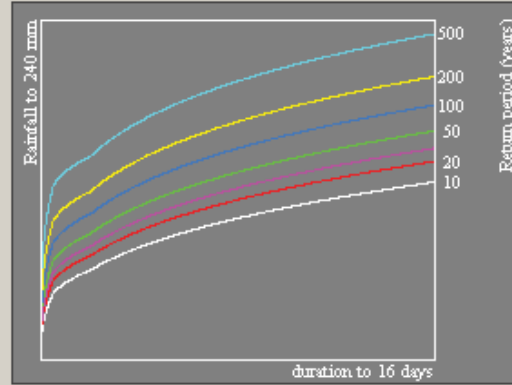
Return period : 30.0 Years ☒ AM ☐ POT

Rainfall depth 48.8617 mm

Calculate... Export... Cancel


 An areal reduction factor of 0.977 has been applied to a point rainfall of 50.0 mm to yield a catchment design rainfall of 48.9 mm.





Calculate : Design rainfall for

☒ catchment 477150 98550 [SZ 77150 98550]
☐ 1 km grid point 474000 99000 [SZ 74000 99000]
☐ Manually entered values for a point

Area : 1.3775 km²

C : -0.02600 D3 : 0.38551
 D1 : 0.42200 E : 0.30738
 D2 : 0.26887 F : 2.27328

Duration : 6 Hours ☐ Fixed ☒ Sliding

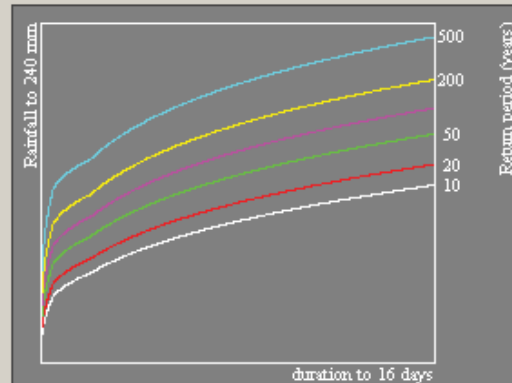
Return period : 100.0 Years ☒ AM ☐ POT

Rainfall depth 67.0931 mm

Calculate... Export... Cancel


 An areal reduction factor of 0.977 has been applied to a point rainfall of 68.7 mm to yield a catchment design rainfall of 67.1 mm.





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APPENDIX E: NPPF TECHNICAL GUIDANCE EXTRACTS

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Table 1: Flood zones

(Note: These flood zones refer to the probability of river and sea flooding, ignoring the presence of defences)

Zone 1 - low probability Definition This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%). Appropriate uses All uses of land are appropriate in this zone. Flood risk assessment requirements For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a flood risk assessment. This need only be brief unless the factors above or other local considerations require particular attention. Policy aims In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage systems².
Zone 2 - medium probability Definition This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year. Appropriate uses Essential infrastructure and the water-compatible, less vulnerable and more vulnerable uses, as set out in table 2, are appropriate in this zone. The highly vulnerable uses are <i>only</i> appropriate in this zone if the Exception Test is passed. Flood risk assessment requirements All development proposals in this zone should be accompanied by a flood risk assessment. Policy aims In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development, and the appropriate application of sustainable drainage systems.
Zone 3a - high probability Definition This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year. Appropriate uses The water-compatible and less vulnerable uses of land (table 2) are appropriate in this zone. The highly vulnerable uses should not be permitted in this zone. The more vulnerable uses and essential infrastructure should only be permitted in this zone if the Exception Test is passed. Essential infrastructure permitted in this zone should be designed and constructed to remain operational and safe for users in times of flood. Flood risk assessment requirements All development proposals in this zone should be accompanied by a flood risk assessment. Policy aims In this zone, developers and local authorities should seek opportunities to: • reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage systems;

- relocate existing development to land in zones with a lower probability of flooding; and
- create space for flooding to occur by restoring functional floodplain and flood flow pathways and by identifying, allocating and safeguarding open space for flood storage.

Zone 3b - the functional floodplain

Definition

This zone comprises land where water *has* to flow or be stored in times of flood.

Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. But land which would flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood in an extreme (0.1%) flood, should provide a starting point for consideration and discussions to identify the functional floodplain.

