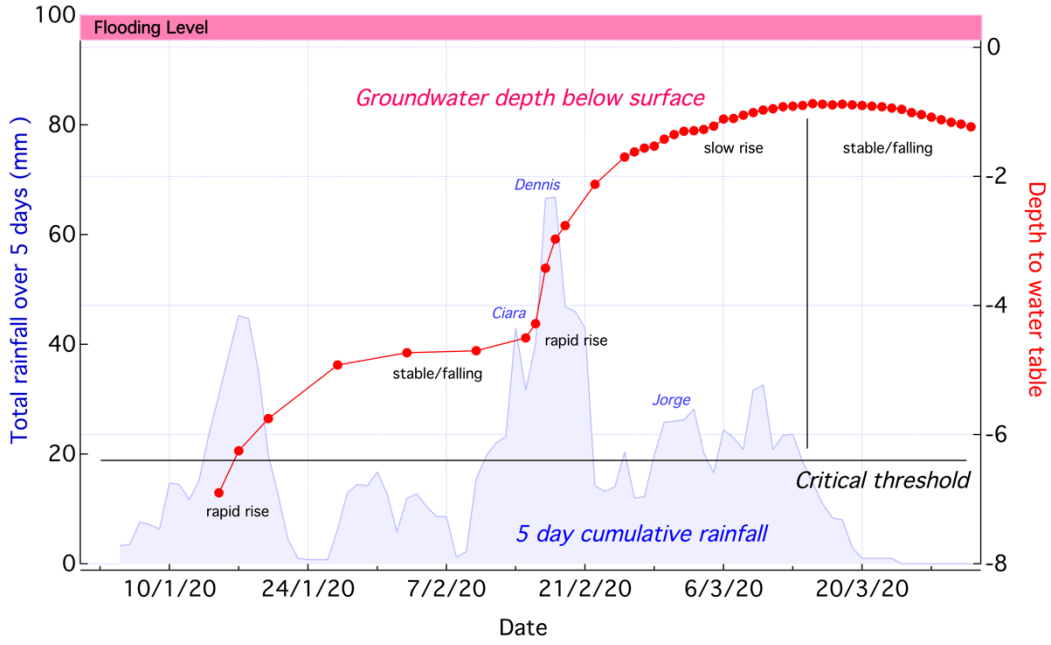
WInter rainfall and groundwater level trends

As reported, groundwater levels seem to have peaked and are now beginning to fall slowly. It is hard to see the bigger picture from the rolling 5-day snapshot on the EA website and the plot below shows the pattern over the last three months and how the levels rose and fell in response to rainfall. The height of the water table is a balance between the amount of incoming rainfall versus the rate that water percolates away underground to the river catchment. On top of that are seasonal effects of surface evaporation and the action of plants and trees during the growing season. For the Lavant Stream-Wey catchment the trends for this winter suggests that it has been taking about 5 days for periods of heavy rain to tip the balance such that groundwater rise. It is possible to tentatively identify the balancing point and predict that when more than of 20 mm of rain falls over a 5-day period (the 'critical threshold' shown on the diagram) then the groundwater level begins to rise. If rainfall averages less than 20 mm over a 5-day period (that's still pretty wet!), then the groundwater level remains stable or begins to fall.



Groundwater levels From January to March (red line on the figure) can be seen to rise in two steps. The blue line is the '5-day' rainfall record. At the start of the year groundwater was about 7m below flood height, only to rise quickly by over 2m after a period of sustained rainfall in early January (peaking at over 40mm/5-days around the 17th January). Thereafter rainfall was less than the 'critical threshold' during a dryer spell in the run-up to Storm Ciara, and levels stabilised and began to fall slightly. The week of Ciara and Dennis, which saw rainfall peaking at 70mm rain/5-days kicked the levels up again by over 3 m, then, critically, levels continued to rise while the weather remain very wet, greater than the critical threshold, for 3 weeks. At this time the risk of serious flooding was in the balance and my last note predicted that we would need less than 15mm rain per 5 days to stabilise the situation. Thankfully this has been the case and after two weeks of almost NO RAIN groundwater levels are falling.

The water table is still exceptionally high and another period of heavy rain might still tip the balance but as spring advances, temperatures warm, plants grow, it is likely that the rate of fall will, as in past years, accelerate to about 8 cm/day, returning the water table to about 25m below ground level by the end of the summer.

So, a preliminary outcome of this study is that the amount of rainfall which will raise groundwater levels (about a week later) is about 20 mm across 5 consecutive days. It is the pattern of rainfall, not just the amount, that impacts on flood risk. A longer term study might help refine groundwater level predictions in relation to changing climate patterns. It may also reveal other patterns, for example whether the year-to-year changes in crop types and cultivation times across the Lavant catchment might also have any impact on alleviating flood risk. Having now acquired all the measurements of groundwater levels recorded by the EA in Farringdon since 2001 (a total of 750,000, measured every 15 mins!) there may be scope to progress this later in the year.

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