Avery Brook Homes

Water Quality Concerns of Groton Utilities

March 7, 2023

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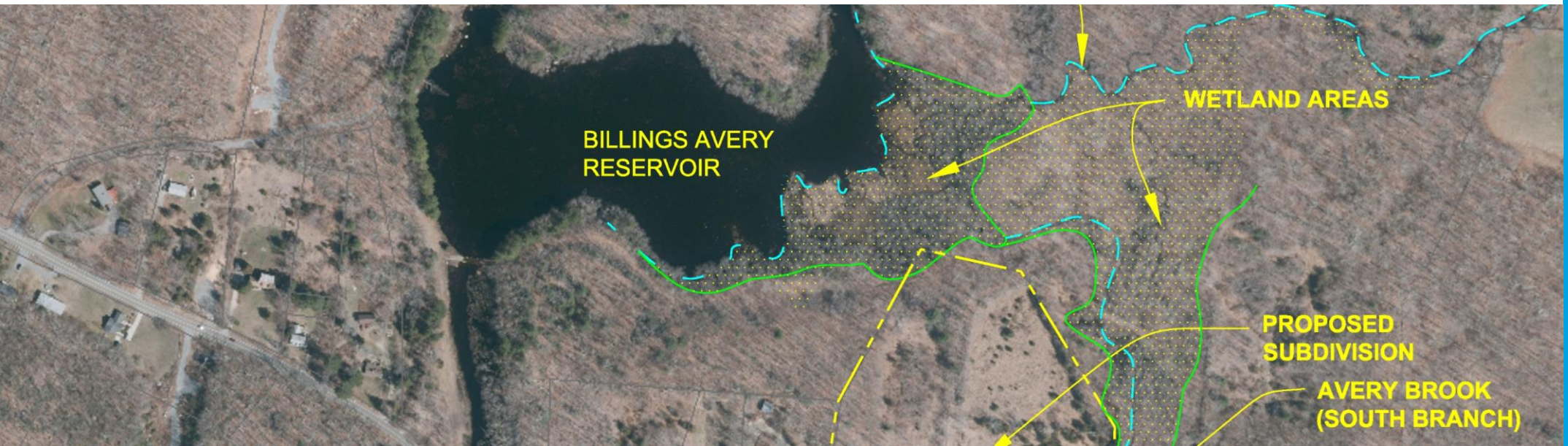
GROTON UTILITIES
At Your Service



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Overview

- The proposed site is environmentally sensitive
- The developer has not addressed all of the potential contaminants or all of the potential impacts
- The analyses submitted to date are incomplete and understate the impacts
- Further documentation by the developer is unlikely to show that this project on this site is environmentally sound
- The project will have unacceptable impacts on watercourses and their associated wetlands
- The proposed housing density is 6 times higher than CT DEEP has judged to be acceptable for this water supply setting.

The Setting

- 9.2 acres site off Stoddards Wharf Road
- Adjacent watercourses and assoc. wetlands
  - Avery Brook
  - Billings Avery Reservoir
- Soils—largely sandy loams
  - Agawam sandy loam
  - Hinckley sandy loams
- Ground surface sloping to east and southeast
- Groundwater flowing generally northwesterly through sandy soils to watercourses

The Setting

- **The site is surrounded by sensitive receptors**
- **It is important to look beyond the site boundaries**

Sensitive Receptors

- The watercourse named Avery Brook
- The watercourse called Billings Avery Reservoir---an open pond that is part of the Groton water supply system
- The wetlands surrounding the brook and the reservoir
- 26 proposed private drinking water wells
- 2 or more existing private wells on neighboring lots

Contaminants of Concern

- Nitrogen compounds, including nitrates
- Phosphorus compounds
- Pathogens
  - Bacteria
  - Viruses
- Suspended solids
- Petroleum products
- Other organic compounds
- Heavy metals
- Sodium

Hydrologic Cycle

- Surface waters
- Wetlands
- Groundwater

- Interactions
  - Groundwater recharge of streams
  - Stream recharge of groundwater
  - Wetlands that dampen stream flow and interact with water quality