Appropriate uses

Only the water-compatible uses and the essential infrastructure listed in table 2 that has to be there should be permitted in this zone. It should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows; and
- not increase flood risk elsewhere.

Essential infrastructure in this zone should pass the Exception Test.

Flood risk assessment requirements

All development proposals in this zone should be accompanied by a flood risk assessment.

Policy aims

In this zone, developers and local authorities should seek opportunities to:

- reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage systems;
- relocate existing development to land with a lower probability of flooding.

Table 2: Flood risk vulnerability classification

Essential infrastructure • Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.
Highly vulnerable • Police stations, ambulance stations and fire stations and command centres and telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use³. • Installations requiring hazardous substances consent⁴. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as "essential infrastructure")⁵.
More vulnerable • Hospitals. • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. • Non-residential uses for health services, nurseries and educational establishments. • Landfill and sites used for waste management facilities for hazardous waste⁶. • Sites used for holiday or short-let caravans and camping, <i>subject to a specific warning and evacuation plan</i>.⁷
Less vulnerable • Police, ambulance and fire stations which are <i>not</i> required to be operational during flooding. • Buildings used for shops, financial, professional and other services,
restaurants and cafes, hot food takeaways, offices, general industry, storage and distribution, non-residential institutions not included in "more vulnerable", and assembly and leisure. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment works which do <i>not</i> need to remain operational during times of flood. • Sewage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).
Water-compatible development • Flood control infrastructure. • Water transmission infrastructure and pumping stations. • Sewage transmission infrastructure and pumping stations. • Sand and gravel working. • Docks, marinas and wharves. • Navigation facilities. • Ministry of Defence defence installations. • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. • Water-based recreation (excluding sleeping accommodation). • Lifeguard and coastguard stations. • Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms. • Essential ancillary sleeping or residential accommodation for staff required by uses in this category, <i>subject to a specific warning and evacuation plan</i>.

APPENDIX F: WATER COMPANY RECORDS & CORRESPONDENCE

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Chris Pickles

From: Chris Pickles
Sent: 1 May 2013 16:30
To: 'planning@hants.gov.uk'
Subject: Wittering Road, Hayling Island
Attachments: Location Plan.pdf

To whom it may concern,

12 WITTERING ROAD, HAYLING ISLAND PO11 9SP

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment for the above site (location plan attached), including details of historical flooding; this would be greatly appreciated.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind regards

Christopher Pickles
Engineering Technician

Betts Associates Ltd
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY
T - 01244 288178
F - 01244 288516
chris.pickles@betts-associates.co.uk
www.betts-associates.co.uk

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FLOOD RISK MANAGEMENT | STRUCTURAL SURVEYS | PARTY WALL DUTIES | ECOLOGY

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APPENDIX G: LA CORRESPONDENCE

