Eagle Eye
environmental solutions ltd.

FLOOD RISK ASSESSMENT

MERMAID & PLAYBOX SITE-
SEA ROAD, BOGNOR REGIS

Chester Buildings Ltd

01 August 2018
NN1013R01

The Old Brew House
Appeldurcombe House
[redacted]

ARU

DOCUMENT CONTROL

DOCUMENT TITLE	FRA – SITE OF MERMAID AND PLAYBOX, SEA ROAD, BOGNOR REGIS	REVISION	R00
DOCUMENT NUMBER	R00	ISSUE DATE	JULY 2018
PROJECT NUMBER	NN1013	AUTHOR	TP
STATUS	ISSUE	CHECKED	CB
ISSUED TO	CLIENT	PASSED	CB

REVISION HISTORY

REVISION	NOTES	DATE ISSUED

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ARUN DISTRICT COUNCIL FP/185/19/PL

CONTENTS

1. INTRODUCTION 4
2. PROPOSED DEVELOPMENT 4
3. SITE DESCRIPTION 4
4. SUPPLIED INFORMATION 4
5. STRATEGIC FLOOD RISK ASSESSMENT 4
6. POTENTIAL FLOODING ON SITE 4
   6.1 Environment Agency Flood Map for Planning (from rivers and sea) 4
   6.2 Risk of Flooding from Rivers and Sea (ROFRAS) 4
   6.3 Flood Risk Vulnerability and Flood Zone Compatibility 5
   6.4 Historic Flood Outlines 5
7. TIDAL FLOOD RISK 5
   7.1 Modelled Flood Levels, Flood Depths, Breach Levels, Breach Depths, Breach Velocity and Breach Hazards 5
8. FLOOD DEFENCES 6
9. SURFACE WATER (Pluvial) FLOOD MAP 6
10. SURFACE WATER FEATURES 7
11. GROUNDWATER FLOODING 7
12. BGS GEOLOGICAL INDICATORS OF FLOODING 7
13. EXCEPTION TEST 8
14. FLOOD RISK MANAGEMENT 8
   14.1 Flood Mitigation Measures 8
15. FLOOD RISK ASSESSMENT SUMMARY 8
16. REPORT CONCLUSION 9

Table 1 – Water Levels: Tidal Undefended 5
Table 2 – Water Levels: Tidal Defended 5
Table 3- Water Depth: Tidal Undefended 5
Table 4 – Water Depth: Tidal Defended 5
Table 5- Breach Levels 6
Table 6- Breach Depths 6
Table 7 – Breach Velocity 6
Table 8 – Breach Hazard 6
Table 9 – Surface Water Features within 250m of Site 7
Table 10 – Geological Indicators of Flooding 8

ARUN DISTRICT COUNCIL FP/185/19/PL

Figure 1 – Site Location Plan/Proposed Development
Figure 2 – Flood Map for Planning
Figure 3 – Site Reference Points
Figure 4 – Modelled Outlines (Defended Tidal) Map
Figure 5 - Flood Defence Maps – EA Maintained/ 3rd Party Maintained

Appendix A – Groundsure Flood Insight Report
Appendix B – Personal Flood Plan

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1. INTRODUCTION

Eagle Eye Environmental Solutions Ltd (EEES) have produced a Flood risk Assessment Report for the proposed residential redevelopment at Mermaid and Playbox, Sea Road. Bognor Regis. PO22 7AW.

The objective of this assessment is to demonstrate that the proposed development will be safe for its lifetime considering the vulnerability of its users, without increasing the risk of flooding elsewhere. The report was commissioned by Mr M Meisels of Chester Buildings LTD.

2. PROPOSED DEVELOPMENT

It is understood that the proposed development is for a four bedroomed detached three storey house.

Figure 1 contains the site location plan and proposed development elevation plan.

3. SITE DESCRIPTION

The site is located to the west of Sea Road and adjacent to Aldingbourne Rife and the Longbrook pumping station. The site covers an area of approximately 210m². Residential properties are located adjacent to the site on the east side. The sites gradient ranges from 3.550maod at southern end of the site to 3.520maod at the northern end of the site.

4. SUPPLIED INFORMATION

EEES were supplied with proposed site plans, including elevations of the proposed development. Information was requested and supplied by the Environment Agency on flood risk assessment products.

Groundsure Flood Insight Report (GS-5283068) was utilised in the assessment of the flood risk. The report is included in Appendix A. of this report.

5. STRATEGIC FLOOD RISK ASSESSMENT

The property lies within the area covered by the Arun District Council Level 1 and Level 2 Strategic Flood Risk Assessment (SFRA) undertaken by JBA Consulting (Updated 2016). The SFRA uses the Environment Agency Flood Zone maps to inform the assessment and does not provide any additional information relevant to the various risks of flooding.

The SFRA does include an assessment of climate change, and impact on flood zones in the area. However, no account is taken in the assessment of the flood defences.

6. POTENTIAL FLOODING ON SITE

6.1 Environment Agency Flood Map for Planning (from rivers and sea)

The site is located within Flood Zone 3. Flood Zone 3 are areas that could be affected by flooding from the sea with a 1 in 200 (0.5%) or greater chance of occurrence in each year, or flooding from a river with a 1 in 100 (1%) or greater chance of occurrence each year.

Flood Zones refer to the to the probability of river and sea flooding ignoring the presence of any defences. Figure 2 contains the Environment Agency's Flood Map for Planning.

6.2 Risk of Flooding from Rivers and Sea (ROFRAS)

The Environment Agency provides an indication of river and coastal flood risk at a national level on a 50m grid with flood rating at the centre of the grid. ROFRaS data for the site indicates it is in an area of low chance of flooding in any given year.

Low-the chance of flooding from rivers and sea is less than 1 in 100 (1%) but greater than or equal to 1 in 1000 (0.1%) in any given year.

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6.3 Flood Risk Vulnerability and Flood Zone Compatibility

Table 1 and Table 2 from the National Planning Policy Framework (2018) identifies the Flood Risk Vulnerability classification of a site in relation to flooding. The site has been assessed as located in Zone 3a which equates to a high probability

The results of the flood risk vulnerability and flood zone 'compatibility' show that an exception test is required as the proposed development is classed as 'More Vulnerable'.

6.4 Historic Flood Outlines

No records of historic flooding on site are held by the Environment Agency as identified in the Groundsure report. Absence of historic flood events for an area does not mean that the area has never flooded, but only that the Environment Agency do not currently have records within the area.

7. TIDAL FLOOD RISK

7.1 Modelled Flood Levels, Flood Depths, Breach Levels, Breach Depths, Breach Velocity and Breach Hazards

Product 4 and 8 supplied by the Environment Agency contains modelled flood risk data on water levels, flood depths, breach levels, breach depths, breach velocity and breach hazards for tidal undefended and tidal defended at three reference points for the site. All levels are taken from: Ems to Littlehampton Modelling (Arun to East Head Model) produced on: 16/07/2018. Reference points on site are shown in Figure 3. Model outlines (Defended Tidal) Map is shown in Figure 4. Water levels are shown in Tables 2- 9 below.

Table 1 – Water Levels: Tidal Undefended

	Eastings	Northings	0.5%	0.5% (2070)	0.5% (2115)	0.1%
	494749	99216	3.78	4.25	4.85	3.96
	494753	99202	3.79	4.26	4.86	4.97
	494754	99191	3.80	4.28	4.88	3.99

Table 2 – Water Levels: Tidal Defended

	Eastings	Northings	0.5%	0.5% (2070)	0.5% (2115)	0.1%
	494749	99216	N/A	2.50	2.60	N/A
	494753	99202	N/A	2.61	2.67	N/A
	494754	99191	N/A	3.08	3.12	N/A

Table 3- Water Depth: Tidal Undefended

	Eastings	Northings	0.5%	0.5% (2070)	0.5% (2115)	0.1%
	494749	99216	1.26	1.73	2.33	1.45
	494753	99202	1.23	1.70	2.30	1.41
	494754	99191	1.27	1.74	2.34	1.45

Table 4 – Water Depth: Tidal Defended

	Eastings	Northings	0.5%	0.5% (2070)	0.5% (2115)	0.1%
	494749	99216	N/A	0.01	0.08	N/A
	494753	99202	N/A	0.01	0.07	N/A
	494754	99191	N/A	0.04	0.06	N/A

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Table 5- Breach Levels

	Eastings	Northings	20%	0.5%
	494749	99216	2.55	2.87
	494753	99202	2.65	2.96
	494754	99191	3.13	3.37

Table 6- Breach Depths

	Eastings	Northings	20%	0.5%
	494749	99216	0.03	0.36
	494753	99202	0.04	0.34
	494754	99191	0.05	0.20

Table 7 – Breach Velocity

	Eastings	Northings	20%	0.5%
	494749	99216	0.05	0.30
	494753	99202	0.15	0.53
	494754	99191	0.20	1.35

Table 8 – Breach Hazard

	Eastings	Northings	20%	0.5%
	494749	99216	0.52	1.28
	494753	99202	0.53	1.31
	494754	99191	0.54	0.99

8. FLOOD DEFENCES

Bognor Regis coastline faces predominantly to the south east and is exposed to wave action. Historically the area has been inundated by extreme sea levels during surge and storm events. The Aldingbourne rife discharges through a pumped outfall and is at risk from tide locked fluvial flooding and inundation from wave overtopping of the defences.

The coastal defences are predominantly shingle ridges with some sections also having additional protection from wave return walls, wide promenades, and rear splash walls. A series of offshore breakwaters have been constructed to help stabilise the beach and provide additional coastal protection. The National Flood and Coastal Defence Database (NFCDD) Defence Condition Grade – Majority of the timber groynes: Condition Grade 1 (Excellent) or Grade 2 (Good). Small minority at Bognor Regis are Grade 3 (Poor). Rock Groynes: Condition Grade 1 (Excellent). Backshore defences: Condition Grade 2 (Good). Figure 5 contains the flood defence map, Environment Agency maintained, and the flood defence map, 3rd party maintained.