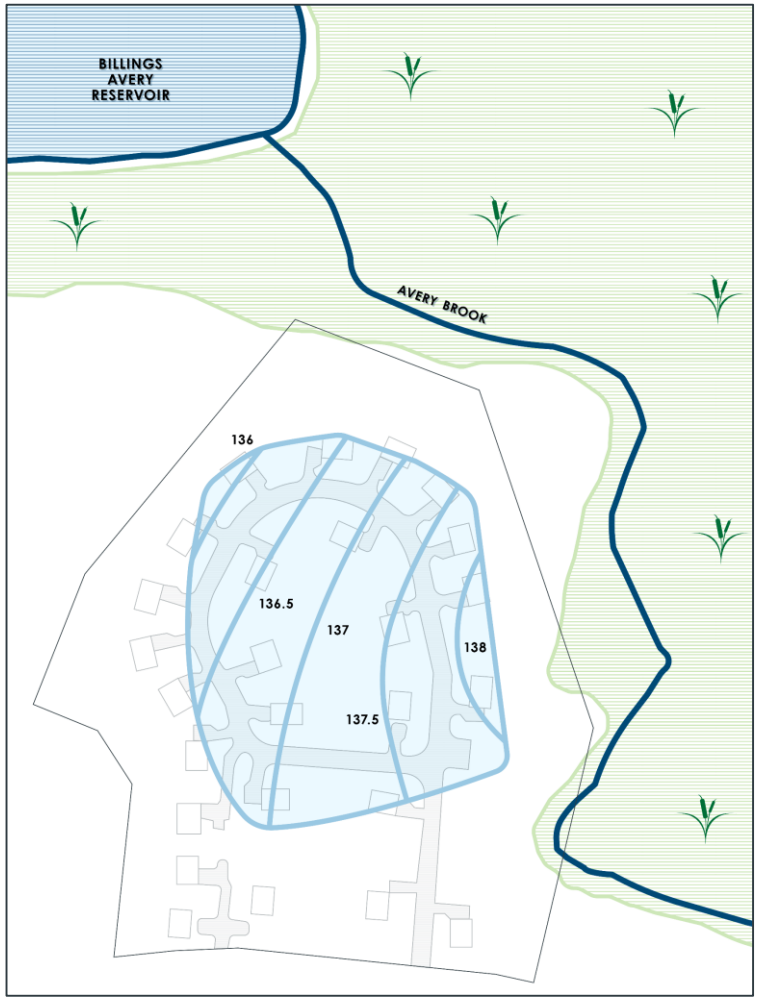
The interactions are critical to environmental protection

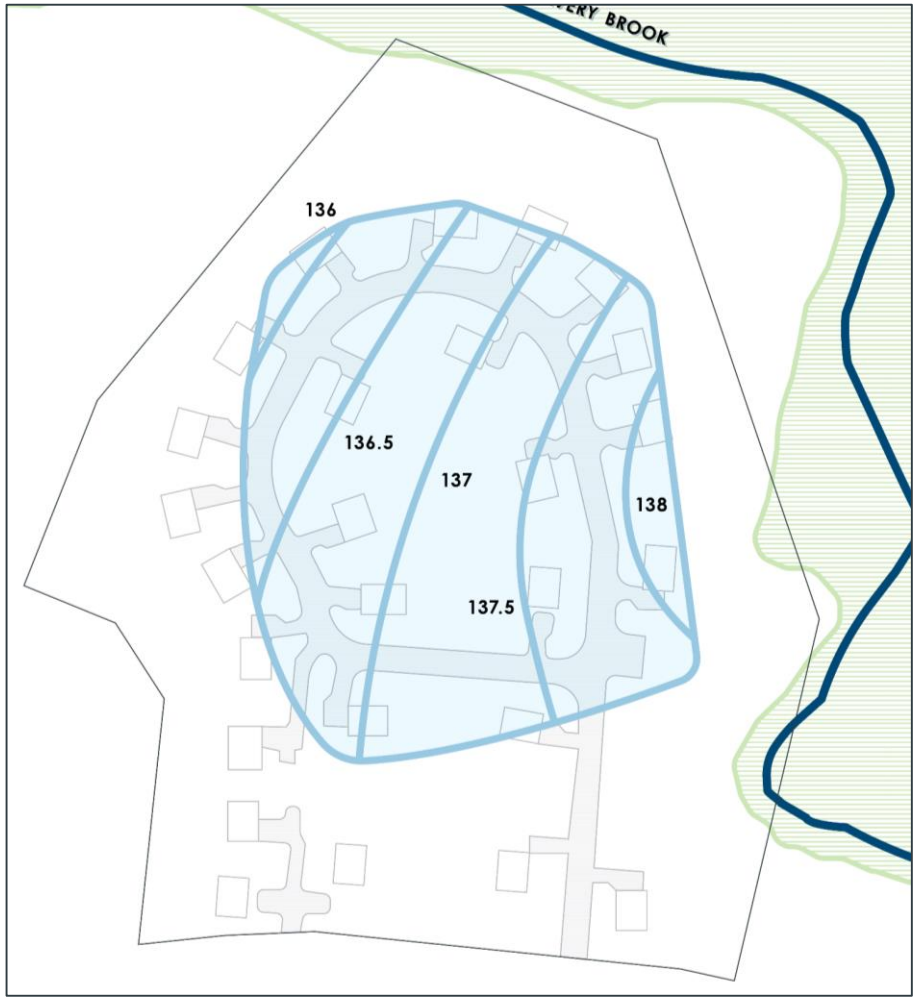
Groundwater Elevations and Flow Directions

