



**200 Park Avenue
Waterlooville
PO7 5EZ**

FLOOD RISK ASSESSMENT REPORT

On Behalf of:

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22 March 2019

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1. Introduction

Instructions were received on March 4th 2019 to carry out a Flood Risk Assessment Report on this site, in accordance with our quotation. It is understood that a pre-application consultation is to be submitted on this site and this report supports the submission. The client has requested a Flood Risk Assessment report, in accordance with the current recommendations given by the National Planning Policy Framework (NPPF) to submit with the planning application.

Following a desk study and deliberations with the Environment Agency (EA) data, this report has been prepared to determine the risk of flooding on the site for the proposed development and recommendations are hereby given to protect the development and its residents from any potential flood risk. This report also aims to investigate the risk of flooding for the proposed development and to provide recommendations to protect the development and its users from any potential flood risk.

The previous guidance and advice from the planners is given below and this report goes on to respond to each point accordingly:

- provide site specific fluvial flood levels and proposed finished floor levels to show that the property will be safe for the lifetime of the development
- take the impacts of climate change into account
- consider how people will be kept safe from the identified flood hazards
- consider how a range of flooding events (including extreme events) will affect people and property
- consider the requirement for flood emergency planning including flood warning and evacuation of people for a range of flooding events up to and including the extreme event.
- Evidence to show that no flood storage will be lost through this development and if so, flood storage compensation must be provided in m³

2. The Existing Site

The site is located on the Eastern side of the Park Avenue, Waterlooville, Hampshire, at grid reference SU 67621 07689. Appendix A contains a location plan for the site. A topographical plan showing site existing ground levels is shown on Appendix B. The levels are provided to ordnance survey datum. The topographical survey plan shows the existing ground levels on the site are approximately between 38.10 and 39.60m AOD.

The existing site mainly consists of an existing dwelling and garage surrounded by grass surface and trees planting, within an urban environment. The geology of the grounds comprise of Head deposits (Clay, silt and gravel) overlying Wittering formation comprising sand, silt and clay. In due course a formal site investigation will need to be undertaken to prove the assumptions contained within this report.

The site, including existing dwelling has an extent of approximately 1100 square metres. A walk over of the site showed that there is a watercourse (Brook) running to the south of the site, along Alameda Road.

The front area of the site, in front of the existing house has a mix of grass/planted areas and compacted gravel / tarmac drive, which connects the property to the Park Road at the Northern

Boundary. Details of the existing site are shown on Appendix B along with some existing site photographs.

3. The Proposed Development

The proposed development on the site involves the removal of the existing dwelling and the construction of three new dwellings. The existing driveway and access will be slightly modified to also service the new houses. Detailed information on the new properties are provided in Appendix C.

4. Policy Background

The Government's sustainable development strategy (SDS) makes it a requirement to assess appropriate procedures for developments in areas at risk of flooding. This is to avoid any unnecessary increase in requirements for flood defences.

The NPPF requires that developers making planning applications on sites that are potentially at risk from flooding should consult with the EA, and where appropriate produce a flood risk assessment (FRA). The aim is to assess the potential risk for the development, demonstrating how flood risk will be managed onsite ensuring that flood risk is not increased elsewhere. The EA flood matrix was consulted and showed that a flood risk assessment is appropriate for this site.

5. Flood Risk Maps and Available Information

Appendix D and E contains a copy of the EA Flood Map for this area. This shows that the development site is not at risk from flooding from river and sea. Further investigation however showed that the site is partly within flood zone 3 and partly within flood zone 2 for risk of surface water, which is from the watercourse to the South of the site, evidence of the flood risk is depicted in Appendix D. Part of the site, to the Western end, is not within any flood risk zone.

As part of this flood risk assessment the EA and their online flood mapping and detailed flood model data (Product 4) was consulted. It was confirmed that part of the site, from approximately the front of the existing house to the Western boundary, is shown to be within Flood Zone 3 - an area with 1 in 100 annual likelihood of flooding (1% chance). The data indicates that part of the site is at risk from fluvial flooding from the water course to the Southern boundary of the site. The water course that runs along Alameda Road is only partially exposed and/or completely enclosed along its length, flowing under buildings and driveways. A more detailed EA flood map and model data can be found in Appendix E.

Appendix E also contains detailed flood mapping data obtained from the Environment Agency. Flood Levels are given within the data, with data compiled in 2016. The outputs from this modelling have been used to obtain the flood depths and extents shown on the map and its data. The map shows an amplified view of our site and show the line of the water courses in gradients of purple / pink and blue, representing Flood Zones 3 and 2 respectively. The map also shows various depth locations where data was recorded and the logs related to point marked on the map are detailed on the table enclosed.

The Eastern part of the development site is shown to be in flood zone 3. EA data predicts the maximum of 1 in 100 year flood level plus an allowance for climate change (35%). The data provided by the EA

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indicate that a maximum level of 39.410m AOD flood level is to be expected on our site for the area within flood zone 3 which represents the most likely risk to the site (Data points 1 to 12 on the EA data contained within Appendix F), which is higher than the existing ground levels

During a flood event the appropriate flood zone 3 EA data flood levels would indicate that up to 1.21m of flood water would be present on our site, using the lowest existing site levels of 38.20m and the flood level of 39.41m AOD. The topographical levels taken on the site indicate that the existing house finished floor level (FFL) of the existing building is 38.900m AOD, indicating that there would be up to 0.51m of flood water within the dwelling for the predicted maximum flood event. Therefore the existing house is at risk from flooding during the 1/100 year flood event according to the EA data and this is shown by the existing property being inside of the predicted flood zone shown on the flood mapping. Therefore as this house is to be removed it provides the opportunity to reduce the flood risk on the site by setting the FFL for the new dwellings at a level higher than the predicted flood level.

The maximum flood level for the 1 in 100 year event + 35% climate change allowance is 39.410m AOD. Therefore we would propose that the new dwelling FFL is provided at a level of 39.510m AOD, thus providing a free board of 100mm over the predicted 1in100 year + 35% flood event level.

