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Development at How Bank Farm Egremont

Flood Risk Assessment

Client:

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REVISION HISTORY

Revision	Date	Details
00	24th October 2019	First issue
01	8th October 2020	Report updated
02	9th October 2020	Minor amendments

CONTENTS

APPENDICES

ABBREVIATIONS

AEP:	Annual exceedance probability
AOD:	Above Ordnance Datum
CCA:	Climate change allowance
FRA:	Flood risk assessment
LiDAR:	Light detection and ranging
LLFA:	Lead Local Flood Authority
MBC:	Metropolitan Borough Council
OWC:	Ordinary watercourse
PPG:	Planning Practice Guidance
ReFH2:	ReFH2: Revitalised flood hydrology model, version 2
SFRA:	Strategic Flood Risk Assessment
SuDS:	Sustainable drainage systems

1.0 INTRODUCTION

1.1. JOC Consultants Ltd is instructed by Gleeson Developments Ltd (the Client), to prepare a flood risk assessment (FRA) for a proposed residential development on land at How Bank Farm, and at the site of the former Orgill Primary School, Egremont, Cumbria. The development is the subject of a planning application to Copeland District Council. This report deals only with the Howbank Farm site and the Orgill School site is the subject of a separate FRA report.

1.2. References in this report to "the site" are references to the How Bank Farm site to which the planning application applies. Specific references to sources of information used in the report are shown in square brackets and are listed in section 11. Figure 1 is presented immediately following page 20 and the appendices follow thereafter.

1.3. This report is prepared specifically for Gleeson Developments Ltd for the purpose of the aforementioned planning application and the report may not be used for any purpose other than for the purpose for which it was commissioned, and it may not be assigned to any third party without our written permission.

1.4. In the preparation of this FRA report, JOC Consultants Ltd has relied on published information and on information provided by the Environment Agency and the Client and accepts no liability for its accuracy or adequacy or for the consequences of any changes to or re-assessment of this data in the future.

2.0 OBJECTIVES

2.1. The objectives of this flood risk assessment are to:

1. establish whether the proposed development is likely to be affected by current or future flooding from any source;

2. establish whether the proposed development will increase flood risk elsewhere; and

3. recommend, as appropriate, measures for managing flood risk.

3.0 PLANNING POLICY ON FLOOD RISK

3.1 National Policy

3.1.1. National Planning Policy in relation to flood risk is set out in the National Planning Policy Framework (NPPF) [1].

3.2 Local Policy

3.2.1. Proposed local policy on development and flood risk is set out in Policy ENV 1 and Policy DM24 of the Copeland Local Plan, adopted on 5th December 2013 [2]. The local planning policies on development and flood risk reflect the requirements of the NPPF and are informed by the Copeland Strategic Flood Risk Assessment (SFRA) published in April 2007 [3].

3.3 Planning Practice Guidance

3.3.1. In addition to national and local policy, the Planning Practice Guidance for Flood Risk and Coastal Change [4] provides advice to planning authorities to assist them when considering planning applications in areas at risk of flooding. The Environment Agency Standing Advice [5] also provides guidance to assist local planning authorities when considering planning applications in areas at risk of flooding.

3.3.2. This report has been prepared with reference to the Planning Practice Guidance and the Standing Advice.

4.0 LOCATION AND DESCRIPTION OF THE SITE

4.1. The site, which is currently in agricultural pasture, is situated adjacent to the west of Egremont, as shown in Figure 1 and extends to approximately 4.21ha. The NGR coordinates at the approximate centre of the site are 300090E, 510980N.

4.2. The topographical survey plan reproduced in Appendix A shows the site to fall generally towards the south, with secondary gradients falling to the west and east. Ground levels fall from 91.4m AOD at the northernmost corner to 67.1m AOD at the south east corner, close to Baybarrow Road. The average gradient of the site is approximately 1 in 16. The lowest part of the site however is at the north-east corner, close to Chaucer Avenue, where ground levels fall to 61.28m AOD.

4.3. The nearest watercourse is Whangs Beck, an OWC which flows south-east, adjacent to the south west boundary of the site. Skirting Beck, which is designated as a "Main River", is approximately 350m to the east of the site and flows south into a culvert which outfalls into the River Ehen.

4.4. The BGS Geology of Britain shows the site to overly the St Bees Sandstone bedrock which is overlain by superficial glacio-fluvial deposits of Devensian – Sand and Gravel and Till, Devensian – Diamicton. The results of the ground investigation show a clear division between these deposits, with low permeability cohesive soils (Till) in the NW part of the site and granular soils (Devensian sand and gravel) in the SE part of the site.

5.0 THE PROPOSED DEVELOPMENT

5.1. A development of 97 dwellings is proposed at the How Bank Farm site, as shown on the site layout plan provided in Appendix B.

5.2. The development is classified as **More Vulnerable** in accordance with Table 2 of the Planning Practice Guidance, paragraph 066.

6.0 FLOOD RISK

6.1 Assessment methodology

6.1.1. The development and proposed or recommended mitigation measures are assessed against the Design Flood, as defined in PPG paragraph 055 [4], taking into account existing flood defences.

6.1.2. Events which exceed the Design Flood and breach events are assessed as residual risks.

6.1.3. Flood risk at the site has been assessed using data received from the Environment Agency and the local planning authority.

6.2 Information Reviewed

6.2.1. In the preparation of this FRA report, the following information been reviewed:

6.2.2. Information received from the Environment Agency:

- Product 4 information received on 28th May 2019;

- Modelled flood levels in email dated 22nd October 2019;
- Skirting and Whangs Beck FRMS 2016/17 Modelling Report Final, June 2017 – received on 22nd October 2019;

6.2.3. Information received from Copeland District Council:

- Skirting Beck and Whangs Beck Flood Risk Assessment Report January 2019, VBA Joint Venture Limited – received 22nd October 2019.

6.2.4. Information received on 16th April 2019 from Gleeson Developments Ltd:

- Copy of the Copeland DC Report to the Planning Panel dated 24th April 2019 for application reference 4/19/2044/0F1;
- Topographical survey;
- Site layout sketch plan;
- Whangs Beck Storage Area General Arrangement and Cross Section drawing no: MNW000818-VBA-XX-4T3-DR-PL-0002, revision C01 dated 31/1/19;
- Whangs Beck: Tree Retention, Removals and Protection Plan drawing no: MNW000818-VBA-XX-4T3-DR-L-0001, revision C01 dated 31/1/19;
- Whangs Beck: Landscape Master Plan drawing no: MNW000818-VBA-LL-4T3-DR-L-0001, revision C01 dated 31/1/19;
- Copy of pre-development enquiry to United Utilities.

6.2.5. Information received on 22nd October 2019 from Gleeson Developments Ltd:

- Copy of Sirius Geotechnical Letter report on infiltration tests dated 22nd October 2019.

6.2.6. Information received on 25th August 2020 from Gleeson Developments Ltd:

- a set of the Environment Agency drawings for the Whangs Beck flood alleviation scheme.

6.3 History of Flooding

6.3.1. Egremont has a well documented history of flooding, caused by a combination of insufficient capacity in the sewerage network and culverted watercourses which is exacerbated by the

back-up effect of the River Ehen when it is in spate. There is however, no available evidence of historic flooding at the site which, given its location and elevated position is not surprising.