- **Data needed to determine the degree of impacts on watercourses and wetlands**
  - **How deep is the water table?**
  - **What is the direction of groundwater flow?**
  - **How fast does groundwater travel?**
  - **How long will contaminants be retained in the groundwater before reaching wetlands and watercourses?**
  - **How long will contaminants be retained in the groundwater before reaching abutters' properties?**

- **Developer has not properly characterized the interactions between the groundwater and Avery Brook on and near this site**

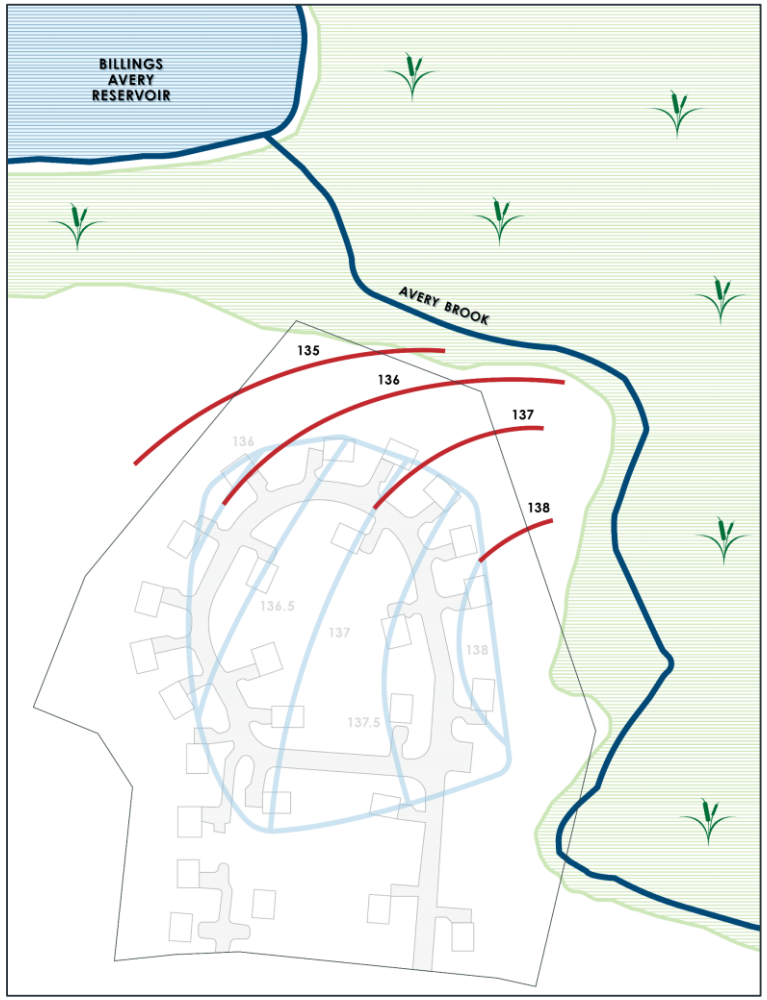
Groundwater contours reported by Fairbank