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APPENDIX H: SURFACE WATER RUN-OFF CALCULATIONS

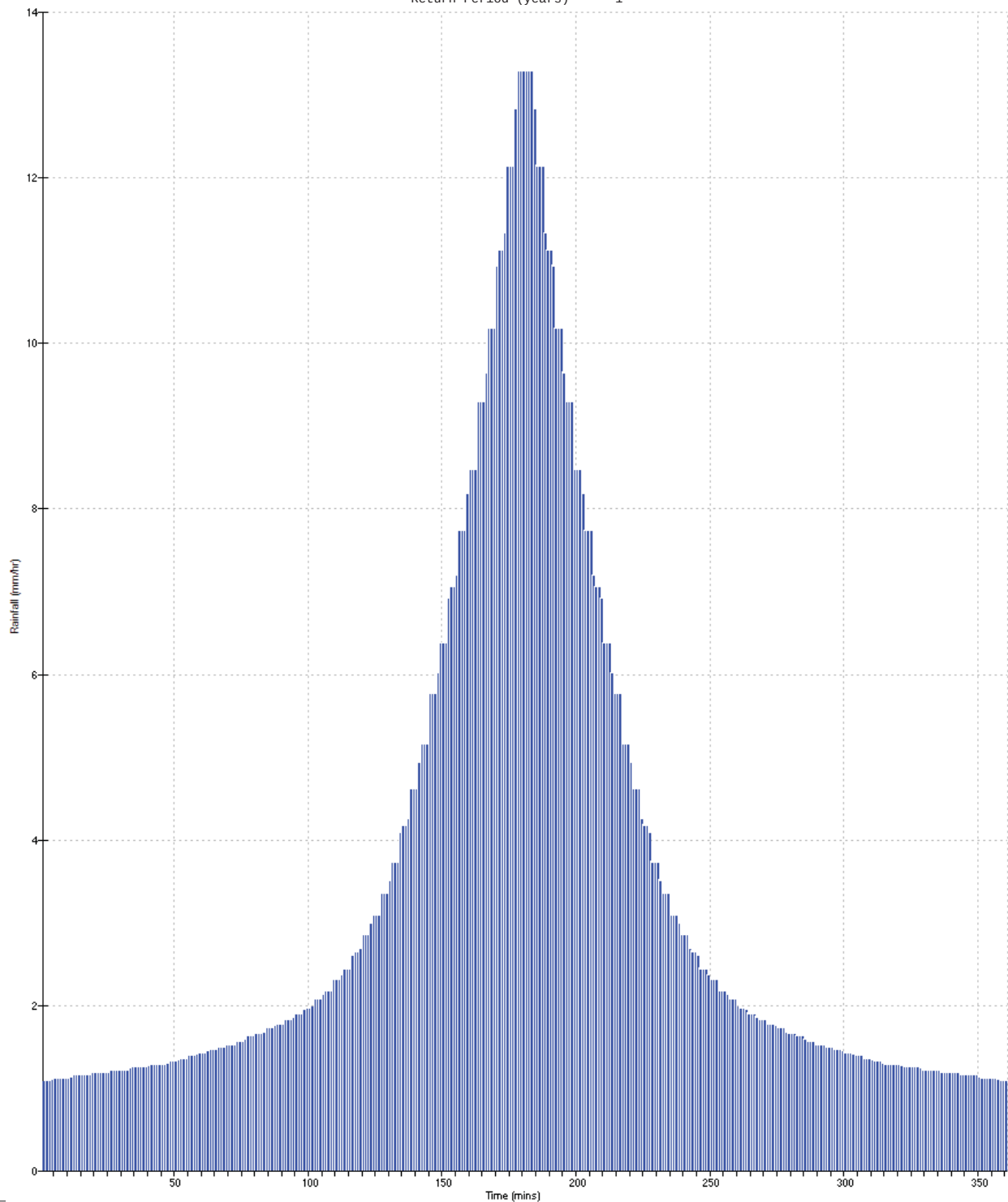
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Rainfall profile

Storm duration (mins) 360

FEH Data

C(1km)	-0.027
D1(1km)	0.429
D2(1km)	0.268
D3(1km)	0.382
E(1km)	0.309
F(1km)	2.244
Peak Intensity (mm/hr)	13.290
Ave. Intensity (mm/hr)	3.390
Return Period (years)	1

