355 Kings Acre Road
Hereford
HR4 0SL

10th July 2024

Mr A Lewis
Planning Department
Herefordshire Council
Plough Lane
Hereford.

Dear Mr Lewis,

Planning Application P222769/F

I wish to object to this application on the grounds that the Hydraulic Modelling Technical Notes raise too many questions for it to be regarded as a reliable guide to the effectiveness of the drainage strategy. Consequently, the drainage strategy must also be considered unreliable and the Planning Application should be rejected.

I therefore urge that the Sequential Test for sites with a lower flood risk is rigorously applied, so that the residents of Kings Acre Road and Breinton Lee are not subject to increased flood risk.

Summary

The Runnoff model results appear to significantly misrepresent the nature of the flood risks experienced by the residents of Kings Acre Road and Breinton Lee.

The results appear to show that the plot to the East of the site is modelled as greenfield land acting as a huge flood plain, rather than the raised urban area it is in the process of becoming. The drainage ditches along the southern boundary of the plot and the eastern edge of the site appear to have been inaccurately modelled using LiDAR data rather than the accurate topological data which was available and this has resulted in an underestimation of the flood risk on Kings Acre Road and Breinton Lee. The Hydraulic Modelling Technical Note makes no mention of how the drainage pipes under Kings Acre Road and Breinton Lee have been represented. As many of the residents' letters and photographs have shown, these features and the amount of water in them is absolutely crucial in determining the amount of flooding which occurs. Even if the model underestimates the amount of flooding, the Notes admit that there will be more water in the eastern ditch in the post-development situation than there is now, which must make the flooding worse than it is now.

The Notes describe the soil of the catchment area to be "freely draining slightly acid loamy soils". It seems to specify that the percentage of rainfall runoff is constant throughout long, heavy storm events. This implies that the soil will not become waterlogged, even though the shallow topsoil is underlaid by relatively impervious clay or Raglan Mudstone.

These points are discussed in more detail in the attached Appendix.

Yours faithfully,

[redacted]

K. Calvert, B.Sc.(Hons), M.Sc.

Appendix

Paragraph 3.12 of the Hydraulic Modelling Technical Note states that the input parameters must be very accurate in order to obtain meaningful results.

"3.12 Factors which can affect runoff calculations are as follows:

a) Permeability of soils, with runoff less accurately predicted in highly permeable soils. The soils at the site within the catchment were described on Soilscapes as "freely draining slightly acid loamy soils". The entire catchment has an SPRHOST value of 38.04%, indicating a just below average permeability.

b) Small drainage catchments can result in small rainfall depths. Runoff calculated by models with an initial storage component (such as the PDM model used in ReFH) may therefore be very sensitive to storage parameters and initial conditions. Total runoff estimates may therefore be uncertain.

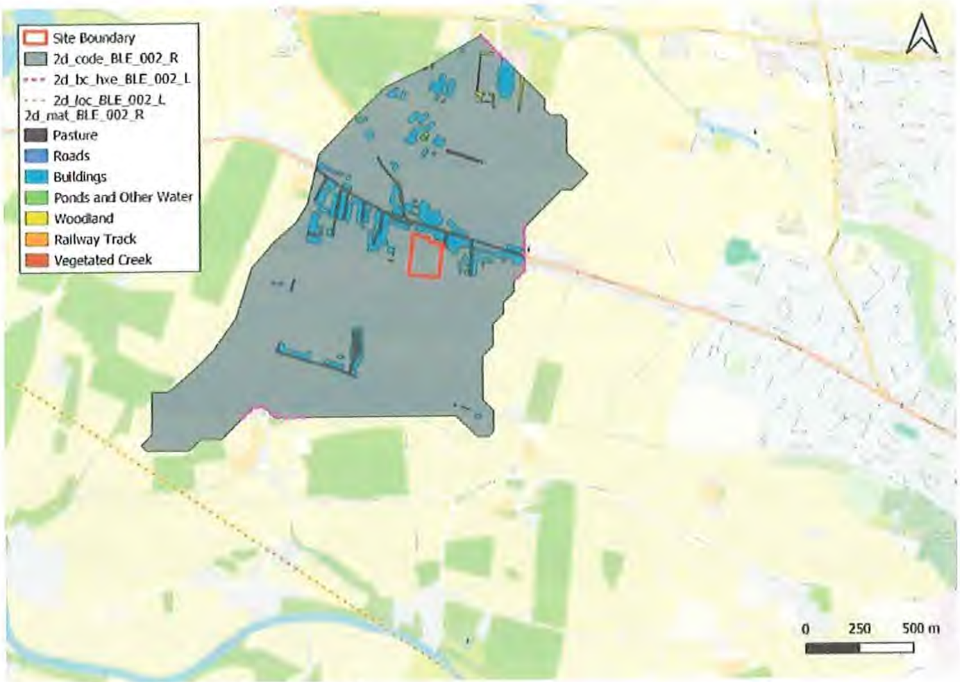
c) Urbanisation resulting in different surface characteristics and runoff coefficients to the natural catchment."

