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Liability for water contamination: who will pay?

By Andrew McKinnon, Resident, Ferguson Township

Steckler Petition

On April 2, the Ferguson Township Board of Supervisors held a public hearing on the Steckler Petition:

"We, the undersigned, believe the Harter and Thomas Wellfields have been put unnecessarily at risk to pollution by the selling of Penn State University land, at Whitehall Road, to the Toll Brothers Developers, in order to build student housing, to be known as "The Cottages at State College." Since the acreage being developed is directly upland of these wells, and the geology is known as karst topography, the likelihood of runoff, regardless of detention and infiltration basins, seems probable as we enter into an era of extreme weather events due to Climate Change.

Therefore, we respectfully request Ferguson Township require written confirmation, prior to construction, that PSU and Toll Brothers are to be held financially responsible, in perpetuity, for any pollution to these wells directly attributable to the Cottages Development. And that the residents/taxpayers/rate-payers of Ferguson Township would not bear the financial burden should our water be rendered polluted by this development, which was pushed forward unguided by the Precautionary Principle and despite citizens concerns and actions of dissent."

McKinnon's Remarks to Ferguson Supervisors, April 2

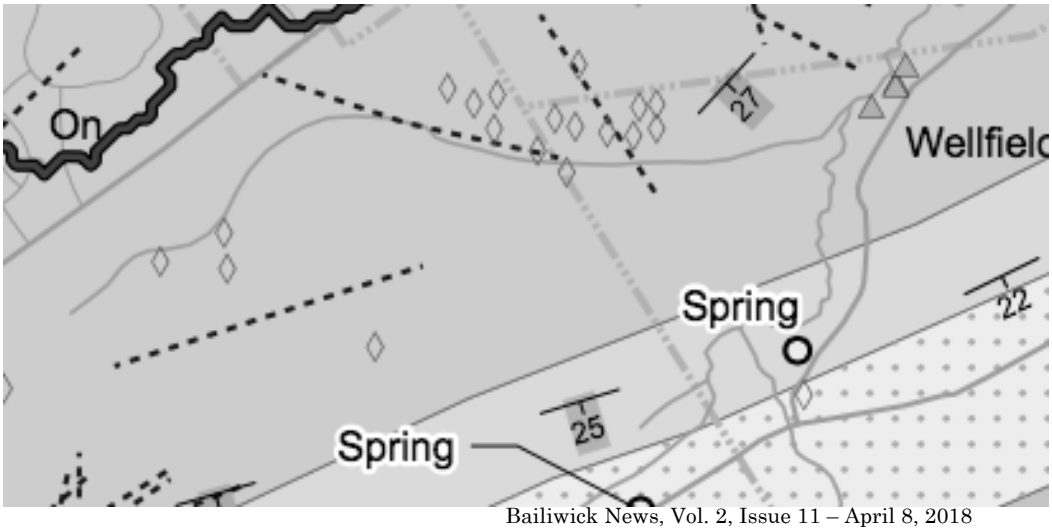
Against widespread public opposition to the Cottages development, Penn State has chosen to forge ahead with plans to develop 44 acres of prime farmland and breathtaking scenery while placing the State College water supply at risk. These are resources rightfully allocated to the public trust, but Penn State not only insists on destroying the landscape but also claims it has no liability in the event the water is contaminated. This hands off position – essentially a "have our cake and eat it too" attitude – that is, we'll accept all the benefits of development but assume none of the risks, must be confronted.

In this spirit I would like to briefly describe the hydrogeological risks to the State College water supply posed by the Cottages development in order to emphasize that Penn State and its developer, Toll Brothers, must be held financially accountable if activities associated with the site pollute our drinking water.

I have a B.S. in Geology and worked for 12 years in hydrogeology in the Centre Region. It is well known that the Nittany Valley is underlain by fractured carbonate rock, that is, limestone and dolomite, and the primary way that water flows through such rock is via fractures and conduits. Surface evidence of this karst terrain is in the form of caves, sinkholes and other closed depressions, as well as fracture traces, which are usually seen as linear features on aerial photographs.

