

19 November 2015

Joan R. Deaver  
Sussex County Council  
2 The Circle, P.O. Box 589  
Georgetown, DE. 19947

RE: The Village Center- Kings Highway and Gills Neck Road

Dear Councilwoman Deaver,

This letter is a follow up to our recent letter regarding the proposed Village Center Project. Unfortunately, due to a typographical error, that letter had the incorrect date of 21 June 2013 instead of 21 June 2015. Please accept this as a correction of that date.

We have reviewed the 9 October 2015 letter from Davis, Bowen & Friedel, Inc. (DBF) sent to Mr. Lawrence Lank, the County's Director of Planning and Zoning regarding the Village Center project. DBF's letter addressed many of the items of the State's PLUS review. As you are aware, the Lewes Board of Public Work's water supply wells are directly across Kings Highway from the proposed project. In addition, the proposed Village Center Project is directly over our well's Surface Water Protection area. Our greatest concerns are related to the potential impact of the proposed project on our City's water supplies. We have, therefore, retained the services of a registered professional hydrogeologist, Advanced Land and Water, Inc. ("Advanced"), to review the information in the PLUS report and DBF's response to those comments. Enclosed is a copy of Advanced's report for your information. As you can see, the report identifies several serious concerns regarding the impacts from a project of this nature if constructed over a major source of water for our wells.

As previously noted, these wells are the sole source of water for the City of Lewes and surrounding communities we serve. Any adverse impact on groundwater quality and/or quantity would have a severe effect on Lewes and the surrounding communities. We, therefore, request that you give serious consideration to these issues in making your decisions regarding the Village Center Project and the life blood-water of Lewes.

Respectfully,

C. Wendell Alfred- President

D. Preston Lee, P.E.- Vice President

A. Thomas Owen- Secretary

Jack Leshner- Treasurer

Nancy Levenson- Assistant Treasurer  
Directors of The  
Board of Public Works for the City of Lewes



November 19, 2015

Mr. Darrin Gordon, General Manager  
Lewes Board of Public Works  
107 Franklin Avenue  
Lewes DE, 19958

Re: Impact of Proposed Village Center on Community Wellfield in Lewes, DE  
City of Lewes Board of Public Works; ALWI Project No. DE3N280

Dear Mr. Gordon:

Advanced Land and Water, Inc. (ALWI) was retained by the Lewes Board of Public Works (BPW) to evaluate potential hydrogeologic effects on the BPW wellfield from the proposed Village Center commercial development project. Five BPW community supply wells serve the City of Lewes (City), are permitted and approved by the Delaware Department of Natural Resources and Environmental Control (DNREC) and are completed in an unconfined aquifer. Completion of the wells in the unconfined Columbia Aquifer, the quality of which is influenced by surficial activities, makes the wells particularly prone to adverse impacts (both water quality and supply sustainability) from incompatible land uses within their hydrologic capture zone.

#### **OUR RELEVANT QUALIFICATIONS AND GERMANE EXPERTISE**

ALWI is a hydrogeological consulting firm specializing in water resources exploration, development, testing, permitting, rehabilitation and protection for both public and private sector clients. Many of our largest projects and strongest client-service relationships have arisen in direct service to Mid-Atlantic public utilities providing drinking water to its citizens and customers.

We fully understand the unique hydrogeologic setting of the Lewes area, including the value of carefully managing incompatible land uses on and near lands essential to the sustainability of shallow-sourced groundwater resources. Since our inception, we have provided consulting services addressing both public and private sector concerns on locally important matters of groundwater protection, allocation permitting, mitigation of water quality hazards of both natural (e.g., salt water intrusion) and manmade (e.g., point and non-point sources) origin, and long-term sustainability.

Lewes BPW engaged us to make this assessment and to provide related consulting support based on our specialized qualifications and germane experience. For the sole use and benefit of BPW, ALWI performed this evaluation, reliant on previously available information. We did not

develop new data or perform fieldwork to support the findings and opinions herein. Rather, we drew upon our abundant source water protection experience and our review of certain documents provided by BPW and otherwise readily available to us in the public record. Specifically, we reviewed the 2003 DNREC Source Water Assessment Report performed for the BPW wellfield, the March 2015 Planned Land Use Service (PLUS) report for Village Center as prepared by the Delaware Office of State Planning Coordination, the Sussex County Source Water Protection Ordinance and other maps and documents related to the proposed mixed use development.

