

Cllr V Smith
 "Cherry Trees"
 Station Lane
 TEWKSBURY
 GL20 5DB

Reference: Increased flooding risk in Tewkesbury and environs

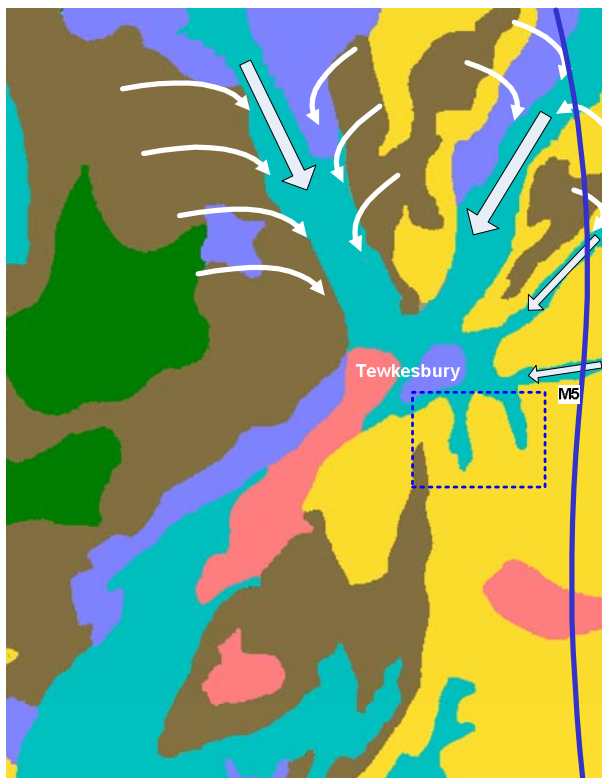
Dear Mr. Smith,

In our recent conversations you have asked me, as a professional Soil Scientist, to add my comments following a review of your own report and the additional authoritative perspectives provided by Professor Cluckie.

Firstly, I would like to concur with Professor Cluckie in saying that your report is not only extremely helpful and informative, it also contains detailed and well researched local information. Your report demonstrates that current risk assessments are based to some extent upon limited, inaccurate and potentially outdated data with significant omission of influential factors.

The purpose of this letter is to consider one of these factors of omission raised by Professor Cluckie by focusing within my own area of expertise; the influence that the soils and topography may have on the risk of fluvial and pluvial flooding in the area surrounding Tewkesbury.

The following diagram is one that I have produced specifically for this review and is based on soil maps of the area. It shows the six major soils groups in the area surrounding Tewkesbury and the influence of the local topography on the flow of fluvial and pluvial waters.



Medium textured soils	Freely draining floodplain soils. Texture: Loamy	
	Slightly acid loamy and clayey soils with impeded drainage. Texture: Loamy	
	Freely draining slightly acid loamy soils. Texture: Loamy	
Medium to heavy textured soils	Slowly permeable seasonally wet slightly acid loamy and clayey soils. Texture: Loamy to clay loam	
Heavy textured soils	Clay loam floodplain soils with naturally high groundwater. Texture: Clay loam	
	Lime-rich loamy and clayey soils with impeded drainage. Texture: Clayey	

Of particular interest is the low lying South Eastern area of Tewkesbury enclosed on the map within the dotted, blue rectangle.

The soils within this rectangle are heavy textured, clayey soils typical of floodplain terrain. They have naturally high groundwater levels and heavily impeded drainage with Hydraulic Conductivity rates in the very low range of 0.10 - 0.01 mm/day when saturated^{ref 1}). This means that water in these soils moves very slowly indeed and that natural drainage when saturated is measured in weeks not minutes and hours.

The comparatively lighter soils (loams and clay loams) of the higher ground and upstream of Tewkesbury drain relatively freely (about 0.5 cm/sec) and would contribute significantly to flows within the watershed above Tewkesbury given high levels of rainfall and pluvial flows. Additionally, the underlying subsoils of many of these soils have impeded drainage causing water moving through these soils on slopes to spring to the surface. This gives rise to surface runoff and soil erosion as clays and silts in particular are carried off downstream.

Naturally, as the map shows, the flood waters drain towards, and are concentrated upon, the central meeting points of Tewkesbury. At these points, and when the inherent ability of the downstream drainage capacity has been overwhelmed, rivers go out of bank and the flood waters spread across the floodplain to the South and East of Tewkesbury. This was exacerbated in 2007 by the coincidental (but not uncommon) impact of the tidal limit of the River Severn.

As has been stated, by the time of such inundation these soils would be effectively impervious, offering no useful drainage. Nevertheless, under normal circumstances the waters would spread across this floodplain to an even, shallow depth where they would remain for a number of weeks while the natural effects of slow drainage and evaporation take effect.

However, as has been pointed out in your report, the intervention of both recent development work and the construction of bypasses raised (for good reason) above the level of the floodplain and their consequential landfill have reduced the effective floodplain area and impeded the flow of waters across it.

In my opinion, given the virtually impervious nature of the soils at the point of severe inundation by floodwaters, the manmade restrictions in available floodplain area and the obstructions to flow would result in the displacement of this water both in terms of elevation and in seeking alternative avenues of escape.

Evidently in the summer floods of 2007 such displacement took place across large areas of Tewkesbury where flooding is either highly unusual or has never previously been recorded. This, along with the recorded data, strongly suggests and supports both your views and those of Professor Cluckie that the current risk of flooding to 13 or 14 metres Above Ordnance Datum (AOD) cannot be discounted.

Furthermore, it raises the risk that more housing development will restrict the available floodplain still further, which may have the consequence of greater amplification of the displacement effect and raising the recorded flood heights to levels as yet unrecorded.

Tewkesbury Borough Council needs to gain a very clear understanding of the multiple risks and factors influencing this issue particularly following the stark outcomes of the summer floods of 2007. It is not sufficient to follow the limited and rather narrowly defined guidance from the Environment Agency. I believe that it is their duty not only to be far more deeply considerate of all these factors, but to err on the side of caution for all the citizens of Tewkesbury.

Please keep me informed of your progress with your report and call on me if I can be of further assistance.

Kind regards.

Yours Sincerely,



Simon Fox MSc BSc MBCS MIBC