6. Risk Assessment

Consultations have been held with the EA data. The information from the EA depicts that the proposed development site lies partially within Flood Zone 3 - an area where the chance of flooding from both rivers and the sea has been assessed as less than 1.0% in any year (1 chance in 100 in any year) and partly within flood zone 2 - an area where the chance of flooding from both rivers and the sea has been assessed as less than 0.10% in any year (1 chance in 1000 in any year)

Therefore measures are required as noted previously to ensure that a flood event will not adversely affect the site and nearby areas.

7. Effects on Existing Drainage Strategy

New developments must ensure that their drainage strategy does not increase flood risk onsite or elsewhere, and must account for flows from roads and overland as possible source for onsite flood, in order to manage, prevent and control runoff flow patterns. The NPPF guidance's advises that 'both the rates and volumes of runoff from new developments should be no greater than the rates prior to the proposed development'.

Currently, the proposed development site is within the urban setting and the majority of the area proposed for the new dwelling is lawned or softlandscaped area.

To limit the proposed development surface runoff water and to achieve flow rates similar to the ones prior to the development a sustainable urban drainage systems (SUDs) scheme will be required. Government policy and strategy strongly recommends the use of SUDs as approach to prevent the increase in flood risk. Systems should be implemented to reduce the amount of surface runoff in the event of a peak rainfall.

A permeable paving system should be utilised on driveways to allow water to infiltrate through the surface layer and be stored and/or controlled discharged through the sub base construction make up. This would allow the water to gradually seep into the ground or discharged to a storage location.

Similarly, the use of roof drainage controlled discharge into soakaway, provided with then adequate storage capacity would minimise the effects of high surface runoff flow.

In due course and before any detailed design is carried out a site specific trial hole investigation would need to be carried out to determine soil properties and ground water levels. Similarly, before the carryout of the detailed design of drainage systems an infiltration/soakaway test should be carried out to determine the expected soil infiltration rate on site then a suitable soakaway / attenuation system can be designed to maintain green field run off levels from the new development on the site.

The new development will have a small impact on the foul water flow due to the increase in number of people using the site, this will be minor for the new dwelling and the additional foul water will be discharged into the local Foul water sewer within Common Road. Southern Water will need to be contacted in order to obtain permission for the new discharge. The foul water discharge on the site will not affect flood risk as the flood risk on this site is from the nearby watercourse. We would however propose that any new inspection chambers placed within the flood zone are fitted with sealed lids to avoid flood water from entering the foul water system during a flood event.

8. Flood Water displacement

As the proposed new dwelling is partially within the predicted flood zone the proposed new development will affect the volume of displaced water, should a flooding event occur unless measures are put in place to negate this.

Using the existing topographical levels on the site and the available EA flood data during the predicted flood zone 3 event (flood level of 39.410m AOD) approximately 593.23m³ of flood water will be stored on the site. These calculations have been made using the EA flood data, topographical site levels and the existing structures on the site that will currently impede flood water storage. Calculations have then been undertake to calculate the proposed flood water storage on the site when taking into account the removal of the existing house and the rebuilding of the new dwellings. This exercise showed that a loss of 39.33m³ would result from the development if existing ground levels on site were retained.

In order to avoid this flood water from being displaced we would propose that existing ground levels are reduced in zones K and L on the sketches included within Appendix G. The existing ground level in Zone K will be reduced by 160mm and the existing ground levels within Zone L (where the old house used to be positioned) will be reduced by 150mm. BY undertaking these level reductions the flood water storage on the site during the 1in100 year + 35% climate change allowance will not be effected by the development.

9. Sequential and Exception Test

Sequential and exception tests are required to prove that developments provide wider sustainability benefits to the community that outweigh flood risk. The NPPF classifies 'areas at risk of flooding' as land within Flood Zones 2 and 3, or land within Flood Zone 1 which have critical drainage problems and which have been notified as so to the local planning authority by the EA.

The aim of the sequential test is to steer developments towards flood zone 1 and avoid areas at risk. The information obtained from the EA states that our development site is partially within a flood zone 1 and partially within flood zones 2 and 3. The site is a redevelopment of an existing site and dependant on the Developers works to the existing dwelling already on the site. The previous discussions have proven that the new dwellings can be constructed to avoid any direct risk from flooding. Access to and from the site will also be available during any flooding due to the location of the flood zone and the site access. Foul and storm water drainage issues can be suitably detailed to avoid increasing or being effected by any flooding issues. It will also be possible to avoid any flood water displacement by installing the measures as noted above. The existing house will a FFL below that of the predicted event will also be removed as part of the redevelopment. Therefore considering the previous points we believe that the site is suitable for development as long as the proposed measures are installed as previously noted and the development will actually result in a reduction of flood risk on the site.

10. Conclusion and Recommendation

Investigation results have shown that according to the EA flood mapping and data part of the site of the proposed development is within a flood zone 1 with no risk of flooding, and part is within flood zone 2 and 3 with associated flood risk.

Using the predicted flood data supplied by the EA a maximum predicted flood level of 39.410m AOD can be expected during the 1 in 100 year +35% climate change allowance event. As in the previous paragraphs we would propose that a new FFL for the new dwellings is set at a minimum of 39.510m AOD, thus providing a free board of 0.10m above the predicted floor event.

Storm water drainage discharge from the site will be limited by using permeable construction for new driveway / parking areas on the site. Storm water will then be discharged into soakaways, early geotechnical information would suggest that a soakaway solution is feasible but in time a full site investigation including soil infiltration testing will need to be undertaken to confirm this.

Foul water from the site will be discharged into the local foul sewer within Park Road. The local sewer service provider will need to be contacted to obtain permission to discharge into the system. The foul water discharge from the site will increase slightly but will not be significant and will not affect flood risk on the site. We would however propose that any new drainage inspection chambers within the predicted flood zone are installed with sealed covers to ensure that no flood water will enter the foul water system during a flood event.

