PROVENCHER ENGINEERING

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November 9, 2004

Ms. Ellen Chagnon, Conservation Scientist
Town of Hopkinton - Conservation Commission
Town Hall - 18 Main Street
Hopkinton MA 01748

Via: US Mail and e-mail: echagnon@hopkinton.org

Reference: Hydrogeologic Review & Recommendations #3
Stagecoach Heights – Wood Street, Hopkinton, Massachusetts
Project No. PE092.02

Dear Mrs. Chagnon & Members of the Commission:

Provencher Engineering is pleased to present our summary and recommendations of our additional review of the additional hydrogeologic related information for the above project, submitted by Haines Hydrogeologic, in a letter dated November 3, 2004.

Item 1: Vernal Pool Hydrology and Deicing Impacts:
Haines indicates that the drainage area to the first of 3 vernal pools along Wood Street is reduced by 4% under proposed conditions, and that this is an insignificant change. Haines further indicates that "if adverse impacts to the water levels in the vernal pools are observed during the five-year monitoring period, … minor regrading can be done to return the watershed to its original size." It appears that Haines delineated the subwatershed to this first vernal pool, but did not perform any additional calculations, as best we can tell, as recommended in our previous review letter, and as recommended previously by FST. Data tables of peak flows and ponding levels in the vernal pools provided by Haines continue to represent the three vernal pools analyzed as one entity, and not as three individual entities as recommended.

Consequently, in lieu of actual individual vernal pool hydrology calculations as recomended, we defer to the Commission to decide whether a 4% reduction in drainage area is "insignificant." We also offer for consideration that it appears that this vernal pool may also receive runoff from across Wood Street. If so, then a 4% decrease from on-site development would actually be less impact considering the entire watershed (on-site plus off-site). Lastly, the Commission may consider whether the "minor regrading" should be done initially, if it is, in fact, only minor.

Specific low nitrate – no phosphate fertilizer product information was not provided by Haines, as recommended. However, as required by DEP, this should be implemented at a minimum.

Item 2: Utility Trench Anti-Seepage Devices
The additional anti-seepage devices at the "certain specified locations" should be added to the plans for approval, to insure they are constructed in the field.

Item 3: Hydrologic Area #2 Recharge Deficit:
Haines confirms that the septic system will not recharge the vernal pools in Hydrologic Area #2 (HA #2), as previously reported. Therefore, to augment the 1,021 GPD recharge deficit

estimated by Haines in the vernal pool portion of HA #2, the 4,256 GPD estimated infiltration from detention basin A will be critical to sustaining the vernal pools groundwater baseflow. Haines discusses the conservative estimates of hydraulic conductivity used in their analysis, and that only a relatively small amount of recharge in basin A would more than offset the above deficit. In principal, we agree. However, for this infiltration capacity to be achieved, it is imperative that underlying groundwater does not hinder the infiltration capacity. This presents another issue in itself, which is discussed further in the next section.

Item 4: Effects of Underlying Groundwater on Detention Basin Infiltration

Haines indicates that groundwater underlying the basin will not be present to reduce the infiltration capacity of the basins because "the detention basins are surrounded by perimeter drains to intercept any seasonal high water table in the basins' area." While we were not aware that the basins are proposed to be surrounded by perimeter drains based on our review of the plans, we are more concerned with the long-term effects on the natural groundwater elevations caused by these proposed underdrains, and in particular, their reduction in groundwater baseflow to the vernal pools, than the potential reduction in infiltration in the basins. Installing underdrains around the basins will undoubtedly convert some groundwater baseflow into a surface water discharge, which is contradictory to what the fundamental goal is in maintaining groundwater baseflow to the vernal pools. We disagree with Haines that "the water table in the glacial till will reach equilibrium and the flow infiltrating into the glacial till and out of the glacial till to the surface and bedrock aquifer will be the same as it is now." Equilibrium will be reached, the water table will be lowered, and any intercepted groundwater will become a surface discharge, depleting the vernal pools' groundwater baseflow, different from what exists now.

We recommend, at a minimum, elimination of all perimeter drains under all detention basins. Then, a re-evaluation of the infiltration from the basins should be conducted based on the natural groundwater levels under the basins, and the effects of the water table rise (mound) on the infiltration rate can be determined. Even if the underlying groundwater elevations rise up above the basin bottoms and into the basins under storm events, it is still possible to achieve some limited infiltration of the stormwater runoff through the basins. A Hantush mounding analysis assumes lateral groundwater flow away from the source of application. The limited infiltration may still be sufficient to mitigate the 1,021 GPD recharge deficit discussed above in item 3.

We trust this review meets your satisfaction. We would be pleased to answer questions or discuss comments regarding our review or recommendations. Please feel free to call.

Very truly yours,
PROVENCHER ENGINEERING

Donald A. Provencher, PE
President

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