The Cottages is to be located in the Zone 2 wellhead protection area, and therefore in the recharge zone, for the Thomas and Harter wellfields that supply two thirds of the drinking water for State College. The site lies about one mile upgradient from the Thomas wellfield and one and a half miles upgradient from the Harter wellfield. Dye trace studies suggest that water, and thus water borne contaminants, could travel 300 or more feet per day from the site to the wells, thereby potentially reaching them in a matter of weeks. Potential contaminants from the site include oil, gasoline, grease, glycol, deicing agents, chemical spills, and coliform bacteria.

A prominent fracture trace has been mapped on the site.



Portion of Figure 3, p. 76, 2007 State College Borough Water Authority Source Water Protection Report – Dashed lines are fracture traces. Diamonds are sinkholes. Triangles are public water wells.

Part of it manifests as the swale that runs across the site downslope from Whitehall Road. This swale is quite close to where the basins for stormwater captured from the site have been placed. Because of the way such basins are constructed, such as through compaction of soils and therefore decreasing the number of natural pores in the soil, contaminated stormwater could become channeled and enter the swale, percolate downward into the groundwater system, and flow southeast toward the Thomas and Harter wellfields.

Alternatively, stormwater could flow into existing sinkholes (several have been mapped in the vicinity of the site) or create new sinkholes and enter the groundwater system. Indeed, the significant alteration of topography and soils at the site through grading, increasing the amount of impervious surfaces, and channeling of stormwater flow increases the risk of sinkhole formation, providing direct avenues for contamination to enter the subsurface. Finally, risk is elevated because even if the soils on the site are not altered through compaction or other disturbance, they are generally thin in this area and therefore have limited filtration capacity. Also, the depth to bedrock is shallow, allowing contamination to reach the groundwater system relatively quickly.

In conclusion, I am concerned that activities associated with development or operation of the Cottages puts our drinking water at risk. This is in addition to the guaranteed destruction of open space, farmland, and scenery enjoyed by residents, many of whom may have come to the area because of these natural attractions. Unfortunately, it may be too late to save the land, but at least we can save our water. I respectfully ask you to hold Toll Brothers and Penn State accountable for any degradation of our drinking water.

Editor's Notes – K. Watt

In support of citizen efforts to locate and hire an independent karst hydrogeologist to conduct an independent risk assessment of the proposed Nestle water bottling operation in Spring Township, I spent some time looking for consulting hydrogeologists online. One hit was the International Association of Hydrogeologists Commission on Karst Hydrology. https://karst.iah.org/karst

In the sidebar at that page headed "Rapid Groundwater Flow," the organization presents an "Illustration of the hydrogeologic reasons of a waterborne disease outbreak that occurred in May 2000 in Walkerton, Canada."

The caption continues: "The 30-day capture zone for drinking water well 7 was delineated on the basis of modeling (MODFLOW), ignoring the specific nature of karst. Subsequent tracer tests demonstrated that the protection zones were inadequate." The sidebar cites a report by Stephen Worthington, published in in *Methods in Karst Hydrogeology*, by Nico Goldscheider & David Philip Drew, 2007).

For background, the Walkerton outbreak of E. coli killed five people and sickened thousands, likely from runoff from cow manure rapidly entering groundwater and contaminating drinking water supplies, followed by a series of human failures to identify the contamination and notify the public.