9. SURFACE WATER (Pluvial) FLOOD MAP

Surface water flooding is defined as flooding caused by rainfall-generated overland flow before the runoff enters a watercourse or sewer. In such events, sewerage and drainage systems and surface watercourses may be entirely overwhelmed.

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Surface water flooding will usually be a result of extreme rainfall events, though also occur when lesser amounts of rain falls on land which has low permeability and/or is already saturated, frozen or developed.

Flood data is provided by JBA Risk Management Limited on the risk of Surface Water (pluvial) flooding at the site, flooding has been identified as Negligible. This indicates that this area would be expected to be affected by surface water flooding in a 1 in 1000-year rainfall event to a depth of less than 0.1m.

The data set was produced by simulating 1 in 75 year, 1 in 200 year and 1 in 1000-year rainfall events. The JBA model provides the maximum depth of flooding in each 5m "cell" of topographical mapping coverage. The maps include 7 bands indicating areas of increasing natural vulnerability to surface water flooding. These are;

- Negligible - Less than 0.1m in a 1 in 1000 year rainfall event
- Low – Greater than 0.1m in a 1 in 1000-year rainfall event
- Low to Moderate – Between 0.1m and 0.3m in a 1 in 200 year rainfall event
- Moderate – Between 0.3 and 1m in a 1 in 200 year rainfall event
- High – Between 0.1, and 0.3m in a 1 in 75 year rainfall event

10. SURFACE WATER FEATURES

The following surface water features were identified within 250m of the site. A surface waters feature map is contained in the Groundsure Report, Appendix A.

Table 9 – Surface Water Features within 250m of Site

	34.0	S
	15.0	W
	79.0	NW

11. GROUNDWATER FLOODING

Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

Based on the underlying geological conditions the site is susceptible to the potential for groundwater flooding at surface which relates to Superficial Deposits Flooding.

The British Geological Survey confidence rating of the result is 'Moderate'. Confidence ratings are on a threefold scale- Low, Moderate and High. This provides a relative indication of the BGS confidence in the accuracy of the susceptibility result for groundwater flooding. This is based on the amount and precision of the information used in the assessment. BGS Groundwater Flooding map is contained in the Groundsure report, Appendix A.

12. BGS GEOLOGICAL INDICATORS OF FLOODING

The BGS Geological Indicators of Flooding (GIF) data set is a digital map based on the BGS Digital Geological Map of Great Britain at the 1:50,000 scale (DiGMapGB-50). The data identifies the presence of superficial geological deposits which indicate that the site may be, or have been in the past, vulnerable to inland and/or coastal flooding. The assessment does not take into account of any man-made factors such as flood protection schemes. Table 10 shows the Geological Indicators of Flooding within 250m of site.

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Table 10 – Geological Indicators of Flooding

	On Site	Lower flood potential from the sea: areas affected in extreme cases due to combined factors e.g. very high tides/high wind speeds/ large storm surge.
	S	Higher flood potential from the sea: the first areas to experience the effects of coastal flooding.
	E	Lower flood potential from rivers: areas affected by secondary flooding in extreme cases as a result of a prolonged flood event.
	E	Higher flood potential from the sea: the first areas to experience the effects of coastal flooding.

13. EXCEPTION TEST

The purpose of the exception test is to ensure that the new development is only permitted in areas at risk from flooding where flood risk is clearly outweighed by other sustainability factors and where the development will be safe for its lifetime, considering climate change and without increasing the risk elsewhere.

- Creation of short term employment opportunities during the construction phase of the development;
- The proposed development will provide sufficient housing to enable the residents to live in a home that is suitable to their needs;
- The development proposed is to replace the previous building on site that was destroyed by fire;
- A high quality, efficient living environment will be created; and,
- Flood risk mitigation measures are incorporated into the developments design to reduce flood risk.

The development has been deemed safe, without increasing the flood risk elsewhere.

14. FLOOD RISK MANAGEMENT

14.1 Flood Mitigation Measures

- The residents of the property would be advised to register with the Environment Agency's Floodline Warnings Direct Service to receive alerts and warnings.
- A site flood plan should be drawn up using the councils Flood Warning and Evacuation Plan Guidance. A personal flood plan is also recommended, an example of a personal flood plan is contained in Appendix B.
- It is recommended that permeable surfaces be incorporated into the design of outdoor spaces where possible to minimise reduction of surface water run-off and hence pressure on the drainage systems. 'Soft' landscaping materials such as vegetation are most effective, also gravels and permeable hard paving.

15. FLOOD RISK ASSESSMENT SUMMARY

- The site covers an area of approximately 210m². The actual proposed residential development covers an area of approximately 85m². This leaves an area of 125m².
- The development area of the site lies within the Environment Agencies flood zone 3, this is land assessed as having a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year ignoring the presence of sea defenses, and a 1 in 100 (1%) or greater chance of occurrence of flooding from rivers.
- Th EA holds no records of the site flooding, although reports of flooding in the surrounding areas have been identified.
- The EA risk of flooding from rivers and sea has been assessed as Low.

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- Finished ground floor levels in the proposed development are set at 4.050maod. The lowest level on site is at the northern end at a height of 3.520maod, the highest site levels are at the southern end at 3.550maod.
- Modelled tidal flood levels (defended) on site range from 2.60maod to 3.12maod. Tidal undefended levels range from 4.85maod to 4.88maod. This is based on an annual exceedance probability of 0.5% (2115).
- Modelled tidal water depth levels (defended) on site range from 0.06m to 0.08m. Tidal undefended levels range from 2.30maod to 2.34maod. This is based on an annual exceedance probability of 0.5% (2115).
- Modelled flood breach levels on site range from 2.87maod to 3.37maod. This is based on an annual exceedance probability of 0.5% (2115).
- Modelled flood breach depths on site range from 0.20maod to 0.36maod. This is based on an annual exceedance probability of 0.5% (2115).

16. REPORT CONCLUSION

The Flood Risk Assessment considers all sources of flooding at and near the site. Fluvial and tidal flood risk has been analysed using the results from computer models supplied by the Environment Agency, as well as existing Environment Agency Flood Zone Mapping. Information was also extracted from the Groundsure Flood Insight Report.

The proposed site is situated on the south east coastline and therefore exposed to wave action. Historically the area has been inundated by extreme sea levels during surge and storm events. The Aldingbourne rife discharges through a pumped outfall and is at risk from tide locked fluvial flooding and inundation from wave overtopping of the defenses. Due to the level of defenses and coastal protection, it is concluded that flooding would only occur in extreme events. The resulting flood extents are predicted to be much smaller than those indicated in the Flood Zones, which represent an undefended case.

The ground floor finished floor levels of the proposed development are at a height of 4.050maod. The highest modelled flood depth (Tidal defended: 0.5% -2115) on site is 3.12maod. This gives the proposed development on site a freeboard allowance of 0.93maod.

It has been assessed that the proposed development of the site will be safe for its lifetime considering the vulnerability of its users, without increasing the risk of flooding elsewhere. The Flood Risk Assessment is based on the submitted proposed development plans for the identified site.

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FIGURE 2

Flood Map For Planning

Flood Map for Planning (Rivers and Sea). Centred on P022 7AW. Created 11/7/18.

Environment Agency

Scale 1: 10,000

N
W E
S

Flood Map for Planning (Rivers & Sea)

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

Flood Map Areas (assuming no defences)

Flood Zone 3 shows the area that could be affected by flooding:

- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occuring each year.

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FIGURE 3

Site Reference Points

Site Boundary & Node Point Map. Centred P022 7AW. Created 11/7/18.

Environment Agency

N

Legend

- Site Nodes
- Site Boundary

Scale: 1:400

0 10 20
Meters

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FIGURE 4

Model Outlines (Defended Tidal)

Model Outlines (Defended Tidal) Map. Centred P022 7AW. Created 11/7/18.

Environment Agency

N

Legend

- Site Boundary
- 0.5% AEP (Defended Tidal)
- 0.1% AEP (Defended Tidal)
- 0.5% AEP (2070) (Defended Tidal)
- 0.5% AEP (2115) (Defended Tidal)

Annual Exceedance Probability (AEP) The probability of a flood of a particular magnitude, or greater occuring in any given year.

Scale: 1:10,000

0 0.25 0.5
Kilometers

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FIGURE 5

Flood Defence Maps

Flood Defence Map (EA Maintained). Centred on P022 7AW. Created 11/7/18.

Environment Agency

Legend

Defences (EA maintained)

- Asset type not defined
- Embankment
- Wall
- Flood Gate
- Demountable Defence
- Bridge Abutment
- High Ground
- Beach
- Barrier Beach
- Promenade
- Quay
- Cliff
- Dunes