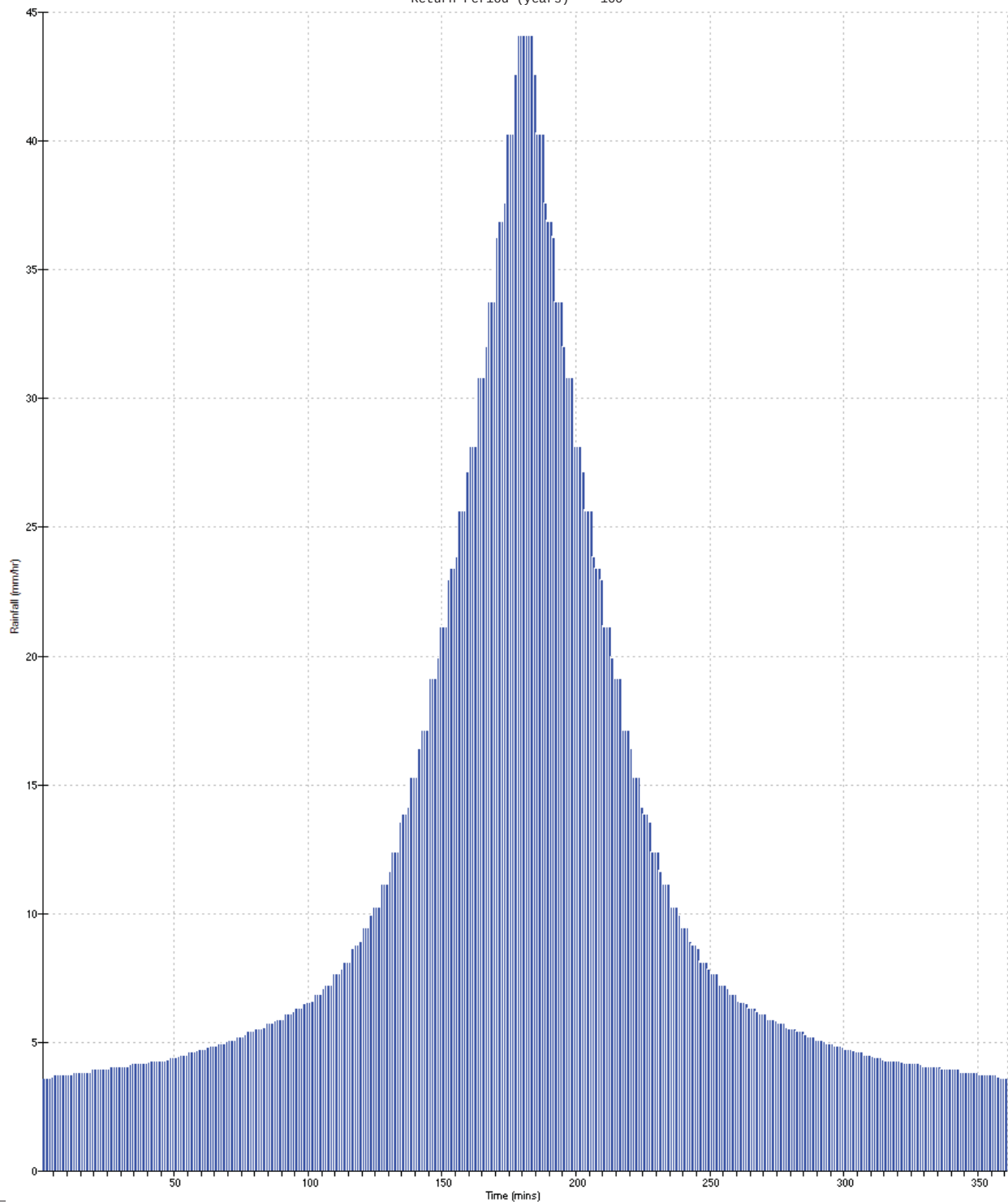


Rainfall profile

Storm duration (mins) 360

FEH Data

C(1km)	-0.027
D1(1km)	0.429
D2(1km)	0.268
D3(1km)	0.382
E(1km)	0.309
F(1km)	2.244
Peak Intensity (mm/hr)	44.075
Ave. Intensity (mm/hr)	11.244
Return Period (years)	100



Betts Associates Ltd		Page 1
Old Marsh Farm Barns	12 Wittering Road	
Welsh Road Sealand	Hayling Island	
Flintshire CH5 2LY	Yeates Design	
Date 29.04.2013	Designed by CP	
File	Checked by	
Micro Drainage	Source Control W.12.6.1	

ICP SUDS Mean Annual Flood

Input

Return Period (years) 1 SAAR (mm) 680 Urban 0.000
Area (ha) 0.092 Soil 0.295 Region Number Region 7

Results l/s

QBAR Rural 0.2
QBAR Urban 0.2

Q1 year 0.1

Q1 year 0.1
Q30 years 0.4
Q100 years 0.5

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Old Marsh Farm Barns	12 Wittering Road	
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Flintshire CH5 2LY	Yeates Design	
Date 29.04.2013	Designed by CP	
File	Checked by	
Micro Drainage	Source Control W.12.6.1	

Greenfield Runoff Volume

FEH Data

Return Period (years)	1
Storm Duration (mins)	360
Site Location	GB 477150 98550 SZ 77150 98550
C(1km)	-0.027
D1(1km)	0.429
D2(1km)	0.268
D3(1km)	0.382
E(1km)	0.309
F(1km)	2.244
Areal Reduction Factor	1.00
Area (ha)	0.056
SAAR (mm)	680
CWI	101.400
SPR Host	29.520
URBEXT (1990)	0.0980