6.4 Flood zones

6.4.1. The Flood Map for Planning in Appendix C shows the site to be in Flood Zone 1. No part of the site is in the Functional Floodplain, zone 3b.

6.5 Skirting Beck and Whangs Beck Flood Alleviation Scheme

6.5.1. In assessing the risk of flooding to the development the effect of the Skirting Beck and Whangs Beck Flood Alleviation Scheme, proposed by the Environment Agency has been considered. The scheme has been developed in response to the high risk of flooding in the town of Egremont and is described in the FRA report [6] submitted with the planning application to Copeland District Council under reference 4/19/2044/0F1.

6.5.2. In summary, the scheme comprises the creation of four main flood storage areas at:

- How Bank on Skirting Beck, to the north of How Bank Farm, providing 10,000m^3 of storage retained by an earth embankment with a crest level in the range 67.65m to 68.50m AOD;
- Whangs Beck Upper on Whangs Beck, to the west of the site, providing 6,000m^3 of storage retained by an earth embankment with a crest level in the range 78.0m to 78.80m AOD;
- Whangs Beck Lower on Whangs Beck, to the south of the site, providing 4,500m^3 of storage retained by an earth embankment with a crest level in the range 69.8m to 70.62m AOD;
- West Lakes Academy to the east of the site, providing 6,000m^3 of storage retained by earth embankments and retaining walls up to 1.5m high.

6.5.3. In addition to the storage areas, the scheme also includes for improvements to existing culverts; the creation of sustainable drainage features to manage overland flows; the raising of kerbs and the creation of low walls to manage overland flows in the highway, and flood resilience measures to selected properties that are exposed to residual risks.

6.5.4. Since the modelling report produced by Capita/Aecom in June 2017, further refinements to the model and the design proposals have been made, resulting changes to the impounding

embankment crest and spillway levels and the standard of protection. Current proposals are shown on the Whangs Beck Storage Area General Arrangement and Cross Section, to which reference is made in 6.2.4 above.

6.6 Fluvial flood risk

6.6.1. Although the site is in Flood Zone 1, which represents an annual probability of fluvial flooding less than 0.1%, the Skirting Beck and Whangs Beck Flood Alleviation Scheme flood storage areas will result in raised water levels behind the impounding embankment structures which could potentially have an effect of the site. Modelled flood levels at the storage areas have been provided by the Environment Agency and are reproduced in Appendix D.

6.6.2. The spillway level at the How Bank Storage area is 67.65m AOD but, as shown in the data in Appendix D, the 1% AEP flood level including an allowance for climate change is 67.48m AOD, which indicates no overtopping of the spillway in this event. The site will not therefore be at risk from this storage area under normal operating conditions.

6.6.3. The Whangs Beck Upper flood storage area is adjacent to the south-west boundary of the site. The modelled 1% AEP flood level at the Upper storage area including an allowance for climate change is 78.12m AOD, which exceeds the spillway level of 78.00m AOD, so the spillway will be overtopped in this event. The site layout plan in this area however, shows houses that are either at a higher level than the 79.0m contour, or downstream of the impounding embankment where the flood level will be lower. There is however some uncertainty as to the Whangs Beck water level between the upper and lower storage areas in a 1% AEP flood.

6.6.4. The Whangs Beck Lower flood storage area is adjacent to the southern boundary. The modelled 1% AEP flood level at the Lower storage area including an allowance for climate change is 69.90m AOD. The houses in the vicinity of this storage area are all on ground that is higher than the 71.5m contour, except plots 84 to 97 which are on ground between 65.0m and 71.5m AOD. The Capita/Aecom modelling report refers to proposals by Cumbria County Council to create cascading swales in the verge of Baybarrow Road to convey exceedance flows and to alter the road profile in order to direct surface water towards the swales. Provided the swales have sufficient capacity to convey the exceedance flows there should be no adverse effect of flooding to the development.

6.6.5. Any overtopping of the spillway will, according to the data in Appendix D, result in a velocity of 1.3m/s. This however is the velocity over the 35m wide spillway; if the flow is then contained in a narrower corridor, velocities could be significantly higher with potentially

damaging consequences to the site access road from Baybarrow Road, across which the exceedance flow would pass.

6.6.6. The flow rate over a broad crested weir can be estimated as:

$Q = g^{0.5}b(2E/3)^{3/2}$ which resolves to:

$Q = 1.705bE^{3/2}$

where:

Q = flow rate (m^3/s);

b = spillway width (m)

E = specific energy over the crest = $H + v^2/2g$ (m)

H = water depth (m)

v= velocity (m/s).

6.6.7. With a spillway crest of 69.80m AOD; a water level of 69.9m AOD and a velocity of 1.3m/s (both as stated in Appendix D), the 1% AEP flow rate including CCA passing over the spillway is estimated to be $4.79m^3/s$. Further details were informally requested from the Environment Agency to clarify exactly how exceedance flows which overtop the spillway will be managed to avoid flood risk to the development in the lowest part of the site but no information has been received to date.

6.7 Surface water flood risk

6.7.1. The Updated Surface Water Flood Map shows the site is at a 'Very Low' risk of surface water flooding, (see Appendix E). No overland flow paths are indicated within the site.

6.8 Risk of sewer flooding

6.8.1. Sewer flooding can occur when the capacity of a sewerage system is exceeded, or when the outflow from the sewer is restricted to the extent that the water level in the system rises and emerges from gullies or manholes at low points. There is no existing risk of sewer flooding to the site as there are no sewers in the immediate vicinity, and given the topography of the site, the risk of this type of flooding following development is assessed to be low.

6.9 Risk of groundwater flooding

6.9.1. Groundwater flooding of land occurs when the water table rises above the ground surface or enters basements and is typically associated with permeable rock such as chalk. These conditions are not present at the site and no basements are proposed in the development. The risk of this type of flooding is negligible, given the geology and topography of the site.

6.10 Risk of flooding from reservoirs and canals

6.10.1. The reservoirs flood map shows the site is not in an area at risk of flooding from the uncontrolled release of water from reservoirs (see Appendix F). A catastrophic failure of the Whangs Beck Lower impounding embankment however, could result in the sudden release of up to 4,500m^3 of water. The likelihood of such an event is very low, provided the embankment and spillway are adequately maintained by the Environment Agency but, should such a release of water occur, the area most affected would be downstream of the site. There could however be shallow overland flow at high velocity close to the eastern boundary, between Chaucer Avenue and Baybarrow Road. The storage capacity of the lower storage area is 4,500m^3, which is below the threshold of 10,000m^3 at which the requirements of the Reservoirs Act 1975, as amended by the Flood and Water Management Act 2010, apply. It cannot therefore be assumed that the safety inspection regime imposed by the Act would apply to the lower flood storage area but, as already stated, the likelihood of a catastrophic failure is assessed to be very low.

6.10.2. The site is not at risk of flooding from canals.

7.0 EFFECTS OF CLIMATE CHANGE

7.1 Climate change allowances

7.1.1. The effects of climate change must be assessed over the lifetime of the development. The Planning Practice Guidance states at paragraph 026 that residential development should be considered for a minimum period of 100 years. For the purposes of this assessment, climate change effects are therefore considered up to the year 2120.

7.1.2. Current guidance on the application of climate change allowances was issued in February 2016 and updated on 22nd July 2020 [7]. The guidance provides the anticipated changes to peak river flow and rainfall intensity for different scenarios of carbon dioxide emissions over future epochs up to 2115.