0 100 200 300

Metres

N W E S

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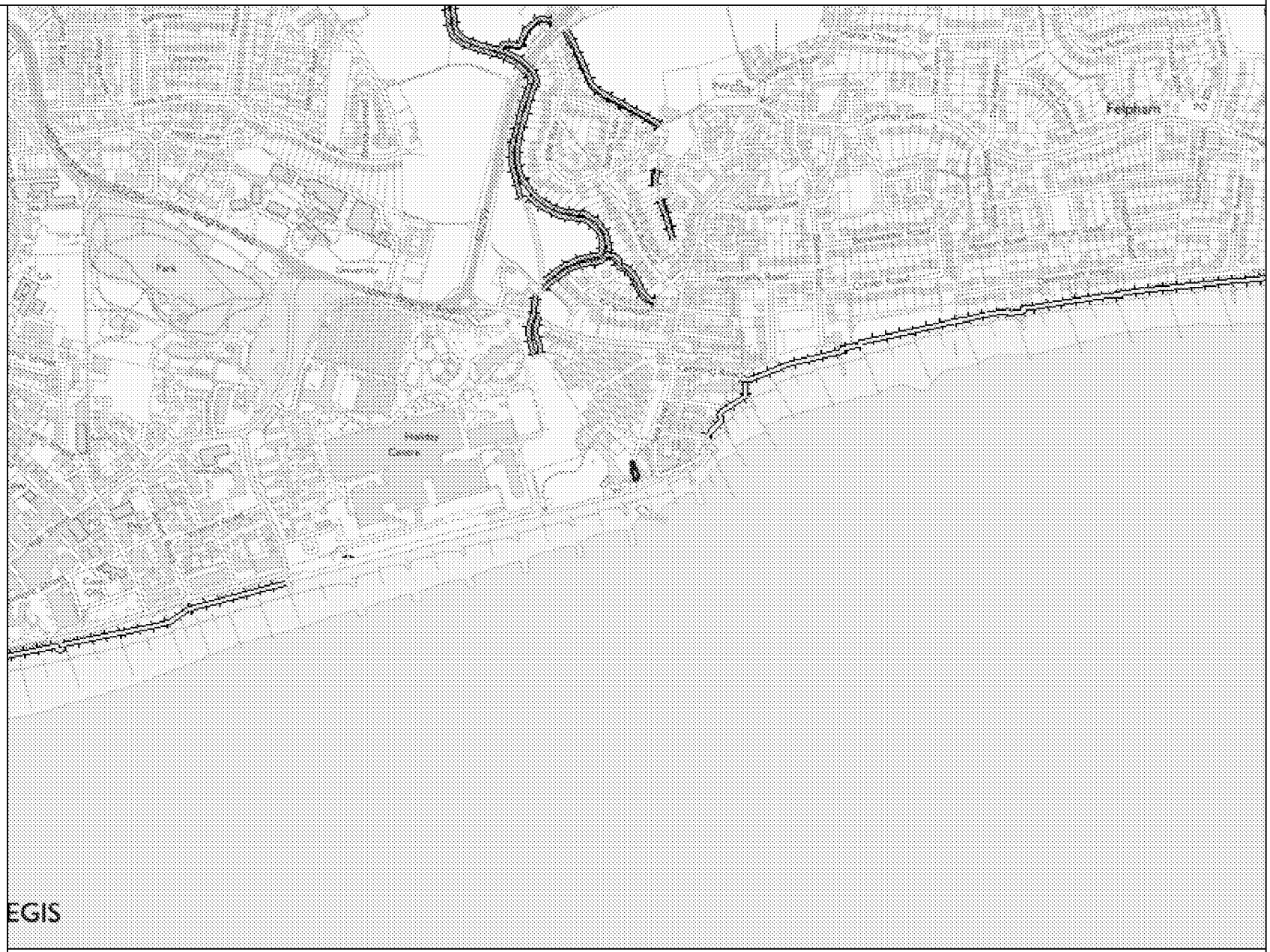
Flood Defence Map (3rd Party Maintained). Centred on P022 7AW. Created

Environment Agency

Legend

Defences (3rd party maintained)

- Asset type not defined
- Embankment
- Wall
- Flood Gate
- Demountable Defence
- Bridge Abutment
- High Ground
- Beach
- Barrier Beach
- Promenade
- Quay
- Cliff
- Dunes



0 100 200 300

Metres

N W E S

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APPENDIX A

Groundsure Flood Insight Report

Flood Insight

Address:	MERMAID AND PLAYBOX, SEA ROAD, FELPHAM, PO22 7AW
Date:	31 Jul 2018
Reference:	GS-5283068
Client:	Eagle Eye Environmental Solutions

NW N NE

W E

SW S SE

Aerial Photograph Capture date:	20-May-2015
Grid Reference:	494753,099200
Site Size:	0.02ha

Groundsure
LOCATION INTELLIGENCE

Contents Page

Contents Page 3

Overview of Findings 4

1. Environment Agency/Natural Resources Wales Flood Map for Planning (from rivers and the sea) 6

1. Environment Agency/Natural Resources Wales Flood Zones 7

2. Environment Agency/Natural Resources Wales RoFRaS Flooding Map 12

2. Environment Agency/Natural Resources Wales Risk of Flooding from Rivers and the Sea (RoFRaS) 13

3. Environment Agency/Natural Resources Wales Historic Flooding Events Map 15

3. Environment Agency/Natural Resources Wales Historic Flooding Events 16

4. JBA Surface Water (Pluvial) Flood Map 17

4. JBA Surface Water (Pluvial) Flooding 18

5. Surface Water Features map 20

5. Surface Water Features 21

6. BGS Groundwater Flooding Map 22

6. Groundwater Flooding 23

7. BGS Geological Indicators of Flooding 25

8. JBA Canal Break map 26

8. JBA Reservoir and Canal Data 27

ARUN DISTRICT COUNCIL FP/185/19/PL

Groundsure
LOCATION INTELLIGENCE

Overview of Findings

For further details on each dataset, please refer to each individual section in the main report as listed.

Section 1:Environment Agency/Natural Resources Wales Flood Zones	
1.1 Are there any Enviroment Agency Zone 2 floodplains within 250m of the study site?	Yes
1.2 Are there any Environment Agency/Natural Resources Wales Zone 3 floodplains within 250m of the study site	Yes
1.3 Are there any Flood Defences within 250m of the study site?	Yes
1.4 Are there any areas benefiting from Flood Defences within 250m of the study site?	No
1.5 Are there any Proposed Flood Defences within 250m of the study site?	Yes
1.6 Are there any areas used for Flood Storage within 250m of the study site?	No

Section 2:Risk of Flooding from Rivers and the Sea (RoFRaS)	
2.1 What is the Risk of Flooding from Rivers and the Sea (RoFRaS) Flood Rating for the study site?	Low

Section 3:Historic Flood Events	
3.1 Has the site been subject to past flooding as recorded by the Environment Agency/Natural Resources Wales?	No

Section 4:JBA Surface Water (Pluvial) Flood	
4.1 Is the site or any area within 50m at risk of Surface Water (Pluvial) Flooding?	No

Section 5: Surface Water Features	
5.1 Are there any surface water features within 250m of the study site?	Yes

Section 6: Groundwater Flooding	
6.1 What is the maximum BGS Groundwater Flooding susceptibility within 50m of the study site?	Potential at Surface
6.2 What is the BGS confidence rating for the Groundwater Flooding susceptibility areas?	Moderate

Section 7:BGS Geological Indicators of historic flooding	
7.1 Are there any geological indicators of historic flooding within 250m of the study site?	Yes

Section 8:JBA Reservoir and Canal Data	
8.1 Is the property located in an area identified as being at potential risk in the event of a reservoir failure?	No
8.2 Is the property located in an area identified as being at potential risk in the event of a canal break?	No

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Additional Matters

Riparian ownership

If your land abuts a river, stream or ditch, you may have responsibility to maintain this watercourse, even if Title Deeds show the property boundary to be adjacent to the watercourse. This includes the responsibility for clearing debris and obstructions which may impede the free passage of water and fish, and also includes the responsibilities to accept flood flows through your land, even if these are caused by inadequate capacity downstream. There is no duty in common law for a landowner to improve the drainage capacity of a watercourse. Please contact Groundsure if you need further advice on riparian ownership issues relating to this property.

Sewerage Flooding

Extreme rainfall events may overwhelm sewerage systems and cause local flooding. The water and sewerage companies within the UK are required to maintain 'DG5 - At Risk Registers' which record properties that have flooded from sewers and/or are considered to be at risk of flooding from sewers in the future. If your property is on the 'At Risk' Register, this may be recorded within a standard CON29 Drainage and Water search.

Using this Report

The following report is designed by Environmental Consultants for Environmental Professionals bringing together the most up-to-date market leading environmental data. This report is provided under and subject to the Terms & Conditions agreed between Groundsure and the Client.

Note: Maps

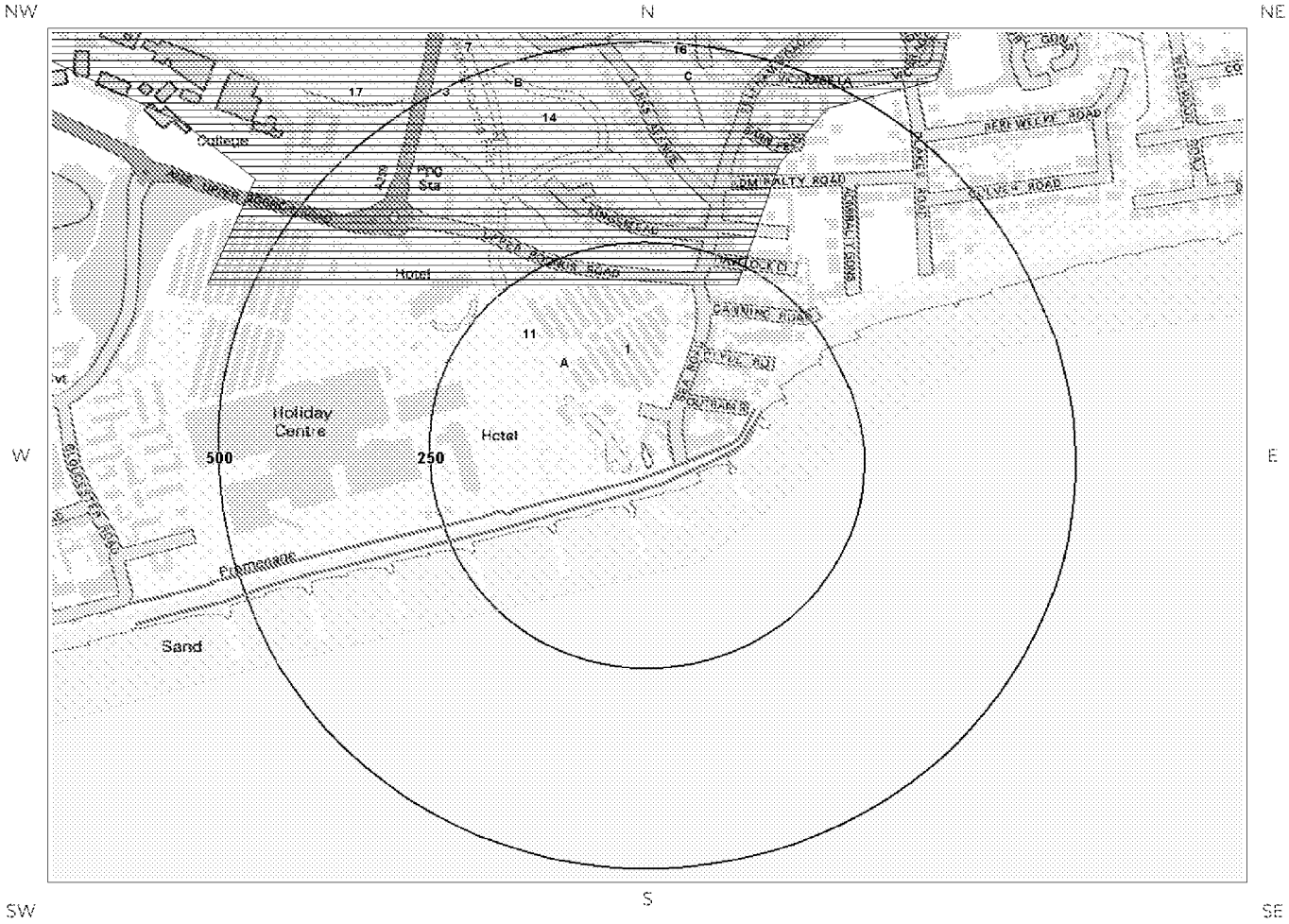
Only certain features are placed on the maps within the report. All features represented on maps found within this search are given an identification number. This number identifies the feature on the mapping and correlates it to the additional information provided below. This identification number precedes all other information and takes the following format -Id: 1, Id: 2, etc. Where numerous features on the same map are in such close proximity that the numbers would obscure each other a letter identifier is used instead to represent the features. (e.g. Three features which overlap may be given the identifier "A" on the map and would be identified separately as features 1A, 3A, 10A on the data tables provided).