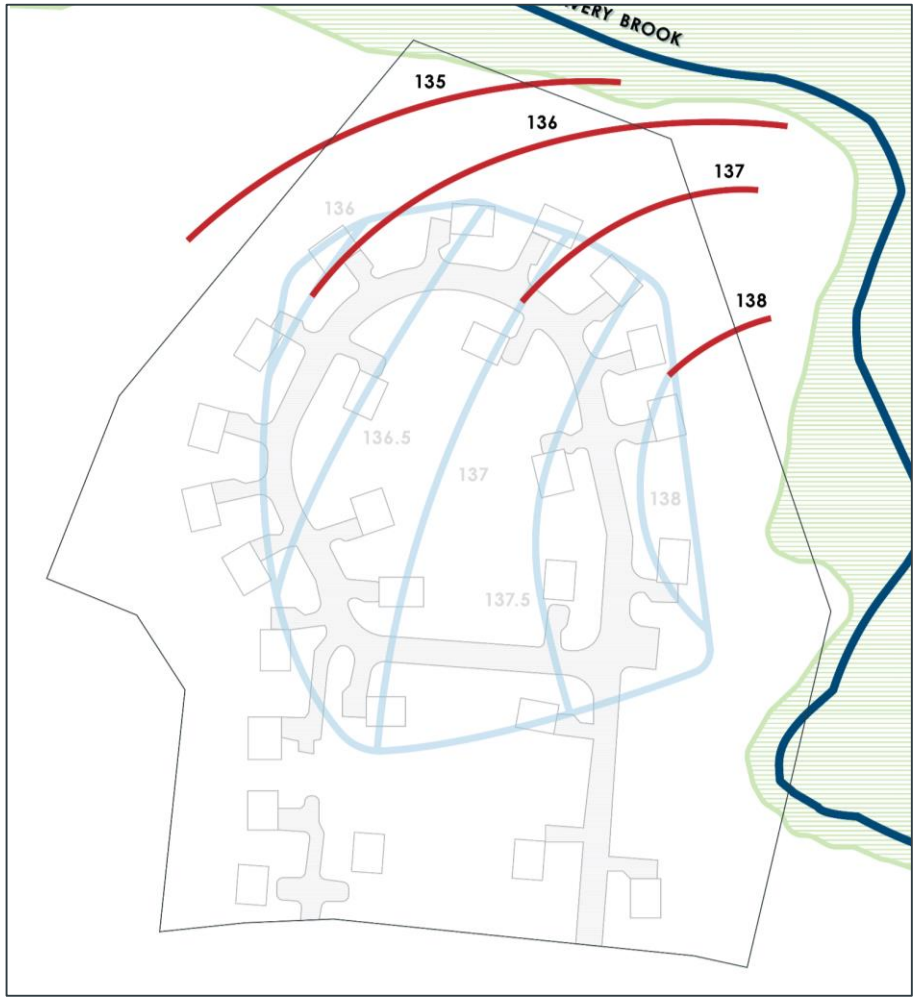




- Data limited to central portion of site
- Apparent NW'ly flow of groundwater

Groundwater contours—reasonable extrapolation





- Contours bend to the north as groundwater interfaces with Avery Brook
- Groundwater flow in SE corner not addressed