Flood water displacement on the site could potentially occur due to the area of new dwellings contained within the predicted flood zone. To ensure that no flood water is displaced off of the site we would propose that ground levels on the site are reduced as shown on the sketches in Appendix G. Instigating these ground level reductions in the proposed flood zones marked on the sketch is feasible and will ensure that additional flood water storage volume is created on the site to equal that lost due to the new dwelling.

We would also propose that a Flood Warning Plan is produced for the development at design / construction stage. This plan should be reviewed at least annually and would include the following information:

- Contact the Environment Agency Floodline Service on 0845 988 1188 and <https://flood-map-for-planning.service.gov.uk/> to check that the flood risk to the property has not changed, for example flood defences may be built in the future.
- Contact the Environment Agency Flood Warning Service on 0845 988 1188 to register to the Floodline Warnings Direct service. This offers free 24 hour flood alerts direct to your phone or email address. This information is also on the Environment Agency website and is currently available at www.environment-agency.gov.uk/subjects/flood/floodwarning. This is a free service which provides vital information in the event of a flood.

- Prepare and maintain a 'safe haven' flood kit to contain items which are essential for evacuation/refuge. The flood kit will also be useful for general emergency situations. This should be stored where you can easily get to it and on the first floor of the property, and should include:
 - A torch
 - Blankets or a sleeping bag, warm clothing and waterproofs
 - A first-aid kit, including a supply of any essential medication
 - A list of useful telephone numbers
 - A supply of bottled water
 - A stock of non-perishable food items
 - A portable radio and supply of batteries
 - Wellington boots or similar waterproof boots
- Contact the local emergency authorities to find out whether evacuation is considered necessary and where they are providing for evacuees. Or whether safe refuge should be sought on the designated ground and first floor 'safe haven' areas as noted within this report.

Therefore to reiterate our discussions and conclusions in specific terms related to the below points raised by the planners:

- Provide site specific fluvial flood levels and proposed finished floor levels to show that the property will be safe for the lifetime of the development – [this has been proven by the setting of the proposed FFLs and the EA flood data obtained within Appendix D and E.](#)
- Take the impacts of climate change into account – [Climate change has been take into account as described and as noted within the available EA flood data in Appendix E](#)
- Consider how people will be kept safe from the identified flood hazards – [The site users will be kept safe by setting the FFL of the new dwellings above the predicted flood event levels as noted within the report](#)
- Consider how a range of flooding events (including extreme events) will affect people and property – [These have been considered and dealt with within this report](#)

- Consider the requirement for flood emergency planning including flood warning and evacuation of people for a range of flooding events up to and including the extreme event – [As noted within the previous paragraph](#)
- Evidence to show that no flood storage will be lost through this development and if so, flood storage compensation must be provided in m³ – [This have been considered and dealt with within this report](#)

We believe that if the above measures are installed then the new development will not result in any increase in flood risk to the site users or nearby areas.



ELVIN GOMERY
B.Eng (Hons.)

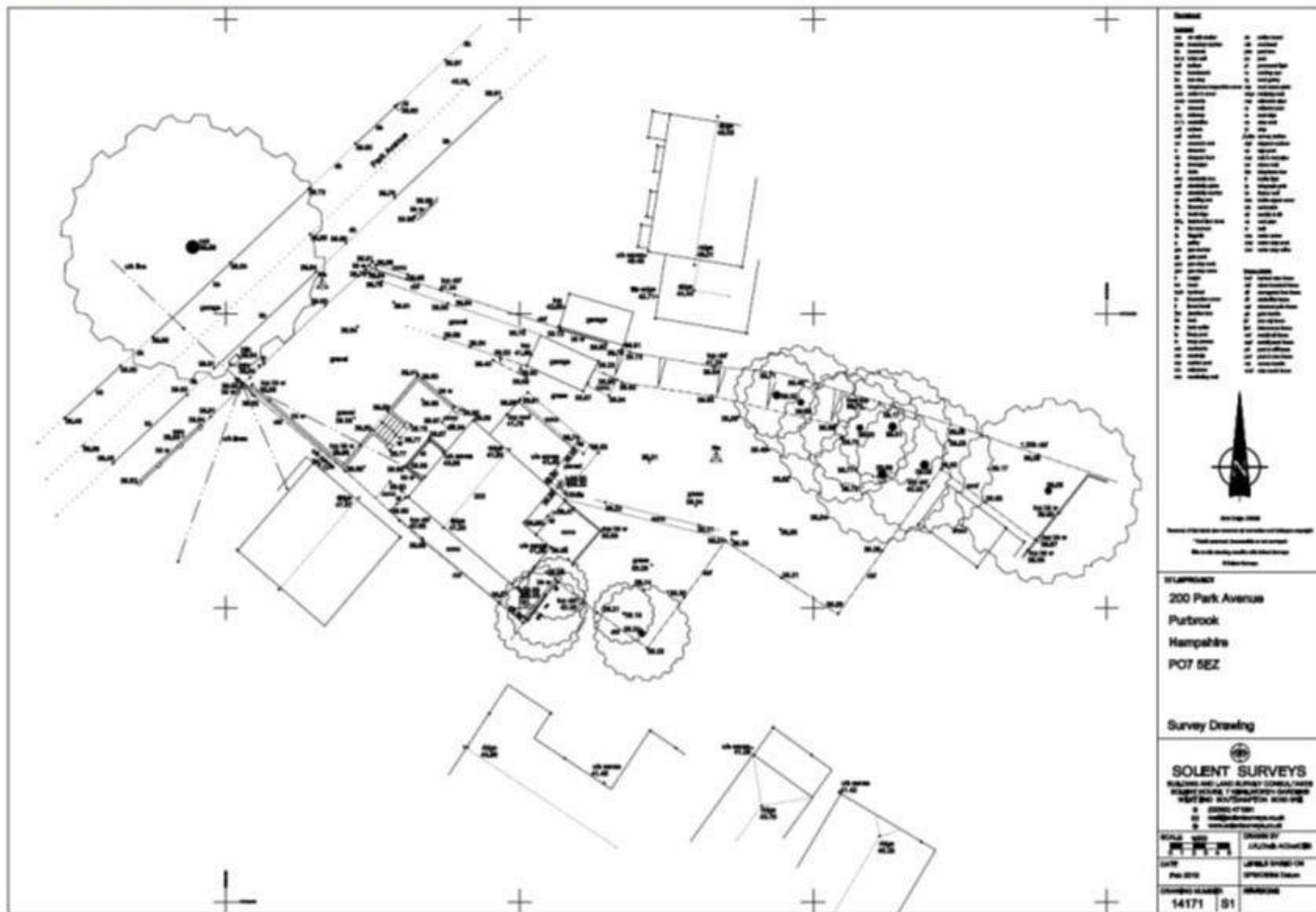
DAVID BUTTON
B.Sc. (Hons), C.Eng.,
M.I.C.E.

