



Bromsgrove District and Redditch Borough Strategic Flood Risk Assessment

Level 1 Report – Summary of Changes

Bromsgrove District Council and Redditch Borough Council

January 2009

Final Report

9T1791

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1 INTRODUCTION

Following the submission of the Draft Level 1 SFRA in September 2008, Royal Haskoning received three lists of changes required in the final report. These were received from the Environment Agency, Bromsgrove District Council and Redditch Borough Council. This summary document presents all the requirements received and details the changes made to the draft report in each case. The changes made by Royal Haskoning in each case are shown in red.

2 ENVIRONMENT AGENCY COMMENTS

1. SFRA

2.1.2 The return period of the River Salwarpe during the July 2007 flood event in Droitwich Spa is between 1 in 200 and 1 in 1,000.

This comment was not included in the Final – this comment does not seem to be relevant to the paragraph as the only mention of return period refers to the CEH and Droitwich is outside the study area.

Page 10 – Belbroughton has a history of flooding, some of it is related to problems with the culverts and blockages. More recently September 2008 substantial flooding happened in Belbroughton – some interesting videos can be seen on ‘you tube’

The following points were added to Appendix B and Figure 3:

235	Queens Car Park, Belbroughton	Cause i and cause iv	September 2008	YouTube	Fast flowing water down road and through car park
236	Nash Lane, Belbroughton	Cause i – Belne Brook	September 2008	YouTube	Belne Brook broke banks. Video shows flooding approximately 2ft deep.
237	Dark Lane, Belbroughton	Cause i and cause iv	20 th July 2007	YouTube	Video shows water flowing fairly rapidly down and across road.

Page 26 - Hen Brook suffers frequent flooding around Stoke Prior / Stoke Wharf, from a combination of badly maintained watercourses and flooding from the Canal. If more allocations in this area are expected, then these flooding problems need to be investigated in more detail at a Level 2 stage SFRA.

Following paragraph added:

“Frequent flooding from this Brook has occurred around Stoke Prior/Stoke Wharf, from a combination of badly maintained watercourses and flooding from the Canal, mentioned above. As a result the Environment Agency has stated that if any more allocations are expected in this area then these flooding problems need to be investigated further in a more detailed Level 2 SFRA.”

3.1.7 – The Marlbrook Reservoir at Marlbrook quarry has caused flooding problems in the past, this is due to a collapsed culvert, proposals to rectify this have been put forward but these works have still not been implemented.

Following paragraph added:

“The only records of flooding within the region have been obtained from the Environment Agency who have commented on previous flooding problems at the Marlbrook Reservoir at Marlbrook quarry resulting from the collapse of a culvert. It should be noted that proposals have been put forward to rectify this, but the works have still not been implemented.”

Page 41 – The site allocated within these tables will need to be sequentially tested, especially those which are in a flood risk area. Other sites of a lesser risk should be considered. Sites within these tables which are allocated for development and contain significant parts of the site within a flood risk area will require further work at the Level 2 SFRA. This will need to show that the sites can be developed without increasing flood risk (preferably reducing it !) and that the developments are safe.

Following paragraph added before tables in Section 4.3.3:

“These sites will also need to be sequentially tested, especially those which are in a flood risk area, with sites of a lesser risk being potentially considered. Sites within these tables which are allocated for development and contain significant parts of the site within a flood risk area will require further work in a Level 2 SFRA in order to demonstrate that the sites can be developed without increasing flood risk, preferably reducing it, and that the developments are safe.”

Development sites such as A3/A4/A5 – have watercourses running through them - what checks will be done to ensure that flood risk can be dealt within on these sites? Could lidar be used to show that the levels rise significantly so flood risk won't be a problem?

Following paragraph added before tables in Section 4.3.3:

“Some of the sites, such as A3, A4 and A5, have watercourses running through them that have not been included within the Environment Agency's Flood Zone Mapping (due to their catchment areas being smaller than 3km²) or been modeled independently. These sites will therefore require further analysis within site specific FRAs or a Level 2 SFRA to gain a more detailed understanding of the floor risk within these locations.”

4.4 – Is the LPA using the climate change for the sequential test, this would be similar to other SFRA's in the area. If so, do the maps provided assist the LPA in using climate change for the sequential test.

Following paragraph inserted into section 4.4 *“The extent of the flood outlines used for the analysis of climate change, as discussed above, are shown in Figure 12.”*

Figure 12 ‘100 Year Flood Outline Considering the Effect of Climate Change’ inserted.

As a result Figure 12 (Areas of Concern) becomes Figure 13 and Figure 13 (Source Protection Zones within Bromsgrove and Redditch) become Figure 14.

4.6.5 – Can we have something more specific in terms of guidance in reducing flood risk , there are a couple of issues that come from the Worcestershire Scrutiny Task Group on improvements to culverts and maintenance, however these were not detailed. Can these issues be taken forward to form recommended policies for new development i.e.

Any new development on a site should give full consideration to improving existing culverts by either opening them up or if this is not practicable then the existing culvert should be improved in capacity.

New developments that have watercourses running through them should have a comprehensive plan for managing and maintaining the watercourse.