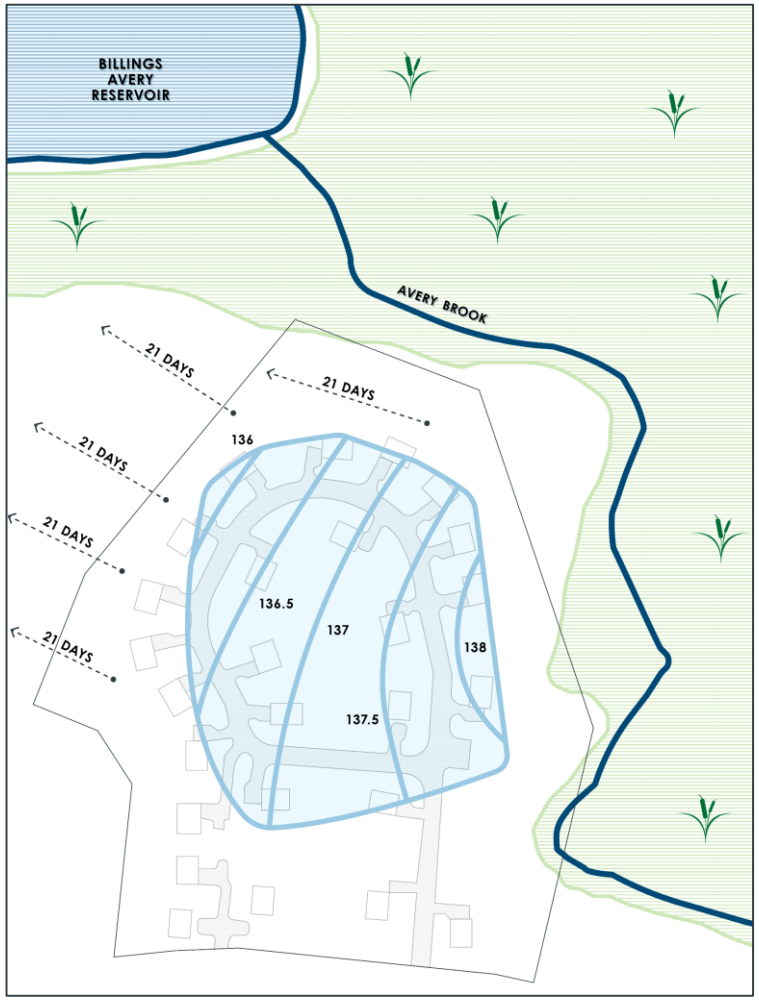
Travel times

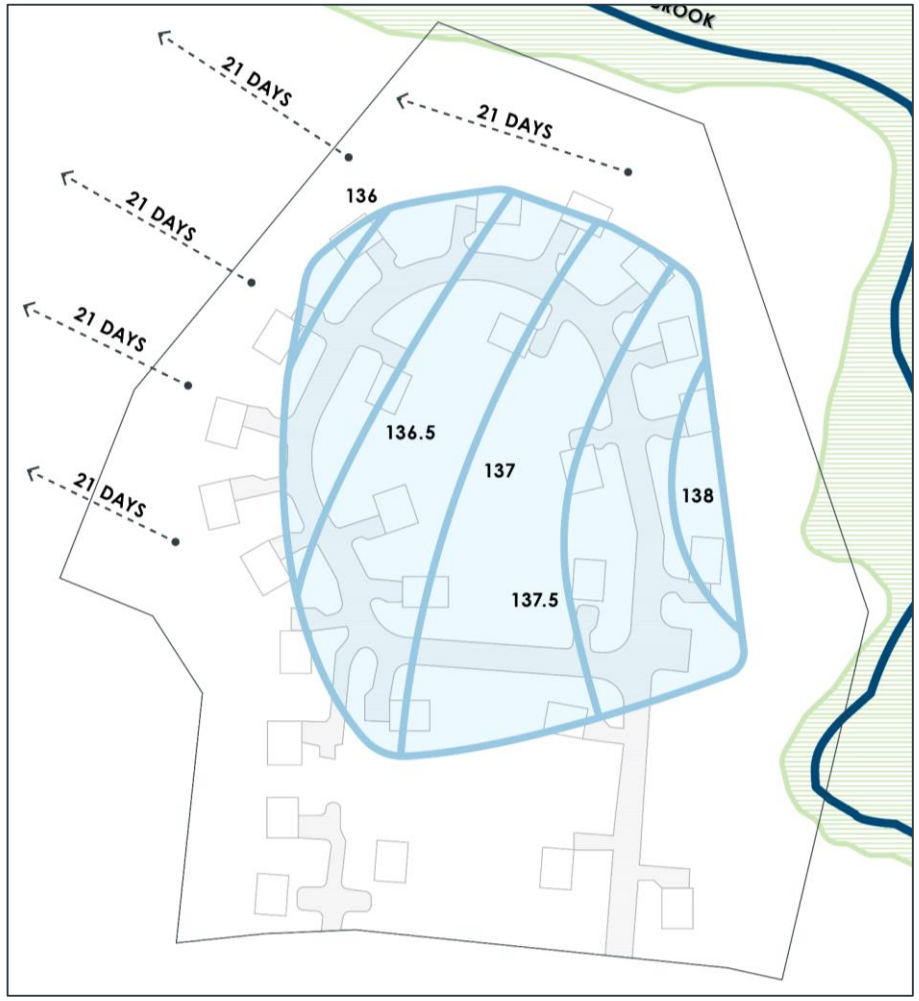
- Groundwater flow from the site to the reservoir
  - A few months
- Groundwater flow from the site to Avery Brook
  - A few weeks
- Surface water flow in Avery Brook to Reservoir
  - A few hours

Pathogen Inactivation, specifically viruses

- CT DEEP requirements for wastewater disposal
  - 21-day inactivation period for most cases
  - 56-day inactivation period for nearby public and private drinking water supplies
  - Provide inactivation period on-site or obtain easement for off-site encroachment
- Developer's assessment (Fairbank report)
  - Based on 21 days, not 56 days
  - Shows encroachment on GU land
  - Ignores travel time to Avery Brook

Virus inactivation—distances reported by Fairbank





- Based on NW'ly flow
- Based on 21-day inactivation period
- Demonstrated impact on abutters

