ENGINEERING A SUSTAINABLE FUTURE

Carlisle ZBA
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INDEPENDENT HYDROGEOLOGIC STUDY, 100 LONG RIDGE ROAD

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Key Hydrogeologic Questions

- Effect of proposed septic system on wells – on-site and neighbors?
- Effect of new wells on neighbors' wells?
- Effect of wells on each other?

Objectives of Nobis Study

- Improve conceptual hydrogeologic model of overburden & bedrock groundwater
- Bedrock investigation
- Groundwater mounding analysis
- Nitrate mass balance analysis
- Nitrate dispersion analysis
- *<u>Not</u>: critiquing work of others; recommending permit granting or denial*

Simplified Hydrogeology at Site

- Overburden
  - Soil and swamp deposits
  - Sandy Glacial Till (will receive septic discharge)
  - Dense, low permeability glacial till may or may not blanket the bedrock
- Fractured Bedrock
  - Schist (metamorphic) is predominant rock type
  - Water found in fractures only
  - All wells in area are bedrock wells
  - Overburden can be a source of recharge

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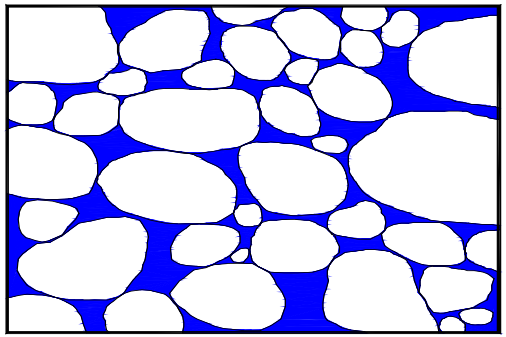
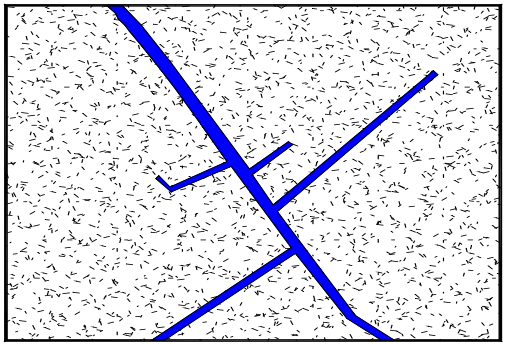
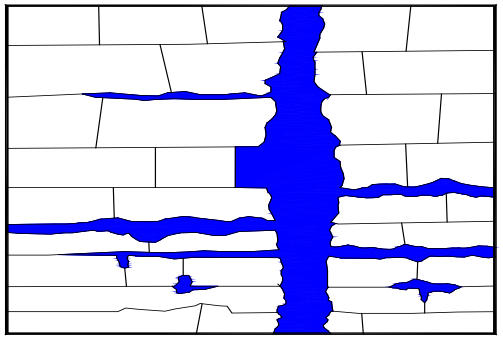
Types of Aquifers



Sand & Gravel Aquifers



Fractured Bedrock Aquifers



Karst Aquifers

Conceptual Model (1)

- Schist
- Outcrop fractures primarily NE; also NW
- Airphotolineaments primarily NW
- NE and NW most likely groundwater flow directions
- Degree of connection with overburden unknown.
- All water supply wells in bedrock

Conceptual Model (2)

- About 2 Mgal of water can be expected to recharge site in an average year.
- Overburden is sandy glacial till, 0 – 25 feet thick
- Water table: 0 – >11 feet deep
- Saturated thickness @ Septic Areas: 3 – 13 feet
- All MWs in overburden

Groundwater Mounding

- Model assumptions
- Predicted mound heights
  - Septic Area 1: 0.70 ft after 90 days (5.9 ft depth to top)
  - Septic Area 2/3: 1.53 ft after 90 days (5.5 ft depth to top)
  - *Note: results vary with assumptions*
  - *Area 3 (alone) may be shallower than 4 ft*

Nitrate Mass Balance

- Use 2015 DEP Guidance
- Use applicant design parameter of 110 gpd per bedroom; 2.4 Mgal/yr
- Regulatory, not “scientific” estimate
- Mass balance yearly dilution suggests nitrate load too great to be diluted below 10 mg/L

Nitrate Dispersion

- Complex equation with many assumptions
- Diffusion and advection only
- Results useful for relative comparison
- Results apply to overburden only
- Results highly dependent on GW contours
- Problem at property line NE of septic 2/3

Questions??

Communication

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