Brem_052_Coventry

*DRAFT – For discussion purposes only*

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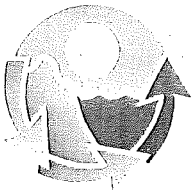



December 13, 2006

Carlisle Zoning Board of Appeals
66 Westford Street
Carlisle, MA 01741

RE: Coventry Woods

Dear Board Members:

Per the request of Mr. Michael Epstein, 57 Spencer Brook Lane, Carlisle, Massachusetts, who is a direct abutter to the project, I have reviewed the Definitive Comprehensive Permit for Coventry Woods prepared by Stamski and McNary, Inc. dated September 15, 2006. Horsley Witten Group (HW) is an interdisciplinary consulting firm comprised of engineers, hydrologists, wetland scientists and planners. We have served as a consultant to the U.S. Environmental Protection Agency (USEPA) for 18 years. We also serve as consultants to the Commonwealth of Massachusetts and many municipalities throughout the nation. HW has taught over 200 workshops nationally on the subjects of groundwater protection, wellhead protection and watershed management under contract to the USEPA. Our firm recently authored the Smart Growth Toolkit prepared for the Massachusetts Executive Office of Environmental Affairs.

The project includes 41 dwelling units on 22.6 acres to be served by conventional on-site septic systems. The development of the property is constrained by glacial till (low-permeability), shallow groundwater and wetlands. All of these factors severely limit the amount of development that can be accommodated in a sustainable manner. The proposed development plan presents significant environmental issues. Our specific comments regarding wastewater disposal are as follows:

**1. Groundwater Flow Direction:** Septic System "C" is located upgradient from abutter's wells (Epstein & Stone and possibly Brueing). Based upon the test pit data provided by Stamski and Mcnary which includes water table depths, HW computed estimated water table elevations and analyzed hydraulic gradients in the area of Septic System "C". This data suggests a westerly groundwater flow direction, towards the abutters' wells. The applicant should be required to provide a water table map showing groundwater flow directions under existing and post-development conditions and evaluate impacts to the abutters' wells.

**2. Sensitivity to Pollution:** The test pit logs in the area of Septic System "C" (TP 30 – TP 36) indicate that "refusal" is reached at shallow depths (7-9 feet below grade). This suggests a shallow depth to bedrock and a very limited saturated thickness (approximately 4-6 feet) in the surficial glacial till deposits. This means that there is little opportunity for dilution of wastewater pollutants in the groundwater as they flow downgradient towards the abutter's wells. Therefore plumes of contamination that are generated at

the septic system locations can be expected to remain in high concentrations. I agree with the Commonwealth recommendations for monitoring wells.

**3. Nitrogen Loading:** A nitrogen loading analysis should be conducted to determine impacts at the downgradient property line and at the abutters' wells. Conventional septic system effluent contains 40 – 60 mg/liter of nitrogen. The state and federal drinking water standard is 10 mg/liter. The nitrogen loading analysis and model should conservatively predict nitrogen concentrations downgradient from the proposed septic system and at the downgradient wells.

**3. Pathogens and Travel Time:** Groundwater travel times between the proposed septic system need to be evaluated in order to properly evaluate water quality impacts (and specifically pathogens) to the wells. Viruses are known to survive in groundwater for over 200 days and have been documented to move hundreds of meters in groundwater (USEPA, 1987). Three factors make this a serious concern in this location. They are: a) the steep hydraulic gradients measured by the applicant in the area of the proposed system (7%), b) very limited saturated thickness (approximately 6 feet) and c) the shallow bedrock which transmits groundwater through fractures at high velocities to neighboring wells. I recommend that the applicant should evaluate travel times and pathogen transports between the proposed septic systems and abutters' wells taking into account flow through bedrock fractures.

**4. Stormwater Impacts on Groundwater:** The applicant proposes to construct large stormwater basins in the vicinity of Septic System "C". The discharge of stormwater into these basins will alter the hydrology of the area by raising groundwater levels. This has two implications: a) water table levels at the Septic System "C" location will be higher than existing (pre-development) conditions further constraining the amount of wastewater that can be discharged at this location, while still meeting Title 5 vertical separation requirement of four to five feet and b) this will steepen the hydraulic gradient towards the abutters' wells increasing groundwater flow velocities and pollutant transport. We have requested a copy of the drainage report and been denied. We recommend that the applicant should evaluate the mounding effects caused by stormwater disposal.

**5. Groundwater Mounding:** The discharge of wastewater at the proposed locations will increase the water table level. This is known as groundwater mounding. A septic system discharging on the order of several thousand gallons/day will have a significant ground water mound (several feet in height can be expected). This analysis should be conducted by the applicant to ensure that the proposed vertical separation distance of four to five feet can be maintained under "maximum groundwater conditions". We have conducted a preliminary mounding analysis that indicates an additional 4-7 of water table rise dependent upon final septic design flow rates. It also suggests that hydrologic impacts will occur across the property boundary on the Epstein/Stone parcel. Our model suggests a water table rise of approximately 1-2 feet at the Epstein/Stone septic system. This may compromise Title 5 compliance at their system. It may also cause basement flooding. We recommend that the applicants provide a groundwater mounding analysis that incorporates both wastewater and stormwater infiltration.

In summary, the proposed project raises serious questions regarding the impacts of wastewater disposal on abutters' drinking water wells. This is a public health issue and should be fully evaluated prior to any decisions by the Board of Appeals.

Please call me with any questions that you have regarding my comments.

Sincerely,

HORSLEY WITTEN GROUP, INC.

Scott W. Horsley
President

Reference: U.S. Environmental Protection Agency. 1987. Septic Tank Siting for Minimum Contamination of Ground Water by Microorganisms.
Office of Ground Water Protection, Washington, D.C.

Cc: Carlisle Board of Health
Carlisle Board of Selectman
Carlisle Planning Board
Mr. Michael Epstein