7.2 Peak river flow allowances

7.2.1. Climate change allowances are provided for each river basin district in England and as the site is situated within the North West river basin district, the allowances applicable to the period 2070 to 2115 are shown in Table 7.1 below.

Table 7.1: Total percentage change in peak river flow in the period 2070 - 2115

River Basin District	Allowance Category	Climate change effect
NORTH WEST	H++	95%
	Upper end	70%
	Higher central	35%
	Central	30%

7.2.2. The allowances in Table 7.1 refer to the 1961-1990 baseline epoch. The Capita/Aecom Modelling Report states that a 20% CCA has been applied, based on the Central allowance, adjusted from the 2012 estimates in an earlier report by Atkins.

7.3 Peak rainfall intensity

7.3.1. The climate change guidance requires the Central and Upper End allowances to be used when assessing the effects of increases to peak rainfall intensity. The allowances apply across the whole of England and are shown in Table 7.2 for the period 2070 to 2115.

Table 7.2: Total percentage change in peak rainfall intensity in the period 2070 - 2115

Allowance Category	Climate change effect
Upper end	40%
Central	20%

7.3.2. Estimates of peak rainfall rates and runoff have been prepared using FEH 2013 point data for the site and the ReFH2 model. The results for return periods between 1 year (100% AEP) and 1000 years (0.1% AEP) are provided in Appendix G. The effects of the CCA allowances on the site in its existing condition are shown in Table 7.3 below.

Table 7.3: Effect of climate change on the 1% AEP rainfall event – existing condition		
	Peak runoff rate increase	Runoff volume increase
20% CCA	24.7%	25.6%
40% CCA	51.2%	53.0%

8.0 EFFECT OF THE DEVELOPMENT ON FLOOD RISK

8.1 Fluvial flood risk

8.1.1. The proposed development will have no effect on fluvial flood risk.

8.2 Surface water flood risk

8.2.1. It is estimated for the purposes of this FRA that the development will create an impervious area over approximately 50% of the site. This is a conservative estimate as the impervious area in Gleeson developments is usually between 40% and 50% of the gross site area. The ReFH2 model results in Appendix G show that this could increase the 1% AEP peak runoff rate and runoff volume by approximately 624% and 451% respectively. These increases can be mitigated by the proposals for surface water management in section 9.2 below.

9.0 FLOOD RISK MANAGEMENT

9.1 Fluvial flood risk

9.1.1. With the exception of those parts of the development on land below the 1% AEP – 20% CCA flood level of 69.90m AOD at Whangs Beck Lower storage area, (plots 84 to 97), no flood risk management measures are necessary in respect of fluvial flooding.

9.1.2. Plots 84 to 97 are potentially at risk of flooding from overland flow when the Lower storage area spillway is overtopped. It is understood from the Environment Agency and Cumbria County Council however that overland flow downstream of the spillway will be conveyed swales adjacent to Baybarrow Road. This exceedance flow will be prevented from entering the low lying part of the site where plots 84 to 97 are located by the access road into the site from Baybarrow Road. We have not had sight of any details of the proposed swales and it has not therefore been possible to assess the risk of flooding from the swales when the

spillway is overtopped. It is a matter for the Environment Agency to ensure that this risk is adequately assessed.

9.1.3. The design of the access road and footpaths from Baybarrow Road should allow for a crossing of high velocity overland flows from the spillway, unless the Environment Agency provide for exceedance flows to pass safely under the access way in a culvert; otherwise there is a risk that the roadway of footpath could be washed away in a major flood.

9.2 Surface water flood risk

9.2.1. The effect of the proposed development on surface water run-off volumes can be mitigated by the implementation of sustainable drainage principles. The Building Regulations require surface water to be discharged according to the following preference hierarchy:

1. to ground by infiltration;
2. to a watercourse;
3. to a sewer, if options (1) and (2) are not reasonably practicable.

9.2.2. Infiltration tests were carried out in September 2019 by Sirius Geotechnical and its report is provided in Appendix H. Conditions in the southern part of the site appear favourable for infiltration drainage but it is likely that a supplementary controlled surface water discharge to Whangs Beck may be required.

9.2.3. The drainage strategy for the development divides the site into four sub-catchments, as shown in the plan in Appendix I. Each sub-catchment drains to its own attenuation storage facility which discharges to a watercourse. Ground conditions for infiltration are suitable only in sub-catchments 3 and 4 and this is reflected in the estimates of storage capacity provided in Appendix J.

9.2.4. Details of the sub-catchments and discharges therefrom are provided in Table 9.1 below.

9.2.5. The attenuation storage facilities are:

- Sub-catchment 1: below-ground storage tank;
- Sub-catchment 2: five cascading storage basins;
- Sub-catchment 3: three cascading storage basins; and
- Sub-catchment 4: one storage basin.

Table 9.1: Drainage of sub-catchment areas					
Sub-catchment	Area (ha)	Suitable for infiltration?	Preliminary storage estimate (m^3)	Proposed controlled discharge rate (l/s)	Receiving watercourse
1	0.611	No	189	5.0	Whangs Beck
2	0.743	No	260	5.0	Whangs Beck
3	1.260	Yes	109	5.0	Whangs Beck
4	1.650	Yes	172	5.0	Skirting Beck

9.2.6. It is recommended that a detailed drainage design is prepared for the development in accordance with the technical standards for sustainable drainage [8] and the Building Regulations 2015. The design should be submitted to Copeland District Council for approval prior to construction.

9.3 Residual risks

9.3.1. Residual risks are those which persist after any flood risk management measures designed to protect against the design flood event. These risks include:

- flood events that are greater than the design event;
- greater climate change effects than the 20% CCA used in the Environment Agency flood alleviation scheme;
- catastrophic failure of the impounding embankments; and
- an increase in the design event resulting from updated flood forecasting.

9.3.2. The site is in Flood Zone 1 and is not therefore generally at risk from a 0.1% AEP flood event. There is no reference in the FRA report for the Skirting Beck and Whangs Beck Flood Alleviation Scheme, or in any of the other documents received in connection with that scheme, to the 0.1% AEP flood level at the Whangs Beck storage areas. As the Lower storage area embankment provides containment only for flood events having an AEP greater than 2% (occurring on average more frequently than once in 50 years), it is evident that in all events greater than this, the spillway will be overtopped. In a 0.1% event, there could be

downstream flooding, originating from the How Bank and Whangs Beck storage areas, some of which could potentially affect the lower parts of the site. It is therefore recommended that finished floor levels at plots 84 to 97 are at least 450mm above the external ground level in order to mitigate this risk. It is also recommended that flood resilient construction methods and materials are applied up to 900mm above the finished floor level. These measures should be reviewed and, if necessary, adjusted when the results of the Environment Agency verification modelling are known.

9.3.3. The residual risk associated with a greater climate change effect than the 20% allowance applied in the Environment Agency flood alleviation scheme can be mitigated by the recommendations in 9.3.2 above. It is recommended however, that the current climate change allowances are applied by the Environment Agency to its design of the flood alleviation scheme in order to assess their effects.