Where a feature is reported in the data tables to a distance greater than the map area, it is noted in the data table as "Not Shown".

All distances given in this report are in Metres (m). Directions are given as compass headings such as N: North, E: East, NE: North East from the nearest point of the study site boundary.

Groundsure
LOCATION INTELLIGENCE

1. Environment Agency/Natural Resources Wales Flood Map for Planning (from rivers and the sea)



Environment Agency/Natural Resources Wales Flood Map for Planning Legend

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- Search Centre
- Search Buffers (m): 100, 250
- Zone 2 Floodplain
- Zone 3 Floodplain
- Flood Defences
- Area used for Flood Storage
- Proposed Flood Defence Scheme
- Area Benefiting from Flood Defences

Report Reference: GS-5283068
Client Reference: NN1013

1. Environment Agency/Natural Resources Wales Flood Zones

1.1 River and Coastal Zone 2 Flooding

Is the site within 250m of an Environment Agency/Natural Resources Wales Zone 2 floodplain? Yes

Environment Agency/Natural Resources Wales Zone 2 floodplains estimate the annual probability of flooding as between 1 in 1000 (0.1%) and 1 in 100 (1%) from rivers and between 1 in 1000 (0.1%) and 1 in 200 (0.5%) from the sea. Any relevant data is represented on Map 1 – Flood Map for Planning:

ID	Distance (m)	Direction	Update	Type
1	0.0	On Site	29-May-2018	Zone 2 - (Fluvial /Tidal Models)
2A	4.0	W	29-May-2018	Zone 2 - (Fluvial /Tidal Models)

1.2 River and Coastal Zone 3 Flooding

Is the site within 250m of an Environment Agency/Natural Resources Wales Zone 3 floodplain? Yes

Zone 3 shows the extent of a river flood with a 1 in 100 (1%) or greater chance of occurring in any year or a sea flood with a 1 in 200 (0.5%) or greater chance of occurring in any year. Any relevant data is represented on Map 1 – Flood Map for Planning.

The following floodplain records are represented as green shading on the Flood Map (1):

ID	Distance (m)	Direction	Update	Type
11	0.0	On Site	30-May-2018	Zone 3 - (Fluvial Models)
12A	4.0	W	30-May-2018	Zone 3 - (Fluvial Models)

1.3 River and Coastal Flood Defences

Are there any Flood Defences within 250m of the study site ? Yes

This search consists only of flood defences present in the dataset provided by the Environment Agency/Natural Resources Wales. Any relevant data is represented on Map 1 – Flood Map for Planning.

The following flood defence records are represented as lines on the Flood Map (1):

ID	Distance (m)	Direction	Update
20	10.0	S	11-May-2018
21	24.0	S	11-May-2018

1.4 Areas benefiting from Flood Defences

Are there any areas benefiting from Flood Defences within 250m of the study site? No

Any relevant data is represented on Map 1 – Flood Map for Planning.

1.5 Areas of Proposed Flood Defences

Are there any Proposed Flood Defences within 250m of the study site? Yes

ID	Distance (m)	Direction	Project Name	Project reference	Flood Type	Projected Spend	Standard of Protection after completion (% likelihood of flooding in any given year)	Number of households to benefit*
22	197.0	N	Lambay Secondary Defence Flapvalve Replacement, Bognor Regis	SOC008E/000A/007A	Sea Flooding	Year 1:£5,000 Year 2:£30,000 Year 3:£15,000 Year 4:£15,000 Year 5:£000	0.0	0

* This illustrates the number of households that move from 'very significant' or 'significant' to 'moderate' or 'low' probability of flood risk bands if the proposed flood scheme is to be implemented.

Any relevant data is represented on Map 1 – Flood Map for Planning.

Guidance: This search consists only of proposed flood defences present in the dataset provided by the Environment Agency/Natural Resources Wales. Please note that proposed flood defence schemes will not influence the current RoFRaS ratings for the site.

1.6 Areas used for Flood Storage

Are there any areas used for Flood Storage within 250m of the study site? No

Flood Storage Areas are considered part of the functional floodplain, and are areas where water has to flow or be stored in times of flood. Technical Guidance to the National Planning Policy Framework states that only water-compatible development and essential infrastructure should be permitted within flood storage areas, and existing development within this area should be relocated to an area with a lower risk of flooding. Any relevant data is represented on Map 1 – Flood Map for Planning.

Notes on Flood Zone Data:

This data relates solely to flooding from rivers or the sea. The Environment Agency/Natural Resources Wales estimate that over 2.5 million properties are at risk of flooding within England and Wales. River flooding occurs when a watercourse cannot cope with the water draining into it from the surrounding land. This can happen, for example, when heavy rain falls on an already waterlogged catchment. Coastal flooding results from a combination of high tides and stormy conditions. If low atmospheric pressure coincides with a high tide, a tidal surge may happen which can cause serious flooding.

The Groundsure Flood Insight Report comments upon whether a property lies in proximity to Environment Agency/Natural Resources Wales Zone 2 and Zone 3 floodplains. The Government's Technical Guidance to the National Planning Policy Framework explains how flood risk should be considered at all stages of the planning and development process in order to reduce future damage to property and potential loss of life. The Government looks to planning authorities to ensure that flood risk is properly taken into account in the planning of developments to reduce the risk of flooding and the damage which floods cause.

Flood Zones enable planning authorities to apply the sequential test (see Technical Guidance to the National Planning Policy Framework) for development proposals and prevent inappropriate development.

Technical Guidance to the National Planning Policy Framework defines the flood zones as: -

Zone 1 – little or no risk with an annual probability of flooding from rivers and the sea of less than 0.1%

Zone 2 – low to medium risk with an annual probability of flooding of 0.1-1.0% from rivers and 0.1-0.5% from the sea.

Zone 3 – high risk with an annual probability of flooding of 1.0% or greater from rivers, and 0.5% or greater from the sea.

Flood Zone 3b/Flood Storage Areas - very high risk with the site being used as part of the functional flood plain or as a Flood Storage Area.

The flood zones are the main constraint map underpinning decisions on development and flood risk.

Existing Flood Defences

Flood defences seek to reduce the risk of flooding and to safeguard life, protect property, sustain economic activity and the natural environment. Flood defences are designed to protect against flood events of a particular magnitude, expressed as risk in any one year. For example, defences in urban areas may be built to provide protection against flood events of a size which might occur on average once in one hundred years or less.

Proposed Flood Defences

This information is taken from the Environment Agency/Natural Resources Wales's database of Areas to Benefit from New and Reconditioned Flood Defences under the Medium Term Plan (MTP). The dataset contains funding allocation for the first financial year (from April). Funding for the following four financial years is not guaranteed, being only indicative, and will be reviewed annually. Projects within the Medium Term Plan qualify for inclusion in this dataset if:

- the investment leads to a change in the current standard of protection (change projects);
- the investment is a replacement or refurbishment in order to sustain the current standard of protection (sustain projects);
- the project has an initial construction budget of £100,000 or more; and
- the project is included within the first five years of the MTP

The data includes all the Environment Agency/Natural Resources Wales's projects over £100K that will change or sustain the standards of flood defence in England and Wales over the next 5 years. It also includes the equivalent schemes for all Local Authority and Internal Drainage Boards. The number of households and areas of land contributing to DEFRA's Outcome Measures (OM) are also attributed i.e. could benefit from major work on flood defences.

These data also contain Intermittence Flood Maintenance Programme that show the annual maintenance programme of work scheduled to be carried by the Environment Agency/Natural Resources Wales, Local Authority or Internal Drainage Board on flood defences. Data details routine maintenance as well as intermittent work that has been funded for the coming year. The data contains a start and end coordinate defining the relevant river section where work is planned.

Information Warning

Please note that the maps show the areas where investment is being made to reduce the flood and coastal erosion risk and are not detailed enough to account for individual addresses. Individual properties may not always face the same risk of flooding as the areas that surround them. Also, note that funding figures are indicative and any use or interpretation should account for future updates where annual values may change.

Every possible care is taken to ensure that the maps reflect all the data possessed by the Environment Agency/Natural Resources Wales and that they have applied their expert knowledge to create conclusions that are as reliable as possible. The Environment Agency/Natural Resources Wales consider that they have created the maps as well as they can and so should not be liable if the maps by their nature are not as accurate as might be desired or are misused or misunderstood, despite their warnings. For this reason, they are not able to promise that the maps will always be accurate or completely up to date.