## **BACKGROUND INFORMATION**

Lewes BPW makes use of five public water supply wells, located on public land, immediately south of Cape Henlopen High School and as close as a few hundred feet west of the closest portion of the proposed Village Center development site. Two of these wells have a screened interval deeper than 100 feet below ground surface, while the other three are screened even more shallowly. All five wells are completed in the unconfined Columbia-Pocomoke aquifer, which means they are particularly:

1. Susceptible to contamination arising from incompatible land uses and activities within and near their source water protection areas or SWPAs (formerly known as wellhead protection areas or WHPAs; herein we use WHPA) and;
2. Dependent for sustainable capacity, on local groundwater recharge from precipitation falling within and near the WHPA for the wellfield.

In December of 2003, DNREC published a Source Water Assessment Report, documenting the use of a numerical groundwater flow model which the agency used to delineate the five-year, time-of-travel capture zone for the City's wellfield. Based on the DNREC model, groundwater (and prospective contaminants therein) within this capture zone could enter the wells themselves within five years of precipitation and/or release. The wellfield likely receives groundwater from beyond the five-year-time-of-travel. Nevertheless and as a matter of apparent policy, DNREC deemed the 5-year time-of-travel zone as one preferentially worthy of protection both from a water quality (i.e., contamination risk) and quantity (sustainable recharge) perspective.

In 2003, DNREC identified then-existing commercial and institutional point sources of potential contamination as well as non-point sources of contamination, such as those generally suggested by land use, within the source water protection area. Based on then-existing land uses within the WHPA, DNREC interpreted the wellfield as having high susceptibility to nutrients and petroleum hydrocarbons, moderate susceptibility to pathogens, pesticides and organic compounds, and low susceptibility to metals and PCBs.

The City experiences a seasonally varying water demand, with the highest water use occurring during the summer months. As of 2003, the average daily population throughout the year was 2,600 residential customers, which more than doubled to an average of 6,400 between May 1 and September 30. The seasonality of the City's demand, combined with variability in precipitation, continuously alters the area from which the wellfield captures groundwater.

Irrespective of the static position of the 5-year DNREC-delineated WHPA boundary, the actual area from which the wellfield captures groundwater varies based on a combination of factors and circumstances:

- Seasonal withdrawal fluctuations,
- Natural variability in recharge rates based on precipitation variance,
- Changes in land use within and near the capture zone, and
- Changes in stream stage within surface bodies hydrologically connected to the aquifer and other factors.

Notwithstanding this variability, the area encompassed by the DNREC-modeled WHPA is static, and reflects computer model input parameters selected and assigned by the agency in 2003. A DNREC representative confirmed via telephone that the agency is not in the regular and customary practice of updating WHPAs when factors such as land use, imperviousness and water demand change, all of which are factors that may come to affect the shape and size of the groundwater capture zone.

#### **RELATIONSHIP OF WHPA TO PROPOSED VILLAGE CENTER**

The DNREC delineated WHPA encompasses much of the proposed Village Center development site; a map showing this WHPA is provided in Delaware Geological Survey Report of Investigation No. 65 (DNREC, 2003). Construction of the Village Center introduces the prospect of potential point-source contamination hazards among its as yet undetermined tenants (e.g., gasoline stations, automotive repair facilities, dry cleaners, etc.), non-point contamination risks (e.g., stormwater entrainment of petroleum hydrocarbons and metals), and increased impervious surface acreage within the WHPA.

The hydrologic consequence of increased impervious surface cover is a decrease in overall groundwater recharge within the WHPA. The professional literature is rife with studies of the efficacy of stormwater infiltration facilities. Many researchers document the risk of siltation, biofouling, clogging of pore spaces, the development of channelized short-circuiting pathways and other challenges associated with predicting the long-term performance of such facilities as initially engineered. Even if stormwater discharges at the Village Center are intended to reenter the groundwater system through infiltration systems that may seem appropriately engineered initially, there likely exists no assurance that such systems would be free of siltation and/or biofouling over time.