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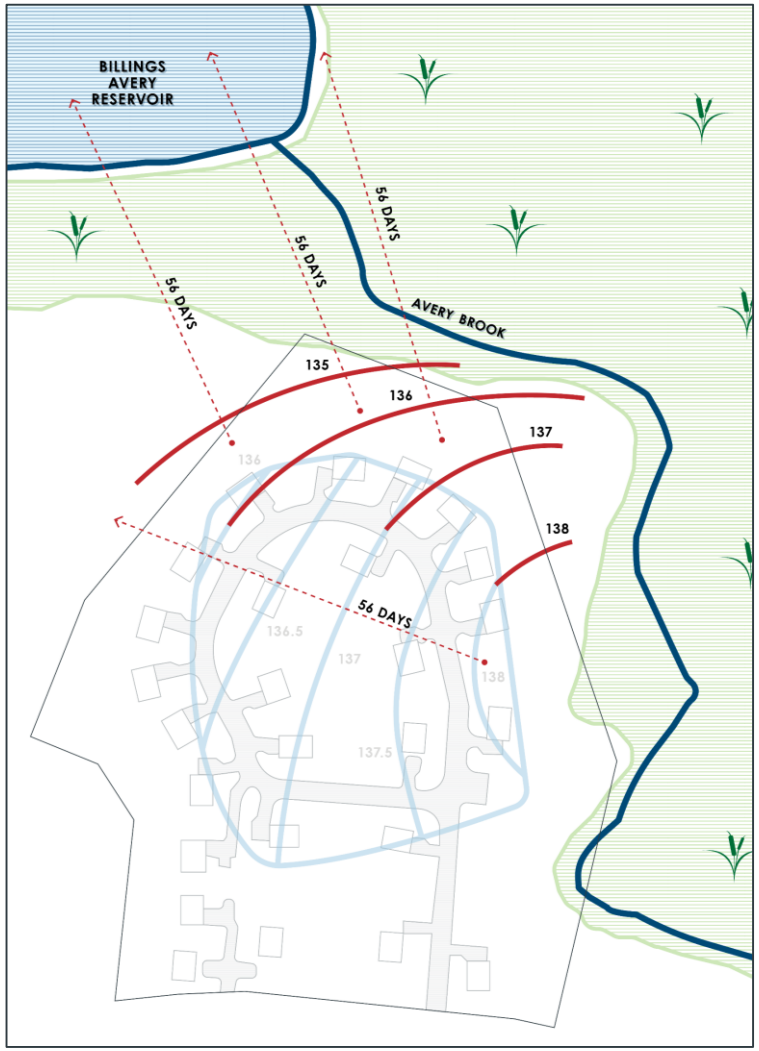
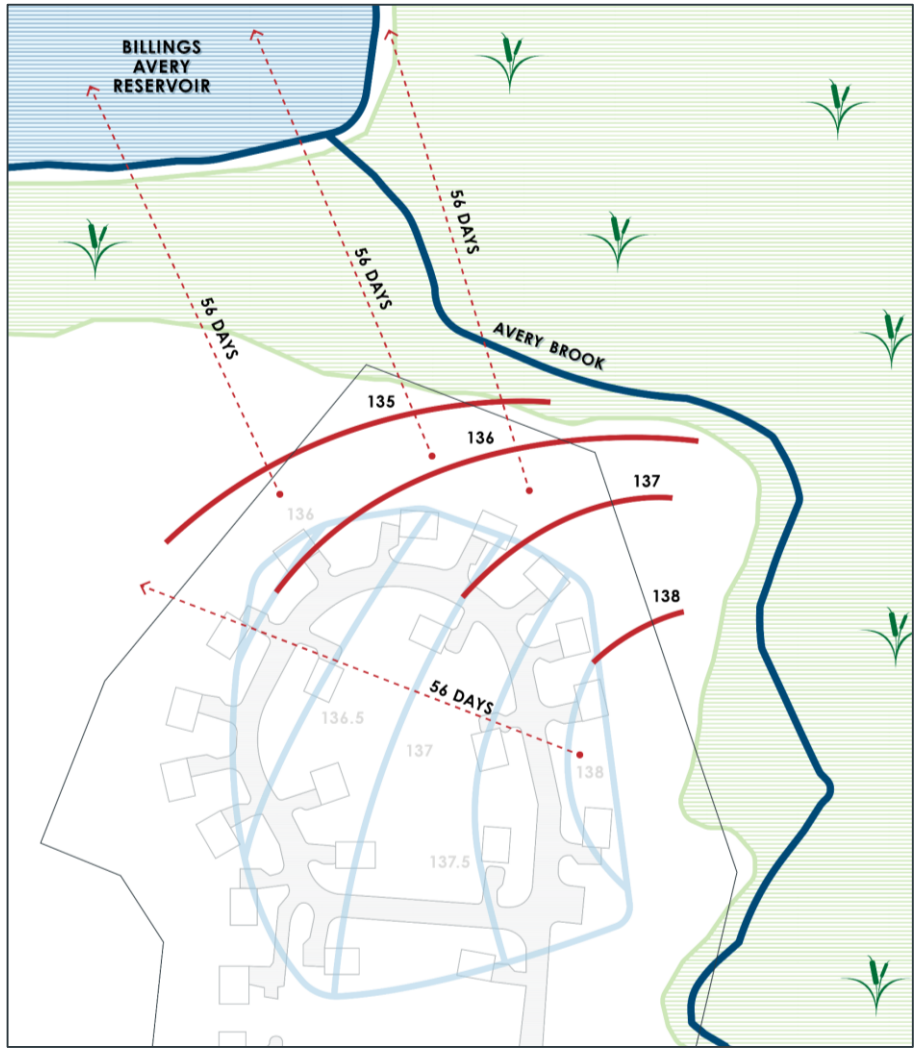
Virus inactivation—reasonable extrapolation





- Consider likely flow to the north
- Consider 56-day inactivation period
- Expect impacts on
  - Avery Brook
  - Billings Avery Reservoir
  - Many on-site potable wells
  - Abutters' wells

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Nitrate contamination

- Drinking water standard = 10 mg/l
- Planning guideline = 5 mg/l
- High nitrates are always associated with measurable amounts of other contaminants
- Average recharge nitrogen concentration
  - Add up all nitrogen sources—pounds per year
  - Add up all recharge sources—million gallons per year
  - Compute composite concentration— mg/l---an average across the site
  - Show that all points along property line are less than 10 mg/l