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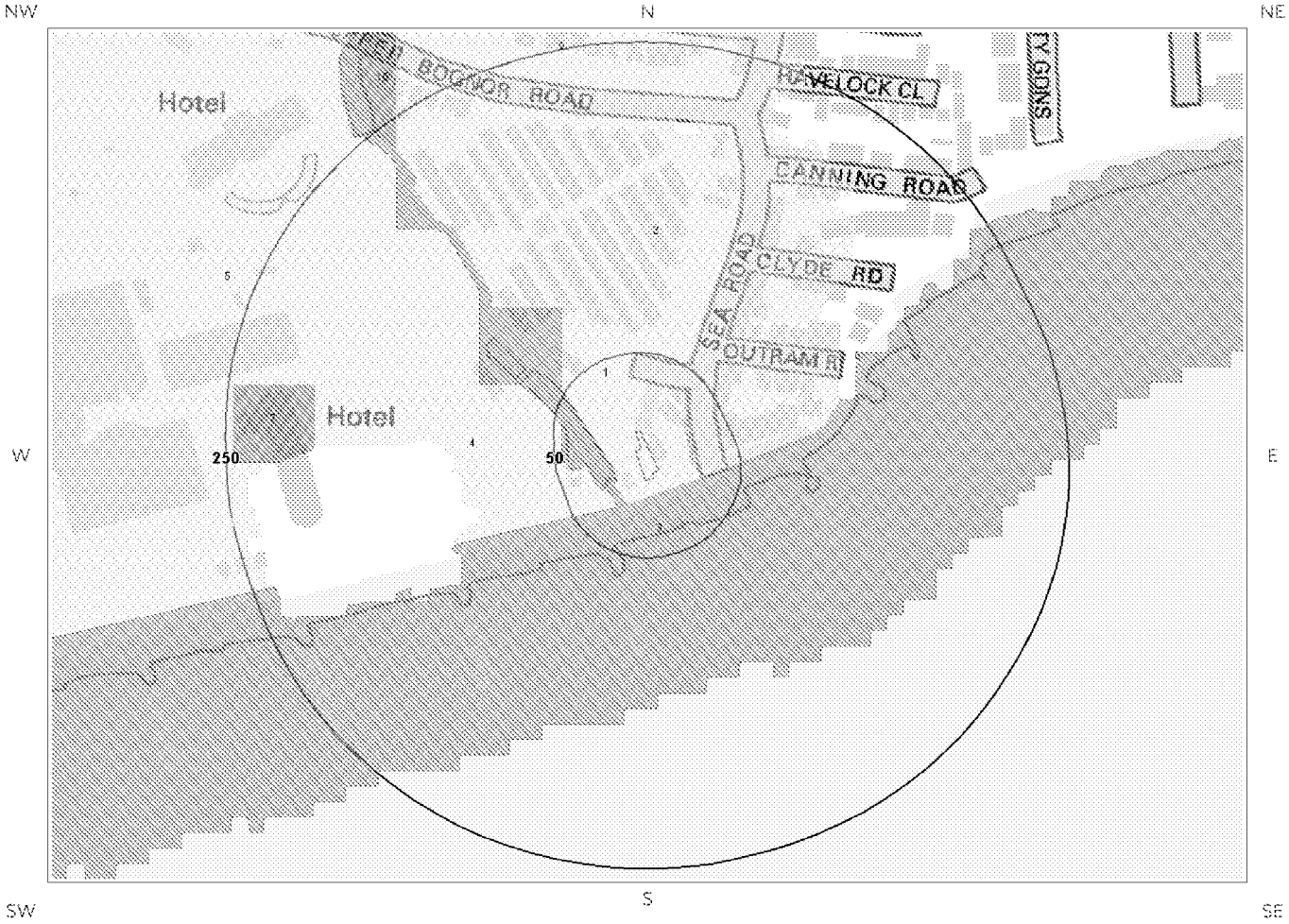
Flood Storage Areas

Flood Storage Areas may also act as flood defences. A flood storage area may also be referred to as a balancing reservoir, storage basin or balancing pond. Its purpose is to attenuate an incoming flood peak to a flow level that can be accepted by the downstream channel. It may also delay the timing of a flood peak so that its volume is discharged over a longer time interval.

A flood storage area may take the form of a wet or dry reservoir. A wet reservoir is a water storage facility in which storage can be effected by allowing water levels to rise during flood times. A dry reservoir is typically adjacent to a river and comprises an enclosed area that accepts water only at peak times. These areas are also referred to as Zone 3b or 'the functional floodplain' and has a 5% or greater chance of flooding in any given year, or is designed to flood in the event of an extreme (0.1%) flood or another probability which may be agreed between the Local Planning Authority and the Environment Agency/Natural Resources Wales, including water conveyance routes. Development within Flood Storage Areas is severely restricted.

2. Environment Agency/Natural Resources Wales RoFRaS Flooding Map



Environment Agency/Natural Resources Wales RoFRaS Flooding legend

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Site Outline

Search Buffers (m)

RoFRaS Rating

Very Low

Low

Medium

High

Report Reference: GS-5283068
Client Reference: NN1013

2. Environment Agency/Natural Resources Wales Risk of Flooding from Rivers and the Sea (RoFRaS)

2.1 Environment Agency/Natural Resources Wales Risk of Flooding from Rivers and the Sea (RoFRaS) Flood Rating (River and Coastal)

What is the highest risk of flooding onsite? Low

The Environment Agency/Natural Resources Wales RoFRaS database provides an indication of river and coastal flood risk at a national level on a 50m grid with the flood rating at the centre of the grid calculated and given above. The data considers the probability that the flood defences will overtop or breach by considering their location, type, condition and standard of protection.

RoFRaS data for the study site indicates the property is in an area with a Low (greater than 1 in 1000 but less than 1 in 100) chance of flooding in any given year.

Any relevant data within 250m is represented on the RoFRaS Flood map. Data to 50m is reported in the table below.

ID	Distance (m)	Direction	RoFRaS Flood Risk
1	0.0	On Site	Low
2	0.0	On Site	Low
3	10.0	S	High
4	24.0	SW	Low

Notes on RoFRaS data:

This information is based on the very latest Environment Agency/Natural Resources Wales Risk of Flooding from Rivers and the Sea (RoFRaS) data. This data has been created by dividing the flood plain into 50m squares, or smaller areas where a square if intersected by a river or coastline. These are called impact cells. The method then calculates the likelihood that the centre of each impact cell will start to flood using a number of different flood scenarios.

A number of insurance companies providing cover for flood risk use this data as the basis of their risk model, although they may also utilise additional information such as claims histories, which may further influence their decision. Where a high risk of flooding is identified flood risk insurance may be difficult to obtain without further work being undertaken. Property owners of sites within Low and Medium risk areas are still considered to be at risk of flooding and insurance premiums may be increased as a result. Owners of properties within Low, Medium and High risk areas are advised to sign up to the Environment Agency/Natural Resources Wales's Flood Warning scheme. The probability estimates for RoFRaS risk bands are as follows:

Very Low – the chance of flooding from rivers or the sea is considered to be less than 1 in 1000 (0.1%) in any given year.

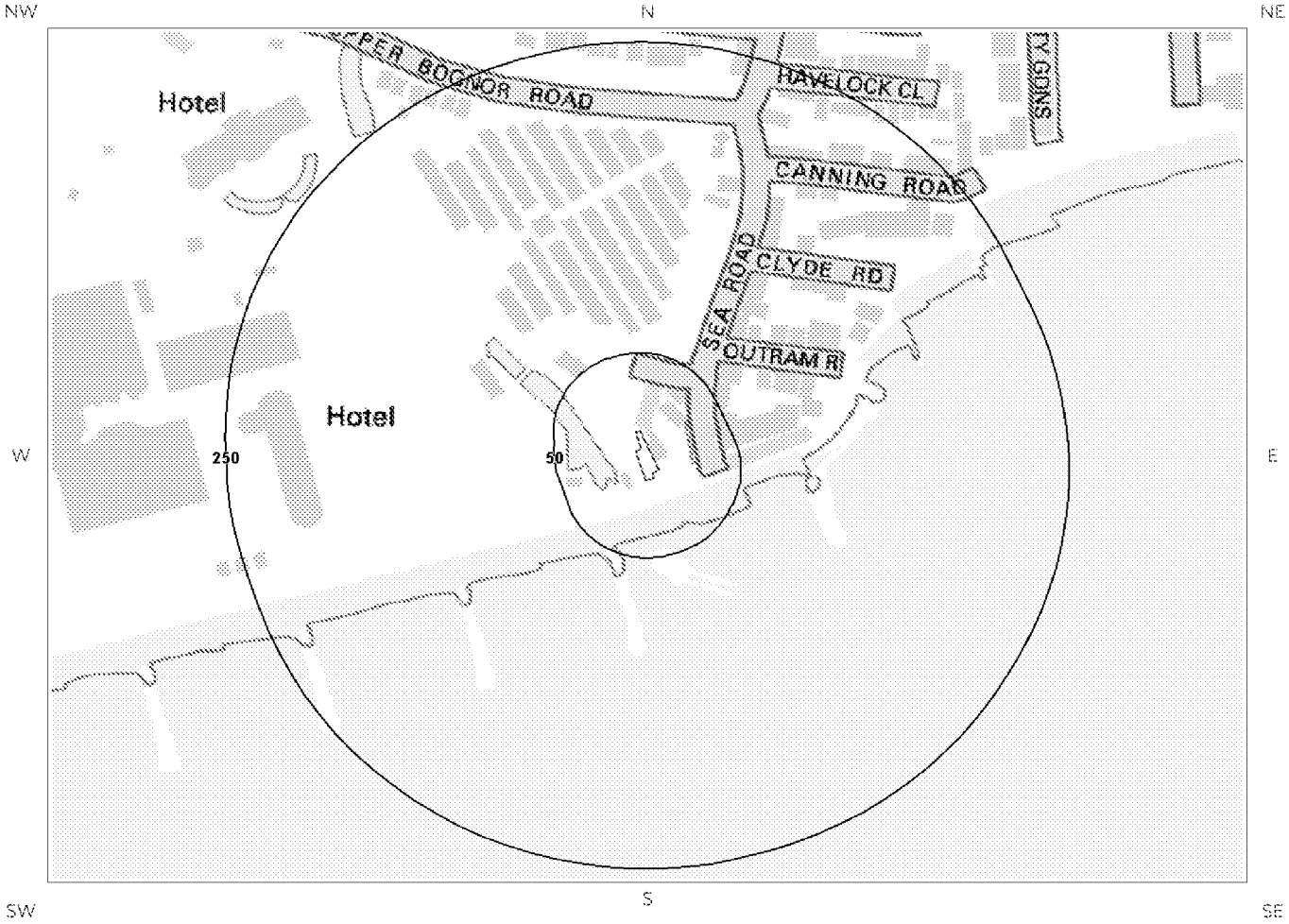
Low – the chance of flooding from rivers or the sea is considered to be less than 1 in 100 (1%) but greater than or equal to 1 in 1000 (0.1%) in any given year.