9.3.4. In the unlikely event of a catastrophic failure of the impounding embankments, as discussed in 6.10.1 above, there would be a sudden release of stored water. The effects of this do not appear to have been considered in the FRA report for the flood alleviation scheme. The recommended raised floor levels to Plots 84 to 97 will provide some protection against such an event, but internal flooding of these houses cannot be ruled out should such an event occur. As noted in paragraph 6.10.1, a catastrophic failure of the impounding embankments is considered to be very unlikely.

9.3.5. It is recommended that the above recommendations for flood risk management are reviewed when further details of the proposals for managing exceedance flows and the effects of increased climate change allowances are received from the Environment Agency.

10.0 CONCLUSIONS AND RECOMMENDATIONS

10.1 Conclusions

10.1.1. The development is classified as More Vulnerable and is in Flood Zone 1.

10.1.2. Although Egremont has a history of severe flooding, caused by rapid response runoff from the upper catchment; inadequate capacity in the sewerage and culvert network; and high water levels in the River Ehen preventing drainage, there is no evidence of flooding at the site, which is in an elevated position upstream of Egremont.

10.1.3. The risks of surface water flooding and sewer flooding to the development are very low and the site is not currently within an area at risk from the uncontrolled release of water from

reservoirs. The Skirting Beck and Whangs Beck Flood Alleviation Scheme will however create areas of impounded water above the downstream ground level and a catastrophic failure of the embankments could potentially affect the eastern part of the site between Chaucer Avenue and Baybarrow Road. The likelihood of such an event is assessed to be very low, provided the embankments are adequately designed and maintained.

10.1.4. The site is not at risk of flooding from any canal.

10.1.5. The use of a 20% CCA in the Skirting Beck and Whangs Beck Flood Alleviation Scheme is not in accordance with current guidance and could result in future flood levels being under-estimated. The lowest part of the site, at the north-east corner near Chaucer Avenue, is potentially at risk from flood events which exceed the spillway levels of the flood storage embankments at How Bank and Whangs Beck. The risk can be mitigated by the flood risk management recommendations in paragraph 9.3.2 above.

10.1.6. The effect of climate change on peak rainfall intensity is estimated to increase peak runoff rates in the 1% AEP event within the range 25% to 51%. Runoff volumes in the same event are estimated to increase in the range 26% to 53%.

10.1.7. The creation of impervious area within the development could increase surface water runoff rates and volumes by 624% and 451% respectively. These increases will be mitigated by the application of sustainable drainage principles in the drainage design for the development, including the provision of attenuation storage.

10.1.8. Ground conditions are not suitable for infiltration drainage in the northern part of the site, but are likely to be suitable in the southern part. Disposal of surface water from the development by infiltration, supplemented by controlled discharges to Whangs Beck and Skirting Beck is therefore proposed.

10.1.9. The development will not increase off-site flood risks provided the recommendations for surface water management are implemented.

10.2 Recommendations

10.2.1. The recommended flood risk management precautions in section 9 of this report should be implemented in the design and construction of the development.

10.2.2. It is recommended that a detailed drainage design, based on the drainage strategy, is prepared and submitted to Copeland District Council and United Utilities for approval, prior to construction.

11.0 REFERENCES

1. National Planning Policy Framework. Department for Communities and Local Government. February 2019.

2. Copeland District Council Local Plan 2013 – 2018, adopted 5th December 2013.

3. Copeland District Council SFRA, 2007.

4. Planning Practice Guidance: Flood Risk and Coastal Change. Updated 15th April 2015. Department for Communities and Local Government.

