



09th February 2022

F.A.O. Andrew Bradley
Strata Homes
Quay Point
Lakeside Boulevard
Doncaster
DN4 5PL

Re: - Proposed Development at Westgate, Cleckheaton – Flood Risk Appraisal

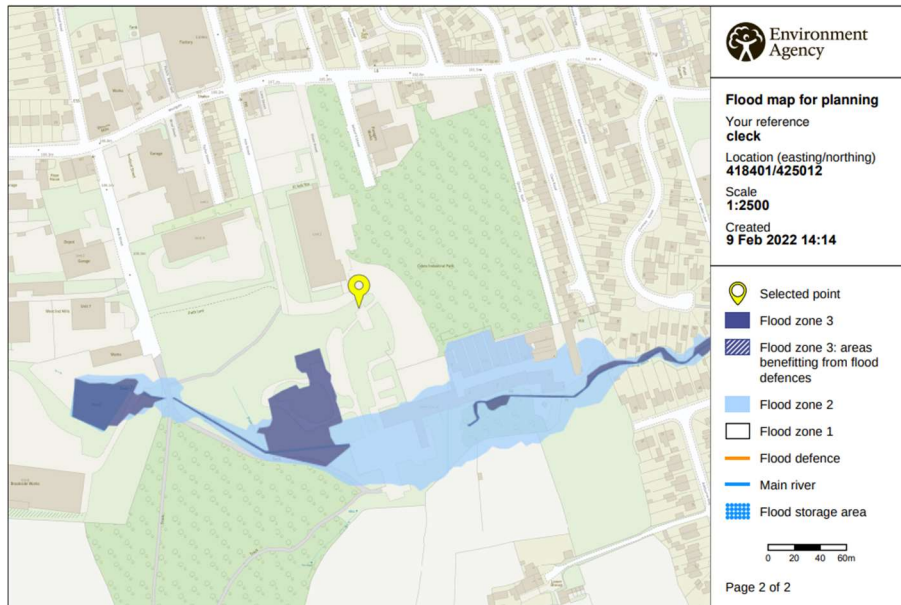
Introduction

Queensberry Design Ltd (QDL) have been instructed by Strata Homes to assess the fluvial flood risk attributed to the proposed residential development located off Westgate, Cleckheaton.

The aim of this appraisal is to understand the current flood risk, assess flood risk to new dwellings proposed by Strata Homes and the impacts on the wider catchment following this development.

Existing Flood Risk

The Environment Agency's Flood Map for planning shows most of the development lying in Flood Zone 1 at a low risk of flooding. The southern extent of the site is located within Flood Zones 2 and 3, at a medium to high risk of fluvial flooding from Blacup Beck.



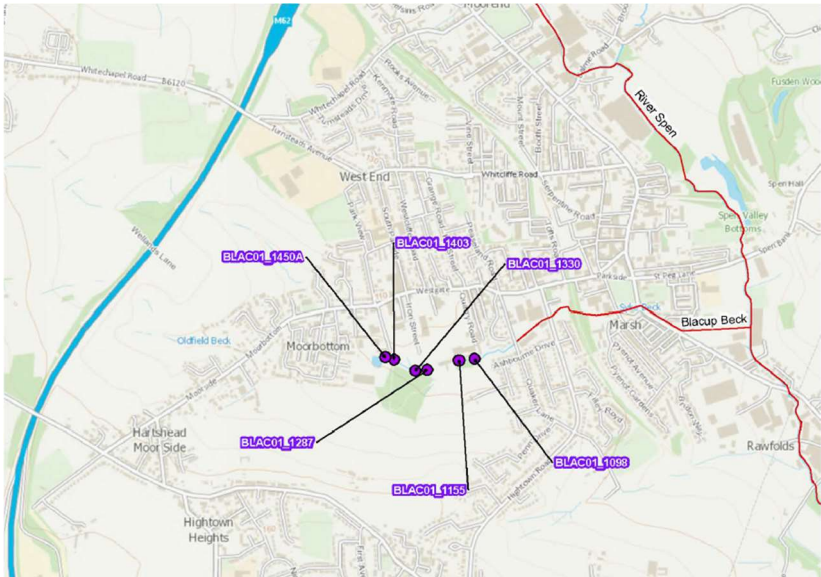
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Information available from a previous Flood Risk Assessment has provided Environment Agency node point locations and model results. These results provide flows and water levels for various annual exceedance probabilities (AEP). As it can be seen by the location plan node BLAC01_1287 is located on the schemes southern boundary, the node results confirms a water level of 94.631 AOD for the 1% AEP (extent of flood zone 3)