We also believe that groundwater mounds may develop beneath such stormwater infiltration systems, lessening the predictive certainty of the nature of the reentry of such water or of its pathway once it does enter the subsurface. Groundwater mounds also lessen the time for microbial action to degrade residual contaminants during percolation and before water table intercept. Many agencies programmatically presume no net recharge from such systems over the long haul for a combination of these reasons.

Absent the assuredness of the continuity of groundwater recharge in its pre-development quantity, if the wellfield withdrawal rates are held constant and irrespective of the absence of formal DNREC WHPA re-delineations, we assume that the actual 5-year capture zone would expand in approximate acre-for-acre proportion to the lost pervious area.

#### **STORMWATER INFILTRATION: DUBIOUS EFFICACY AND POTENTIAL WELLFIELD RISK**

The expansive impervious surfaces associated with the Center constitute a risk to the long-term sustainable capacity of the BPW wellfield. The 2003 DNREC model presumes availability of natural groundwater recharge amounts, throughout the WHPA and in perpetuity. The expansion of impervious surfaces associated with the Center will violate this assumption. The 5-year capture area may respond by enlargement in orientations and by degrees, which would require an updated model to predict. The capture zone associated with the wellfield may entrain groundwater (including possibly already-polluted groundwater) that now otherwise supports base-flow to streams. The ultimate capacity of the wellfield also may diminish, the evidence for this long-term imperilment would be greater pumping cycle drawdowns, longer-duration pumping cycles or both. We believe that these potentialities require detailed study and contingency planning before Village Center approval otherwise could be countenanced.

Based on publicly available information researched in support of this assessment, the Village Center plan includes 203,000 square feet (4.66 acres) of commercial space and a 1,127 space parking lot. Assuming the size of a typical parking space is approximately 9 feet by 18 feet and adding an assumed 50% for driveways and other paved areas not specifically designated as parking spaces, we anticipate roughly 11 acres of imperviousness associated with the commercial subcomponent of the project. Future plans also exist to construct a multicultural center and YMCA facility, both of which will add to the total impervious surface area on-site. The exact total impervious surface acreage that will be created if the proposed Village Center is approved is not known with assuredness at this time.

The planned creation of roughly 11 acres of impervious surfaces within or immediately proximal to the WHPA raises overlapping concerns associated both with contamination risk and sustainable groundwater supply capacity. Stormwater infiltration may impart inferior water quality. Infiltration systems may possess questionable long-term functionality in the face of siltation and biofouling. The creation of more than 11 acres of imperviousness likely would result in wellfield capture zone expansion beneath even more of the Village Center site, regardless of whether DNREC changes the formal WHPA delineations or not. Based on experience, we generally would expect to see a further expansion of the five-year capture zone in rough proportion to the impervious surface areas until it intercepts a source of recharge equivalent to that lost by creation of additional impervious surfaces associated with the proposed Village Center.

The resulting effect of this loss of potential recharge area easily may cause:

1. An expansion of the 5-year capture zone, quite possibly beneath the entire Village Center site rather than just the majority of it;

2. A potential for increased surface water capture from Ebenezer Branch, a tributary of Canary Creek, into the underlying unconfined aquifer.

The Village Center developer has expressed intent to engineer systems that collect and introduce stormwater into the unconfined aquifer below the Center, per the January 1, 2014 Sediment and Stormwater Regulations. However, ALWI has neither seen nor reviewed the specific means by which stormwater will be treated and recharged.

The introduction of stormwater into the unconfined aquifer also raises potential water quality concerns, as exact means of treatment have not been specified by the applicant. Effective treatment of stormwater through processes such as sand filters and carbon polishing filters often is regarded as expensive. Many developers oppose agency requirements or suggestions (e.g., not the developer's rejection of "green technology" suggestions within the PLUS report) for such treatment measures based on its cost, but absent assured treatment, the risk of entrainment and subsequent groundwater discharge of petroleum hydrocarbons and metals (from vehicles and businesses) seems unconstrained. The risk of nutrient entrainment and its subsequent release into groundwater (from ornamental shrubbery and lawn and garden businesses) also seems more than minimal.

Even if the stormwater recharge were desirable from a water quality perspective, it is conjectural whether the capacity of the wellfield would benefit. This is because Village Center is close to a hydrologic divide, whereby water east of the divide flows towards Pot Hook Creek, while water west of the divide flows towards the wellfield and ultimately, Ebenezer Branch. Stormwater introduced on the eastern side of the corresponding groundwater divide may not recharge the capture zone for the wellfield irrespective of the location at Village Center (i.e., within or outside the delineated WHPA) where it originated.

