

Issue 2 Flood Risk

Day1-2

NAS/RL/09213/

Hignett Family Trust Ref: 276

December 2011

Addendum 1 to PS

B&NES Core Strategy

Position Statement on B&NES FRMS Note on Reviewed Flood Storage Volume used as the basis for the WYG Bath Compensatory Storage Study Phase 1 (November 2011) (CD4/FR36).

Background

B&NES draft Core Strategy relies on the future use of existing Flood Zone 3 land in the City of Bath for provision of residential and employment development, involving raising of ground levels and defences .

The strategy suggested by B&NES to replace the flood conveyance and storage volumes lost during the redevelopments is to create upstream storage areas to intercept the flows that cause the flooding through the centre of Bath. The strategy consists of lowering ground levels in existing Flood Zone 3 areas.

Conclusion

The Council have re-calculated the necessary flood storage compensation for proposed developments in the River Corridor in the City of Bath leading to a reduction from 345,000m³ (CD4/FR2) to 204,718.44m³ (CD4/FR36). Having checked the data, we conclude that the correct figure is 270,000m³..

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Documents available to Robson Liddle

- 1) FRMS Appendix I - The Atkins Site Specific Report (CD/FR22) detailing flood levels, return periods of each site flooding and the initial compensatory storage volumes – Document 1
- 2) The B&NES FRMS Note on Reviewed Flood Storage Volume (CD4/FR36) used as the basis for the WYG Bath Compensatory Storage Study Phase 1 (November 2011) - Document 2

Assessment of B&NES storage calculations

In Document 1 the total volume of flood compensation for the development sites was calculated as 345,000m³ up to and including the climate change event flood envelope and level. This included some sites with extant planning permissions and proposed development site boundaries where they lay within the climate change flood envelope.

In Document 2 the extant sites (B16) Bath Western Riverside and the Cricket ground (B3b) were removed. City of Bath College and adjoining land (B6b – B6g) were also removed because they lie in the climate change envelope not the current Flood Zone 3. Only part of the REC site was considered for redevelopment rather than the whole area. The new volume of flood storage was then calculated on the outline of Flood Zone 3, up to the climate change flood level, this equated to 146,786m³ for the development sites only. This means that no compensation storage has been included for parts of the development sites that lie in the climate change envelope ie between Flood Zone 3 and Flood Zone 3 +20%Climate Change, even though some are suggested as short term (2009-2014) or medium term (2015-2019) residential allocation planning sites.

The extant site (B16) accounted for 58,114m³, the sites around the Bath College and adjoining Green Park House account for 7,530m³, the Cricket Ground 37,720m³ and the partial REC site area reduced the volume by a further 44,920m³. The remaining reduction in volume (49,930m³) relates mainly to the climate change flood envelope.

B&NES have added two new volume allowances to the development site compensation calculation;

- 1) a 20% for peak flow effect allowance of 29,357.20m³, and
- 2) an additional allowance of 28,575m³ for overland flood routing “cut off” when three proposed development sites are raised or defended in 1) Lower Bristol Road; 2) Land between St James Parade and Corn Street; and 3) Locksbrook development parcels. These “cut off” areas are all located in the climate change flood envelope not the current Flood Zone 3. This shows B&NES are not consistent in their policy in relation to climate change flood risk areas when calculating development site flood compensation volumes. These additional allowances bring the proposed new flood compensation volume to 204,718.44m³ in Document 2.

Arithmetic Error

As the methodology of calculation of flood compensation is different between Document 1 and 2 we have checked Appendix A of Document 2 to determine each development parcel volume difference. During the check we found an error in the summation of the

total volumes by B&NES, they quote 146,786.24m³ whereas the actual volume generated by our summation of their figures was 151,074.01m³ a shortfall of 4,287.77m³ in the B&NES calculations. If the additional 20% peak flow allowance is added then this figures rises to a 5,145.32m³ compensation volume shortfall.

PPS 25 Policy on Climate change and compensation volume allowances

PPS25 (CD2/20) requires any organisation or person proposing a development, to consider that development through the lifetime of the plan or proposed development. The guidelines in PSS25 suggest flood risk for residential property should be considered over a 100 year period and for commercial use ,over a 60 year period, not just the current day flow scenarios. Annex B of PPS25, paragraph B10 and Paragraphs 3.95 – 3.99 of the PPS25 Practice Guide detail that the effect of climate change must be taken into account when developing planning policy and publicly funded flood alleviation schemes.

When the extent of the climate change envelope is taken into consideration over each of the development site footprints, it adds a further 145,478m² or 43,643m³ of lost flood storage, based on an approximate average 0.3m depth of water across each parcel. Comparing this with the (20%) peak flow allowance above, an additional shortfall of 14,286m³ is created.

Additional cut off areas and compensation volume allowances

B&NES have added 3 areas of “cut off” land in the Document 2 calculations.

There are other areas and volumes that need to be added to the total compensation volume which relate to areas of the climate change envelope which lie between development parcels.