APPENDIX

A. Site Location Plan



B. Site Topographic Survey





Front driveway to existing house



Rear patio of existing house



Rear garden to existing house

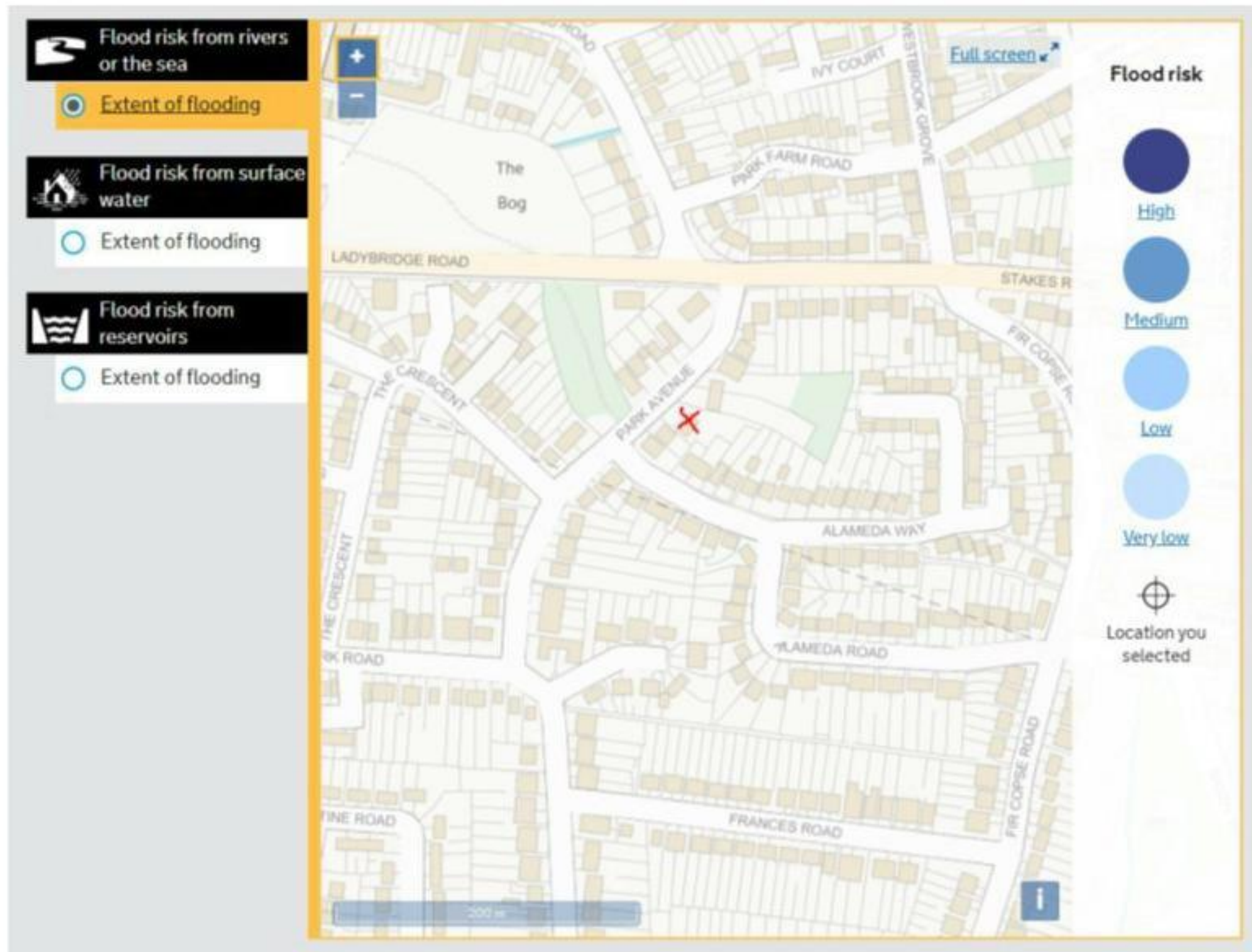
C. Proposed Development Plans

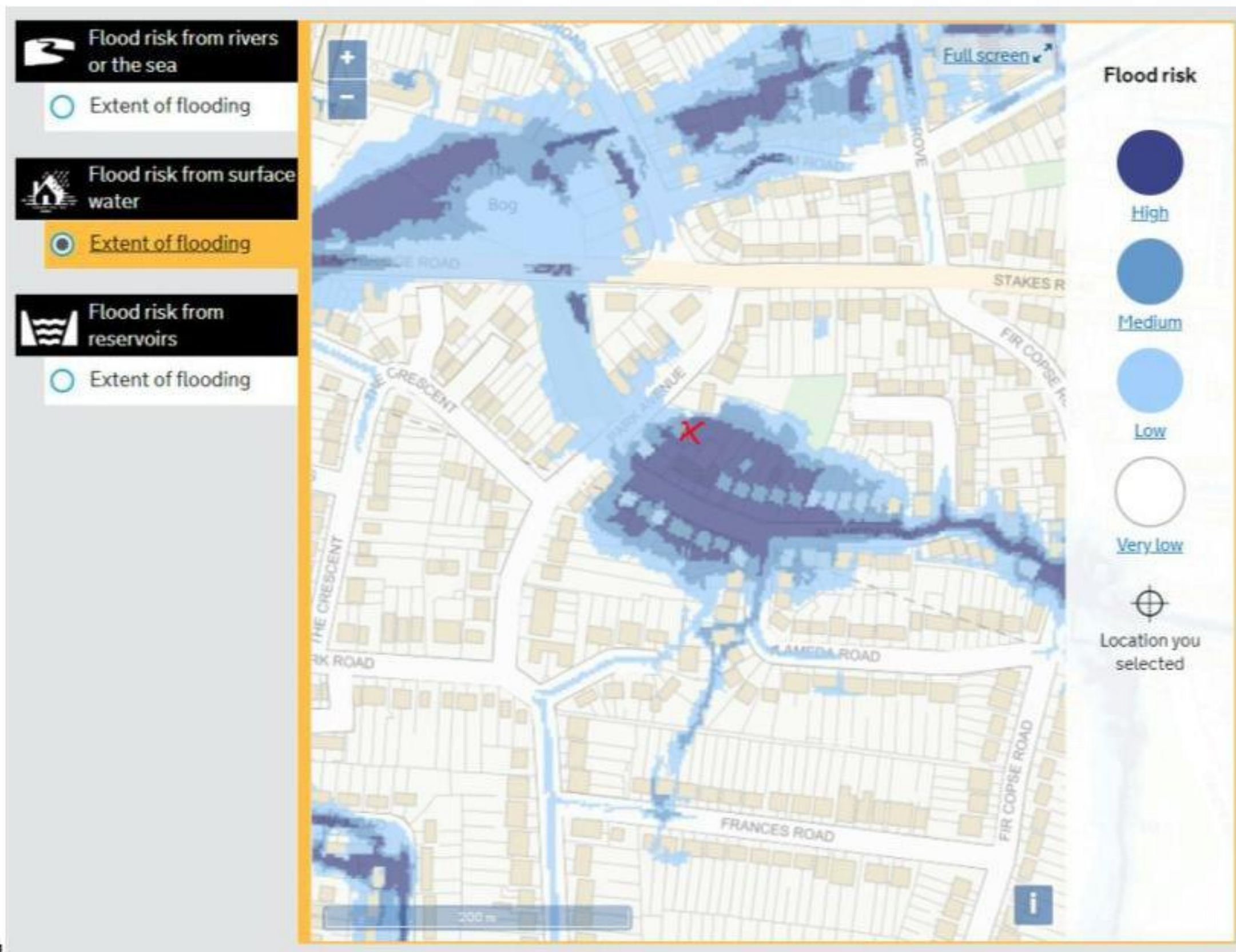




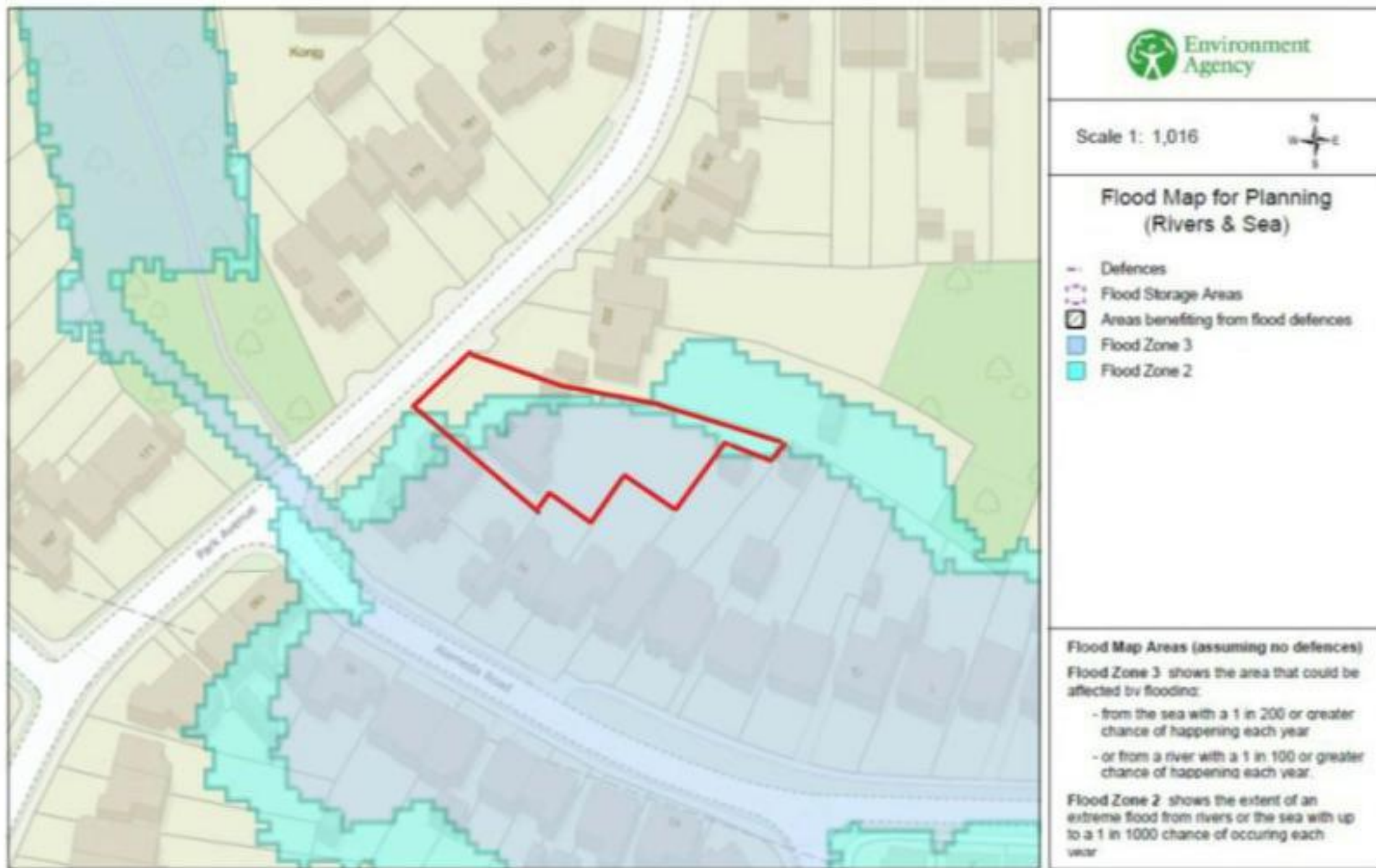


