Tracey Iwanczuk
Hope End Farm
Cradley
Herefordshire WR13 5JQ

Ref: K0710/cn

12th April 2016

Dear Tracey,

FLOOD RISK AT THE SITE PROPOSED FOR CRADLEY SHOP, ADDRESSING CONCERNS

Thank you for sending us the further concerns of one member of your community, whose views that "*Flood risk [is] inadequately addressed and contrary to new national policy requirements*". Their words are reproduced below, for the sake of completeness:

> "*A significant part of the site is within the flood plain and has flooded a number of times in the past ten years including as recently as March 9th 2016. The Flood Risk Assessment issued in support of the application understates the level of risk that applies to the field and fails to address the more stringent requirements of a new national policy introduced in February 2016. The recent national policy update of 'Environment Agency: Flood risk climate change allowances, February 19th 2016,' imposed much more stringent requirements relating to the modelling of predicted climate change impacts on higher levels of flood risk. Under the new policy the flood risk must be modelled using predicted climate change impacts double those previously assumed. This has not been done in the application.*
>
> *Furthermore, the application understates the flood risk to the field relying only on indicative Environment Agency maps rather than actual flood events and outdated, basic modelling of the flood extents. The theoretical analysis is not calibrated against actual past flood events, has not been based on a channel survey and fails to analyse potential 'constrictions' such as culverts.*
>
> *Overall the assessment is not adequate to properly assess the fluvial flood risk to the site*".

In addition, a historic occurrence of sewer flooding was mentioned. I have enumerated these concerns as follows:

1) The floodplain and has flooded a number of times in the past ten years, including as recently as March 9th 2016.
2) The Flood Risk Assessment uses a climate change allowance that was replaced on 19th February 2016 by more stringent requirements, double those previously assumed.
3) The probable occurrence of sewage contamination would be wholly incompatible with a children's recreation area as proposed.
4) The FRA relies only on indicative Environment Agency maps rather than actual flood events. The theoretical analysis is not calibrated against actual past flood events, has not been based on a channel survey and fails to analyse potential 'constrictions' such as culverts

I would like to put these views into context, so that you and other members of your community are better able to assess their relevance to your proposals.

1) Previous flooding

Reports of flooding were documented in Appendix D of the FRA, where two witnesses testified to having seen up to about half the field under floodwater. Unfortunately, no photographs were available which could have been used to pin down the actual level to which water rose and neither of the witnesses could remember dates. The important thing from a flood risk perspective is not whether the field will flood, we know that it does, but rather whether flooding could reach the proposed shop. If any member of your community has photographic evidence which could elucidate this issue, we would very much welcome it, to help calibrate our findings.

2) The climate change allowance

NPPF guidelines require that assessments of flood risk include an allowance for climate change. The methodology for this was previously to increase the calculated peak flow by 20%, as a blanket allowance over a 100 year period. Residential developments are regarded as having a 100 year design life but commercial developments such as this are generally regarded as having a shorter design life, usually taken as 60 years. In order to be conservative, the analysis of flood risk in the Cradley FRA took the climate change allowance as 20%, raising the 1:100 year peak flow from 28.0 m^3/s to 33.6 m^3/s (see Figures C-5 and C-6).

Environment Agency guidelines were updated in February 2016 and are now given separately for each river basin. Those for the Severn River Basin district are summarised in Table 1. It can be seen that the climate change multiplier should be taken in relation to the design life of the proposed development and the "Allowance category". Environment Agency guidelines state that the allowance category to use should be based on the vulnerability of the development. As a shop, which has a low vulnerability in flood risk terms, the lowest allowance category should therefore apply. This means that, depending on the design life of the development, the climate change allowance should be either 20% or 25%. The value of 20% was used in the FRA and I can see no reason to double this value, as your concerned community member believes.

Table 1 peak river flow allowances for Severn River Basin district

Allowance category	Total potential change for '2020s' (2015 to 2039)	Total potential change for '2050s' (2040 to 2069)	Total potential change for '2080s' (2070 to 2115)
Upper end	25%	40%	70%
Higher central	15%	25%	35%
Central	10%	20%	25%

3) Sewer flooding

The children's play area, in the location in which it has been proposed, should not be affected by fluvial flooding but if your concerned community member believes that the children's play area will be directly affected by sewer flooding, then they should provide the evidence.

4) The theoretical analysis

Your concerned community member believes that the design flood level should include a channel survey, representing potential 'constrictions' such as culverts and should be calibrated against actual past flood events. We would agree that such a rigorous analysis would be appropriate for a large, highly vulnerable development such as a big housing estate. The NPPF is clear however that the rigour of any such analysis should reflect the scale of development and associated flood risk and the detail suggested by your concerned community member would not normally be warranted by a single, low vulnerability building, proposed within Flood Zone 1.

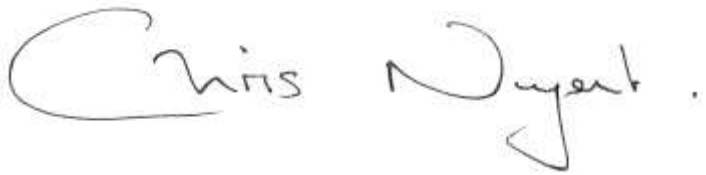
It is not true, as your concerned community member states, that "*the application understates the flood risk to the field relying only on indicative Environment Agency maps*". As described in Appendix C of the FRA, design levels for the site were established using a Manning analysis of a cross-section of the channel and floodplain through the proposed location of the shop, This is the same methodology used in most (if not all) hydraulic models to describe open channel flow. Even cursory inspection of the cross-section in Figure C-5 and C-6 of the FRA shows that the effect of constrictions in the 5 m wide channel are likely to be small in relation to the circa 70 m wide flooded section, reaching water depths of over 3 m near the channel.

While not representing the detail of channel constrictions, the analysis in Appendix C overstates the flood risk to the site of proposed development by using an unrealistically high value for the Manning roughness. As shown on Figure C-6, the value of 0.15 was used. This number may seem small but it represents a floodplain covered with heavy stands of timber and dense brush in the summer. This conservatively high value ensures that the calculated design level of 70.0 mAOD is also conservatively high.

To summarise, while using a methodology appropriate to the scale and flood risk associated with this low vulnerability development, the analysis of design flood levels nevertheless takes steps to ensure that the results of the analysis show a design flood level that is, if anything, too high. Providing the shop is built above 70.0 mAOD, it is very unlikely to be affected by fluvial flooding from Cradley Brook.

I hope that this has clarified the rationale behind our FRA and its analysis of design flood levels, which we believe are appropriate to the scale and flood risk associated with your proposed commercial development.

Yours sincerely,



Chris Nugent
Senior Hydrologist