If two parcels of land in close proximity have their frontages raised to defend them from flooding but the small frontage between them is not raised then flood water will still propagate up between the two new defences and potential enter the development site via a side or back door. The Lower Bristol Road is a classic example where water propagates between Churchill Bridge and Camden Mill and runs west along the Lower Bristol Road. Whilst an allowance for part of the Lower Bristol Road has itself been included where it abuts development parcels B8 and B9 no allowance has been included at the source of the flooding at Churchill Bridge / Camden Mill (labelled as B-LBR2 by us). If the Lower Bristol Road and back doors to the extant BWR B16 site and B8-B9 sites are to be defended, and hence the reason for adding the yellow “cut off” areas (CD4/FR36 Appendix B) then sites not included in the Core Strategy as potential development need to be included in the flood defence strategy and overall flood compensation storage volume calculations or back door flooding will still occur. There are two areas of the Lower Bristol Road where this scenario will occur if contiguous defences are not created, these areas equate to 12,970m² @1.00m depth or 12970m³ in Flood Zone 3 at B-LBR2 and a further 15,930m² @ 0.3m depth / 4,779m³ in the climate change envelope at B-LBR2 and B-LBR1 which is adjacent to the Consented BWR B16 site. Other parcels of land between the B13 series sites and B19-B20 sites need to have a compensation volume allowed for, so that contiguous defences can be delivered. A total allowance of 19,524m³ would be appropriate ((12970+4779)+10%).

Volume comparison summary

If we accept that the extant sites are removed because the flood compensation storage has already been agreed in their planning consent and other sites not now considered to be fully available for redevelopment will not come forward, then the following volumes would apply if the same methodology were applied to calculating flows including for the influences of climate change and “cut off “ areas:

Document 1 Atkins FRMS Appendix D $345,000 - 58,114 - 37,720 - 44,920 = 204,246\text{m}^3$

Document 2 B&NES November 2011 $204,718 + 5,145 + 43,643 = 253,506\text{m}^3$

Neither of these include allowances for protecting the Lower Bristol Road in full or provision of contiguous defences between say plots 13a-13b-13c-13d-13e.

An additional compensation volume allowance of approximately $19,524\text{m}^3$ needs to be included in any replacement flood storage areas.

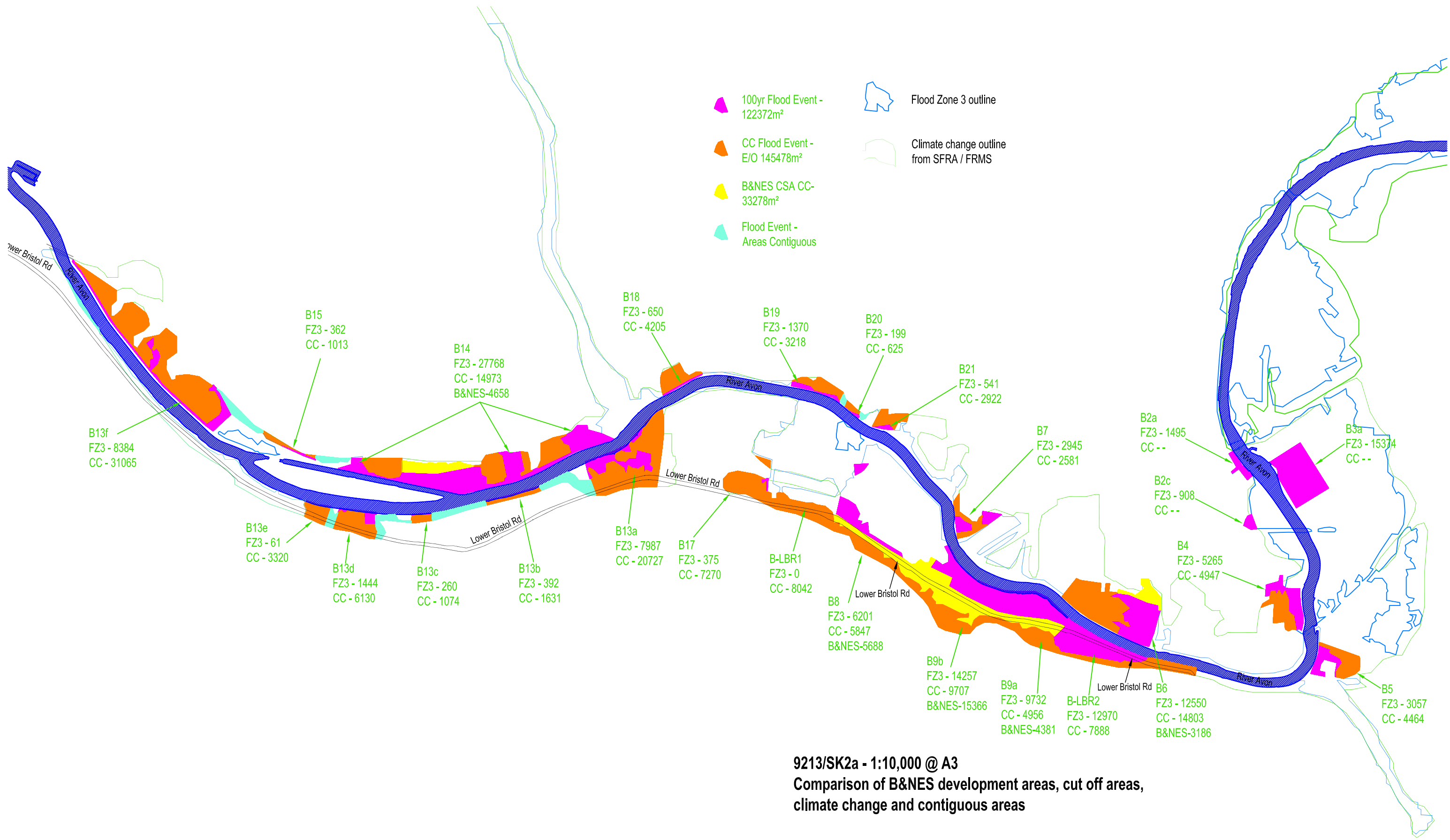
We therefore consider that based on the development sites and Lower Bristol Road protection proposals as described by the Council, the minimum volume of flood compensation that needs to be provided upstream of Bath should be circa $270,000\text{m}^3$, not $204,718.44\text{m}^3$, an increase of $65,000\text{m}^3$.

