Professional Services Corporation, PC

Memorandum

Date	April 6, 2016
To	Maeghan Walters, Conservation Agent
From	Thomas C. Houston
Project	Residences at West Union, Ashland, MA
Subject	Review of GeoHydroCycle March 4, 2016 letter report regarding Groundwater Modeling Evaluation of Proposed Development 133 West Union Street.

Professional Services Corporation, PC (PSC) is in receipt of a groundwater evaluation for the proposed development at 133 West Union Street in Ashland, MA. In response to concerns raised about the groundwater drains provided for each retaining wall, the applicant provided additional modeling for the project in order to evaluate potential impacts from the drains to the intermittent stream. GeoHydroCycle, Inc. (GHC) was retained to develop a groundwater model based upon the hydrogeologic information on the site.

The retaining wall system for the project includes a tiered two-wall system to the rear of the northerly site and a single retaining wall along the southerly portion of the site. The two-tiered wall system contains a retaining wall drain for each of the two walls that discharge into an infiltration trench (IT-1) then into an infiltration basin (IB-1) and into a second infiltration trench (IT-2). The longer retaining wall on the southerly side of the project contains two retaining wall drains, one of which discharges into an infiltration trench (IT-3) and a second which discharges into an infiltration basin (IB-2). The GHC letter report identifies the components of this system as Figure 3.

According to the March 4th, 2016 letter report addressed to the Capital Properties Group, GHC did not visit the site, perform any subsurface exploration or provide any independent testing as part of their evaluation. Also, GHC stated that they did not review or evaluate the analyses or calculations performed by Guerriere & Halnon. The GHC conclusions regarding the site were limited to soils evaluation, observed groundwater (or interpreted from redoximorphic features) based upon supplemental soils borings and test pits advanced by Paul Aldinger. **A copy of the supplemental soils tests should be provided and should be mapped on the plan in relation to the system components.**

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The GHC letter report does not opine on the adequacy of the drains, tranches and basins, indicating that all were designed by Guerriere & Halnon and that GHC did not include a review or evaluation of the analyses or calculations performed by Guerriere & Halnon. Calculation of the baseflows from the wall systems and groundwater contributions to the intermittent stream were calculated by GHC. **It is recommended that the adequacy of the infiltration systems also be included in the analysis to ensure that the systems are adequately sized.** This additional analysis is important to support the GHC assertion that "Based on our understanding, because the water being removed by the drains is being returned to groundwater by the trenches and basins at different locations, no water is lost from the aquifer and the resulting flow in the stream is unchanged where it leaves the Site."

The wall drain recharge systems may be impacted by groundwater mounding that occurs beneath the much larger site drainage recharge systems. The GHC analysis does not include impacts to the recharge capabilities of infiltration trenches and recharge galleys that occur concurrently during recharge of storm events by the main site recharge systems. Mounding from the main site recharge systems were not included in the GHC analysis, although it is unlikely that mounding would impact the wall recharge systems except possibly under the largest, most infrequent design events (for instance, the 50 and 100 year storms).

GHC determined the hydraulic conductivity range of between 9.6 and 26.4 feet per day. A conceptual model of the groundwater flow was developed, with an assumption that the aquifer is homogeneous and isotropic with a single value for hydraulic conductivity. **GHC should indicate whether the lower, higher, or average value of the hydraulic conductivities was utilized for the Calibration Model and Prediction (post-system) Models.**

The MODFLOW analysis was not included in the letter report and should be provided for evaluation. The groundwater baseflow from the wall drains should be provided and included in the input data. Also the recharge calculations and a mounding analysis beneath the larger systems should be provided.

In general, the infiltration trenches and galley systems will capture the flows that discharge from the groundwater to the wall drain system by reintroducing the flows back into the groundwater table via the infiltration trenches and galley systems. To the extent that the systems are adequately designed to accommodate the GHC-calculated baseflows and are sized and sited in suitable soils with proper separation to groundwater, the conclusions presented in the report appear reasonable.