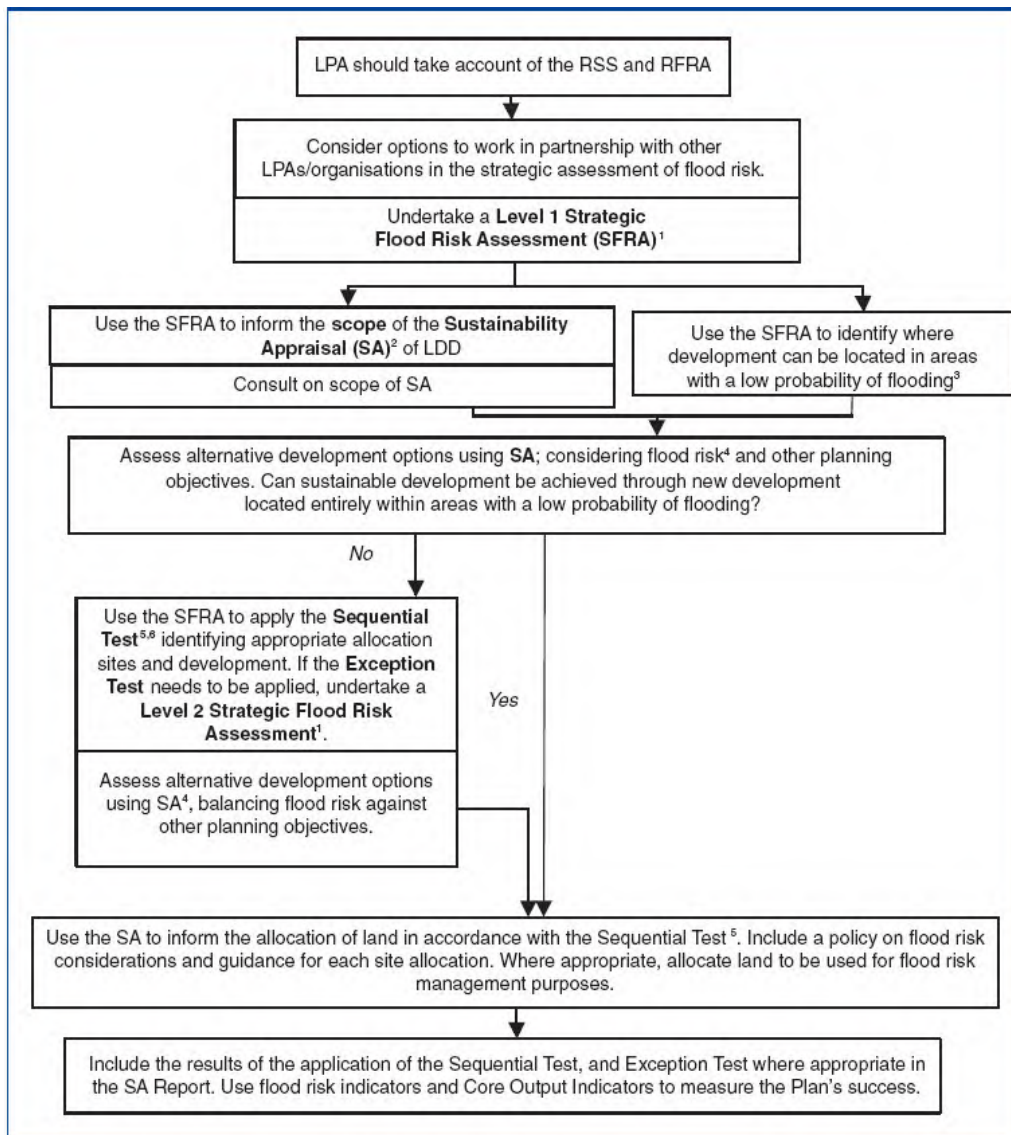
Other ways of reducing flood risk is increasing flood storage, improving flood flow routes, removing existing obstructions to flow.

As a general comment I notice there isn't much in the Level 1 on recommended flood risk policies, is this going to be done at level 2.

Addition of section 5.2.2:

LDF Policies and Development Control Policies

The Strategic Flood Risk Assessment provides flood risk information to support appropriate land use allocations within the Borough and District. The site allocations within the Core Strategy Local Development Document should reflect the Council's strategic planning policies and approach to flood risk and site allocations should reflect the application of the Sequential Test, as well as guidance on how flood risk issues should be addressed at sites allocated within flood risk areas. The following flow chart has been taken from PPS25: A Practice Guide, pp14 and illustrates how flood risk issues should be factored into LDDs in the detailed allocation of land use types across their area:



Notes

- 1 Guidance on undertaking a SFRA can be found in chapter 3.
- 2 Guidance on developing the scope of SA can be found in ODPM (2005) *Sustainability Appraisal of Regional Spatial Strategies (RSS) and Local Development Documents (LDD)*. Guidance on suitable flood risk indicators can be found in *Flood Risk Assessment Guidance for New Development FD2320, D2.1*.
- 3 Flood Zone 1 for fluvial and tidal flooding and with a low risk of flooding from other sources.
- 4 Including an assessment of the potential effect of proposed development on surface water run-off.
- 5 Including consideration of the variability of flood risk within a Zone.
- 6 Including in broad terms, consideration of the variability of flood risk within a flood zone from existing SFRA's.