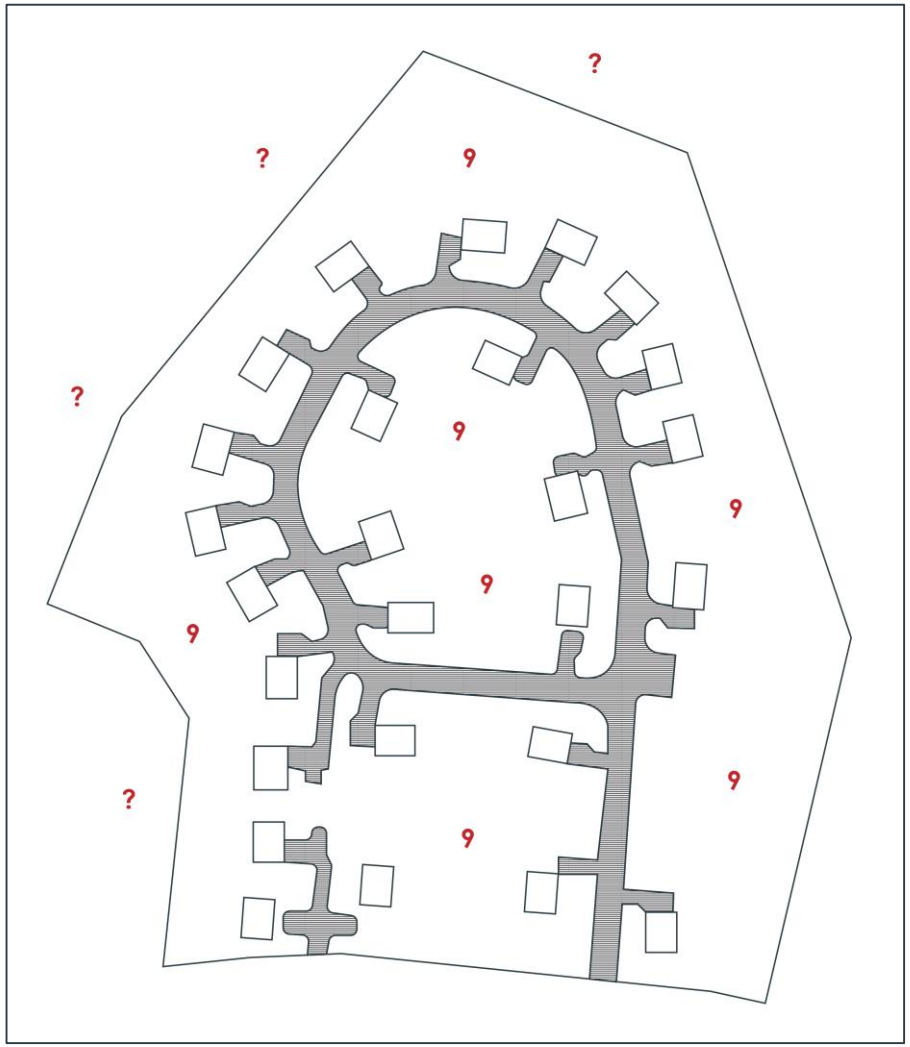
Nitrate contamination

- Wright-Pierce estimate of avg. recharge concentration
- N load from wastewater effluent 640 lb/yr
- N load from fertilizer 70 lb/yr
- N load from stormwater infiltration 10 lb/yr
- Total 720 lb/yr
- Recharge volume 6.7 Mgal/yr
- Average recharge concentration 13 mg/l
- At points along property line > 15 mg/l
- Drinking water standard 10 mg/l

Nitrate contamination

• Developer's estimate of avg. recharge concentration		
• N load from wastewater effluent	640 lb/yr	510 lb/yr
• N load from fertilizer	70 lb/yr	0
• N load from stormwater infiltration	10 lb/yr	0
• Total	720 lb/yr	510 lb/yr
• Estimate of recharge volume	6.6 Mgal/yr	6.8 Mgal/yr
• Average recharge concentration	13 mg/l	9 mg/l
• At points along property line	> 15 mg/l	not reported
• Drinking water standard	10 mg/l	10 mg/l

Groundwater nitrate map



- Based on Fairbank calculations
- Site average recharge concentration---9 mg/l
- Concentrations at property lines not estimated