Medium – the chance of flooding from rivers or the sea is considered to be less than 1 in 30 (3.3%) but greater than 1 in 100 (1%) in any given year.

High – the chance of flooding from rivers or the sea is considered to be greater than or equal to 1 in 30 (3.3%) in any given year.

Groundsure
LOCATION INTELLIGENCE

3. Environment Agency/Natural Resources Wales Historic Flooding Events Map



Environment Agency/Natural Resources Wales Historic Flooding Events legend

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Site Outline

125
250
Search Buffers (m)

Historic Flood Events

Report Reference: GS-5283068
Client Reference: NN1013

3. Environment Agency/Natural Resources Wales Historic Flooding Events

3.1 Historic Flood Outlines

Has the site or any area within 250m been subject to historic flooding as recorded by the Environment Agency/Natural Resources Wales? No

This database shows the individual footprint of every flood event recorded by the Environment Agency/Natural Resources Wales and previous bodies.

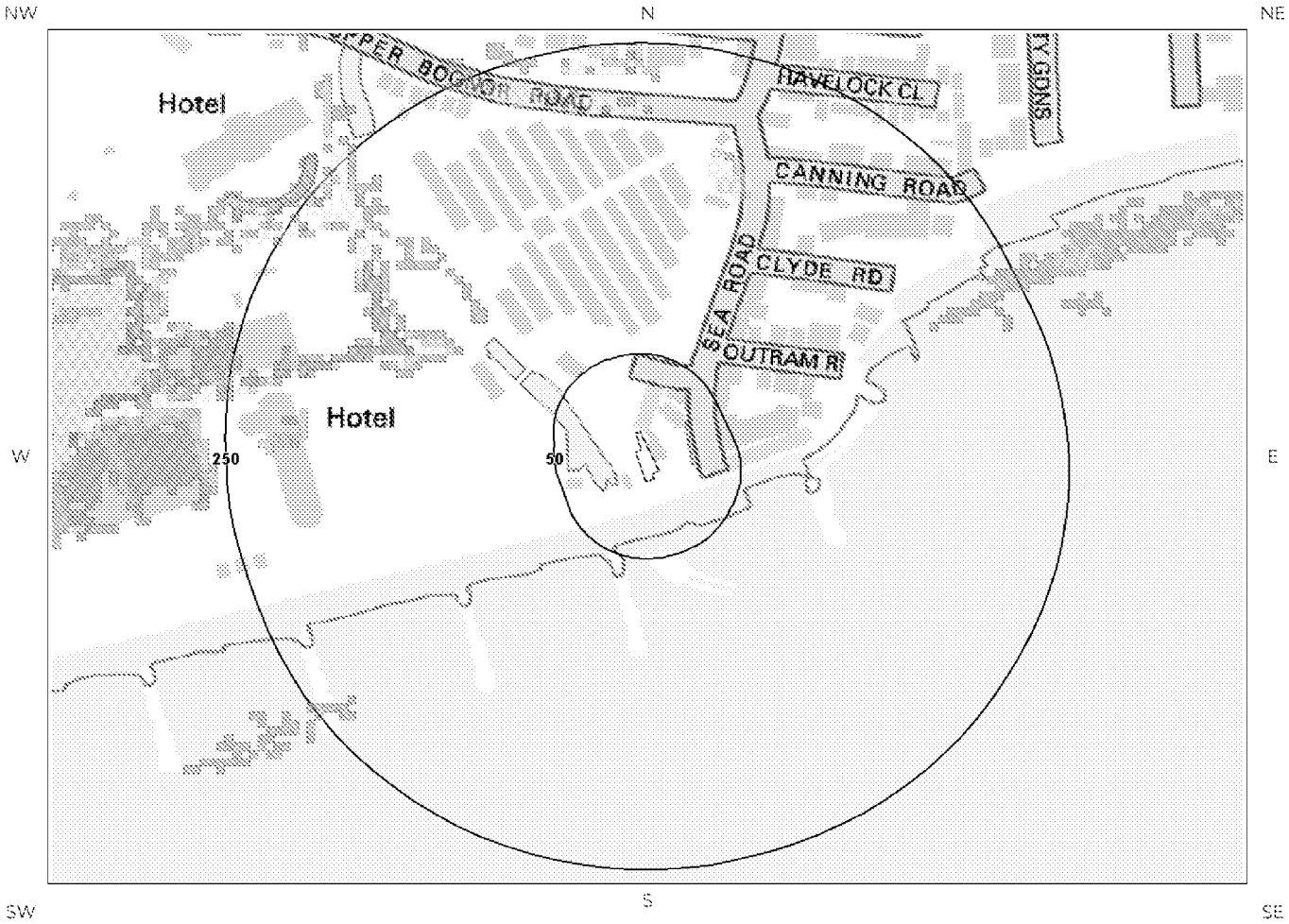
Any records found within the search radius are displayed on Map 3 – Historic Flooding Events.

Notes on Historic Flooding data:

Over 21,000 separate events are recorded within this database, dating back to 1947. This data is used to understand where flooding has occurred in the past and provides details as available. Absence of a historic flood event for an area does not mean that the area has never flooded, but only that the Environment Agency/Natural Resources Wales do not currently have records of flooding within the area. Equally, a record of a flood footprint in previous years does not mean that an area will flood again, and this information does not take account of flood management schemes and improved flood defences.

Groundsure
LOCATION INTELLIGENCE

4. JBA Surface Water (Pluvial) Flood Map



JBA Surface Water (Pluvial) Flood Legend

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Site Outline

125
250
Search Buffers (m)

Highly Significant
Significant
High
Moderate to High

Moderate
Low to Moderate
Low

Report Reference: GS-5283068
Client Reference: NN1013

4. JBA Surface Water (Pluvial) Flooding

Surface Water (pluvial) flooding is defined as flooding caused by rainfall-generated overland flow before the runoff enters a watercourse or sewer. In such events, sewerage and drainage systems and surface watercourses may be entirely overwhelmed.

Surface Water (pluvial) flooding will usually be a result of extreme rainfall events, though may also occur when lesser amounts of rain falls on land which has low permeability and/or is already saturated, frozen or developed. In such cases overland flow and 'ponding' in topographical depressions may occur.

What is the risk of pluvial flooding at the study site?	Negligible

Guidance: The site or an area in close proximity has been assessed to be at Negligible Risk of surface water (pluvial) flooding. This indicates that this area would be expected to be affected by surface water flooding in a 1 in 1000 year rainfall event to a depth of less than 0.1m.

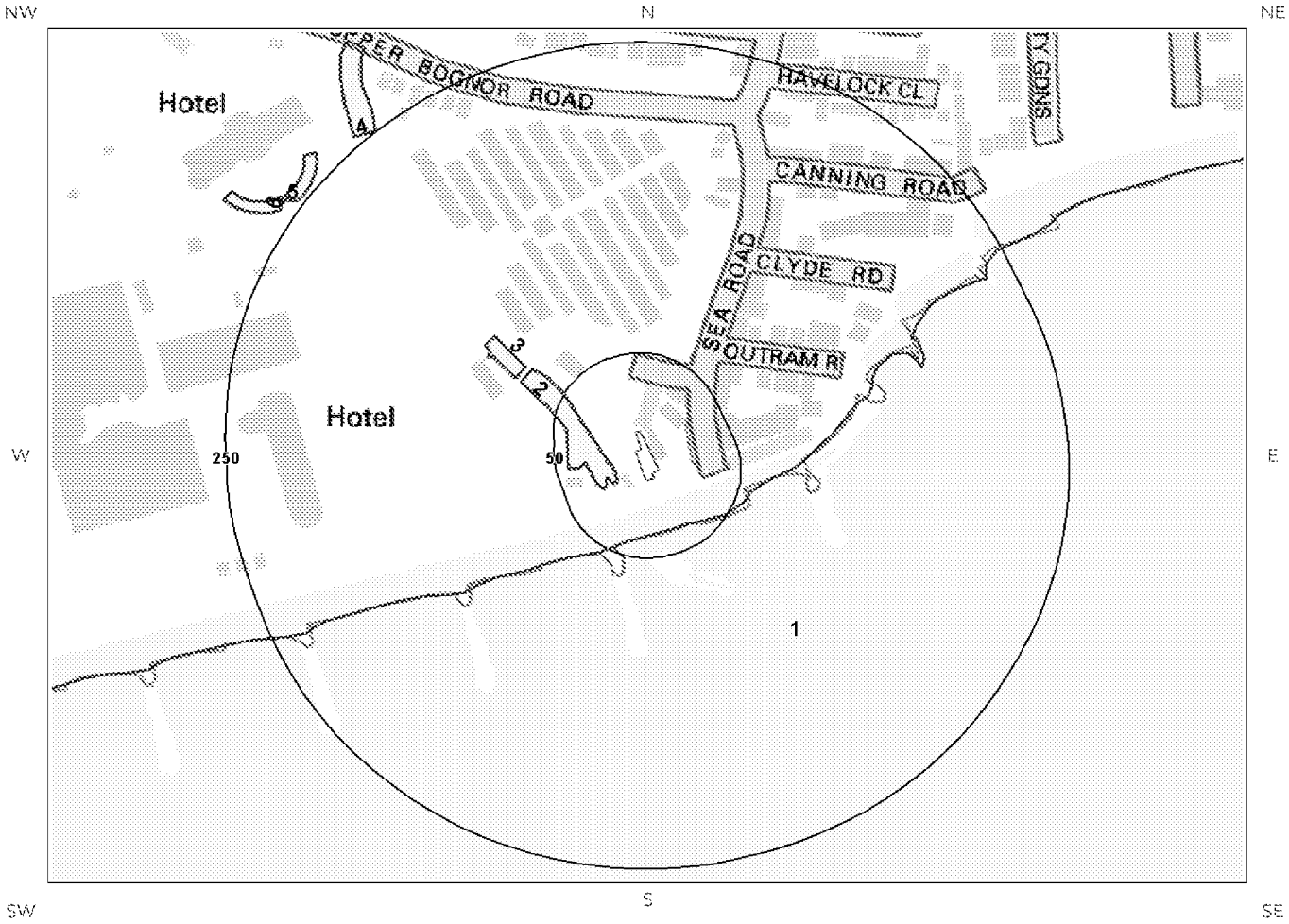
Notes on Surface water (Pluvial) Flooding data:

JBA Consulting surface water flood map identifies areas likely to flood following extreme rainfall events, i.e. land naturally vulnerable to surface water or "pluvial" flooding. This data set was produced by simulating 1 in 75 year, 1 in 200 year and 1 in 1000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though older ones may even flood in a 1 in 5 year rainstorm event.