The SFRA provides the baseline information for the Sustainability Appraisal (SA) of LDDs for the scoping and evaluation stages, in addition to providing the evidence base for the application of the Sequential Test and Exception Test in the land use allocation process. Ideally the LPA should demonstrate, as part of the SA, that it has considered a range of options in conjunction with the Flood Zone information from the SFRA and applied Sequential Test and, if necessary, Exception Test. The LDDs should identify the specific flood risk related issues which will need to be addressed for certain site allocations when a planning application is submitted for their development.

Suggested local polices for the LDF, which presume that PPS25 is followed, are listed below:

- *Development sites should be allocated according to the Sequential, and if necessary Exception tests, as detailed within this report, and evidence must be provided for the reasoning;*
- *Additional FRAs should be carried out for sites for which Flood Zones are undefined or other sources of flood risk are considered an issue, as recommended within this SFRA;*
- *Where development is proposed in undefended areas of the floodplain, which lie outside of the functional floodplain it must remain safe without increasing flood risk, and ideally reducing the risk;*
- *Where development is proposed behind raised flood defences additional analysis will be required as part of a Level 2 SFRA or site specific FRA with regards to the increase in residual risk through loss of flood site storage or the disruption of conveyance routes;*
- *Application of the flood risk management hierarchy should be used before solutions such as ground raising or the construction of new defences are considered;*
- *Where appropriate the LDF should allocated green corridors along the lines of watercourses;*
- *Paving of gardens or other areas should be controlled and SUDS would be required to drain these wherever practicable; and*
- *Appropriate SUDS techniques should be considered for all new developments to ensure that flood risk is not increased elsewhere. For Greenfield sites, this will require a calculation of Greenfield runoff rates.*
- *Any new development on a site should give full consideration to improving existing culverts by either opening them up, or if this is not practicable, then the existing culvert should be improved in capacity;*
- *New developments that have watercourses running through them should have a comprehensive plan for managing and maintaining the watercourse; and*
- *Where practicable flood risk should be reduced by increasing flood storage, improving flood flow routes and/or removing existing obstructions to flow.*

4.7.2 – Brownfield redevelopment should look at opportunities to reduce the surface water run-off from the development, this should be a minimum of 20% reduction in surface water discharge. In instances where existing surface water flooding problems occur a greater reduction in run-off may be required.

Addition of following paragraph:

“However, any redevelopment on Brownfield sites should look at opportunities to reduce the surface water run-off from the development, which the Environment Agency recommends should be a minimum of a 20% reduction in surface water discharge. In instances where existing surface water flooding problems occur, a greater reduction in run-off may be required”

4.7.3- With regard to the comment ‘The Environment Agency will object to any development which does not accord with the guidance contained within PPS25’ it should be noted that there are other organisations/key players who have a role in PPS25 – LPA’s should object if the sequential test can not be passed, Land Drainage Authorities

should oppose development that will increase surface water run-off into localised watercourses. Local Emergency Planners and Local Resilience Forums should oppose development where they can not evacuate or rescue safely. Developers also have a responsibility.

Addition of following paragraph:

“In addition, the Local Planning Authority will object if the sequential test cannot be passed, Land Drainage Authorities should oppose development that will increase surface water runoff into localised watercourses and Local Emergency Planners and Local Resilience Forums should oppose development where there is no safe access or egress for evacuation or rescue. Developers also have a responsibility to follow the guidance of PPS25.”

4.8.2 The document does not give very clear guidance on how LPA’s should undertake the sequential test. We recommend this be extended and clarified.

Addition of Guidance note with clear reference to PPS25

4.8.3 A review of the existing RFRA should be undertaken - however a revised one is due to be released at the end of the year.

Addition of following paragraph:

“The final version of the West Midlands RFRA was published in October 2007 and can be downloaded from the West Midlands Regional Assembly website (www.wmra.gov.uk). This document concludes that both Bromsgrove District and Redditch Borough have a low inherent flood risk, although flooding hot spots were identified in Redditch town by the Borough Council and Bromsgrove District Council stated that flood risk was a significant factor in strategic planning as part of the RFRA. The Environment Agency has advised that a revised version of this document is due to be released at the end of the year, although this does not yet appear to be available at the time of writing this SFRA. “

4.8.4 Surface water drainage systems should be designed to cater for a 30% increase in rainfall intensity as advised in PPS25 for residential or 20% for commercial development, which normally has a shorter lifetime.

Addition of following paragraph:

“PPS25 advises that the surface water drainage systems of all new developments should be designed to cater for a 30% increase in rainfall intensity for residential developments and 20% for commercial (lower, due to the shorter lifetime of the development).”

4.8.5 Residual Risk section of the SFRA needs to be expanded, - we suggest the following text. New developments will be expected to show that they do not increase flood risk for up to the 1 in 100 year flood event plus climate change and that there is no reduction in the floodplain. All development will need to demonstrate that it is safe, over the lifetime of the development, this will involve the following;

raising finished floor levels 600mm above the 1 in 100 year plus cc flood event.