D. Risk of Flooding



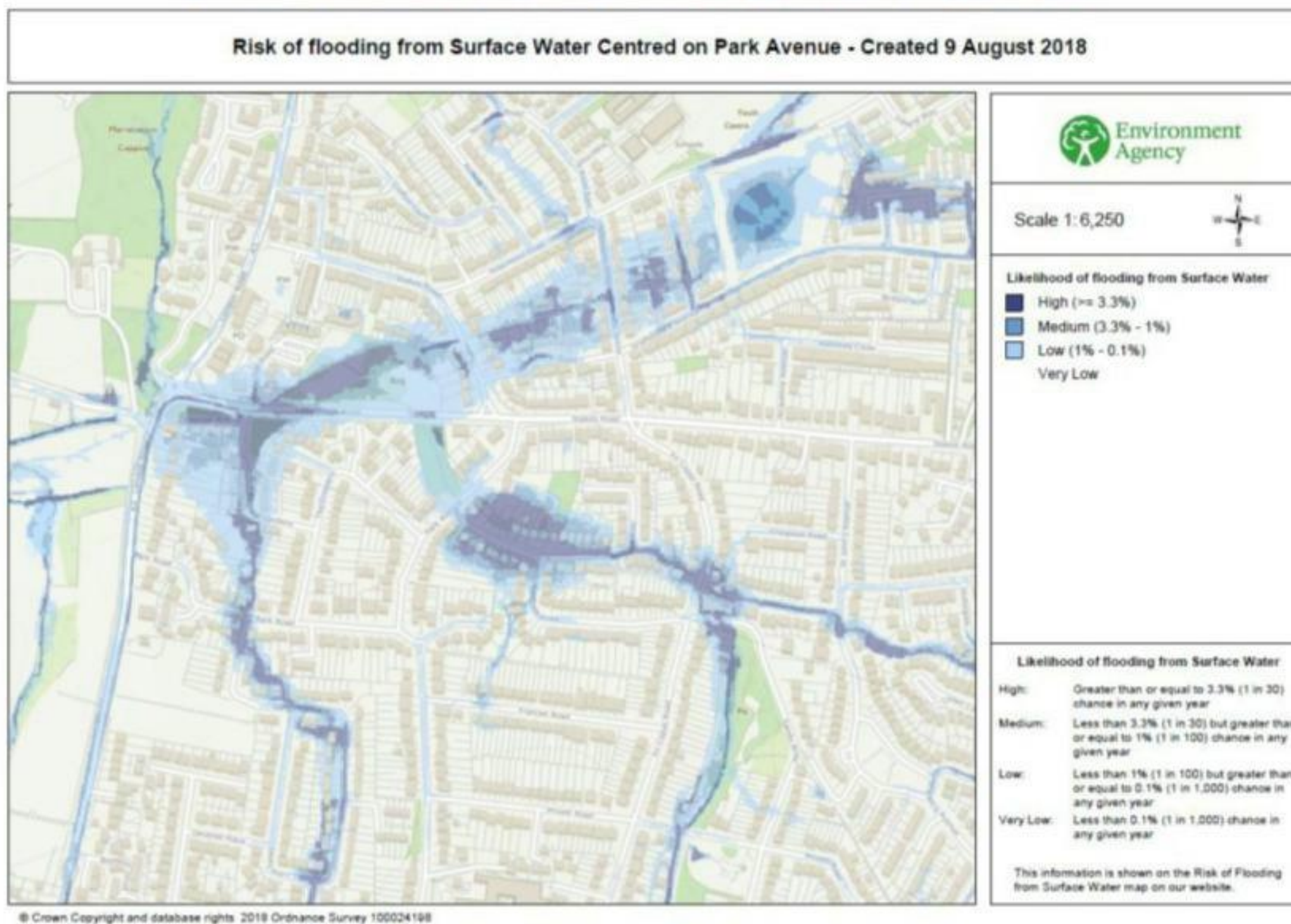


Flood Map for Planning (Rivers and Sea) Centred on Park Avenue - Created 9 August 2018