2009 River Spen Model Results (Level - mAOD, Flow - m³/s) - RFI/2021/194183																
Node Point	Annual Exceedance Probability (AEP)															
	20% AEP (1 in 5)		10% AEP (1 in 10)		4% AEP (1 in 25)		2% AEP (1 in 50)		1.33% AEP (1 in 75)		1% AEP (1 in 100)		1% AEP (1 in 100) +20% CC		0.1% AEP (1 in 1000)	
	Max Stage	Max Flow	Max Stage	Max Flow	Max Stage	Max Flow	Max Stage	Max Flow	Max Stage	Max Flow	Max Stage	Max Flow	Max Stage	Max Flow	Max Stage	Max Flow
BLAC01_1330	94.682	1.793	94.73	2.059	94.772	2.503	94.802	2.794	94.819	2.96	94.831	3.074	94.886	3.591	95.123	5.812
BLAC01_1155	91.177	1.789	91.274	2.324	91.32	2.637	91.369	2.969	91.398	3.167	91.414	3.312	91.487	3.996	91.747	5.807
BLAC01_1098	90.449	1.794	90.509	2.289	90.54	2.689	90.581	2.979	90.575	3.174	90.586	3.314	90.739	3.939	91.304	5.932
BLAC01_1403	95.94	1.799	95.991	2.119	96.071	2.694	96.108	3.041	96.129	3.25	96.137	3.369	96.183	4.074	96.47	6.016
BLAC01_1287	94.477	1.785	94.544	2.305	94.579	2.637	94.605	2.965	94.62	3.159	94.631	3.304	94.68	4.001	94.937	7.383
BLAC01_1450A	97.677	1.815	97.884	2.12	98.073	2.635	98.095	2.944	98.108	3.123	98.116	3.249	98.147	3.826	98.262	6.594

QDL have used the site topographical survey to produce a ground model to represent the existing topography, as part of this modelling localised areas of raised ground (existing stockpiles) have been removed to provide a true representation of Blacup Beck’s surrounding topography. This model has then been used to analyse the area and volume of water based on the flood zone 3 water level (94.631 AOD). Referring to drawing QD1776-100-01 the output of this modelling concludes a total flood zone volume of 1703m³ over an area of 7580m². Generally, this modelled flood outline is similar to the Environment Agency mapping considering the mapping is based less detailed LIDAR data.

The output confirms part of the proposed development is located within flood zone 3 (plots 66, 67, 69 – 72) as well as the green space to the west and south of these units.

Risk to New Dwellings

The general approach to development within Flood Zone 3 is to raise FFL's 600mm above ground level or flood level (whichever is higher). This approach to determine a minimum FFL of 95.231 AOD (600mm above 1% AEP).

To account for rising river levels due to climate change the DEFRA and Environment Agency document 'Flood Risk Guidance for New Development' suggests a coarse approach is to allow an additional 150mm above the 1% AEP. However, as the Environment Agency model provides a modelled 1% AEP + 20% water level the minimum proposed FFL shall be 600mm above this $94.680 + 600\text{mm} = 95.280$ AOD.

QDL have also been appointed by Strata Homes to prepare a level design and remediation earthworks design. Due to the development constraints for the need to try and maintain a cut and fill balance the proposed levels have been raised above existing ground level. The minimum proposed FFL is 97.225 AOD (2.545m above the 1% AEP + 20% water level). The level raising means the need a large retaining wall along the southern boundary.

Based on the modelled water levels and the proposed levels the dwellings are significantly above the flood zone meaning all dwellings are not at risk of flooding from Blacup Beck.

Impact on Wider Catchment

As discussed above and shown on drawing QD1776-100-01 the development does encroach into flood zone 3, therefore any flood zone 3 volume lost by the implementation of the development must be mitigated to ensure the existing flood plain volume is maintained.

The proposed development levels have been modelled against the 1% AEP water level to determine how much flood water will be displaced based on the proposed levels. This has concluded the proposed development will displace 198m^3 of flood volume as shown on drawing QD1776-100-02.

In order to mitigate the 198m^3 it is proposed to reduce levels south of Blacup Beck (within the Strata redline) during the de-culverting works – the design of which is subject to further survey work, refer to QD1776-100-03 for extent of anticipated location of works.

Development Surface Water Management

Consultation with the LLFA has established the scheme must restrict flows to 5 l/s/ha which equates to 26 l/s based on developed boundary.

Attenuation is proposed to be within an under ground precast concrete attenuation tank located within the open space fronting plots 66, 67, 69 – 72 which is in flood zone 3 (pre-level rising). As shown on drawing QD1776-100-02 the tank is within the displaced flood zone, as such like the dwellings is not at risk of flooding.

However, as the outfall passes flow into Blacup Beck the surface water simulation must include a surcharged outfall to ensure the storage provided is sufficient for the scheme under a fluvial flood event when water levels breach Blacup Beck.

Conclusion

Following analysis of the Environment Agency mapping and water levels some proposed dwellings are in flood zone 3.

However, these dwellings (and the majority) of the development are raised above existing to achieve a cut and fill balance. Meaning the proposed dwellings are significantly above flood levels therefore should be classified as flood zone 1.

The scheme must mitigate the loss of flood volume (198m^3) it is expected this can be accommodated within the de-culverting works.

Should you have any further queries please be in touch.

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Queensberry Design Ltd