

**Appendix F-4**  
**Leggette, Brashears & Graham, Inc. Memo**

November 7, 2016

# LEGGETTE, BRASHEARS & GRAHAM, INC.

4 RESEARCH DRIVE, SUITE 204  
SHELTON, CT 06484  
PHONE (203) 929-8555 | FAX (203) 926-9140  
www.lbgweb.com



## *MEMORANDUM*

**TO:** Mr. Robert DeLuca, Group for the East End

**FROM:** John G. Zbell, CPG, LEP   
Kenneth Taylor, CPG  
Reviewed By: Robert F. Good, Jr., CPG, LEP

**DATE:** November 7, 2016

**SUBJECT:** Review of Draft Environmental Impact Statement  
The Hills at Southampton  
Hamlet of East Quogue, Southampton, NY

---

Leggette, Brashears & Graham, Inc. (LBG) on behalf of the Group for the East End (GEE) has completed a review of the September 2016 “Draft Environmental Impact Statement, Application The Hills at Southampton, Mixed-Use Planned Development District (MUPDD), Hamlet of East Quogue, Town of Southampton Suffolk County, New York” (the DEIS). The DEIS was prepared to address the requirements of the New York State Department of Environmental Conservation (NYDEC) Environmental Quality Review Act (SEQRA) and the “Final Scope for the Draft Environmental Impact Statement”, issued by the Town of Southampton on July 1, 2015. The purpose of the DEIS was to evaluate the potential for adverse impacts associated with the proposed improvements for the above-referenced project.

LBG’s review focused on the hydrogeologic data presented in the DEIS and the evaluation of nitrogen loading associated with the proposed development. LBG reviewed the input parameters for the “Simulation of Nitrogen in Recharge (SONIR)” model developed by Nelson, Pope & Voorhis, LLC (NPV) and LBG made a cursory review of the mass-balance nitrogen-loading model (BURBS) model simulation completed by W. Grosser Consulting, Inc. (PWGC). LBG also reviewed the three-dimensional groundwater model developed by PWGC to optimize the placement of the irrigation well for the proposed fertigation system; proposed as the principal mitigation technique for offsetting the anticipated nitrogen loading from the proposed development. LBG used available published information to confirm assumptions and data presented in the DEIS.

This memorandum presents comments to specific sections of the DEIS pertaining to hydrogeologic data and conclusions.

## Nitrogen Loading

To review the nitrogen-loading determination made by NPV, LBG developed an analytical simulation of the SONIR model using the same input parameters used by NPV for existing and proposed future conditions. The simulated results for the analytical model were identical to the SONIR model results, included in Appendices G2 and G3 of the DEIS; confirming the utility of the analytical model for assessment purposes.

LBG then completed a detailed review of the SONIR User's Manual (Appendix G1). The User's Manual outlines the input values used by NPV to evaluate nitrogen loading under existing conditions (Appendix G2) and proposed-project simulations (Appendix G3); and provides justification and references for the use of specific input parameters. As summarized below, several of the input parameters used by NPV in the SONIR model appear to be outside the range-of-values outlined in the User's Manual, published references, and/or industry standards.

### Existing-Conditions Simulation:

- NPV Sheet 3 - Model input at location G1 (Natural Recharge) is 3.08 feet or 36.9 inches. This value is high when compared to the range of Natural Recharge input values of 1.68 to 2.0 feet used by NPV in four other simulations; and in comparison to published data (Jackson, Kung and Brutsaert, 1985)<sup>1</sup> that indicates the natural recharge to the upper glacial aquifer would range from 1.6 to 2.0 feet.

If the Natural Recharge value in the SONIR existing condition simulation is reduced from 3.08 to 2.00 feet, the resulting nitrogen load in recharge decreases from 872 lbs. or 0.24 mg/l (milligram per liter) to 677 lbs. or 0.19 mg/l.

### Proposed-Project Simulation:

- NPV Sheet 1 - Model input at location A24 (fraction of Rain Gardens in study area) is 1.4 acres, and at location A25 (total percentage of project area) is 0.061 or 6.1 percent. Based on a total project area of 591 acres, the 1.4 acres of rain gardens account for 0.24 percent of the total project area (1.4 acres/591 acres).
- NPV Sheet 1 - Model input at location A26 (Runoff from Rain Gardens) is 0.35 inch. Item number 26 on Page 7 of the User's Manual states that "for rain gardens, no runoff would be expected". Thus, the model input at location A26 should be 0.0 inch.

F-4.1  
Sec. 2.2.3



---

<sup>1</sup> Steenhuis, T.S., Jackson, C.D., Kung, S.K.J. and Brutsaert, W., 1985. Measurement of groundwater recharge on eastern Long Island, New York, U.S.A.J. Hydrol., 79: 145--169.

- NPV Sheet 3 - Model input at location B3 (Pet Population) is eight pets. The User's Manual states that the pet population is equal to 17-percent of the human population. The DEIS assumes there will be 118 dwellings with 2.5 people per dwelling for a total human population of 295 and pet population of 50 pets. However, per the DEIS, the occupation of any dwelling is capped at 183 days a year (50 percent), thus the annualized pet population would 25 pets.