More and Highly vulnerable development will need safe dry access up to the 1 in 100 year event plus climate change

Flood management plans will be required to show access to and from the site during flood conditions.

In addition to the above measures there is also the risk of flooding that can occur in flood events in excess of the 1 in 100 year event and the 1 in 1,000 year extreme flood. New development, particularly more and highly vulnerable uses will need to show that the level of flood risk can be safely managed. Emergency Planners and Local Resilience Forums should be contacted on whether they can evacuate safely during times of flooding up to and including the extreme flood event.

“New developments will be expected to show that they do not increase flood risk for up to the 1 in 100 year flood event plus climate change and threat there is no reduction in the storage volume of the floodplain. All development will need to demonstrate that it is safe, over its lifetime. The Environment Agency advise the following:

- *Raising finished floor levels 600mm above the 1 in 100 year plus climate change flood event;*
- *More and Highly vulnerable development will need safe dry access up to the 1 in 100 year event plus climate change; and*
- *Flood management plans will be required to show access to and from the site during flood conditions.*

In addition to the above measures there is also the risk of flooding that can occur in flood events in excess of the 1 in 100 year event and the 1 in 1,000 year extreme flood. New development, particularly more and highly vulnerable uses will need to show that the level of flood risk can be safely managed. Emergency planners and local Resilience Forums should be contacted on whether they can evacuate safely during times of flooding up to and including the extreme flood events.”

Appendix D - Guidance Notes

Dealing with surface water - this should refer to CIRIA C697 and The SUDS Manual

Following paragraph added to section 5:

“There are five general methods, listed below. These are shown in hierarchical order in terms of the ‘management train’, described in the CIRIA SUDS Manual, 2007 (Prevention → Source Control → Site Control → Regional Control). The techniques that are higher in the hierarchy are preferred to those further down so that prevention and control of water at source should always be considered before site or regional controls, such as balancing ponds and wetlands”

Reference to SUDS Manual added.

The Exception Test - 2) Planning and Design - There should be no reference to Burton (presumably cut and paste problem!) Deleted

Section 2 Maintenance paragraph changed to:

“Relatively few defences exist with Bromsgrove District and Redditch Borough. In most cases the design standard and condition of these structure was not available for inclusion within the SFRA. However, the responsibility for the maintenance of the structures is included and it is important that they are maintained to ensure the safety of the people and property behind.”

FRA Procedure - Appendix C refers to East Staffordshire SFRA Level 2 (Burton again - cut and paste error) – **Footers deleted**

For your information there is a small scheme that our DC office at Fradley has been involved in with Redditch BC on the Batchley Brook

The vortex flows scheme has already been referenced in section 2.1.8

There are some flooding problems on the Red Ditch due to historic development, we understand that sections of the Red Ditch have been infilled and we are working with Redditch BC to produce a solution

Addition of following paragraph in section 2.1.8:

The Environment Agency is aware that some sections of the Red Ditch have been infilled and they are currently working with Redditch Borough Council to identify a solution.

Guidance Note dealing with surface water - the different types of measures. The Ciria guidance five techniques - should these be presented in order of preference, prevention and filter strips and swales and more preferable than balancing ponds? One of the Ciria SuDS documents refers to ‘hierarchy of suds techniques’

Inclusion of following paragraph in Section 2:

“Relatively few defences exist with Bromsgrove District and Redditch Borough. In most cases the design standard and condition of these structure was not available for inclusion within the SFRA. However, the responsibility for the maintenance of the structures is included and it is important that they are maintained to ensure the safety of the people and property behind. “

Guidance notes on emergency planning section – police stations/ fire stations are not essential infrastructure but highly vulnerable development. The paragraph on access routes states that the risk of flooding to access routes has been undertaken for different scenarios, this is not true as only the 1 in 100, and 1 in 1000 have been simulated and most of this is generalised flood mapping that won’t show the depth of flooding that would occur. If access is an issue for any of the proposed allocated sites, or there is a risk of overtopping or breach from a flood defence then this will need to be investigated at Level 2 in the SFRA in the form of Hazard Mapping.

First paragraph re-written as

“The success of emergency response is dependent upon a pre-planned course of action. In relation to flooding it is vital that Highly Vulnerable emergency infrastructure, such as hospitals and fire stations, are able to operate and not rendered useless by being flooded themselves. In planning new infrastructure, such as transport links which may be relied upon as essential evacuation routes, it is vital that flood risk is taken into account. Section G11 of PPS25 states that:”

First paragraph of section 2 re-written as

“In the event of a severe flood, either by overtopping or defence breach, consideration must be given to the safe evacuation of people of different levels of mobility. The flood extent maps within this Level 1 SFRA highlight the flood risk to access routes during the 100 and 1,000 year return period scenarios. However, the flood mapping does not show the depth or velocity of flooding that would occur. If access is an issue for any of the proposed allocated sites, or there is a risk of overtopping or breach from a flood defence then this will need to be investigated in a Level 2 SFRA in the form of Hazard Mapping.”

