Standards for Relaxing the Two Foot Separation Between Infiltration Systems and the Seasonal High Water Table

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		Initials	Date
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Effective immediately, NC DENR will consider approving an infiltration system with less than a 24-inch separation from the seasonal high water table if additional investigation and evaluation show that the water quality design volume will infiltrate and any resulting mounding of the water table will subside within five days. The minimum separation that may be provided under any circumstances is 6 inches.

In order to support these findings, please provide a hydrogeologic evaluation prepared by a Licensed Geologist, Licensed Soil Scientist, or Professional Engineer. This evaluation shall be based on borings for which the numbers, locations, and depths are sufficient to define the components of the hydrogeologic evaluation. In addition to borings, other techniques may be used to investigate the subsurface conditions at the site. These techniques may include geophysical well logs, surface geophysical surveys, and tracer studies. This evaluation shall be presented in a report that includes the following components:

1. A description of the regional and local geology and hydrogeology;
2. A description, based on field observations of the site, of the site topographic setting, streams, springs and other groundwater discharge features, drainage features, existing and abandoned wells, rocky outcrops, and other features that may affect the movement of the contaminant plume and treated wastewater;
3. Changes in lithology (rock type) underlying the site;
4. Estimated depth to confining layers;
5. The hydraulic conductivity and transmissivity of the affected aquifer(s);
6. Depth to the seasonal high water table;
7. A discussion of the relationship between the affected aquifers of the site to local and regional geologic and hydrogeologic features;

8. A discussion of the groundwater flow regime of the site prior to operation of the proposed facility and post operation of the proposed facility focusing on the relationship of the system to groundwater receptors, groundwater discharge features, and groundwater flow media; and
9. A mounding analysis under the proposed infiltration basin to predict the level of the SHWT five days after the occurrence of the water quality design storm. Any mounding that occurs after the design storm must subside in a period of five days or less.

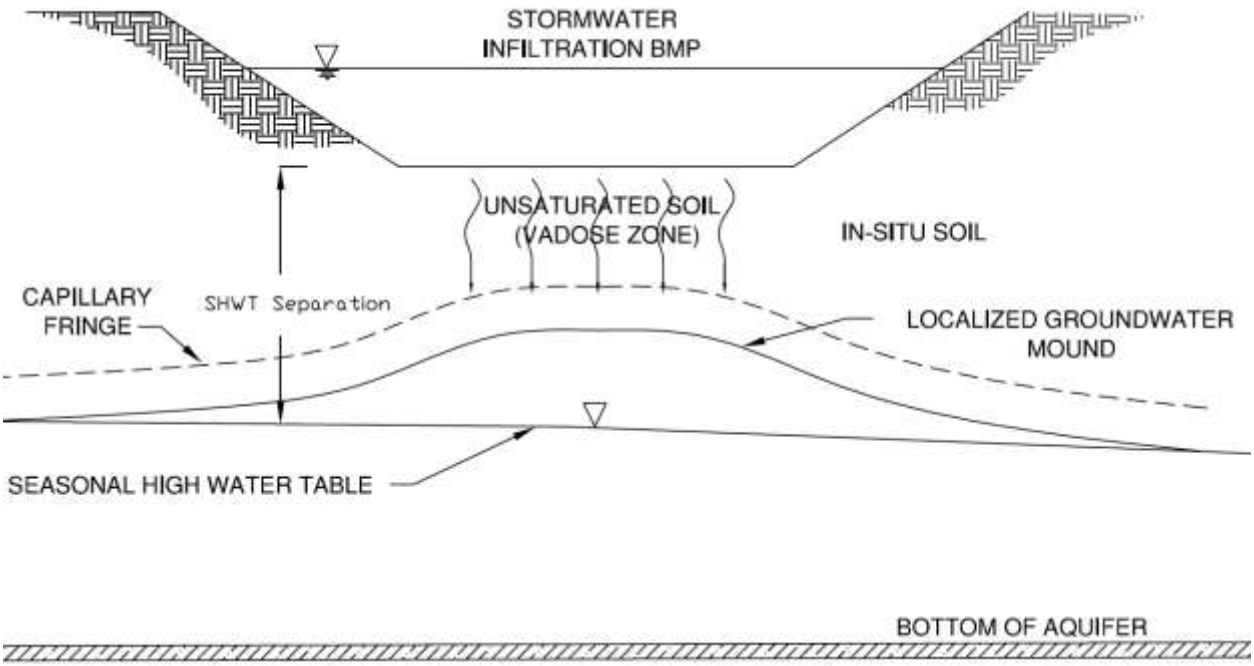
The reasons for this recommendation are:

1. **A capillary fringe above the SHWT can reduce the depth of unsaturated soil zone to less than two feet.**

   Typically, a licensed soil scientist will observe redoxomorphic features of the soil as a surrogate for the location of the seasonal high water table. Often, this information dictates whether a BMP will be designed to infiltrate stormwater in an infiltration basin or to retain it in a wet detention pond. According to NC State wetland soil scientist Mike Vepraskas, the capillary fringe often extends six inches above the redoxomorphic features in the soil. (Note: The capillary fringe lies just above the water table, where water can be drawn upward by capillary forces.) In other words, if the SHWT is found 2 feet below the bottom of a proposed infiltration basin, the capillary fringe may reduce the available unsaturated soil depth to 1.5 feet.

2. **Local water table mounding effects can prevent infiltration from occurring in time for the next storm.**

   The time for water to move through the unsaturated zone is governed by two parameters: (1) the thickness, and (2) the vertical hydraulic conductivity of the unsaturated zone. In the soil beneath an infiltration basin, the water table will eventually rise under the unsaturated zone, which is caused not only by vertical percolation of infiltrating water, but also the *lateral* movement from the temporary ground water mound caused by the basin. Coastal aquifers often do not have a strong gradient to flow *laterally* through the aquifer, resulting in a limited ability for a groundwater mound to dissipate. If there is not an adequate a gradient for a local, temporary mound to dissipate into the surrounding water table, then an infiltration basin above the mound may not draw down in less than five days even if the soil under the infiltration basin is pure sand with a very high unsaturated hydraulic conductivity.



Snapshot of groundwater interaction with an infiltration BMP during a drainage event. Mounding can occur locally, which reduces the drainage gradient of water in the BMP.

3. **No evidence or precedent exists to suggest a smaller water table requirement will meet infiltration basin function.**

   The complex nature of water table/infiltration basin interactions makes hard-and-fast rules difficult to apply in all situations. Currently, the two-foot separation dictates site design options for engineers and developers. Compared to other states, North Carolina's separation requirement is rather small—other states and localities require two to five feet of separation. Given the lack of precedent for a smaller separation across the board, it was suggested by experts and engineers that the two foot distance be maintained.

In cases where infiltration may still be achieved in the required time period with a shallower water table depth than two feet, it is recommended that designers submit a thorough demonstration of proof that their site will meet the functional goals of an infiltration basin.

If you have questions about this technical guidance, please do not hesitate to contact Bradley Bennett at (919) 807-6378 or bradley.bennett@ncdenr.gov or Annette Lucas at (919) 807-6381 or annette.lucas@ncdenr.gov.