



# Hopewell Township Ordinance for Arsenic Treatment Reduces Cancer Risk

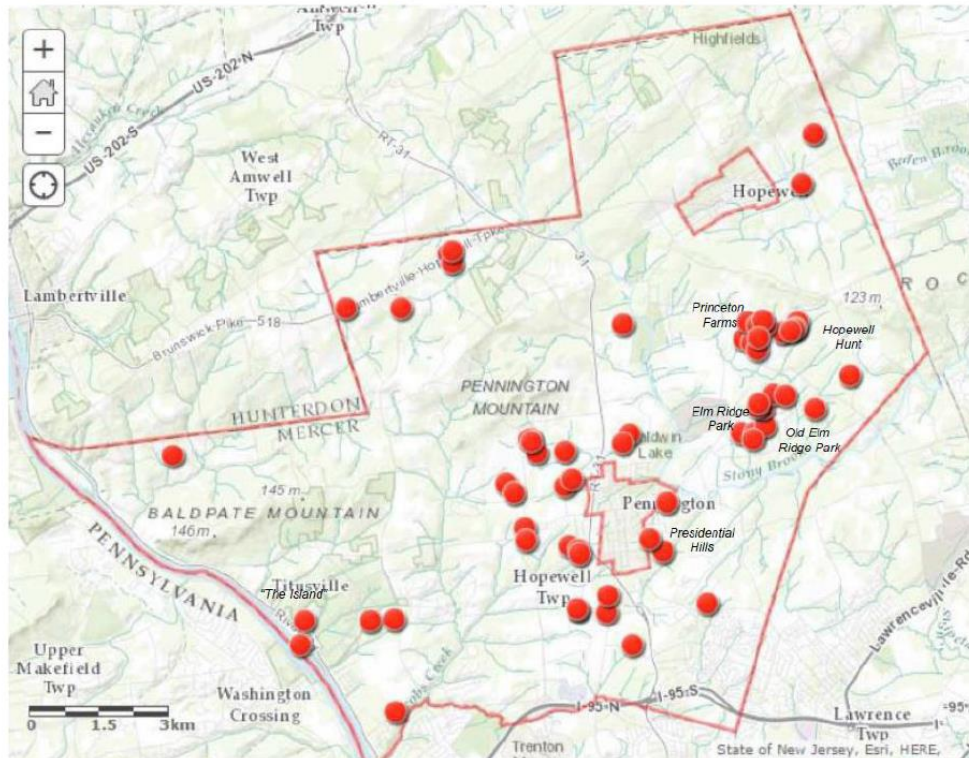
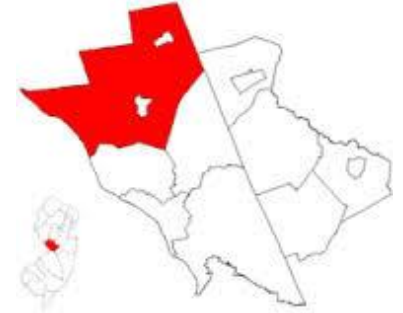
Megan Rockafellow-Baldoni, PhD, MPH

Rutgers University School of Public Health: Dept. Environmental & Occupational Health  
New Jersey Department of Environmental Protection: NJ Geological and Water Survey

**Dissertation Research Committee:** Mark G. Robson, PhD, MPH, DrPH (Chair); Jun-Yan Hong, PhD; Steven Spayd, PhD, MPH, PG; Qingyu Meng, PhD, MS; Pamela Ohman-Strickland, PhD, MS

# Hopewell Township, N.J.

- Located in Mercer County, New Jersey
- Population of ~ 17,000
- Has an ordinance requiring arsenic treatment



TOWNSHIP OF HOPEWELL  
MERCER COUNTY, NEW JERSEY

ORDINANCE NO. 16-17

SECTION I.

16-17 TESTING AND REPORTING REQUIREMENTS FOR WELLS AND SEPTIC SYSTEMS PRIOR TO TRANSFER OF PROPERTY.