Third Paragraph on this page sets out the importance of flood warning and evacuation plans - it should also include the need to deal with residual risk, as flood warning and evacuation plans will not deal with the actual flood risk alone.

Addition of following sentence:

“However these warnings and plans will not deal with the actual flood risk alone so it is important to also address the residual risk of flooding.”

General Comment

– There should be some broad recommendations made for the contents of a level 2 SFRA.

What additional work should the District Councils undertake and why.

Addition of Section 5.2.1:

“Level 2 SFRA Scope

Following the guidance provided in PPS25: A Practice Guide, pp52 and the conclusions of this Level 1 SFRA, the following scope is recommended for a Level 2 SFRA for the study area of Bromsgrove District and Redditch Borough:

- *Appraisal of the current condition of flood defence infrastructure and the likely future management policy with regards to its maintenance and upgrade (this analysis will be limited within the study area due to the limited number of flood defences) – this will assess the likelihood of defence failure and therefore the requirement for additional infrastructure maintenance during the planning period;*
- *An appraisal of the probability and consequences of overtopping or failure of the existing flood risk management infrastructure, including an appropriate allowance for climate change. This SFRA has indicated that only the flood defences on the Sugar Brook in Bromsgrove will require additional analysis, relating to Development Site E8 and potentially the Policy Reference development sites located in proximity to the flood defences. None of the other*

flood defences are located in proximity to the development sites, although this will require further review as part of the Level 2 SFRA;

- *Definition and mapping of the functional floodplain in locations next to proposed development sites – this will assist the Councils in undertaking the Sequential and Exception Tests;*
- *Maps showing the distribution of flood risk across all the Flood Zones from all sources of flooding taking climate change into account. This will require the modelling of watercourses identified as problematic within this Level 1 SFRA and located in proximity to potential development sites to enable accurate execution of the Sequential and Exception Tests. It is recommended that this additional modelling determines the Functional Floodplain, 100 year, 100 year plus climate change, 1000 year and 1000 year plus climate change flood extents on the following watercourses:*

Bromsgrove District

- *the Spadesbourne Brook*
- *the Battlefield Brook*
- *the Gallows Brook*

Redditch Borough

- *the Batchley Brook*
- *the Red Ditch*

- *A review of the revised River Arrow model and re-running to account for the 100 year with climate change, 1000 year flood extent and 1000 year with climate change, if not included;*
- *Investigation into the feasibility of compensatory flood storage in order to ensure that flood risk does not increase as a result of development taking place in the flood plain;*
- *Guidance on appropriate policies for sites which satisfy parts a) and b) of the Exception Test and requirements to consider at the planning application stage to pass part c) of the Exception Test;*
- *Guidance of the preparation of FRAs for sites of varying risk across the flood zones, including information about the use of SUDS techniques;*
- *Identification of the location of critical drainage area and identification of the need for Surface Water Management Plans (as shown in this Level 1 SFRA, surface water flooding is of particular importance within Bromsgrove District and Redditch Borough and requires additional analysis);*
- *Meaningful recommendations to inform policy, development control, and technical issues; and*
- *Analysis of features that have an informal flood defence function (e.g. the weirs and mill ponds etc)."*

3 BROMSGROVE DISTRICT COUNCIL COMMENTS

John Bailey's comments

1.3 *Second Paragraph:* Main River just downstream of the M5 not the M42
Changed

2.1.2 *First Paragraph:* 'Main Rivers' – initially classified from ordinary watercourses to C.O.W's. Is not simply Main River
Sentence: "All these 'Main River' sections were initially classified from Ordinary Watercourses into Critical Ordinary Watercourses (C.O.Ws) before becoming enmained" added

Second Paragraph: Run off from highways could be the prime factor
Addition of "...is thought to be the prime factor" to paragraph

Final Paragraph: 2.0m not 3.0m Changed

2.1.3 *Second paragraph:* If its appropriate Hagley Village junction of Weston Road with Kidderminster Road 'flooding of gardens' by Gallows
Addition of "The culvert underneath Hagley Village at the junction of Weston Road with Kidderminster Road is a known location of where this problem has occurred in the recent past and has resulted in the flooding of gardens."

2.1.4 *Fifth Paragraph:* Downstream – Add??? Where it passes beneath Dagnell End Lane
Addition of "most notably where the Brook passes beneath Dagnell End Lane"

Sixth Paragraph: Lindhurst should be Linthurst Changed

2.1.6 *Fourth Paragraph:* I was worried about the watercourses from Romsley down to Belbroughton. The one that has a series of old mill ponds. First two at head of system shut mill, sling common and also Galton Lane failed 6th September 2008 – 3ft tidal waves for say 4 miles. SERIOUS! Need to Survey all in catchment.

Perhaps same comment.

Addition of: "The potential severity of this problem was evidenced in September 2008 when it was reported that a series of mill ponds had breached, resulting in a three foot "tidal wave" of water travelling approximately four miles downstream. This caused serious flooding of the areas around North Lane and The Queens public house car park. Bromsgrove Council's Drainage Engineer highlighted the need to survey all the ponds within the catchment."