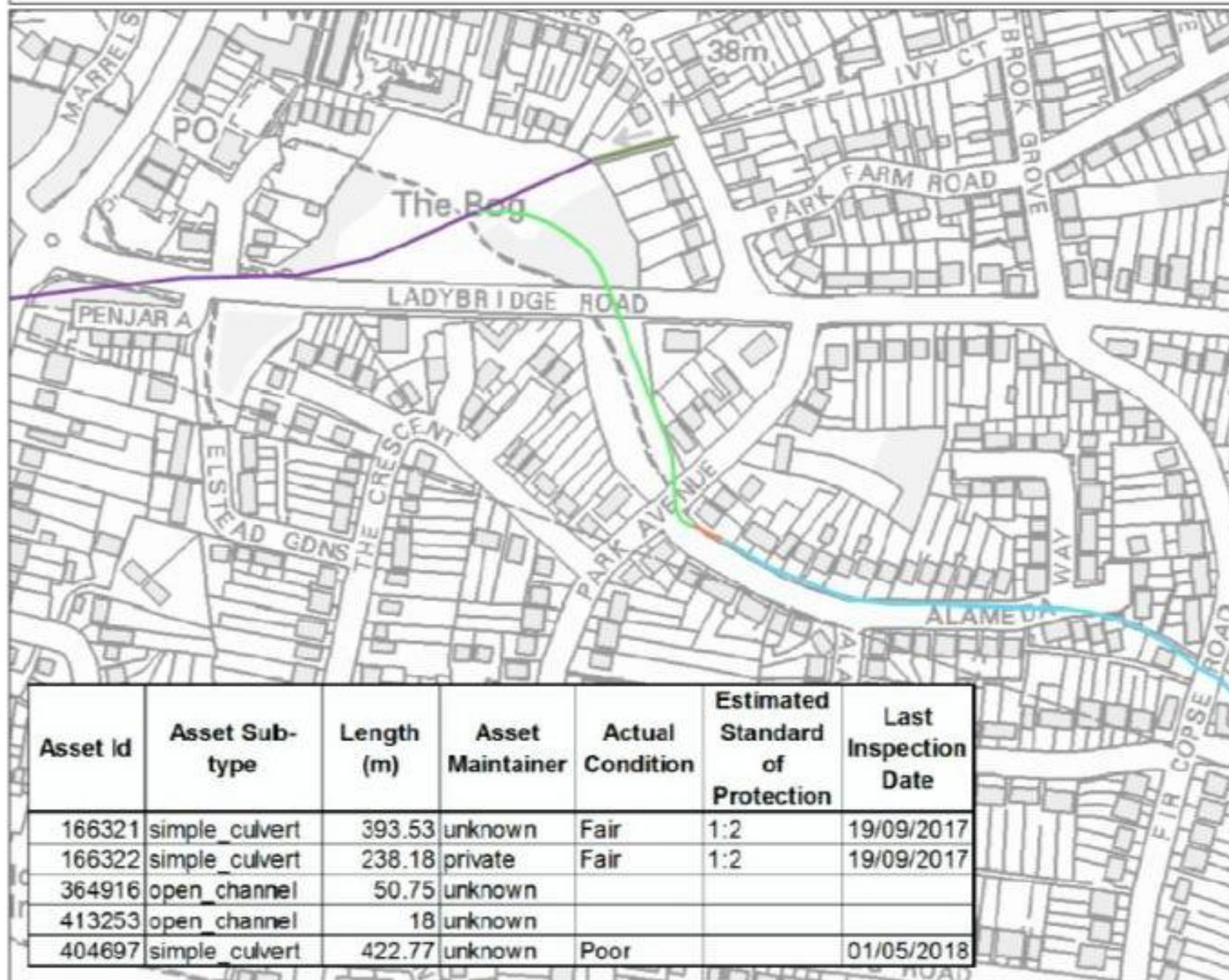


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E. Extract from Valley Road Flood Risk Mapping Study (supplied by the EA)



Defences Centred on Park Avenue - Created 9 August 2018

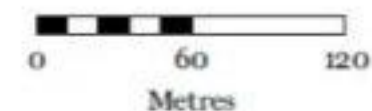


Legend

ASSET_ID	
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364916	
404697	
413253	

1:3,185

*when printed at A4.