The applicant has not clearly identified the means by which stormwater will be retained, treated or infiltrated. Stormwater collected by the on-site management system may come to be contaminated with hydrocarbons and grease from vehicles, road salts from deicing practices in the winter months, and metals from a combination of motor vehicles and other debris. Inadequate treatment of stormwater before discharge to the underlying, into the unconfined aquifer may increase the concentration of any of one these contaminants in the groundwater, potentially affecting the City's supply wells and possibly requiring filtration or other treatment by BPW.

#### **SECONDARY GROUNDWATER QUALITY CONCERNS RELATED TO VILLAGE CENTER**

In addition to the aforementioned risk of contaminant entrainment in percolating groundwater, the proposed commercial development raises additional water quality concerns originating both on- and off-premises. These concerns are as follows:

1. **Future Tenant Activities** – The applicant has not indicated the nature of the commercial tenants that may occupy space in the Center. Gasoline retailers, automotive service and repair businesses, dry cleaners and home centers (e.g., Home Depot, Lowes, etc.) are but a few tenant types where hazardous materials and/or petroleum products may come to be domiciled, stored, sold, used, discharged and/or released either inadvertently or purposefully.

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While the Sussex County Source Water Protection Ordinance imposes some measure of limitation on aboveground and underground storage tanks containing petroleum or hazardous substances within a WHPA, the northeastern portion of the site lies outside of the WHPA as now mapped but easily could be inside the actual capture zone once it expands in response to expansion of impervious surface acreage. Even if such businesses are located just outside of the DNREC-mapped WHPA, they may still be located within the capture zone of the BPW wellfield, now or in the future.

2. **Off-Site Contaminant Capture and Entrainment** – In the event that stormwater infiltration does not balance with the loss of recharge from impervious surface expansion in the WHPA, the size of the capture zone for the wellfield will likely increase. Its lateral expansion may entrain and introduce new potential contaminant threats which otherwise would lie outside the capture zone.
3. **Surface Water Capture and Entrainment** – Ebenezer Branch is a short distance southwest of the wellfield, within the WHPA. Streams on the coastal plain usually are in direct hydrologic contact with underlying, unconfined aquifers. If the Village Center is approved and comes to constitute significant impervious surface acreage within the WHPA, the consequent adjustment of the capture zone for the wellfield may effectively “pull” additional water from Ebenezer Branch into the aquifer. In doing so, the unconfined aquifer could receive more stream water than it otherwise would, affecting water quality results by introducing increased surficial contaminants, particularly during storm events. By comparison, most natural streams on the eastern shore that are unaffected by pumping tend to be gaining streams, where the unconfined aquifer discharges water into the stream. Under the potential scenario described above, Ebenezer Branch may become a losing stream and serve as a source of recharge to the surrounding aquifer, potentially affecting the quality of water captured by the wellfield.

#### **OTHER CONCERNS ARISING FROM OUR ASSESSMENT OF THE PLUS REVIEW**

State and County reviewing agencies have opined on various technical and regulatory aspects of the development plan through the State of Delaware Preliminary Land Use Service (PLUS) review process. Elements of the PLUS review germane to the question of future groundwater supply adequacy and quality include:

1. **Interference from On-site Construction Dewatering Efforts** – The PLUS report identified that elements of site development at the Village Center may entail withdrawals of groundwater to facilitate foundation construction and other subsurface work. If groundwater is intercepted more shallowly than the base of the excavations, construction dewatering may be required. If the amount of water that needs to be withdrawn is significant, the dewatering may interfere with and otherwise affect BPW wells. DNREC permits are required for construction dewatering; we recommend that BPW participate actively in the permitting processes to ensure rights protection.
2. **Source Protection Benefit of Agricultural Land Use** - The Village Center site is currently zoned as agricultural. In the PLUS comments, DNREC also cited Chapter 115 Zoning Article IV 115-19 of the Sussex County Code, which states that “the purpose of these

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[agricultural] districts is to provide for a full range of agricultural activities and to protect agricultural lands, as one of the county's most valuable natural resources, from the depreciating effect of objectionable, hazardous and unsightly uses... These districts are also intended for protection of watersheds, water resources, forest areas and scenic values..." ALWI discussed this comment with DNREC and learned of a general agency view that continued agricultural land use may afford more overall source water protection that would occur if Village Center proceeds notwithstanding the protective provisions within the Sussex County Wellhead Protection Ordinance. Speaking on background, a DNREC representative offered a view that the wellfield would be accorded greater protection if the land in question remained agricultural, than if developed as the Village Center, even after considering the ordinance restrictions within the Sussex County Wellhead Protection Ordinance. We share this view.