The model provides the maximum depth of flooding in each 5m "cell" of topographical mapping coverage. The maps include 7 bands indicating areas of increasing natural vulnerability to surface water flooding. These are:-

- **Less than 0.1m in a 1 in 1000 year rainfall event** - Negligible
- **Greater than 0.1m in a 1 in 1000 year rainfall event** - Low
- **Between 0.1m and 0.3m in a 1 in 200 year rainfall event** – Low to Moderate
- **Between 0.3m and 1m in a 1 in 200 year rainfall event** – Moderate
- **Greater than 1m in a 1 in 200 year rainfall event** – Moderate to High
- **Between 0.1m and 0.3m in a 1 in 75 year rainfall event** – High
- **Between 0.3m to 1m in a 1 in 75 year rainfall event** - Significant
- **Greater than 1m in a 1 in 75 year rainfall event** – Highly Significant

5. Surface Water Features map



Surface Water Features legend

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Site Outline

Search Buffers (m)

Surface Water Feature (wider than 5m)

Surface Water Feature (narrower than 5m)

5. Surface Water Features

Are there any surface water features within 250m of the study site? Yes

The following surface water records are represented on mapping:

ID	Distance (m)	Direction
1	34.0	S
2	15.0	W
3	79.0	NW

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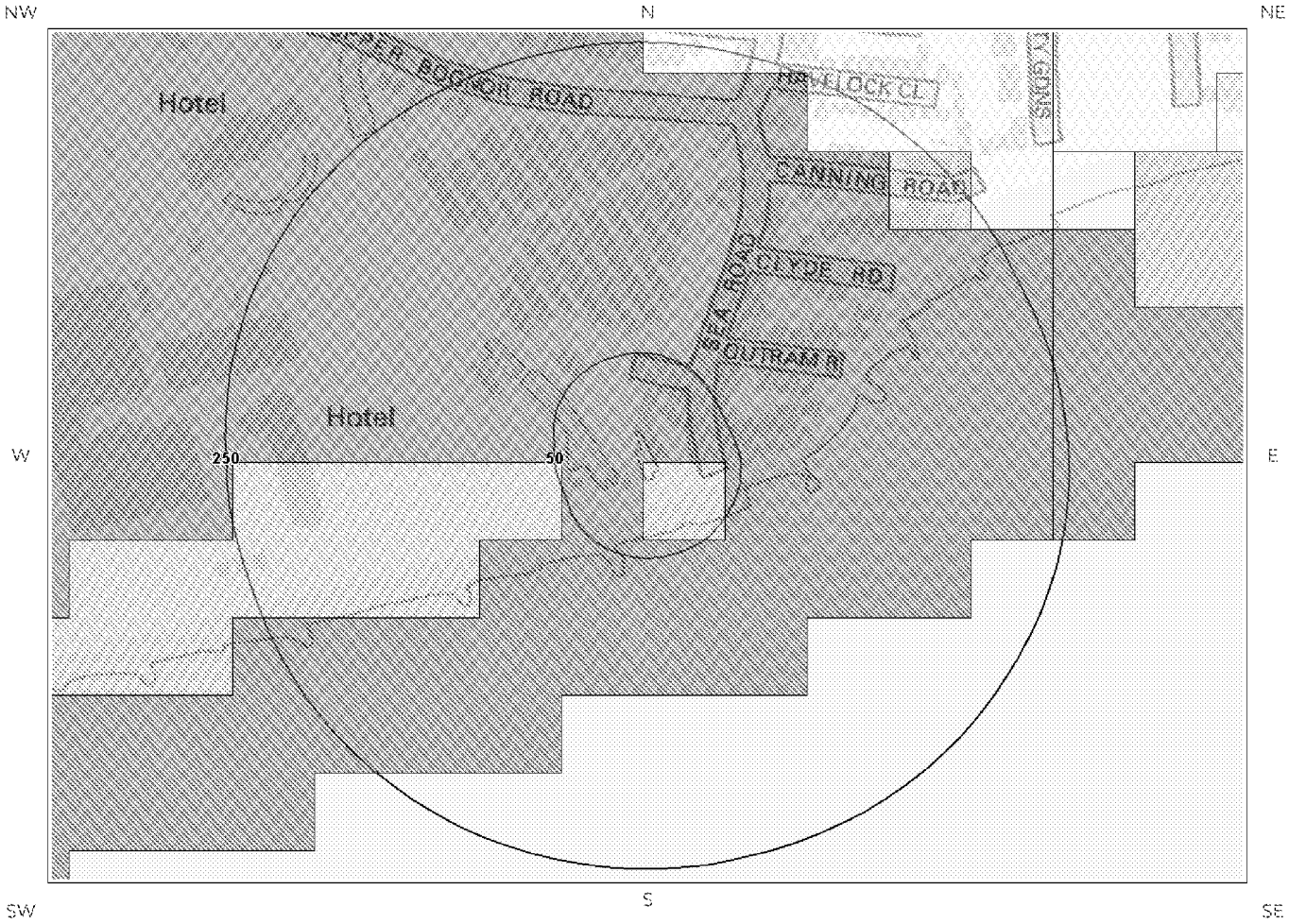
Groundsure
LOCATION INTELLIGENCE

6. BGS Groundwater Flooding Map



BGS Groundwater Flooding legend

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Site Outline

50
250
Search Buffers (m)

Limited potential for groundwater flooding to occur

Potential for groundwater flooding of property below ground level

Potential for groundwater flooding to occur at surface

6. Groundwater Flooding

6.1 Groundwater Flooding Susceptibility Areas

Are there any British Geological Survey groundwater flooding susceptibility flood areas within 50m of the boundary of the study site? Yes

What is the highest susceptibility to groundwater flooding in the search area based on the underlying geological conditions? Potential for groundwater flooding at surface

Does this relate to Clearwater Flooding or Superficial Deposits Flooding? Superficial Deposits Flooding

Where potential for groundwater flooding to occur at surface is indicated, this means that given the geological conditions in the area groundwater flooding hazard should be considered in all land-use planning decisions. It is recommended that other relevant information e.g. records of previous incidence of groundwater flooding, rainfall, property type, and land drainage information be investigated in order to establish relative, but not absolute, risk of groundwater flooding.

6.2 Groundwater Flooding Confidence Areas

What is the British Geological Survey confidence rating in this result? Moderate

Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

The confidence rating is on a threefold scale - Low, Moderate and High. This provides a relative indication of the BGS confidence in the accuracy of the susceptibility result for groundwater flooding. This is based on the amount and precision of the information used in the assessment. In areas with a relatively lower level of confidence the susceptibility result should be treated with more caution. In other areas with higher levels of confidence the susceptibility result can be used with more confidence.

Notes on Groundwater Flooding data:

The BGS Susceptibility to Groundwater Flooding hazard dataset identifies areas where geological conditions could enable groundwater flooding to occur and where groundwater may come close to the ground surface.

Groundwater flooding may either be associated with shallow unconsolidated sedimentary aquifers which overlie unproductive aquifers (Superficial Deposits Flooding), or with unconfined aquifers (Clearwater Flooding).

The susceptibility data is suitable for use for regional or national planning purposes where the groundwater flooding information will be used along with a range of other relevant information to inform land-use planning decisions. It might also be used in conjunction with a large number of other factors, e.g. records of previous incidence of groundwater flooding, rainfall, property type, and land drainage information, to establish relative, but not absolute, risk of groundwater flooding at a resolution of greater than a few hundred metres. The susceptibility data should not be used on its own to make planning decisions at any scale, and, in particular, should not be used to inform planning decisions at the site scale. The susceptibility data cannot be used on its own to indicate risk of groundwater flooding.

7. BGS Geological Indicators of Flooding

Are there any geological indicators of flooding within 250m of the study site? Yes

This dataset identifies the presence of superficial geological deposits which indicate that the site may be, or have been in the past, vulnerable to inland and/or coastal flooding. This assessment does not take account of any man-made factors such as flood protection schemes, and the data behind the report are purely geological.