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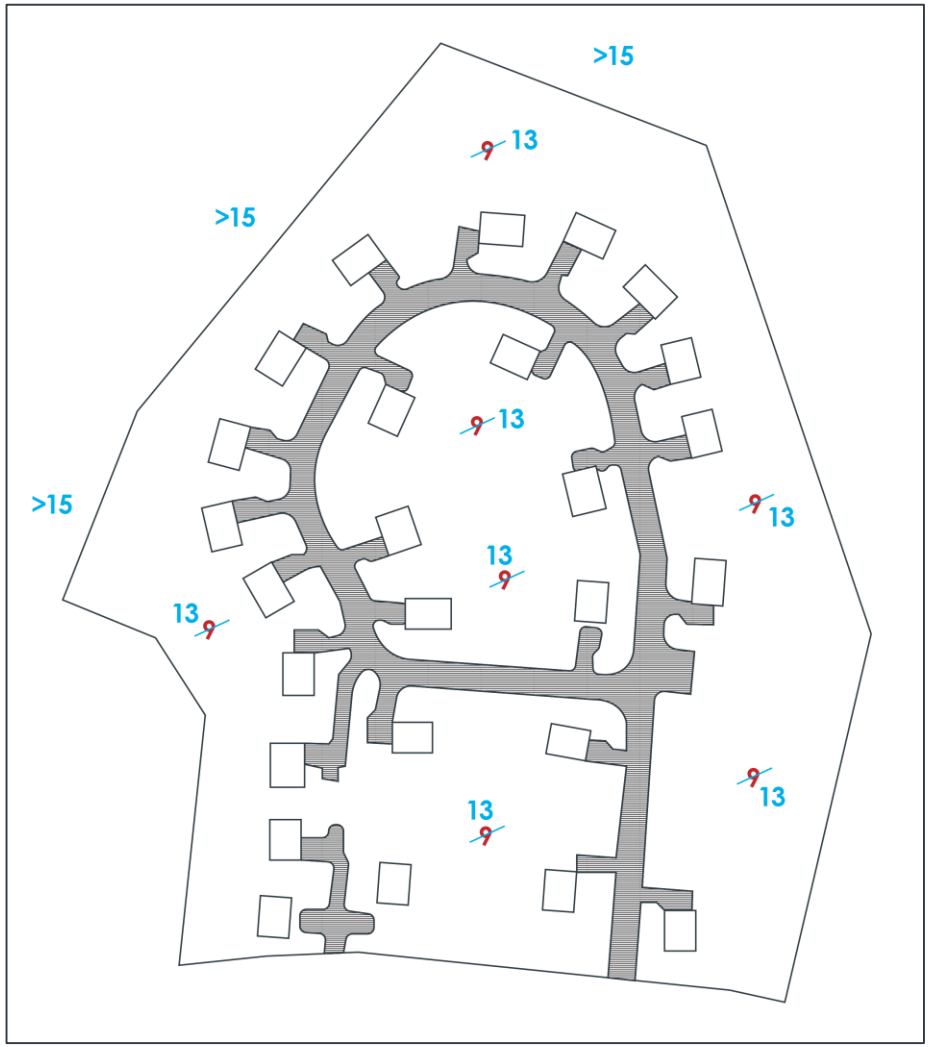
Groundwater nitrate map



- Based on Wright-Pierce calculations
- Site average recharge concentration—13 mg/l
- Property line calculations well above 10 mg/l

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Nitrate contamination

- Many locations within the site where concentrations > 10 mg/l
- Many locations along property line >10 mg/l
- 720 lb/yr headed toward reservoir
- Little attenuation expected in downgradient groundwater
- Project does not comply with DEEP edict to attenuate nitrogen on-site
- No assessment provided of impact on public drinking water supply
- No assessment of impacts on neighboring wells
- Use of on-site wastewater disposal precludes on-site water supply at this development density

Phosphorus impacts

- Sandy loams have little attenuation capability
- Phosphorus in freshwater bodies can cause eutrophication
  - Excessive algal growth
  - Taste and odors
  - Harmful algal blooms (cyanobacteria)
- Unquantified load headed toward reservoir
- Practice in the industry
  - 300-foot buffer zone from septic systems to surface waters
  - This project
    - To Avery Brook 150 feet
    - To reservoir 300 feet
- Developer has not addressed this contaminant

Other contaminants

- Petroleum products—not addressed by developer
- Other organics—not addressed by developer
- Sodium—not addressed by developer

Warning Flags

- CT DPH comment letter (Nov 1, 2022)—recommends a collaborative hydrogeologic investigation of water quality impacts
- LLHD approval letter (several)—all question use of private wells at proposed density
- CT Surface Water Assessment Program—development with lots smaller than 0.5 acres is considered a “high-risk” land use
- NRCS—development restrictions for these sandy soils

General Guidelines and Specific Analyses

- The proposed housing density is significantly higher than planning guidelines issues in several states
  - Average recharge N conc. less than 5 mg/l
  - No more than one bedroom per 10,000 sf of upland
  - No more than 1 dwelling unit per 2 acres of upland
- Those guidelines are based on analyses of specific contaminants and how they are attenuated in the environment
- Wright-Pierce has applied the fundamental scientific basis for those guidelines to this project
- This site can support only a small fraction of the proposed number of homes
- As proposed, this project does not comply with requirements for renovation of nitrates and viruses.

Overall Assessment

- The proposed site is environmentally sensitive
- The developer has not addressed all of the potential contaminants or all of the potential impacts
- The analyses submitted to date understate the impacts of nitrogen and viruses
- The analyses submitted to date are incomplete with respect to phosphorus, petroleum products, other organics and sodium
- Further documentation by the developer is unlikely to show that this site is project is environmentally sound
- The project will have unacceptable impacts on watercourses and their associated wetlands.
- The proposed housing density is significantly higher that CT DEEP has judged to be acceptable for this water supply setting
- This site can support only a small fraction of the proposed number of homes.

THANK YOU