However, much of the data used seems to have been obtained from maps, rather on-site observation and measurement, even when this accurate data was readily available.

I assume that the "freely draining slightly acid loamy soils" description applies only to the top soil and that the run off value is held constant at 38.04% throughout. If so, that implies that 61.96% of the rainfall soaks into the soils and continues to do so indefinitely. Does the input data specify that this soil is dry to begin with and of infinite depth and not subject to becoming waterlogged? The core samples taken on the site on 7th February 2023 show that the top soil is only 0.15m deep, below which is very impervious clay. The presence of this clay and the long periods of wet weather experienced in winter, suggests that some degree of waterlogging will be present before, and certainly during, most storm events. Does this water logging lead to an increased amount of surface water runoff? Does it also lead to a second source of run off through the soil itself along the top surface of the impervious clay, particularly on sloping ground which comprises most of the catchment? This theory is supported by Dr N Geeson's comments which identified a number of springs along the ridge which forms the southern end of the catchment. In that area, the underlying impervious surface is the Raglan Mudstone.

Another factor which might affect the amount of water logging and hence the ability of the rainfall to soak away, is the presence of groundwater. When the core samples mentioned above were taken, no groundwater was detected. However, groundwater monitoring equipment was installed. The report dismisses any influence from groundwater but has not published the data from the monitoring equipment to support this assertion, even though the council's Land Drainage consultee requested that this data be supplied to him.

Another cause for concern, is that the plot to the east of the site has been modelled as greenfield land rather than an urbanised area which it is in the process of becoming. See Figure 3.5 below. I suspect that the applicant will argue that the greenfield data is readily available from the 2022 LiDAR scan whereas the finished levels of the 10-house development plot are not yet known. However, this data must be in the public domain because it would have been necessary in order for the LLFA to approve the drainage strategy for the plot. The results show that this greenfield plot acted as a huge flood plain, holding a significant amount of water which would otherwise increase the flood risk to surrounding areas.



(Source: OpenStreetMap, Rappor)
Figure 3.5 2D Model Schematic.

It also seems that LiDAR data, rather than on-site measurements, have been used to model the existing ditches. if we look at the results of the1% model baseline as represented in Figure 4.1 of the Note, we see that it shows the ditch along the southern boundary of the 10-house plot overflowing its banks about a third of the way along.

(Source: OpenStreetMap, Rappor)
Figure 4.1 Baseline Modelled 1% AEP + CC Flood Extents and Depths.

Comparing this with the topological survey data submitted with planning application Number P170579/RM, it implies a water depth of 0.4-0.5 m.

Figure 4.1 also shows that the remainder of the ditch to the west of this point is almost dry, implying that the base of this stretch of ditch is some 0.4 m higher, whereas if we again consult the topological survey data, we see that the floor of the ditch varies by only 0.15 m along this stretch. The results in figure 4.1 also imply that there is no physical connection between this ditch and the one running north along the eastern edge of the proposed development site and that there is no flow from one to the other, However, I have photographic evidence that the two are connected at the same level. See Photo 1 below.