The applicant's response to the DNREC recommendation that the Village Center site remain agricultural seems unresponsive to the content of the PLUS comment. The applicant offers that the existing agricultural land use currently provides a possible contamination source to the wellfield (in the form of a water treatment chemical storage tank at a wellhead). Such a hypothesized release would require both the failure of a check valve at the well, complete inattention by the owner and the complete absence of any pumping which if undertaken for irrigation or other purposes would control the spread of the hypothetical contamination.

The groundwater quality effect of agriculture is ubiquitous and chronic on the eastern shore but it constitutes a hazard known to BPW and one that its operations accommodate. Agricultural operations occur concordant with applicable nutrient management plans and practices. Those plans and practices already achieve adequate groundwater protection standards. The applicant also posits that the removal of an interfering well would beneficially support the continuity of the BPW supply, but the wellfield has operated satisfactorily in the presence of this alleged interference risk for decades.

## SUMMARY

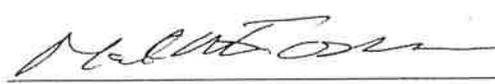
ALWI represents that, within the parameters established by the scope of work, this preliminary hydrogeologic impact assessment has been undertaken and performed in a professional manner, in accordance with generally accepted practices in effect at the time and in the locality that this assessment was performed. Further, ALWI performed this assessment and prepared this letter-report in accordance with the work scope, time frame, and budget stipulated in ALWI Proposal No. DE3N280, as agreed to by the Lewes BPW. Subject to these provisions, ALWI's professional opinions are as follows:

1. **Lewes BPW Wellfield is Imperiled by Village Center** – The proposed Village Center development project represents water quality and supply adequacy imperilments for the neighboring BPW wellfield. Of these, the water quality imperilment risk presents the greatest threat, but the possibility of well yield diminution cannot be negated. Neither design elements of the Center, which have not been fully specified, nor provisions of the Sussex County wellhead protection ordinance adequately protect from foreseeable water quality risks and the possible diminution of supply adequacy arising from Center impervious surface expansion and tenant activities.

2. **DNREC and Sussex County Protections are Limited** – Neither State nor County policies and ordinances provide an assured means (other than via lawsuit) through which Lewes BPW can seek compensation or relief in the circumstance that the impacts we forecast do materialize. DNREC does not adjust WHPAs for development of impervious surfaces that come to exist in groundwater capture zones. Further, DNREC does not consider or adjust WHPAs to reflect stormwater infiltration facilities, whether or not they may be of sufficiently robust design to assure the continuance of groundwater recharge at pre-development rates. Moreover, artificial stormwater recharge easily may introduce an additional contamination source rather than the mere groundwater recharge. The Sussex County Wellhead Protection Ordinance is less robust than we have seen elsewhere, and no mechanism seems to exist to disallow a host of potentially incompatible tenant businesses at the Center. The DNREC comment in the PLUS review is that this locality and circumstance warrants a higher level of source water protection than the Sussex County ordinance provides; we concur.
  
3. **Recommended Actions to Limit Risks** – The best level of protection for the BPW wellfield would be if the site remains agricultural, as DNREC has suggested in its PLUS comments. The alleged risks to the wellfield of continued agricultural activities (hypothesized acute release of agri-chemicals; well-to-well interference with irrigation supplies) both are known risks that BPW has weathered without undue effect for years. If the Village Center project is further countenanced, Sussex County and/or DNREC should accord BPW every opportunity to participate closely and to review and approve proposed mitigation measures in detail. This is because BPW is not merely a neighboring property owner but holds responsibility for the provision of safe drinking water for the residents of the area in perpetuity.

Thank you for this opportunity to have been of service. Please feel free to call our office with any questions.

Respectfully submitted,

  
MARK W. EISNER, P.G.  
President