5. Environment Agency Standing Advice to local planning authorities. April 2015.

6. Skirting Beck and Whangs Beck Flood Risk Assessment version S2, VBA Joint Venture Limited, 31st January 2019.

7. Flood risk assessments: climate change allowances. Environment Agency, 19th February 2016, updated 22nd July 2020.

8. Sustainable Drainage Systems. Non-statutory technical standards for sustainable drainage systems. DEFRA March 2015.

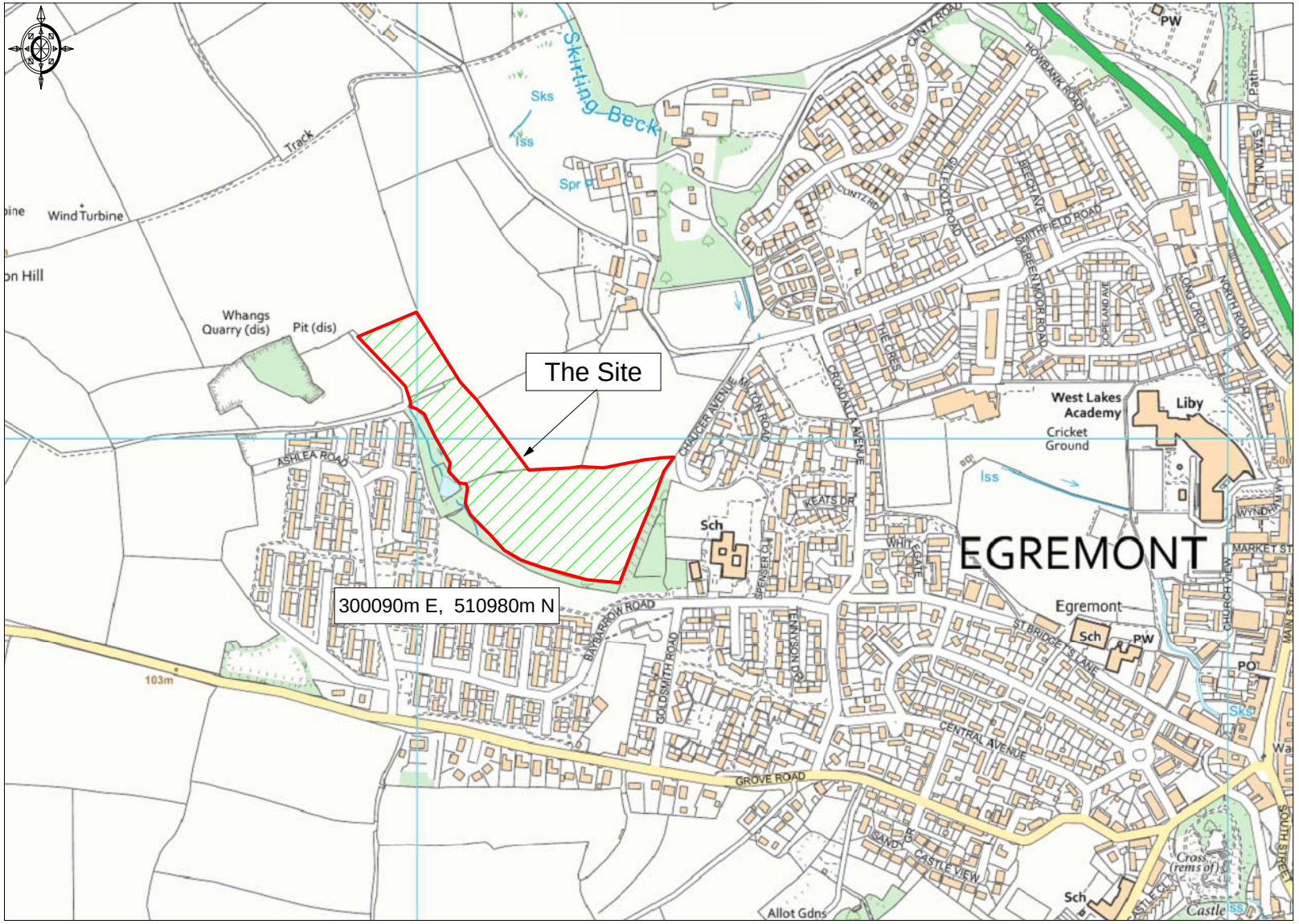
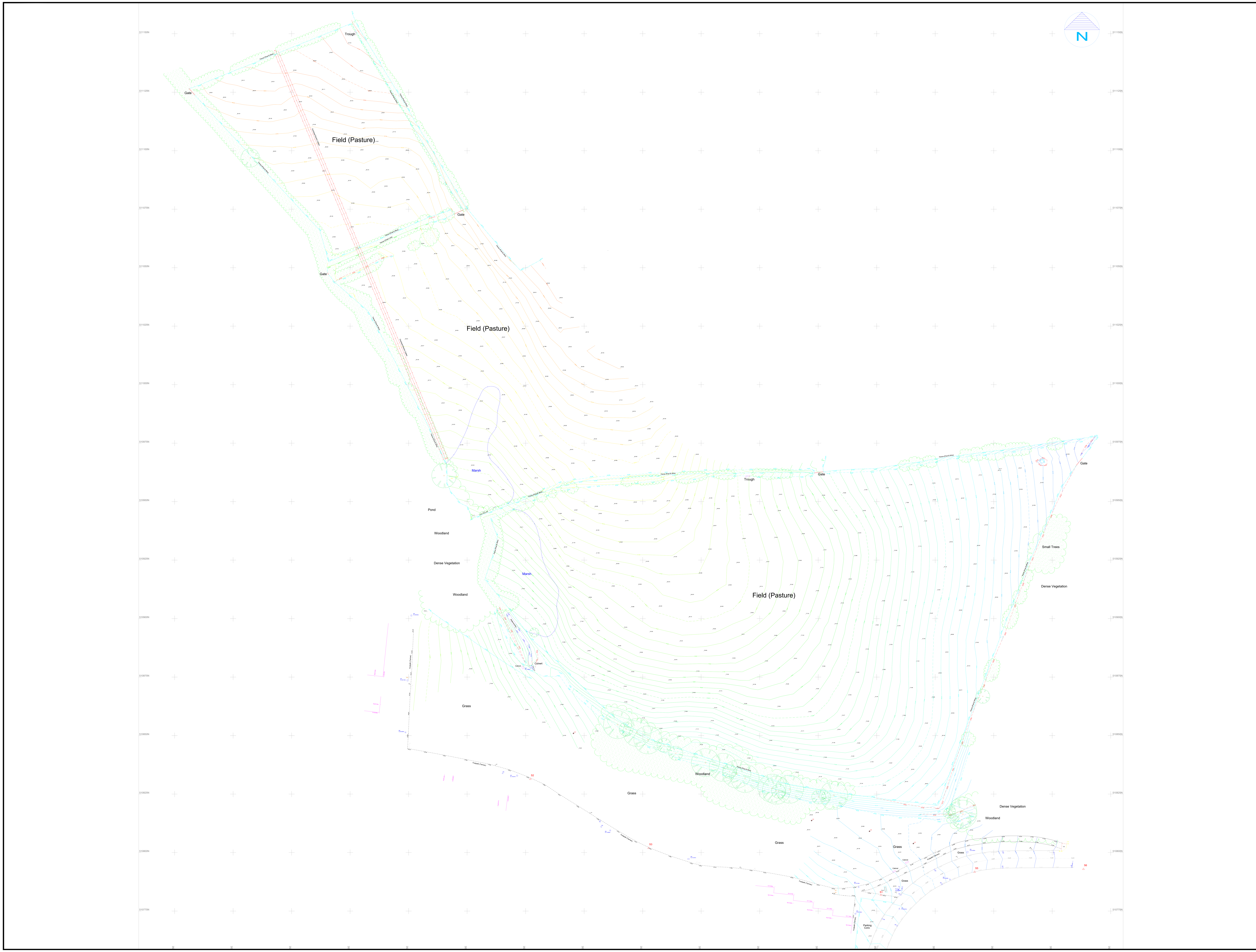


Figure 1: Location Plan

APPENDIX A

Topographical survey plan



Survey Features

- Btm of Batter
- Top of Batter
- Fence (General)
- Fence (Palisade)
- Fence (Metal)
- Fence (Close Board)
- Hedgeline
- Wall
- Building (Structure)
- Road (Channel)
- Track
- Kerbing
- Footpath
- Tree / Vegetation Canopy
- Edge of Stone
- Concrete
- Tarmac / Asphalt
- DK Drop Kerbing DK
- Centreline
- Verge
- Edging Kerbs
- Watercourse / Ditch
- Contour (Major)
- Contour (Minor)
- Overhead Electricity Cable
- Overhead Telecom Cable

0.000m Ground Level	MH CL 0.000m Manhole (Square)
LP Lampost	MH CL 0.000m Manhole (Triangular)
EP Electricity Pole	MH CL 0.000m Manhole (Circular)
TP Telegraph Pole	IC CL 0.000m Inspection Chamber
GAS Gas Valve	CL 0.000m Inspection Chamber (Circular)
CATV Cables / Comms	SV Stop Valve
BT British Telecom	AV Air Valve
Bollard Bollard	FH Fire Hydrant
Survey Station	SC Stop Cock
SP Sign Post	Invert Level 0.000m Invert Level
Tree	WO Wash Out
Bush / Shrub	RG Road Gully
Bin Waste Bin	Gully
LC Lighting Column	POLE Metal Pole
POST Wooden Post	

Underground Utility Mapping

- Underground Electricity Utility
- Underground Gas Utility
- Underground Water Utility
- Underground BT Utility
- Underground Telecom Utility
- Unknown route obtained with GPR
- Unknown Utility
- Surface Water
- Foul Water
- Combined Sewer
- EOT End of Trace
- Loss of GPR Reflection
- Loss/End of Signal

Notes :-

DO NOT SCALE FROM DRAWING
DIMENSIONS TO BE TAKEN ON SITE

Site Grid

Ordnance Survey Grid & Datum
(Trimble GPS System OSTN15 Transformation)
RTK Network

SURVEY STATIONS				
Name	Easting	Northing	Height	Remark
S1	300226.838	510781.821	66.832	
S2	300077.015	510831.396	75.917	
S3	300127.564	510801.912	74.376	
S4	300226.320	510749.899	68.737	
S5	300266.854	510791.710	63.460	
S6	300313.333	510792.930	60.344	

REV	AMENDMENT	DRAWN	DATE

How Bank
Farm
Egremont
JOB TITLE

Gleeson Homes
CLIENT

Topographical Survey
DRAWING TITLE

1:500 @ A0 SCALE	J D Gibson DRAWN
08/04/2019 DATE	J D Gibson APPROVED

Gibson Surveying and Mapping Ltd
21 West View,
Crook,
County Durham.
DL159EY.