The State College Borough Water Authority has used MODFLOW and similar modeling tools in an attempt to map capture zones for the Harter and Thomas drinking water wells in State College and, to the SCBWA's credit, has acknowledged that the modeling technique is inadequate. See, for example, Appendix G of the 2007 SCBWA Source Water Protection Report, Conclusion section:

"With 18 input variables for each of the model's 45,529 cells and an additional 6 input variables for the model's 1679 stream cells, the watershed model has over 830,000 degrees of freedom (not including boundary conditions and hydrometeorological inputs) in terms of inputs that could be adjusted by calibration. Therefore, it is likely that with additional effort the differences between the predictions of the watershed model and measured flows could be reduced. However, the highly variable nature of the errors and their magnitudes made it evident that this would be a substantial effort.

It is also the case that for each change of an input variable a model run of as long as a week is needed to evaluate the effect of that change. While it is possible to attempt calibration with briefer simulation periods (and this was tried), the example simulation shown in Figures G2 demonstrates that achieving reasonable accuracy for a given month is no guarantee that such accuracy will apply over a longer period of time (particularly if that month is the initial month before storage values have equilibrated).

Under these circumstances a decision to continue calibration efforts is only reasonable if there continues to be reason to believe that the underlying assumptions of the model are appropriate for the conditions being modeled. Based on the nature of the errors exhibited by the watershed model and an understanding of how the limitations of the model contribute to that error, it was concluded that the model is very probably not appropriate for its intended purpose.

This conclusion was bolstered by information developed through dye tracing. The results of the dye tracing provided independent evidence of the importance of subsurface flows in the transmission of water beneath the surface channel of Slab Cabin Run.

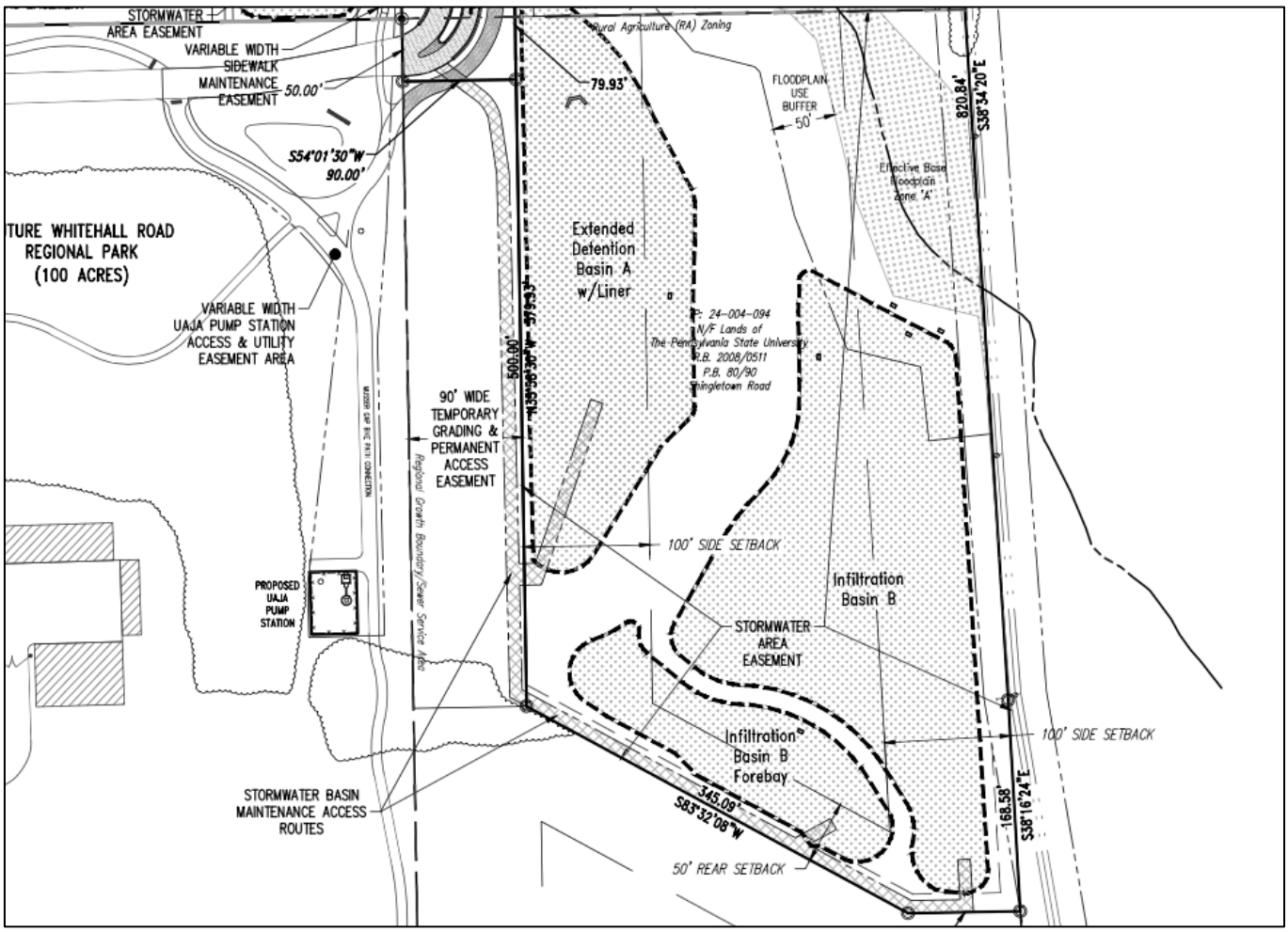
This information lead to the conclusion that, in practical effect, there are two Slab Cabin Runs, one in the visible surface channel and another hidden from view in the shallow subsurface. Transfers of water between the surface channel and the subsurface conduits probably vary significantly in time and from place to place during a storm event and during its aftermath, when much of the surface flow is contributed from the subsurface.