Accounting for the fraction of rain garden land (0.24%), runoff from rain garden land (0.0 inch) and number of pets (25 pets), the nitrogen load prior to mitigation would increase from the 2,626 lbs. (0.66 mg/l) as presented in the DEIS to 2,653 lbs. (0.71 mg/l).

If the proposed nitrogen mitigation from the Lined Greens and rain gardens is incorporated into the original NPV model, the nitrogen load would decrease from 2,626 lbs. (0.66 mg/l) to 2,326 lbs. (0.59 mg/l). Using the updated input parameters outlined above, the nitrogen load would decrease from 2,653 lbs. (0.71 mg/l) to 2,357 lbs. (0.63 mg/l). In both cases, there is a net increase of nitrogen loading to the Weesuck Creek drainage basin from the existing condition (677 lbs.). Of note, this evaluation of nitrogen loading does not incorporate any mitigation associated with the proposed fertigation system.

A cursory review of PWGC's BURBS model determined findings that were similar to the SONIR model, including a net increase in nitrogen loading to the drainage basin without the implementation of the proposed fertigation system.

### **Fertigation System**

A fertigation system for golf course irrigation is proposed as a mitigation measure to nitrogen loading. As proposed, pumped groundwater containing elevated levels of nitrogen will be used for irrigation (fertigation); resulting in a net decrease of nitrogen levels within the drainage basin that offsets the increased nitrogen loading from the proposed project. Our review of the nitrogen-loading model indicates that absent mitigation from the proposed fertigation system, the proposed project would result in a net increase in nitrogen loading in the drainage basin. The mitigation potential of the proposed fertigation system appears to be dependent on the underlying assumption that the concentration of nitrogen in groundwater captured by the proposed irrigation well is 15 mg/l.

The water-quality data presented in tables 2-3 and 2-4 of the DEIS indicates the concentration of nitrate in groundwater near the western boundary of the study parcel ranges from non-detected (MW-2) to 29 mg/l (TW-1). The concentration of nitrate detected in water samples from the Suffolk County Water Authority (SCWA) Spinney Road Production Well-1 and Well-2 in July and August 2014 ranged from 9.22 mg/l to 15.2 mg/l. This range of nitrate values for groundwater near the western boundary of the study parcels appears to support a model input concentration for the proposed fertigation system of less than 15 mg/l.



LBG utilized our simulation of the SONIR model to evaluate how lower concentrations of nitrogen in groundwater captured by the proposed irrigation well would impact the estimated nitrogen loading in the drainage basin. Using NPV's assumed concentration of 15 mg/l, the estimated reduction to the nitrogen load from the fertigation system would be 2,505 pounds; greater than the estimated post-construction nitrogen loading (2,357 lbs.) and resulting in a net negative nitrogen load. If the concentration of nitrate in groundwater is lowered to 9 mg/l (a reasonable value given available data) the estimated reduction to the nitrogen load from the fertigation system would be 1,503 lbs.; resulting in a post-construction nitrogen load (854 lbs.) that exceeds the existing condition (667 lbs.). This analysis demonstrates the significance of the assumed nitrogen concentration in groundwater captured by the proposed irrigation to the nitrogen loading calculation. The concentration of nitrogen in groundwater within the capture zone for the irrigation well should be verified to support final conclusions about the post-construction nitrogen load.

The groundwater flow model developed by PWGC determined the optimal location for the proposed irrigation well is at the southern end of the Hills Property, directly upgradient of Weesuck Creek. This location was selected to ensure that only groundwater from beneath the adjacent farm fields (the assumed source of the nitrogen in the groundwater system) is captured by the irrigation well. Figures 3 and 3a in PWGC's report (Appendix L5) show the simulated groundwater flow paths with the proposed irrigation well pumping at 300 and 38 gpm (gallons per minute), respectively. In both cases, the figures show that groundwater captured by the proposed irrigation well flows from beneath the adjacent farm fields. The figures also show that the simulated flow paths transect through areas where water-quality data is not available; confirming the absence of quantitative water-quality data to support the concentration of nitrogen in groundwater used by NPV for mitigation by the fertigation system. Of note, PWGC recommended a vertical profile and test well be drilled to provide quantitative water-quality data to "verify the modeling results and to best determine where the greatest levels of nitrogen concentration are at the proposed well location to better delineate a screen zone for the well".

## CONCLUSIONS

1. A review of the SONIR Model identified several input parameters that appear to be inconsistent with values outlined in the SONIR User's Manual and/or published values.
2. Without mitigation from the proposed fertigation system, there would be a net increase of nitrogen loading to the drainage basin as a result of the proposed project.
3. There is no water-quality data from the proposed irrigation well capture zone to confirm the concentration of nitrogen in groundwater is equal to or greater than 15 mg/l, the assumed concentration used in NPV's modeling analysis.





4. The applicant's claim that there would be a net decrease of nitrogen loading in the drainage basin as a result of the proposed project is contingent upon a concentration of nitrogen in groundwater captured by the irrigation well equal to or greater than 15 mg/l. If the concentration of nitrogen in groundwater is 9 mg/l, there would be a net increase of nitrogen loading in the basin.
5. The concentration of nitrogen in the groundwater should be verified to substantiate the nitrogen-loading analysis presented by the applicant.

cmm

H:\Group for the East End\The Hills at Southampton\Review of DEIS.docx