Results

Percentage Runoff (%)	26.42
Greenfield Runoff Volume (m³)	3.009

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File	Checked by	
Micro Drainage	Source Control W.12.6.1	

Greenfield Runoff Volume

FEH Data

Return Period (years)	100
Storm Duration (mins)	360
Site Location	GB 477150 98550 SZ 77150 98550
C(1km)	-0.027
D1(1km)	0.429
D2(1km)	0.268
D3(1km)	0.382
E(1km)	0.309
F(1km)	2.244
Areal Reduction Factor	1.00
Area (ha)	0.056
SAAR (mm)	680
CWI	101.400
SPR Host	29.520
URBEXT (1990)	0.0980

Results

Percentage Runoff (%)	30.71
Greenfield Runoff Volume (m ³)	11.603

APPENDIX I: STORMWATER STORAGE ESTIMATES

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STORMWATER STORAGE ESTIMATES

Micro Drainage		Variables	
		FEH Rainfall	Cv (Summer) 0.750
		Return Period (years) 1	Cv (Winter) 0.840
			Impermeable Area (ha) 0.041
Variables		Site Location	Maximum Allowable Discharge (l/s) 5.0
		GB 477150 98550 SZ 77150 98550 ...	
Results		C (1km) -0.027 D3 (1km) 0.382	
Design		D1 (1km) 0.429 E (1km) 0.309	Infiltration Coefficient (m/hr) 0.00000
Overview 2D		D2 (1km) 0.268 F (1km) 2.244	Safety Factor 2.0
Overview 3D			Climate Change (%) 0
Vt			

Micro Drainage		Results
		Global Variables require approximate storage of between 0.0 m³ and 0.4 m³.
		These values are estimates only and should not be used for design purposes.
Variables		
Results		
Design		
Overview 2D		
Overview 3D		
Vt		

Variables	
FEH Rainfall	Cv (Summer) 0.750
Return Period (years) 30	Cv (Winter) 0.840
Site Location	Impermeable Area (ha) 0.041
GB 477150 98550 SZ 77150 98550 ...	Maximum Allowable Discharge (l/s) 5.0
C (1km) -0.027 D3 (1km) 0.382	
D1 (1km) 0.429 E (1km) 0.309	Infiltration Coefficient (m/hr) 0.00000
D2 (1km) 0.268 F (1km) 2.244	Safety Factor 2.0
	Climate Change (%) 0

The screenshot shows the Micro Drainage software interface. On the left is a vertical navigation menu with buttons for Variables, Results (highlighted in orange), Design, Overview 2D, Overview 3D, and Vt. The main area on the right is titled 'Results' and contains the following text:

Global Variables require approximate storage of between 1.1 m³ and 4.6 m³.

These values are estimates only and should not be used for design purposes.

Micro Drainage		Variables	
Variables Results Design Overview 2D Overview 3D Vt	FEH Rainfall		Cv (Summer) 0.750
	Return Period (years) 100		Cv (Winter) 0.840
	Site Location GB 477150 98550 SZ 77150 98550 ...		Impermeable Area (ha) 0.041
			Maximum Allowable Discharge (l/s) 5.0
	C (1km) -0.027	D3 (1km) 0.382	Infiltration Coefficient (m/hr) 0.00000
	D1 (1km) 0.429	E (1km) 0.309	
	D2 (1km) 0.268	F (1km) 2.244	
			Safety Factor 2.0
		Climate Change (%) 30	

Micro Drainage		Results
		Global Variables require approximate storage of between 6.1 m³ and 12 m³. These values are estimates only and should not be used for design purposes.
Variables		
Results		
Design		
Overview 2D		
Overview 3D		
Vt		

APPENDIX J: SFRA INFORMATION

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6 Conclusions and Recommendations

6.1 Introduction

The purpose of an SFRA is to provide a flood risk dataset to inform strategic decisions on spatial planning rather than to interpret the data and draw conclusions on managing flood risk. There are however, some key conclusions and recommendations that can be drawn from the process of developing this SFRA, and these are summarised in this chapter.