The spreadsheet of our calculations and drawing reference 9213/SK2a are appended.

APPENDIX 1

Drawing 9213-SK2a

Calculation spreadsheet of site areas



9213/SK2a - 1:10,000 @ A3
Comparison of B&NES development areas, cut off areas,
climate change and contiguous areas

Comparison of site area and volumes from Document 2

Dec 2011

Colour Key	B&NES Sites			Site area trace over			Extra Climate change areas		
	Check of B&NES Figures			Robson Liddle check			Robson Liddle area measure		
Plot ref	B&NES Original FZ3	Depth	Volume	Recalculated FZ3	Depth	Volume	Climate area	Average Depth	Volume
B2a	1477.3	1.33	1964.81	1495	1.33	1988.4	0	0.3	0.0
B2c	912.1	1.40	1276.94	908	1.40	1271.2	0	0.3	0.0
B3a	15386.62	3.43	52776.11	15374	3.43	52732.8	0	0.3	0.0
B4	5183.32	1.24	6427.32	5265	1.24	6528.6	4947	0.3	1484.1
B5	3049.84	1.31	3995.29	3057	1.31	4004.7	4464	0.3	1339.2
B6	12688.5	1.03	13069.16	12550	1.03	12926.5	14803	0.3	4440.9
B7	3101.29	1.25	3876.61	2945	1.25	3681.3	2581	0.3	774.3
B8	6462.55	0.55	3554.40	6201	0.55	3410.6	5847	0.3	1754.1
B9a	9658.08	0.97	9368.34	9732	0.97	9440.0	4956	0.3	1486.8
B9b	14562.7	1.07	15582.09	14257	1.07	15255.0	9707	0.3	2912.1
13a	8041.56	0.78	6272.42	7987	0.78	6229.9	20727	0.3	6218.1
13b	336.33	1.15	386.78	392	1.15	450.8	1631	0.3	489.3
13c	307.54	0.97	298.31	260	0.97	252.2	1074	0.3	322.2
B13d	1465.17	0.60	871.78	1444	0.60	859.2	6130	0.3	1839.0
B13e	59.14	0.84	49.68	61	0.84	51.2	3320	0.3	996.0
B13f	8292.25	0.84	6965.49	8384	0.84	7042.6	31065	0.3	9319.5
B14	27911.09	0.80	22328.87	27768	0.80	22214.4	14973	0.3	4491.9
B15	385.78	0.21	81.01	362	0.21	76.0	1013	0.3	303.9
B17	318.34	0.10	31.83	375	0.10	37.5	7270	0.3	2181.0
B18	647.08	0.75	485.31	650	0.75	487.5	4205	0.3	1261.5
B19	1375.74	0.65	894.23	1370	0.65	890.5	3218	0.3	965.4
B20	193.12	0.69	133.25	199	0.69	137.3	625	0.3	187.5
B21	556.5	0.69	383.99	541	0.69	373.3	2922	0.3	876.6
	122371.94		151074.01 m3	121577		150341.3	145478		43643.4
	B&NES quote total as : 146786.24 m3								
		i.e. 4287.77 m3 shortfall							
B - LBR1	Lower Bristol Road South extant site B16			-		-	8042	0.3	2412.6
B - LBR2	Lower Bristol Road source area of flood propagation			12970	1.00	12970.0	7888	0.3	2366.4
	Totals			12970		12970.0	15930		4779.0