Mob. 07896698645
Tel. 01388 764106

email : info@gsmsurvey.co.uk
www.gsmsurvey.co.uk

PROJECT No.	DRG No.	REV
	GH/NBF/TS01	

APPENDIX B

Planning Layout drawing

Drawing No: MGL/PL/111 dated September 2020 by
Twenty 10 Design and Planning

FORMER ORGILL INFANTS SCHOOL, EGREMONT

0m 5m 10m 20m 30m 40m 50m 100m
SCALE BAR @ 1:500

KEY

- 1.8m HIGH TIMBER SCREEN FENCE TO SEPARATE DETAIL
- 1.8m HIGH TIMBER SCREEN DIVISIONAL FENCE TO SEPARATE DETAIL
- 1.8m HIGH SCREEN WALL TO SEPARATE DETAIL
- PROPOSED TREE PLANTING
- EXISTING TREES TO BE REMOVED
- SHARED DRIVE
- AS / OPP 'AS' AND 'OPP' HANDINGS OF HOUSE TYPES

SCHEDULE OF ACCOMMODATION - HOW BANK FARM

TYPE	NAME	DESCRIPTION	SQ.FT	No.
211	Boston	2 bed semi-det.	651	11
301	Tyrone	3 bed semi-det.	759	20
303	Wicklow	3 bed semi-det.	772	4
310s	Woodford	3 bed semi-det.	788	7
304	Killkenny	3 bed detached	772	12
354	-	3 bed detached	904	13
358	-	3 bed detached	984	8
401	Longford	4 bed detached	1066	6
403	Carlow	4 bed detached	1048	4
435	Dublin	4 bed detached	1172	12
TOTAL			**84,485 SQ.FT**	**97No.**

SCHEDULE OF ACCOMMODATION - FORMER ORGILL INFANTS SCHOOL

TYPE	NAME	DESCRIPTION	SQ.FT	No.
301	Tyrone	3 bed semi-det.	759	7
310s	Woodford	3 bed semi-det.	788	3
313	-	3 bed semi-det	772	2
304	Killkenny	3 bed detached	772	3
314	-	3 bed detached	772	2
TOTAL			**13,081 SQ.FT**	**17No.**

CROADALLA AVENUE
CHAUCER AVENUE
Lakeland View
Track
Orgill Primary School
BAYBARROW ROAD
Playground
EMERGENCY LINK / FOOTPATH TO CHAUCER AVENUE
SUDS 4 - STORAGE BASIN
PROPOSED ACCESS PROVISION TO ADJOINING LAND
PROPOSED ACCESS OFF BAYBARROW ROAD TO HIGHWAY AUTHORITY APPROVAL
INFILTRATION TRENCH TO ENGINEER'S DETAILS
SUDS 1 - CASCADING INFILTRATION BASIN
PROPOSED SALES AND SHOW AREA, PLOTS 73-76 TEMPORARY SALES PARKING, PLOT 72
PROPOSED EASEMENT TO CULVERT
NEW CULVERT - SEE EA DRAWING NUMBER IMNW000818-VBA-XX-4C2-DR-C-0002_C04
PROPOSED SUDS BASIN TO ENGINEERS DETAILS
SUDS 3 - STORAGE TANK
SUDS 2 - CASCADING INFILTRATION BASIN
Pond
PROPOSED EA WORKS TO SEPARATE DETAIL
The Laurels
The Elms
The Oaks

REV	DESCRIPTION	DATE
A	ACCESS AMENDED TO HOW BANK FARM; TOPO INFO ADDED TO ORGILL SCHOOL.	06.10.20

gleeson

GLEESON HOMES & REGENERATION

DRAWING
PLANNING LAYOUT

PROJECT
HOW BANK FARM & FORMER ORGILL INFANTS SCHOOL, EGREMONT

SCALE	1:500@A0	REV.	A	DRAWING No.
DATE	SEP 2020			MJG/PL-111
DRAWN	TWENTY10			

TWENTY 10
DESIGN AND PLANNING
Twenty10 Management Limited, 62 Hawkshead Avenue, Euxton, Chorley , Lancashire . PR7 6TE
Tel: (01257) 277 100 Email: info@twenty10.biz Fax: (01257) 268 911

HOW BANK FARM, EGREMONT

APPENDIX C

Fluvial Flood Map for Planning

Flood map for planning

Your reference	Location (easting/northing)	Created
19/013	**300090/510980**	**22 Oct 2019 16:55**

Your selected location is in flood zone 1, an area with a low probability of flooding.

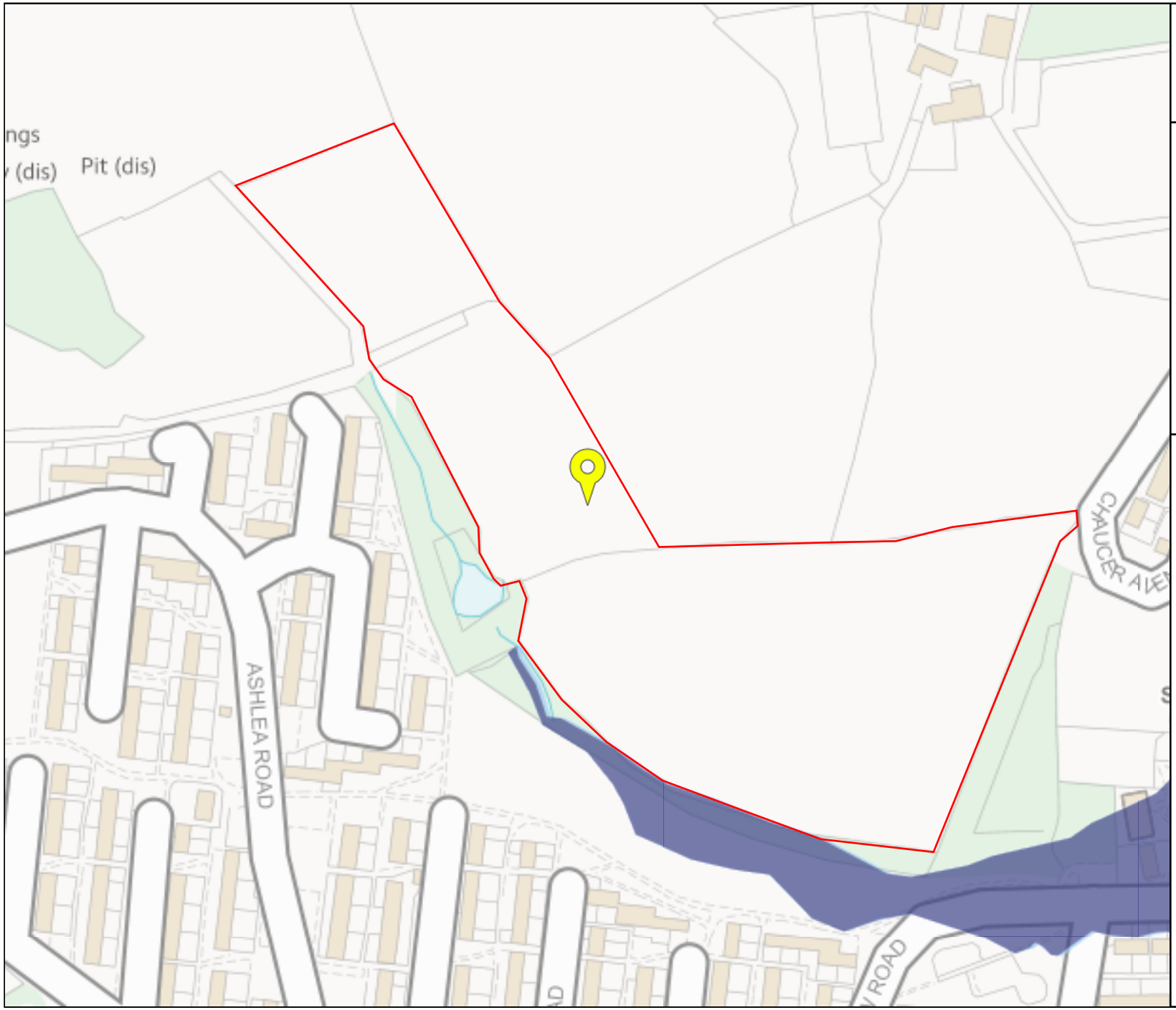
This means:

- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.