2.1.7 Need to specify that the Hen Brook along with the canal at Hanbury road, by the Navigation Public House overflows to flood properties and factory units.

Perhaps alter the wording in this paragraph.

Addition of “The canal, along with the Hen Brook has a tendency to overflow at Hanbury Road, by the Navigation Public House, resulting in the flooding of properties and factory units.”

Appendix A Model Survey of River Arrow with in BDC to its top watershed being done by Environmental Agency??? Conservation with EA in past – JB
This model has not yet been constructed so has not been included in the SFRA

4 REDDITCH DISTRICT COUNCIL COMMENTS

Table B2 – *all changes made to table*

Page	Ref:	Col.	Comments
5	ID 17	4	Repeatedly
5	ID 27	4	Repeatedly
6	ID 31	4	Formerly repeatedly until Q100 works completed, mid-1990s. 20/07/07
6	ID 34	3	Illegal works/obstructions in rear gardens.
		4	Repeatedly
6	ID 4	6	Delete “(and brook overflow)”
7	ID 47	6	“business premises” not “house”
7	ID 50	2	“Matchborough East” not “Mappleborough Green”
7	ID 54	2	“Abbey” not “Abby”
7	ID 60	2	Add “Winyates West”
7	ID 65		Formerly repeatedly, progressive reductions in frequency and magnitude following various improvements. 20/07/07
8	ID 82	3	Former farm land had history of regular, sporadic flooding (anecdotal local knowledge).
8	ID 82	4	Repeatedly following construction of dwellings in early 2000s.
8	ID 82	6	Add “, highways and land drainage.” Delete footbridge comment – not known. Replace with “Highway flooding in excess of 700mm depth.”
9	ID 89	4	Replace with – “Formerly infrequent flooding prior to Brockhill Development. Enforcement actions secured improved performance nevertheless flooding occurred 20/07/07.”
9	ID 91	4	A new relief SWS was constructed by STW in 1978/79 which also significantly improved drainage performance.
9	ID 92	6	“sewage” not “sewerage”
9	ID 93	3	There is a general lack of proper gully provision in terms of both numbers and siting.
10	ID 95	2	“Dagnell End Road” not “Lane”
10	ID 98	2	“Winyates Way, Matchborough/Winyates” not “Matchborough Way, Mappleborough Green.”
10	ID 99	2	“Battens Drive, South Moons Moat” not “Winyates”
10	ID100	2	“Batchley Brook, between Brockhill Drive and Batchley Road” not “Brockhill and Batchley (general)”
10	ID100	6	Add “See also ID 82”
10	ID 102	2	“Bordesley Lane, Riverside” not “Road leading to Abbey Stadium”
10	ID 103	2	“Battens Drive, South Moons Moat” not “Entrance to Arrow Valley Country Park”
10	ID 103	6	Add “See also ID 99”
10	ID 104	2	“Park Way, Abbeydale” not “Bus Route at Forge Mill Museum”
10	ID 106	2	Holloway “Drive” not “Road”
11	ID 108		I can’t find any details in respect of Gibbs Road. Please investigate source, I don’t think it was me? Adjustment to Sedgley Close

11	ID 124	2	"Close" not "close"
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Table B3

Page	Ref:	Col.	Comments
27	ID 233	6	<p>I believe the statement is partially inaccurate. There are significant overland flows from the land between the A441 and B4101 Dagnell End Road (north-east sector). These combine with the River Arrow during times of spate, and due to the fact that the A441 is lower in part, than the bridge over the River Arrow thus rendering the highway regularly impassable due to surface flooding.</p> <p>It may also be the case, that the land in question is no longer properly drained and similar conditions were witnessed by run-off onto the A441 from the east at Bordesley, a relatively short distance north of the Redditch/Bromsgrove border, where there are no visible signs of channels or former channels serving the land in question.</p> <p>Also the reference to the "conflict of rural with urban area" is not understood. The catchment of the Dagnell Brook within Redditch largely remains predominantly rural in character. The A441 and B4101 in fact marks the boundary between escarpment and floodplain river conditions and it is more likely that this is the principle cause for any changes in flow regimes associated with the Dagnell Brook. The highways themselves can have a damming effect upon normal drainage arrangements to the available, open channels.</p> <p><i>Replacement of original text to</i> <i>"Significant overland flows from the land between the A441 and B4101 Dagnell End Road (north-east sector). These combine with the River Arrow during times of spate and, due to the fact that the A441 is lower in part than the bridge over the River Arrow, the highway is regularly rendered impassable due to surface flooding.</i></p> <p><i>The land may no longer be properly drained and similar conditions were witnessed by run-off onto the A441 from the east at Bordesley, where there are no visible signs of channels or former channels serving the land in question."</i></p>

Table B4 - all changes made to table

Page	Ref:	Col.	Comments
29	ID 18	2	Remove reference to Bow Brook
29	ID 18	6	Replace comment with "1 house internally flooded from fields"
29	ID 23	2	"Plack" not "Bow" Brook
29	ID 23	6	Delete "Bank" - twice included in road name.
29	ID 33	6	Add "from sewers and highways drainage"
29	ID 39	6	Add "from sewers and highways drainage"