<http://tinyurl.com/HopewellWater>

## Hopewell Township Requires:

- Testing
  - Homeowners: PWTA list during house sale
  - Renters/Landlords: Change in tenancy or
    - Annually: Total coliform
    - Tri-Annually: VOC, Lead, Arsenic, Gross Alpha, Cadmium
- Whole-house treatment system (Point of Entry) for any contaminants that exceed primary standards
- Post-installation test sent to health dept.
- Deed Amendment
- Maintenance Contract

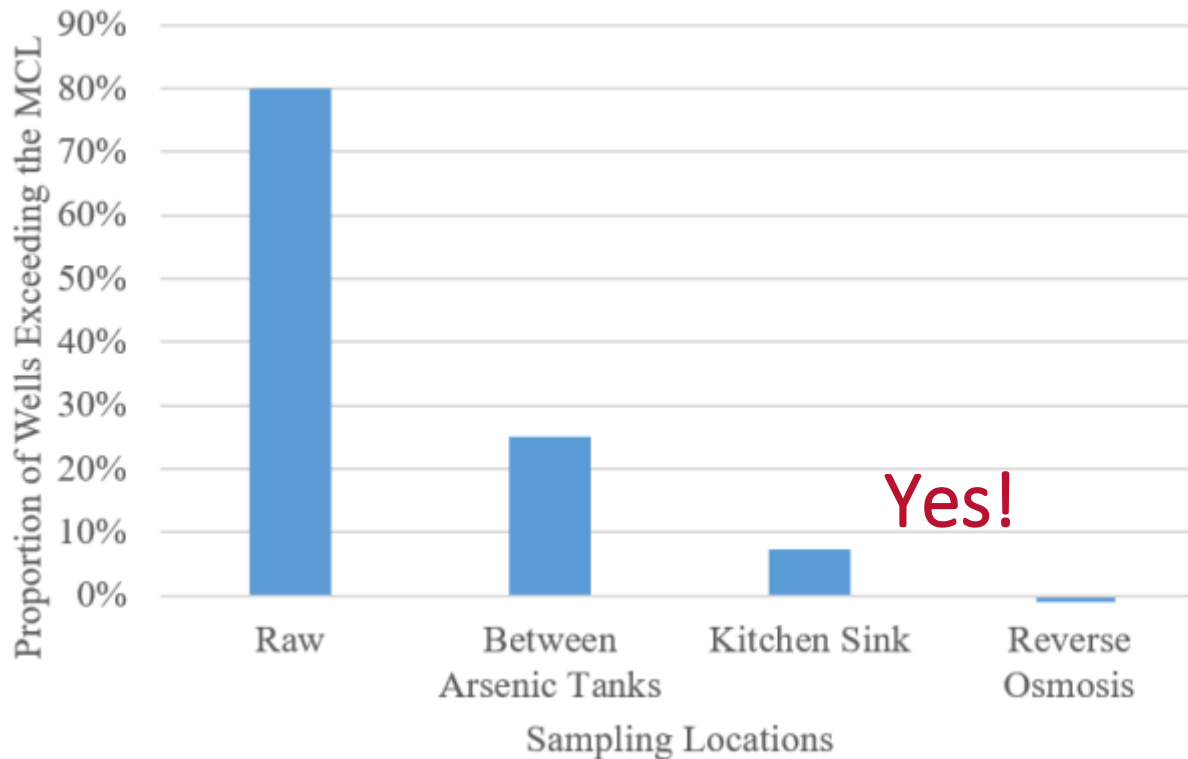
### Arsenic System POET Criteria

3. Must be redundant in design with dual tanks in series that utilizes Granular Ferric Adsorption media or other media as approved by NJDEP. Systems must contain all components as outlined by the NJDEP dual tank schematic found on the information circular available on the NJDEP web site.  
[http://www.state.nj.us/dep/pwta/Arsenic\\_Treatment.pdf](http://www.state.nj.us/dep/pwta/Arsenic_Treatment.pdf)
  - a. Sampling ports for raw, between tanks (middle), and finish water
  - b. Sediment pre-filter with replaceable cartridge to screen to 5-micron nominal
  - c. Capable of preventing media compacting resulting from fine sediments and constant gravity as well as eliminating the possibility of channeling  
Note: both tanks that hold the media must have an electronic backwash valve set to function no more than once every 20-30 days.
  - d. Vessels that house the media must be of industry standard type and sizing to permit future compatibility for new media technology adaptability
  - e. A water totalizer or meter on the finish water line to accurately provide treated water volume in gallons to be recorded at each time of maintenance testing.
  