2016 JFLOW Levels Centred on Park Avenue - Created 9 August 2018

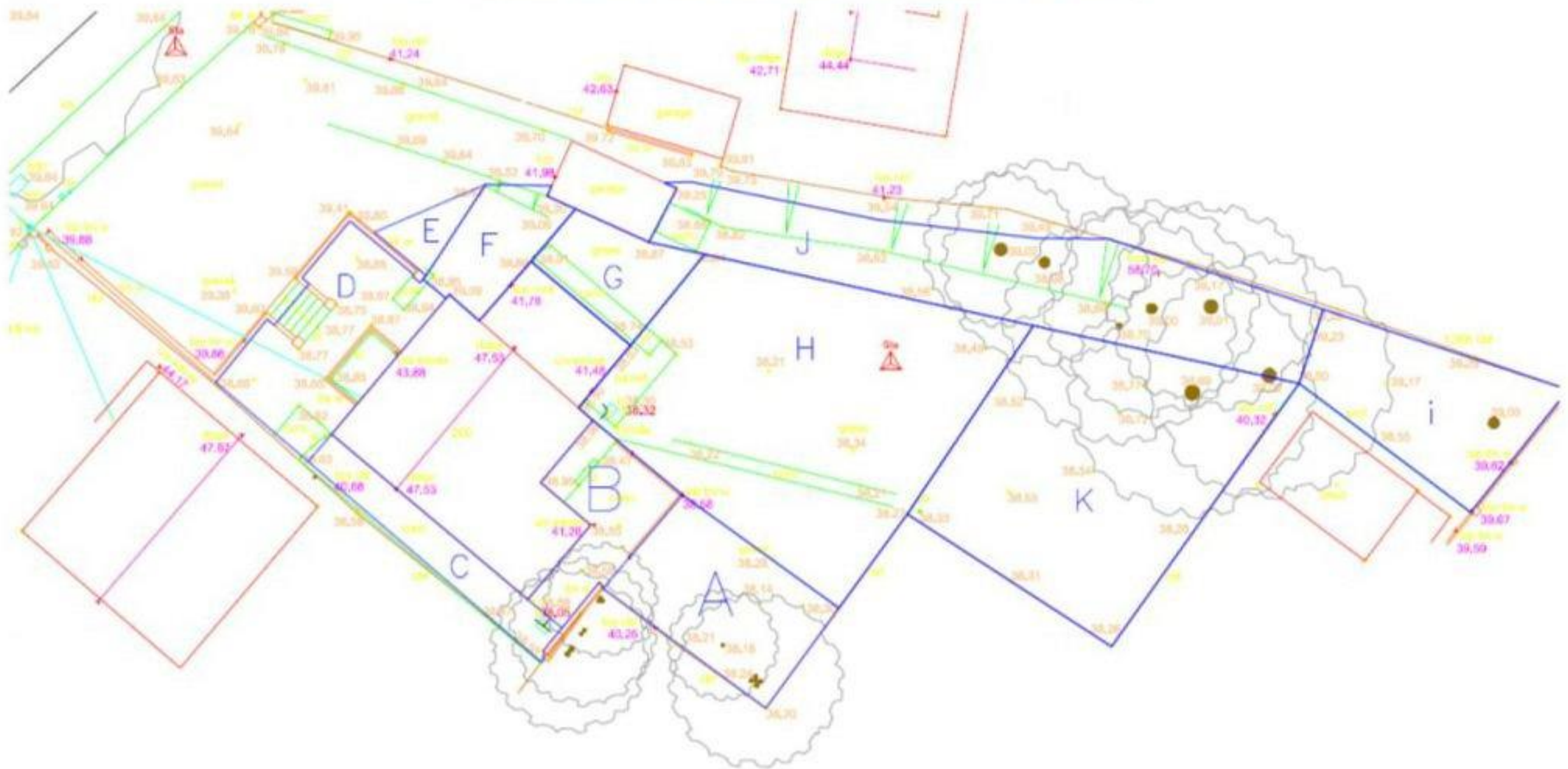


**Water Depths & Levels for 200 Park Avenue, Waterloooville, PO7 5EZ -
2016 JFLOW**

Point	Water Depth (Metres)					Water Surface Level (mAOD*)					Ground Level
	1% Annual Probability/1 in 100 Year (Flood Zone 3)	1% Annual Probability/1 in 100 Year + Climate Change 35%	1% Annual Probability/1 in 100 Year + Climate Change 45%	1% Annual Probability/1 in 100 Year + Climate Change 105%	0.1% Annual Probability/1 in 1000 Year (Flood Zone 2)	1% Annual Probability/1 in 100 Year (Flood Zone 3)	1% Annual Probability/1 in 100 Year + Climate Change 35%	1% Annual Probability/1 in 100 Year + Climate Change 45%	1% Annual Probability/1 in 100 Year + Climate Change 105%	0.1% Annual Probability/1 in 1000 Year (Flood Zone 2)	
1	0.35	0.64	1.47	1.65	0.86	39.11	39.40	40.23	40.41	39.62	38.76
2	0.58	0.87	1.78	1.96	1.09	39.00	39.29	40.20	40.38	39.51	38.42
3	0.47	0.77	1.67	1.85	0.98	39.03	39.33	40.23	40.41	39.54	38.56
4	0.35	0.65	1.34	1.51	0.86	39.04	39.34	40.03	40.20	39.55	38.69
5	0.76	1.05	1.99	2.16	1.27	39.07	39.36	40.30	40.47	39.58	38.31
6	0.78	1.07	1.90	2.07	1.29	39.06	39.35	40.18	40.35	39.57	38.28
7	0.23	0.52	0.93	1.10	0.74	39.18	39.47	39.88	40.05	39.69	38.95
8	No Data	0.02	0.58	0.75	0.24	No Data	39.33	39.89	40.06	39.55	39.31
9	No Data	0.09	0.76	0.92	0.30	No Data	39.41	40.08	40.24	39.62	39.32
10	No Data	No Data	0.33	0.48	No Data	No Data	No Data	40.16	40.31	No Data	39.83
12	No Data	No Data	0.52	0.67	No Data	No Data	No Data	40.25	40.40	No Data	39.73

* Levels in metres above Ordnance Datum Newlyn

F. Proposed onsite floor water storage calculations and sketch



Flood water storage zones on existing site plan



Flood water storage zones on proposed site plan

Existing site 1% 1in100 year + 35% climate change

Flood level		39.41		Flood level	
Zone	Ave existing GL	1in100+35%	Depth flood	Area zone (m2)	Flood volume stored (m3)
A	38.24	39.41	1.17	53.485	62.58
B	38.6	39.41	0.81	30.87	25.0047
C	38.58	39.41	0.83	25.13	20.8579
D	38.7	39.41	0.71	55.84	39.6464
E	39	39.41	0.41	8.05	3.3005
F	39	39.41	0.41	23.51	9.6391
G	38.7	39.41	0.71	25.39	18.0269
H	38.3	39.41	1.11	192.22	213.3642
I	39	39.41	0.41	59	24.19
J	39	39.41	0.41	117.15	48.0315
K	38.55	39.41	0.86	149.53	128.5958
Sum				593.23	m3

Proposed 1% 1in100 year + 35% climate change

Flood level		39.41		Flood level	
Zone	Ave existing GL	1in100+35%	Depth flood	Revised Area zone (m2)	Flood volume stored (m3)
A	38.24	39.41	1.17	48.42	56.65
B	38.6	39.41	0.81	27.26	22.0806
C	38.58	39.41	0.83	30.23	25.0909
D	38.7	39.41	0.71	0	0
E	39	39.41	0.41	5.89	2.4149
F	39	39.41	0.41	31.42	12.8822
G	38.7	39.41	0.71	25.39	18.0269
H	38.3	39.41	1.11	111.17	123.3987
I	39	39.41	0.41	59	24.19
J	39	39.41	0.41	117.15	48.0315
K	38.55	39.41	0.86	149.53	128.5958
New L	38.55	39.41	0.86	107.61	92.5446
Sum				553.91	m3

Therefore reduction in flood storage

39.33 m3

Remedial 1% 1in100 year + 35% climate change

Flood level		39.41		Flood level	
Zone	Ave existing GL	1in100+35%	Depth flood	Revised Area zone (m2)	Flood volume stored (m3)
A	38.24	39.41	1.17	48.42	56.65
B	38.6	39.41	0.81	27.26	22.0806
C	38.58	39.41	0.83	30.23	25.0909
D	38.7	39.41	0.71	0	0
E	39	39.41	0.41	5.89	2.4149
F	39	39.41	0.41	31.42	12.8822
G	38.7	39.41	0.71	25.39	18.0269
H	38.3	39.41	1.11	111.17	123.3987
I	39	39.41	0.41	59	24.19
J	39	39.41	0.41	117.15	48.0315
K	38.39	39.41	1.02	149.53	152.5206
New L	38.4	39.41	1.01	107.61	108.6861
Sum				593.97	m3

Therefore reduction in flood storage

-0.74 m3

Le additional storage provided