29	ID 64	2	“Callow Hill” not “Feckenham”
29	ID 86	2	“Shurnock, Astwood Bank” not “Feckenham”

Also the key on page 30 seems to have used lower case letters as opposed to roman numerals as elsewhere in the report. **Changed**

Level 1 Report

1.3, p4(20), 2nd full para, line 3: after ‘within’, add “and above” **Changed**

2.1.4, p11(27), Batchley Brook: Add new paragraph. “There has been a significant series of developments of the various Prison complexes over the last two decades, and the measures and effects of dealing with any additional run-off is not definitively known. This could have the effect of reducing the efficiency of any previous flow attenuation and cause adverse impact on flow regimes downstream, primarily within the Redditch area. **Added**

p3(19) & p13(29) Reference is made to a length of the Stratford-upon-Avon canal as being 100m and 700m respectively. Q. Which length is correct? **700m – altered on p3**

2.1.8, p13(29), River Arrow: Add new paragraph. “Reference to current OS data and the 1955 edition clearly shows that the Arrow’s course has been substantially re-aligned and mostly formalised as a result of the construction of the above named highways. This is between SP05386802 (rear of Dolphin Road, Abbeydale) and SP06826516 its confluence with the Ipsley Brook at Washford. Visible remnants of its original course have been retained as swales and these extant examples can be found near New Meadow Road (Lakeside), Ravensmere Road (Greenlands) and Nash Road (Park Farm North).”

As a result of these realignments, in conjunction with the EA (formerly NRA – National Rivers Authority), the performance of the River Arrow was raised throughout its entire reach within the Redditch to 1 in 100 year levels. An associated project with the Dagnell Brook at the site of the former Paper Mill Farm was the last phase of this improvement strategy, which was completed in 1994/5.

New paragraph added:

“Reference to current OS data and the 1955 edition clearly shows that the River Arrow’s course has been substantially re-aligned and mostly formalised as a result of the construction of Holloway Drive and Old Forge Drive. This is between SP05386802 (rear of Dolphin Road, Abbeydale) and SP06826516 (its confluence with the Ipsley Brook at Washford). Visible remnants of its original course have been retained as swales and these extant examples can be found near New Meadow Road (Lakeside), Ravensmere Road (Greenlands) and Nash Road (Park Farm North). As a result of these realignments, in conjunction with the Environment Agency, the standard of protection from the River Arrow was raised throughout its entire reach within Redditch to 1 in 100 year levels. An associated project with the Dagnell Brook at the site of the former Paper Mill Farm was the last phase of this improvement strategy, which was completed in 1994/5.”

2.1.8, p13(29) & p14(30), Dagnell Brook: Add: “There are a series of weirs along the various, former mill ponds as well as at the historic confluence with the River Arrow at Five Tunnels (SP05246887). These assist in managing peak water levels and as part of the joint strategy referred to above, an additional 750mm overflow pipe was constructed, direct to the River Arrow (SP05396847 to SP05366852). **Added**

2.1.8, p14(30), Batchley Brook, para.1, line 3: Insert after ‘balancing ponds’ “constructed circa 1949” **Added**

para.2, line 4: delete “rapid”. **Deleted**

Add new paragraph between para’s 2 & 3: “The exceptional events of 2007 and more recently in 2008 have served to demonstrate, that this watercourse is extremely vulnerable to rapid run-off from saturated, rural areas, which previous policies and strategies had not taken such effects into account. **Added**

Para.3, line 2: After ‘2007,’ delete and replace with “newly constructed balancing ponds to serve the Brockhill Residential Development, were modified with vortex flow controls to their outlets.”

Following sentence added

“The Environment Agency is aware that some sections of the Red Ditch have been infilled and they are currently working with Redditch Borough Council to produce a solution.”

2.1.8, p14(30), Red Ditch, para.1, line 2: Insert after ‘and’ – “one tributary” **Added**

para.1, line 4: After ‘Finally’ delete and replace with “, it joins the other main tributary, and passes by a newly constructed off-line balancing pond as well as passing through an existing on-line one, situated within an established industrial area. The former has caused flooding problems in the past, before joining the Bordesley Brook.”

First paragraph changed to

“The Red Ditch rises in Brockhill Wood, just outside the Borough boundary in Bromsgrove District and one tributary flows southeast under the B4184 to Salters Lane. It is then culverted underneath Salters Lane before crossing back under the B4184 and emerging in the Enfield area of Redditch. Finally it joins the other main tributary, and passes by a newly constructed off-line balancing pond as well as passing through an existing on-line one, situated within an established industrial area before joining Bordesley Brook. The former tributary has caused flooding problems in the past.”