4. The treatment system must remove all forms of arsenic, ie AS3 and AS5
  
5. Pre-treatment system must be employed for levels in excess of:
  - a. iron above 0.3 mg/L
  - b. manganese above 0.05 mg/L
  - c. sulfur above 1.0 mg/L or smell detection
  - d. hardness above 300 mg/L
  - e. pH range 6.5 – 8.0
  - f. silica less than 30 mg/L
  
6. Property owners are required to maintain a service agreement. The agreement must include:
  - a. Water test samples, all of which have been taken from the middle sampling port or between the tanks.



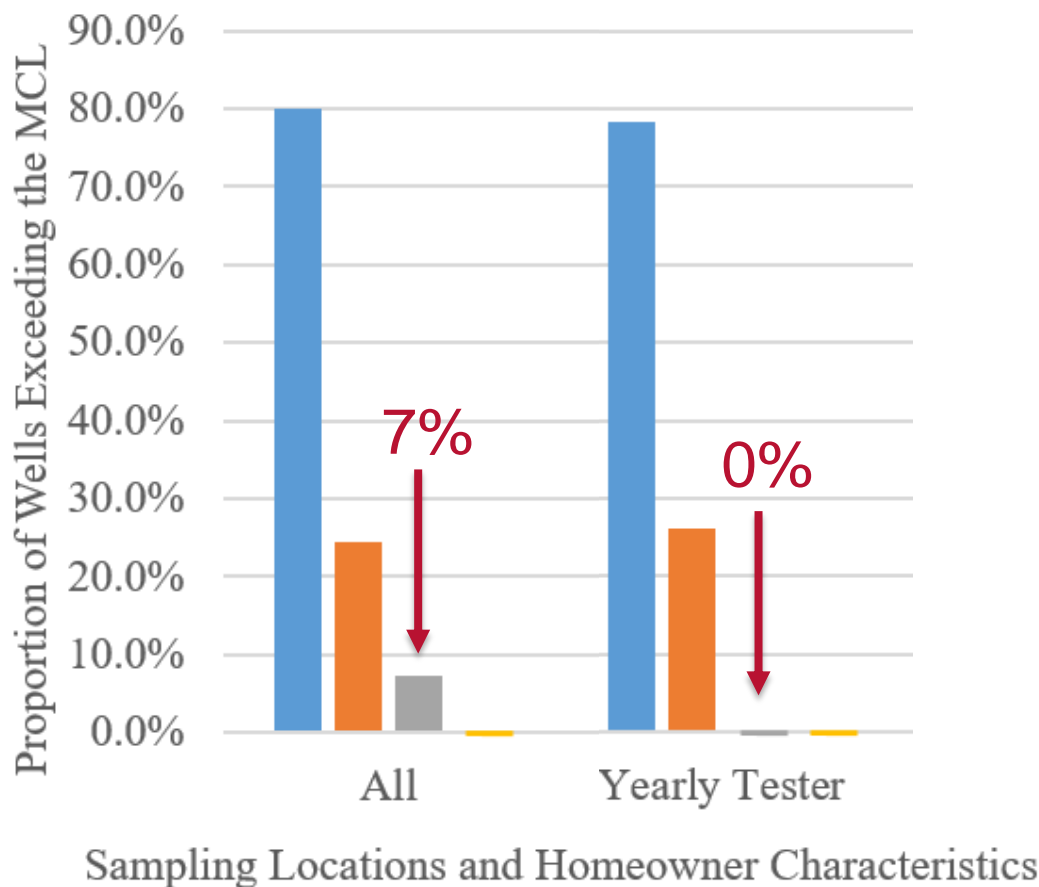
# Is Hopewell's Ordinance Working?