Environment Agency

Flood map for planning

Your reference
19/013

Location (easting/northing)
300090/510980

Scale
1:2500

Created
22 Oct 2019 16:55

- Selected point
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 20 40 60m

APPENDIX D

Predicted flood levels provided by the Environment Agency

John O'Connor

From: Stanger, Graham [graham.stanger@environment-agency.gov.uk]
Sent: 22 October 2019 08:22
To: John O'Connor
Cc: Hall, Chris; Scopes, David S; Tom Lawrenson
Subject: FW: Skirting Beck - Information as requested

Hi John,

Please see info below . I am out of the office shortly and will have limited access to my emails, if you need mor model information please contact Chris Hall / David Scopes our design team who will be able to assist with model information.

Regards

Graham Stanger – Project Manager
Programme & Contract Management (PCM)
part of Operations Assets & Programme Management

Environment Agency
Richard Fairclough House, Knutsford Road, Latchford, Warrington WA4 1HT
Mobile: 07771 51 3115

graham.stanger@environment-agency.gov.uk

Please consider the environment before printing this email

From: Hall, Chris [mailto:Chris.Hall2@atkinsglobal.com]
Sent: 21 October 2019 17:05
To: Stanger, Graham <graham.stanger@environment-agency.gov.uk>
Cc: Scopes, David S <David.Scopes@atkinsglobal.com>
Subject: Skirting Beck - Information as requested

Hi Graham,

As requested, the planning application reference is 4/19/2044/0F1

I have included information below, showing overtopping events at the various reservoirs.

	Event	Overtopping Volume (m3)	Peak Overtopping Flow (m3/s)	Peak Level (mAOD)	Notes
How Bank	Q5+CC			65.56	
67.65	Q10+CC			65.62	
	Q20+CC			65.68	
	Q30+CC			65.96	
	Q50+CC			66.65	
	Q75+CC			67.12	No overtopping for during Q100+CC and below
	Q100+CC			67.48	
Whangs Upper	Q5+CC			77.23	
78	Q10+CC			77.97	
	Q20+CC	2621	0.7	78.07	
	Q30+CC	4284	0.92	78.08	
	Q50+CC	6700	1.2	78.09	Overtopping flow into Whangs Lower
	Q75+CC	8400	1.35	78.12	
	Q100+CC	9900	1.44	78.12	
Whangs Lower	Q5+CC	-		65.8	
69.8	Q10+CC	-		66.23	
	Q20+CC	-		68.79	
	Q30+CC	-		69.67	
	Q50+CC	2,300	0.8	69.87	
	Q75+CC	4,300	1.1	69.89	
	Q100+CC	5,900	1.3	69.9	Overtopping flow down Baybarrow road, through school and eventually into WLA
WLA	Q5+CC			48.87	

49.7	Q10+CC			49.1	
	Q20+CC			49.31	
	Q30+CC			49.41	
	Q50+CC	-		49.59	
	Q75+CC	700	0.6	49.72	
	Q100+CC	6,000	1.3	49.73	

Please let me know if you require anything further.

Chris Hall
Graduate Civil Engineer, Infrastructure
UK & Europe
Engineering, Design and Project Management