6.2 Conclusions

6.2.1 Feasibility of PUSH Housing Target

- The statistical analysis undertaken during Stage 1 of the SFRA concluded that the draft SEP housing target of 80,000 new dwellings in the PUSH sub-region by 2026 is feasible, with regard to flood risk, when assessed at the sub-regional level. This is due to the amount of Greenfield land available in Flood Zone 1.
- However, when assessed at the LPA area scale, some of the housing targets may not be feasible due to the extent of the Flood Zones 2 and 3 within some LPA areas. In particular, the administrative areas of Portsmouth, Southampton and Gosport are significantly constrained by the extent of Flood Zones 2 and 3.
- The large scale of the development required to meet the SEP objectives may result in pressure to locate new development within Flood Zones 2 and 3 for some LPA areas. To avoid or relieve this pressure, consideration may need to be given to revising the distribution of dwellings across the LPA areas to ensure that the individual LPA housing targets are feasible in terms of flood risk constraints.

6.2.2 Flood Risk

The Guidance Documents provided in Appendix C provide an overview of flood risk issues specific to each LPA. Across the sub-region the following broad conclusions can be drawn:

- The sub-region is exposed to flood risk from a number of sources. Flooding from the sea, due to extreme tides, is the predominant source of flood risk, due to the location of some of the sub-region's most populated areas on low lying coastlines in Portsmouth, Southampton, Gosport, Havant, Fareham, Eastleigh and the New Forest. All of the PUSH LPAs contain areas at risk of flooding from rivers and watercourses, with the Rivers Test, Itchen, Hamble, Meon, Wallington, Hermitage Stream and Lavant Stream passing through existing developed areas. In addition, the coastal frontages of Portsea and Hayling Island have experienced flooding caused by wave overtopping; a number of areas in Winchester, Test Valley and East Hampshire have been affected by groundwater flooding; and flooding due to excessive overland flow has caused significant problems in East Hampshire in the past.
- The sub-region is protected from flooding from the sea by defences along the majority of its coastal frontages. The level of protection afforded by the defences along each frontage varies considerably, with areas such as Portsea Island,

parts of Gosport and Southampton, and Hayling Island generally defended to a higher level than other frontages in the sub-region. There are no significant flood defences on rivers in the sub-region, although localised flood protection measures such as bank protection and maintenance of structures provide benefits in terms of flood risk in a number of locations.

- Climate change poses a significant risk to the sub-region. Predicted sea-level rise over the coming century will reduce the level of protection provided by most of the sub-region's flood defences and result in the inundation of larger areas by extreme tidal floods. In addition, increasing severity of storm events is predicted to result in an increase in river flood flows, which will subsequently increase the risk of flooding from rivers.
- The SFRA has assessed the sub-region's coastal flood defences based on the level of protection they provide. The SFRA has stopped short, however, of recommending what is an 'appropriate' standard of protection for the sub-region, or for individual LPA areas within the sub-region. During Stage 2 of the SFRA a review of standards of protection was undertaken based on a variety of guidance documents, policy and European best practice in an attempt to identify suitably appropriate standards that may be considered for the sub-region. This review is summarised in the Technical Note provided in Appendix D. It was concluded that appropriate standards of protection should be identified through a comprehensive review of social and economic factors and agreement from the LPAs, Central Government and the Environment Agency and is therefore beyond the scope of this SFRA. However, the SFRA has delivered a dataset that can assist in this assessment by presenting information on current and future indicative standards, the scale of the potential flood hazards and the social vulnerability of the areas at risk.

6.3 Recommendations

6.3.1 General

It is recommended that the Environment Agency and all Local Authorities in the PUSH sub-region give due consideration to the implications of climate change on flood risk across the sub-region. This SFRA provides a number of datasets that indicate, at a high level, the vulnerability of land to rising sea levels, the vulnerability of communities to flood risk and the levels of investment required to maintain defences to protect from flooding from the sea following predicted sea level rise. The SFRA outputs should be used to assess the sustainability of raising existing defences to contend with rising sea levels in a number of areas, particularly where the residual risks of flooding may remain unacceptably high. Such assessments are outside the scope of this SFRA, but the data collated and the high-level datasets produced should provide a sound basis for further studies in this area.

The SFRA outputs should be used to inform a review of existing defence standards and to assist in identifying potentially higher standards that may be more appropriate in light of climate change forecasts. However, the SFRA outputs alone cannot inform such an assessment, as it should include consideration of wider social and economic factors.

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APPENDIX K: NOTES OF LIMITATION

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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