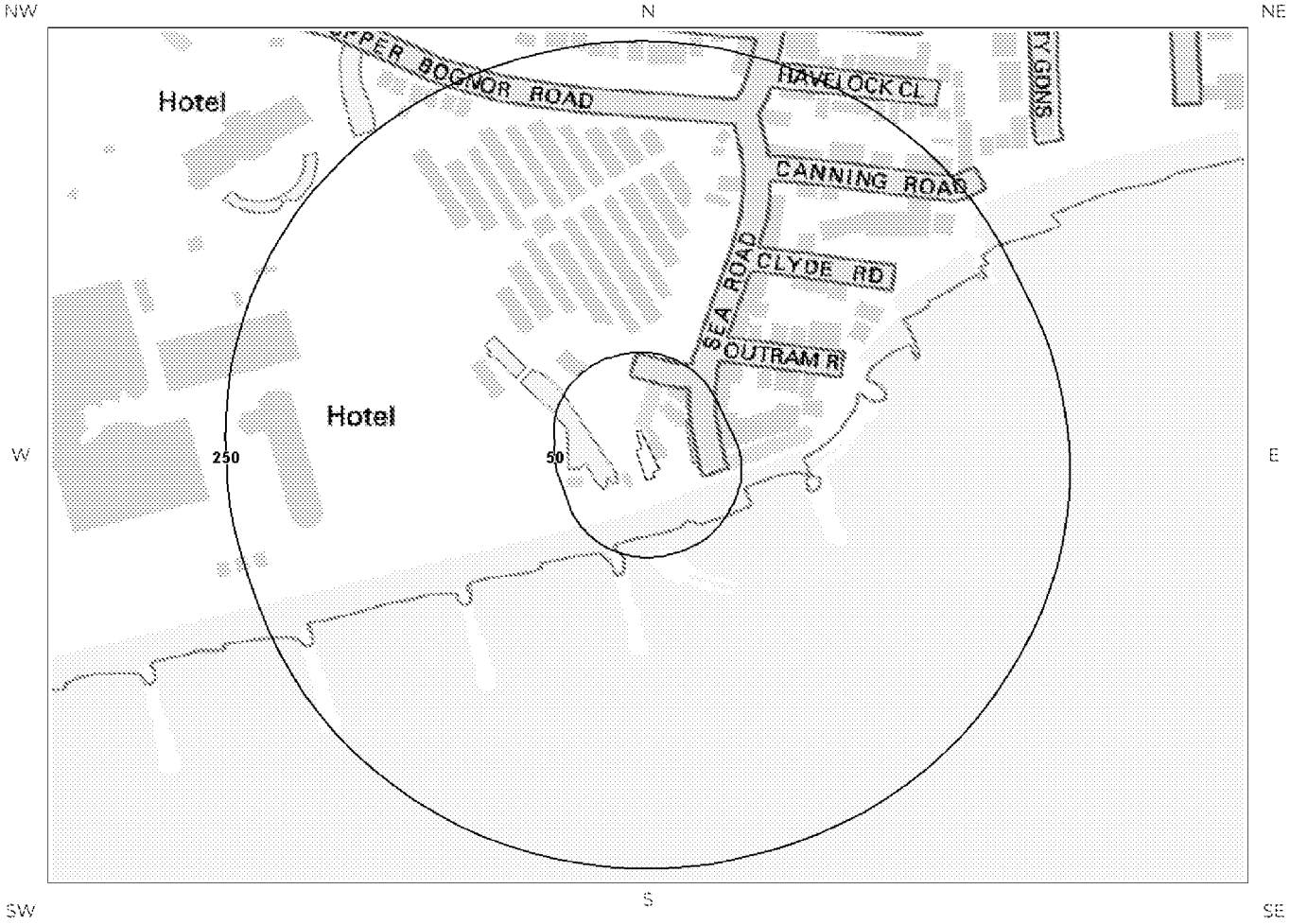
Distance	Direction	Description
0.0	On Site	Lower flood potential from the sea: areas affected in extreme cases due to combined factors e.g. very high tides/high wind speeds/large storm surge.
19.0	S	Higher flood potential from the sea: the first areas to experience the effects of coastal flooding.
27.0	E	Lower flood potential from rivers: areas affected by secondary flooding in extreme cases as a result of a prolonged flood event.
240.0	E	Higher flood potential from the sea: the first areas to experience the effects of coastal flooding.

Notes on BGS Geological Indicators of Flooding data:

The BGS Geological Indicators of Flooding (GIF) data set is a digital map based on the BGS Digital Geological Map of Great Britain at the 1:50,000 scale (DiGMapGB-50). It was produced by characterising Superficial (Drift) Deposits on DiGMapGB-50 in terms of their likely vulnerability to flooding, either from coastal or inland water flow. These Superficial Deposits are considered 'recent' in geological terms, most having been formed in the later parts of the Quaternary geological period (i.e. within the last few tens of thousands of years). Observations made during recent major inland and coastal flooding events have demonstrated that the erosion and deposition of these recent geological sediments have produced subtle topographical variations, resulting in landforms such as fluvial and coastal floodplains. The mapping of these landforms, in conjunction with the fluvial and/or coastal deposits that underlie them, has in turn determined the extent of previous coastal and inland flooding.

On this basis, the floodplains which are at greatest risk from flooding can be both visualised and defined by Superficial Deposits as depicted on geological maps. These include deposits such as river alluvium and lacustrine (lake) alluvium, as well as the First River Terrace or 'Floodplain terrace' (raised flat areas adjacent to or within floodplains, which represent the level of the floodplain prior to the most recent episode of down-cutting). Older and higher river terraces have been excluded as they lie outside the geologically defined floodplain. Areas at risk from coastal inundation are similarly characterised by a range of estuarine or marine deposits that include, for example, tidal flats.

8. JBA Canal Break map



JBA Canal Break legend

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Site Outline

50
250
Search Buffers (m)

Areas at risk from Canal Breach

Report Reference: GS-5283068
Client Reference: NN1013

8. JBA Reservoir and Canal Data

8.1 JBA Reservoir Failure Impact Modelling

Is the property located in an area identified as being at potential risk in the event of a reservoir failure? No

JBA consulting have modelled the flooding impact from 1,700 reservoirs in England and Wales, should there be a catastrophic failure of a reservoir wall or embankment. This data is not displayed on mapping.

Guidance: None required

Notes on Reservoir Failure Impact data:

This dataset identified areas that are most likely to flood following the sudden catastrophic failure of a reservoir and is provided by JBA Consulting. JBA has identified over 1,700 reservoirs that pose a risk to people and property. These maps identify properties that would flood in the unlikely event of the failure of the reservoir's dam or embankment. Empirical methods were used to predict the flow that would result from the failure which was then modelled onto high resolution Digital Terrain Models (DTM) using JBA's advanced 2D hydraulic modelling techniques. The model provides the maximum depth of flooding in each cell of the DTM.

8.2 JBA Canal Break Modelling

Is the property located within 500m of an area identified as being at potential risk in the event of a canal break? No

Database searched and no data found.

Notes on Canal Break modelling data

Canal failure mapping includes two types of failure:

- Breach of raised canal embankments - failure of the embankment due to weaknesses; these are typically caused by erosion or animal burrowing but can also arise from poor maintenance.
- Aqueduct failure - an aqueduct is where the canal passes over infrastructure such as roads, railways and subways, or over other canals and rivers. Failures of these are typically caused by the collapse of the underlying culvert.

A length of over 1,700km of canal covering England, Wales and Scotland was modelled. The canal modelling is restricted to the areas where LIDAR is available as the raised embankments are more defined in the LIDAR than in the Photogrammetry data. Each canal is categorised as part of the Merchant Shipping Notice (MSN 1776 (M)). The majority of the modelled canals are categorised as A, with a few exceptions, which fell under category B.

- Category A: narrow rivers and canals where the depth of water is generally less than 1.5m.
- Category B: wider rivers and canals where the depth of water is generally 1.5m or more and where the significant wave height could not be expected to exceed 0.6m at any time.
- Category C: tidal rivers and estuaries and large, deep lakes and lochs where the significant wave height could not be expected to exceed 1.2m at any time.
- Category D: tidal rivers and estuaries where the significant wave height could not be expected to exceed 2m at any time.

The canal map provides flood extent data only and show flooded areas with a depth greater than 0.1m.

Contact Details

Groundsure
LOCATION INTELLIGENCE

Groundsure Helpline

[redacted]

roundsure
OCATION INTELLIGENCE

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Environment Agency

Data

getmapping®

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Terms and Conditions of business for work of this

Standard Terms and Conditions

Groundsure's Terms and Conditions can be viewed online at this link:
https://www.groundsure.com/terms-and-conditions-may25-2018

APPENDIX B

Personal Flood Plan

Personal flood plan

Name

Environment Agency

Are you signed up to receive flood warnings? ☐
If not call Floodline on 0345 988 1188 to see if your area receives free flood warnings.

Let us know when you've completed your flood plan by calling Floodline [redacted]
This will help us learn more about how people are preparing for flooding.

General contact list	Company name	Contact name	Telephone
Floodline	Environment Agency		[redacted]
Electricity provider			
Gas provider			
Water company			
Telephone provider			
Insurance company and policy number			
Local council			
Local radio station			
Travel/weather info			

Key locations

Service cut-off	Description of location
Electricity	
Gas	
Water	

Who can help/who can you help?

Relationship	Name	Contact details	How can they/you help?
Relative			
Friend or neighbour			

Be prepared for flooding. Act now

Personal flood plan

What can I do NOW?

Environment Agency

- Put important documents out of flood risk and protect in polythene ☐
- Check your insurance covers you for flooding ☐
- Look at the best way of stopping floodwater entering your property ☐
- Make a flood plan and prepare a flood kit ☐
- Find out where you can get sandbags ☐
- Identify who can help you/ who you can help ☐
- Identify what you would need to take with you if you had to leave your home ☐
- Understand the flood warning codes ☐

What can you do if a flood is expected in your area?

Actions	Location
Home	
• Move furniture and electrical items to safety	
• Put flood boards, polythene and sandbags in place	
• Make a list now of what you can move away from the risk	
• Turn off electricity, water and gas supplies	
• Roll up carpets and rugs	
• Unless you have time to remove them hang curtains over rods	
• Move sentimental items to safety	
• Put important documents in polythene bags and move to safety	
Garden and outside	
• Move your car out of the flood risk area	
• Move any large or loose items or weigh them down	
Business	
• Move important documents, computers and stock	
• Alert staff and request their help	
• Farmers move animals and livestock to safety	
Evacuation - Prepare a flood kit in advance	
• Inform your family or friends that you may need to leave your home	
• Get your flood kit together and include a torch, warm and waterproof clothing, water, food, medication, toys for children and pets, rubber gloves and wellingtons	

There are a range of flood protection products on the market to help you protect your property from flood damage. A directory of these is available from the **National Flood Forum** at **www.bluepages.org.uk**

Be prepared for flooding. Act now

ARUN DISTRICT COUNCIL FP/185/19/PL
GEHO0709BQPU-E-E