Under these circumstances it is not feasible to calibrate a watershed model so that its flow estimates would correspond with the fraction of flow that can be measured in the surface channel. Even if it were possible to independently estimate the fraction of flow in the subsurface and to estimate the hydraulic properties of the

subsurface conduits, it is not possible to accurately simulate the behavior of such flow in a continuum groundwater flow model such as GSSHA or MODFLOW.

Continuum models do have application so long as the processes being predicted by the model are not strongly affected by discontinuous flow mechanisms such as subsurface conduits. Otherwise, as now appears to be the case with the flow in Slab Cabin Run, such models are inappropriate." [End quote]

The Walkerton tragedy and the inherent challenges of accurately predicting water flow in subsurface karst systems must be viewed alongside the fact that Toll Brothers' currently-approved Land Development Plan for The Cottages sites a large sewage pumping station near the swale, above the fractures and sinkholes, with a force main to carry raw sewage from more than 1,000 students 4,000 feet uphill to connect with public sewer conveyance systems for eventual treatment at the UAJA plant.



Portion of March 3, 2015 Planned Residential Development Plan, PennTerra Engineering, Inc.

As has been belabored by concerned citizens for several years now, dye trace injections into Slab Cabin Run near The Cottages site in 2005 and 2006, resulted in dyes showing up in the Thomas and Harter wells five days after injection, "traveling at a rate of up to nearly one mile per day." (Source: 2007 SCBWA reports)

Further, two CMT Laboratories infiltration studies were done at the Toll Brothers site in 2013 and 2014, in which water disappeared from the bottom of some pits as fast as it was poured in, indicating the presence of fractures. For these studies, consultants were forced to use non-standard testing protocols because of the thin soil cover and shallow depth to bedrock.

CMT Laboratories consultants cautioned, among other things: "altering a site's grading and drainage characteristics can result in sinkholes developing even when surface/subsurface observations reflect little or no potential...the risk of sinkholes developing in carbonate bedrock/karst areas as a result of stormwater infiltration [Best Management Practices] is inherent."

In sum, a pump failure at the sewage station, caused by or coincident to a heavy rain event, presents a clear risk that raw human sewage will rapidly enter the Harter and Thomas water wells and contaminate them.