2.1.8, p14(30), Bordesley Brook, para.1, line 2: Delete “as a result of railway engineering”

Added

2.1.8, p15(31), Bordesley Brook, para.1, line 1: Insert “railway cesses” **?? Not Added**

2.1.8, p15(31), Blacksoils Brook, para.1, line 1: Replace 'through' with "to the north of" **Added**

2.1.8, p15(31), Blacksoils Brook, para.1, line 11: Delete last sentence and add the following new paragraph: "These works briefly comprised **the** removal of in-channel obstructions and reconstruction and improvement of the outlets into the Arrow Valley Lake as well as restoring flows to the adjacent, former open channel." **Changed**

2.1.8, p15(31), Ipsley Brook, para.1, line 6: Replace 'A418' with "A4189". Add new paragraph "Downstream of this location there are some enforcement issues and also due to the normally low or non-existent base flows, there is a tendency for high levels of nuisance associated with fly-tipping. Robust maintenance regimes are in place to reflect this situation. It also has many, unnamed channels and tributaries which feed in to it throughout its course downstream of Ipsley Alders Marsh.

Following paragraph added:

"Downstream of this location there are some enforcement issues and also due to the normally low or non-existent baseflows, there is a tendency for fly-tipping. Robust maintenance regimes are in place to reflect this situation. It also has many, unnamed channels and tributaries which feed into it throughout its course downstream of Ipsley Alders Marsh."

2.1.8, p15(31), Wharrington Brook, para.1, line 1: Replace 'north' with "east" **Changed**

2.1.8, p16(32), Broadground Ditch: Replace first sentence with "This watercourse, probably originally rose in Oakenshaw or Southcrest Woods. However, little evidence of it remains and the first visible section is between the A4189 and Harport Road, Greenlands, fed by local surface water sewers. The second section, which is no longer in direct communication with the upstream reach is extant north of Nash Road and Old Forge Drive at which point was its former confluence with the Wharrington Brook."

Changed to:

"This watercourse probably originally rose in Oakenshaw or Southcrest Woods. However, little evidence of it remains and the first visible section is between the A4189 and Harport Road, Greenlands, where it is fed by local surface water sewers. The second section, which is no longer in direct connection with the upstream reach is extant north of Nash Road and Old Forge Drive, the location of its former confluence with the Wharrington Brook."

2.1.9, p16(32), Bow Brook, para.3, line 1: Delete "Alcester Road" **Deleted**

2.1.9, p17(33), The Wharrage/Wixon Brook: Replace penultimate sentence with - "Sewer flooding in 2007 badly affected ten businesses which was not due to the effects of The Wharrage which despite high flows, was found to be within banks both upstream and downstream of the location concerned."

Changed to

“Sewer flooding in 2007 badly affected ten businesses. However, during this event The Wharrage which, despite high flows, was found to be within the banks both upstream and downstream of the location concerned.””

2.1.9, p17(33), Plack Brook: Add new paragraph - “Works subsequently carried out by WCC have proved partially effective in reducing flooding in the Poplars Lane, Astwood Lane vicinity. However, minor obstructions (natural and artificial) and lack of general maintenance west of Swansbrook Lane remain the primary causes of flooding associated with the Plack Brook as mentioned in an earlier report and observed during the recent September 2008 events.”

Following paragraph added:

“Works subsequently carried out by Worcestershire County Council have proved partially effective in reducing flooding in the Poplars Lane, Astwood Lane vicinity. However, minor obstructions (natural and man-made) and the lack of general maintenance west of Swansbrook Lane remain the primary causes of flooding associated with the Plack Brook, as observed during the recent September 2008 event.”

4.6.3, p77(93), Rainfall Warnings: Add new paragraph - “The Borough has following recent events, carried out a further review of its “out of hours” land drainage maintenance regimes and re-defined a number of critical locations as super-critical. Consequently, if a marked response is warranted at more than 50% of these super-critical locations, then increased resources are to be immediately deployed. **Added**

4.6.4, p78(94), Washlands, para.2, line 3: Replace ‘on’ with “by” and between ‘and’ and ‘the’ insert “on” **Changed**

Comments from Planning Services

1. Figure 2 does not show Redditch's three 'Areas of Development Restraint'
Changed
2. It would be helpful to have NFCDD in the glossary **Already in the Glossary**
3. On the printed version, it is not possible to read the charts from PPS25 in Appendix D (Guidance Note on FRA Procedure). **Changed**
4. According to the brief/specification issued, the SFRA should make recommendations for Local Development Framework policies and advice and Development Control policies. This does not appear to have been included in this draft. **Addition of section 5.2.2**

5 ROYAL HASKONING CHANGES

Adjustment to paragraph 1 in Section 5.2 to read:

“The Sequential Test must be applied by the Councils for all development sites and other sites in accordance with the findings of this report when preparing the emerging LDF documents for the Redditch Borough and Bromsgrove District. The Guidance Note in Appendix D along with the findings of this SFRA, will assist with this process. If the Exception Test is needed, an update of the existing SFRA (including a review of developer guidance) may be necessary in order to meet the requirements of a Level 2 SFRA as defined in PPS25. The Level 2 SFRA would incorporate additional flood risk analysis and include additional guidance for Councils and developers. This would include a more detailed assessment of the risk and consequence of overtopping of the flood defences. The Functional Floodplain for some main, and minor, rivers and watercourses would need mapping during this update. A recommended Scope for a Level 2 SFRA is shown below.

Management of surface runoff from the proposed sites should use a combination of site specific and strategic SUDS measures encouraging ‘source control’ where possible. These measures should be developed with a strategic approach to flood management in mind. “