*Proportion of Water Samples Exceeding the MCL at Each Sampling Location*



- In other NJ towns, homeowners are likely to install a single tank system.
- 80 % of the homes with treatment systems in Hopewell exceed the MCL in their raw water
- 25% of the homes exceed the standard after one treatment tank
- 7% exceed the MCL after a second tank
- **All homes that have a reverse osmosis back-up system have arsenic at non-detect levels**

# MCL Exceedances by Well Owner Characteristics



■ Raw ■ Between Arsenic Tanks ■ Kitchen Sink ■ RO

### No Treatment

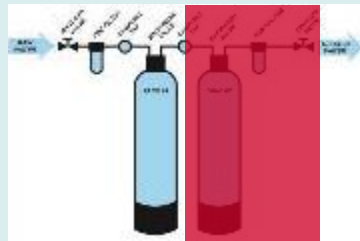


121 lifetime cancer cases (1.7 cases/year)

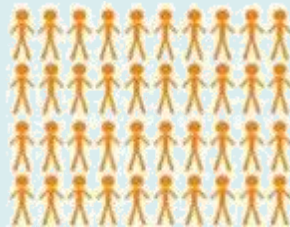


Excess Lifetime Bladder and Lung Cancer Risk for Hopewell Township due to Arsenic in Drinking Water

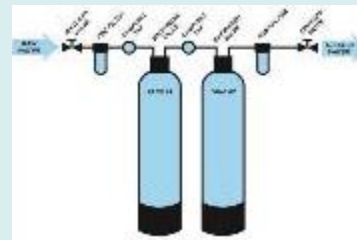
### 1 Arsenic Tank



40 cancer cases (0.57 cases/year)



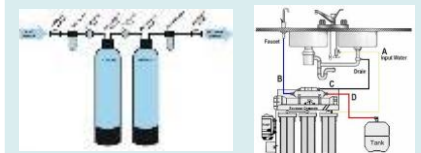
### 2 Arsenic Tanks



16 cancer cases (0.22 cases/year)



### 2 Arsenic Tanks and R.O.



Less than 1 cancer case



## Summary

Hopewell's ordinance will reduce the incidence of excess lifetime (70-year) arsenic-related bladder and lung cancers from 121 (1.7 cancer cases/year) to 16 (0.2 cancer cases/year) **preventing 105 lifetime cancer cases** in 70 years (1.5 cases/year)

Because the high risk of cancer from arsenic can be mitigated with effective arsenic water treatment systems, **this ordinance should be considered a model for other municipalities.**



### Arsenic Exposure and Cancer Risk Reduction with Local Ordinance Requiring Whole-House Dual-Tank Water Treatment Systems



Journal:	<i>Human and Ecological Risk Assessment: An International Journal</i>
Manuscript ID	Draft
Manuscript Type:	Original Article
Keywords:	arsenic, arsenic water treatment, arsenic exposure, well water, New Jersey
Abstract:	<p>Arsenic, a known human carcinogen, occurs naturally in groundwater in New Jersey and many other states and countries. A number of municipalities in the Piedmont, Highlands, and Valley and Ridge Physiographic Provinces of New Jersey have a high proportion of wells that exceed the New Jersey maximum contaminant level (MCL) of 5 µg/L. Hopewell Township, located in Mercer County and the Piedmont Province, has a progressive local ordinance which requires the installation of dual-tank, point-of-entry (POE) treatment systems on affected wells. This provided a unique study opportunity. Of the 55 homes with dual-tank POE treatment systems recruited into this study, 51 homes (93%) had arsenic levels under the MCL at the kitchen sink, regardless of years in service and/or maintenance schedule adherence.</p> <p>We estimate that Hopewell's ordinance will reduce the incidence of excess lifetime (70-year) arsenic-related bladder and lung cancers from 121 (1.7 cancer cases/year) to 16 (0.2 cancer cases/year) preventing 105 lifetime cancer cases in 70 years (1.5 cases/year). Because the high risk of cancer from arsenic can be mitigated with effective arsenic water treatment systems, this ordinance should be considered a model for other municipalities.</p>



## Questions/Contact Info

Megan Rockafellow-Baldoni, PhD, MPH

[Megan.Rockafellow-Baldoni@dep.nj.gov](mailto:Megan.Rockafellow-Baldoni@dep.nj.gov)

609-633-1011