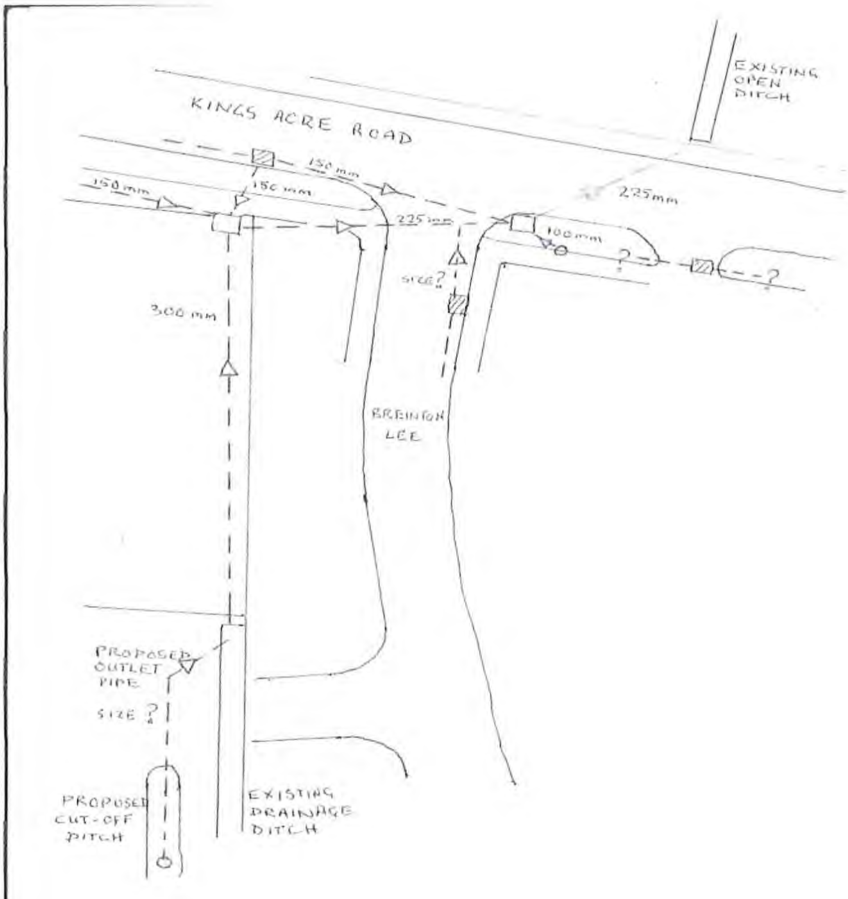
Photo 1. Southern ditch connecting to eastern ditch.

The results also suggest that the extensive flooding in the field at the southern end of Conifer Walk, flows into the eastern end of the ditch, then westward along the ditch and thus adding to the flow in the ditch running north to Kings Acre Road. This is supported by the fact that the topological survey shows that the land at the eastern end of the ditch is approximately 0.3 m higher than it is at the west end and Figure 4.1 also shows there to be a connection between the extensive flooding to the East, and the ditch itself. This is supported by the fact that flooding incidents on the pavement of Kings Acre Road have been more frequent since this ditch was dug in about 2012.

The most likely reason for the LiDAR data being inaccurate is the presence of overgrowing vegetation, which would have been very abundant when they LiDAR scan was flown in June 2022.

A similar situation exists with the ditch which runs North along the eastern edge of the site. Figure 4.1 shows the majority of the ditch to be containing floodwater but a few metres at the northern end to be completely dry. This contradicts the topological survey data which shows that the level of the bottom of the ditch varies by only a few centimetres along its whole length.