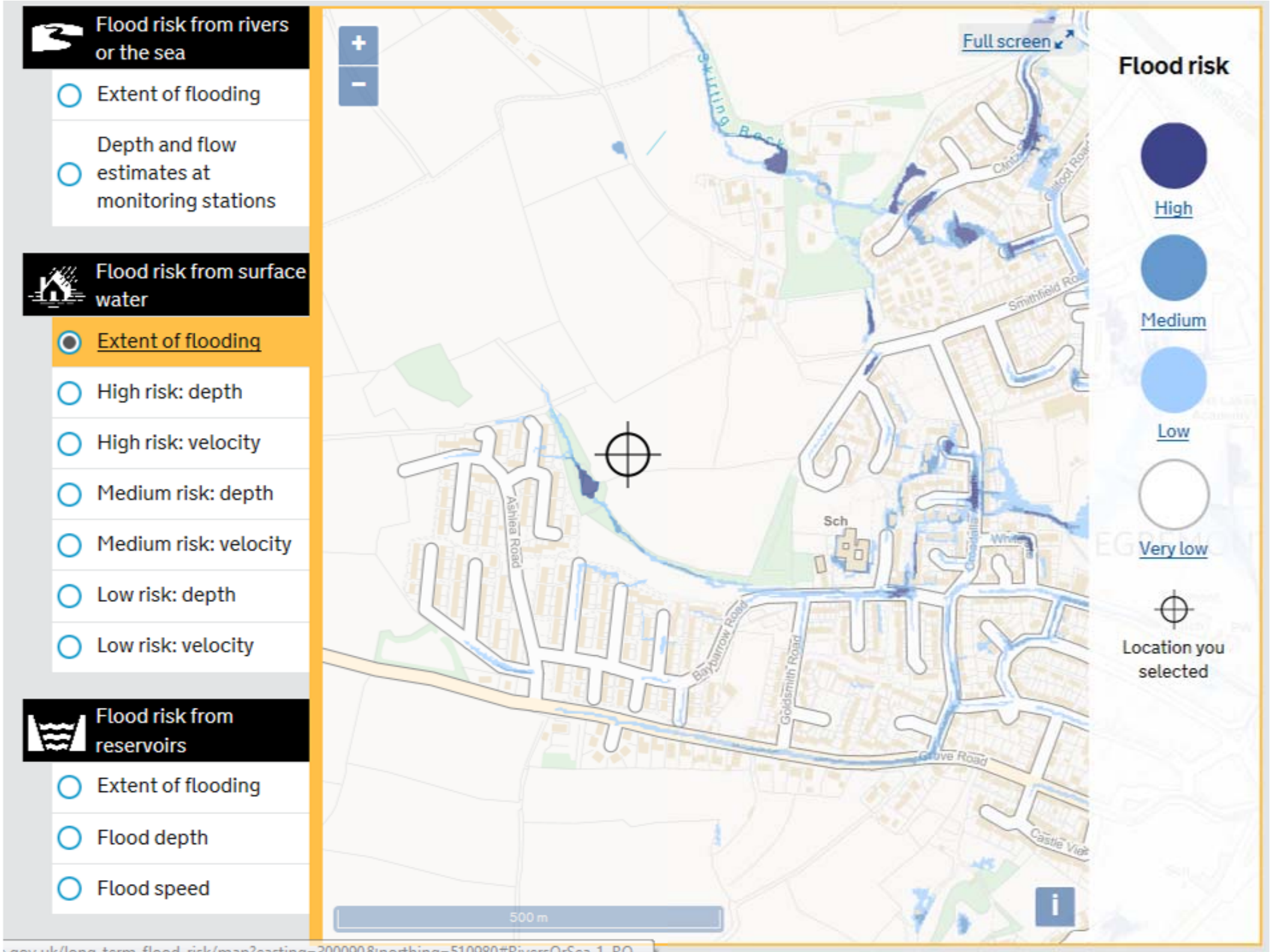
01925 238905

Chadwick House, Birchwood Park, Warrington, Cheshire WA3 6AE

Company

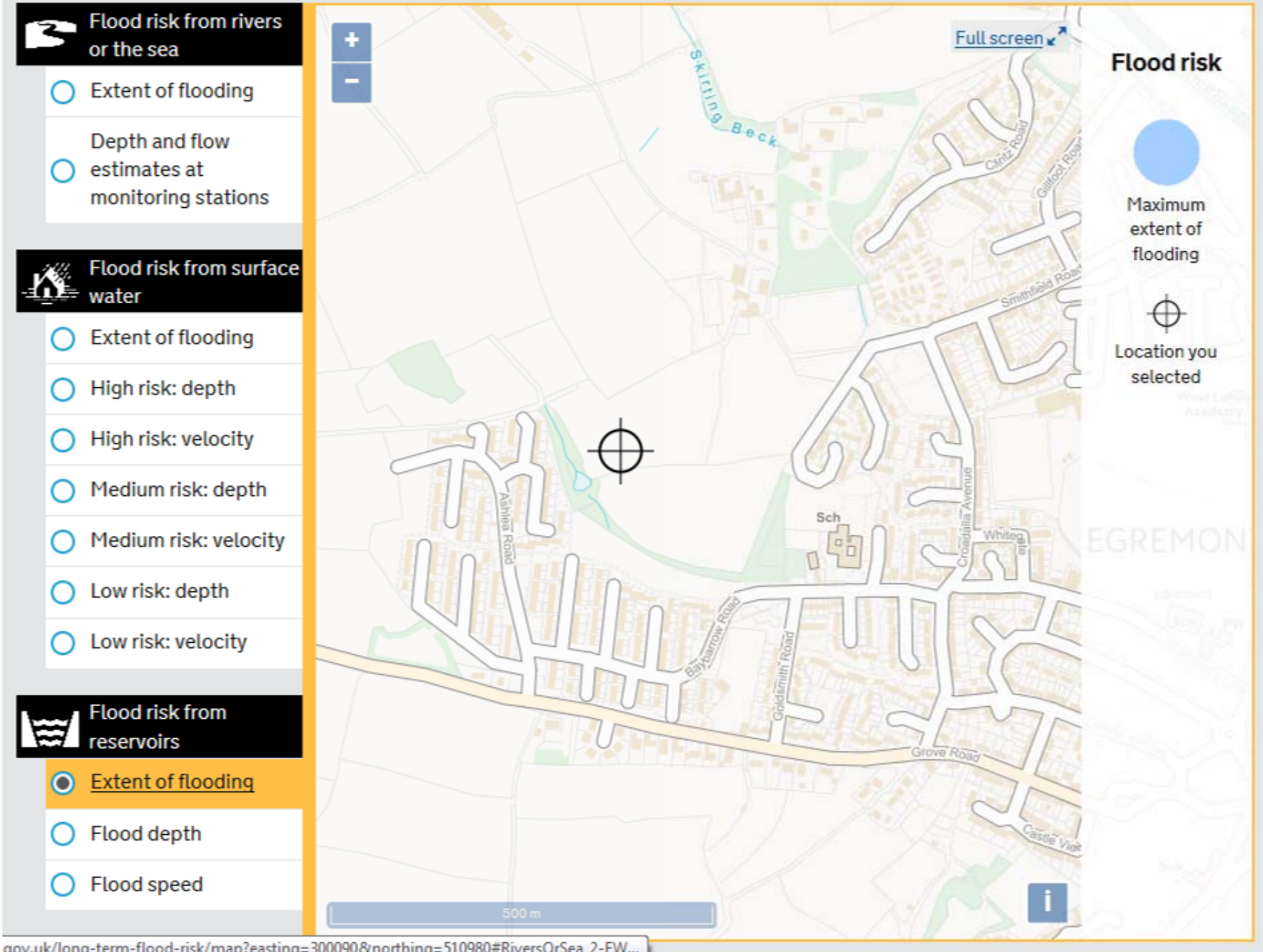
APPENDIX E

Updated Surface Water Flood Map


Flood risk from rivers or the sea
Extent of flooding
Depth and flow estimates at monitoring stations
Flood risk from surface water
Extent of flooding
High risk: depth
High risk: velocity
Medium risk: depth
Medium risk: velocity
Low risk: depth
Low risk: velocity
Flood risk from reservoirs
Extent of flooding
Flood depth
Flood speed
Full screen
Flood risk
High
Medium
Low
Very low
Location you selected
Ashlea Road
Bayarrow Road
Goldsmith Road
Grove Road
Smithfield Ro
Sch
500 m

APPENDIX F

Reservoirs Flood Map


Flood risk from rivers or the sea
Extent of flooding
Depth and flow estimates at monitoring stations
Flood risk from surface water
Extent of flooding
High risk: depth
High risk: velocity
Medium risk: depth
Medium risk: velocity
Low risk: depth
Low risk: velocity
Flood risk from reservoirs
Extent of flooding
Flood depth
Flood speed
Full screen
Skirting Beck
Smithfield Road
Ashlea Road
Sch
Croadilla Avenue
Whitegate
Baybarrow Road
Goldsmith Road
Grove Road
500 m
Flood risk
Maximum extent of flooding
Location you selected
gov.uk/long-term-flood-risk/map?easting=300090&northing=510980#RiversOrSea_2-FW...

APPENDIX G

ReFH 2 estimates of peak surface water runoff rates and volumes

19/013: How Bank Farm, Egremont

REFH2 estimates of surface water runoff rates and volumes

Return period (yrs)	Urbanised peak flow (l/s)	Urbanised direct runoff (m^3)	As-rural peak flow (l/s)	As-rural direct runnof (m3)	Peak flow increase %	Runoff increase %	
1	52.23	257.88	6.71	40.05			
2	58.65	290.30	7.51	45.54	681.5%	537.5%	
5	80.42	400.42	10.31	64.91	680.0%	516.9%	
10	96.06	479.76	12.43	79.57	672.6%	502.9%	
30	123.88	621.29	16.43	107.15	654.1%	479.8%	
50	139.08	698.87	18.73	123.03	642.6%	468.0%	
75	152.46	767.32	20.82	137.49	632.2%	458.1%	
100	162.76	820.14	22.49	148.93	623.8%	450.7%	
200	191.16	966.05	27.28	181.79	600.8%	431.4%	
221	195.59	988.85	28.05	187.09	597.3%	428.6%	1% AEP with 20% CCA
445	228.42	1158.37	34.01	227.88	571.7%	408.3%	1% AEP with 40% CCA
500	234.14	1188.00	35.08	235.25	567.4%	405.0%	
1000	269.42	1371.18	41.99	282.46	541.7%	385.4%	

Effect of CCA on 1% AEP event

	Peak flow rural increase	Runoff volume rural increase	Peak flow post develpment increase	Runoff volume post development increase
20% CCA increase	24.7%	25.6%	769.8%	564.0%
40% CCA increase	51.2%	53.0%	915.8%	677.8%