Also, if the ditch is indeed dry at the northern end, then there cannot be any flow from the ditch into the culvert under the garden of Number 343 and therefore no overflow from the open silt pit by the pavement on Kings Acre Road. However, as this overflow has in fact been observed and photographed on a number of occasions then the model must be wrong. As far as the flood risk on Kings Acre Road is concerned, the accurate modelling of these ditches is absolutely paramount and the apparent inaccuracy shown in the results suggest that the model is unreliable.



Sketch 1

Also, of crucial and importance is the modelling of the drainage pipes under King's Acre Road. See Sketch 1 above.The survey carried out by Turnwater in 2013 shows that there is a 300 mm pipe running from the northern end of the ditch to the silt pit by the pavement on Kings acre Road. Part 1 of the survey said that this pipe is 225mm dia., but that survey was only concerned with surveying the pipes under Breinton Lee, whereas Part 2 was solely concerned with this pipe from the ditch, and it described it as 300mm dia., so I would take the latter as the more reliable figure.

The other inputs to this pit are two 150 mm diameter pipes carrying rainwater from the highway drains and the footpath drains. The outlet from the silt pit is a 225 mm pipe running east under Breinton Lee road to another pit, and then north on Kings Acre Road to discharge into an open ditch in the garden of number 304A Kings Acre Road. To make matters worse, there are two more inputs before the flow reaches the pipe under King's Acre Road. The Turnwater report mentions a pipe coming in from the side at 3 o'clock (from the south?) This is presumably from the road gully on the eastern side of the Breinton Lee roadway. There is also the 100 mm pipe from the footpath drain to the silt pit on the eastern side of Breinton Lee. Clearly, the capacity of the many input pipes exceeds that of the single output pipe, so when the capacity of the output pipe is exceeded, the excess overspills the open top of the first silt pit and floods along the footpath of Kings Road. As the gully in Breinton Lee is at about the same level (69.1m) it is also likely that this will overflow and flood the road surface of Breinton Lee. As the centre of Kings Acre Road is 300 mm above the level of the footpath, the floodwater cannot escape that way. Also, the drainage pipes from the roadway and the footpath feed back into the silt pit, so it cannot go that way either. The height of the top surface of the silt pit is very close to the height of the base of the drainage ditch (about 69.0m again). So, overflow from the silt pit will continue for as long as the ditch contains a significant depth of water. Clearly, flow rates in these pipes need to be accurately calculated to determine whether overflow from the silt pit will occur. There is no mention in the Note as to whether any flow rate constraints have been applied to the drainage pipes. This is another major cause for concern. it should be mentioned that the Turnwater survey of the pipes observed significant joint displacement which would reduce the theoretical capacity of the pipes and also likely lead to faster silt buildup, further reducing the capacity.

The situation will be exacerbated post development because the drawings show that the cut-off ditch will be connected to the existing ditch by an outfall pipe, thus increasing the flow in the 300 mm pipe running north to the open silt pit. Is this pipe included in the model? Also, the results show that post-development, the water level in the existing ditch will be increased, further increasing the likelihood that the open top silt pit will overflow.

(Source: OpenStreetMap, Rappor)
Figure 4.5 Post Development Modelled 1% AEP + CC Flood Extents and Depths.

Although the post-development results say that there is increased water in the drainage ditches, there does not appear to be any corresponding increase in the water depths downstream of the drainage pipe under the Kings Acre Road. Compare Figure 4.5 above with Figure 4.1.This also makes me question the accuracy with which these pipes are modelled. The strategy seems to be aimed at reducing the risk to flooding of the houses on Kings Acre Road from overland flows from the south, while ignoring the risk of flooding from the north due to the drainage system being overwhelmed. This increased risk also applies to the properties on Breinton Lee, even though the results show that the risk there is also unchanged.

I strongly believe that all these factors combine to show that the modelling is inaccurate and unreliable and that it needs to be significantly modified before it can be used to design a drainage strategy. Consequently, the drainage strategy must also be considered unreliable and the Planning Application should be rejected.

K. Calvert, B.Sc.(Hons), M.Sc.