What's In Your Water?

Establishing a Drinking Water Testing Program in Your Community

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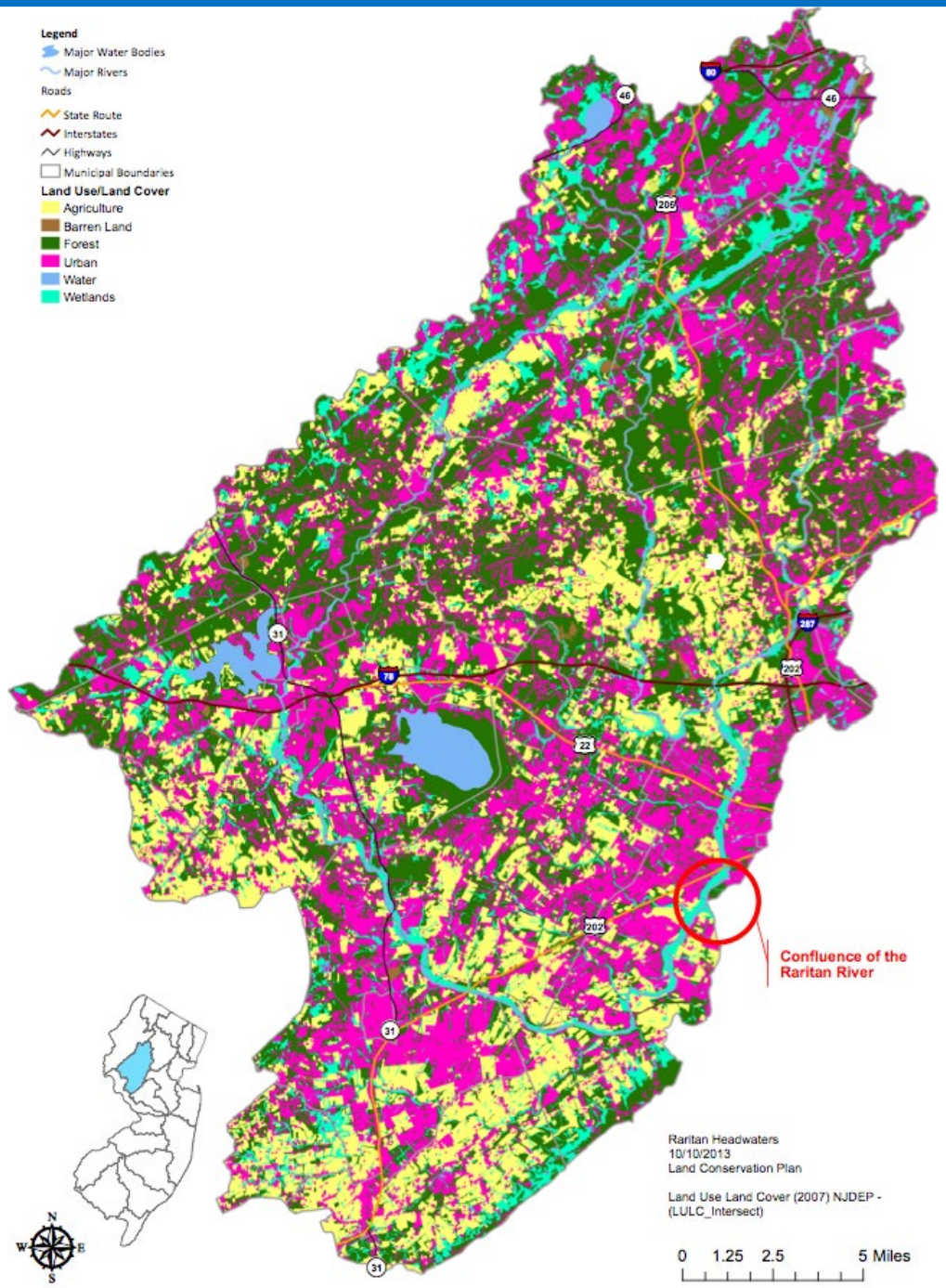
Raritan Headwaters

Your water is our mission.

Watershed Tools for Local Leaders Seminar Series
April 12, 2018

…there's a complicated mix of **forests,** farms, and folks here, all in need of high quality water.



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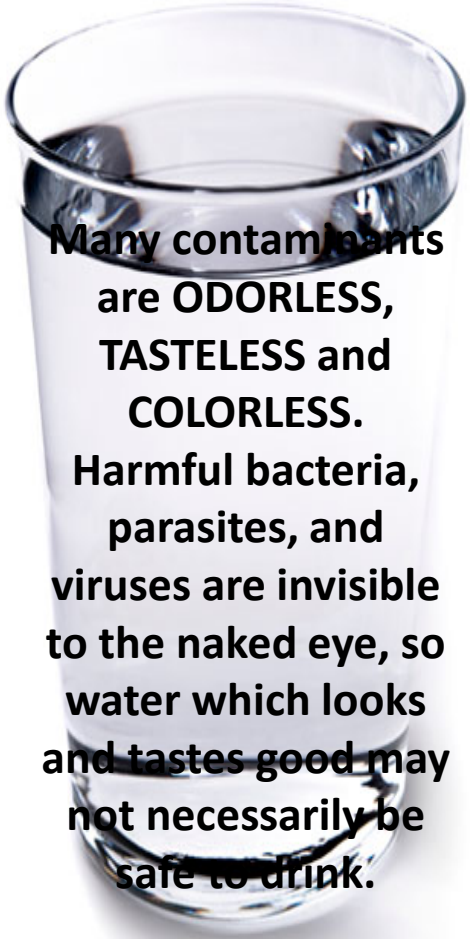

Many contaminants are ODORLESS, TASTELESS and COLORLESS. Harmful bacteria, parasites, and viruses are invisible to the naked eye, so water which looks and tastes good may not necessarily be safe to drink.

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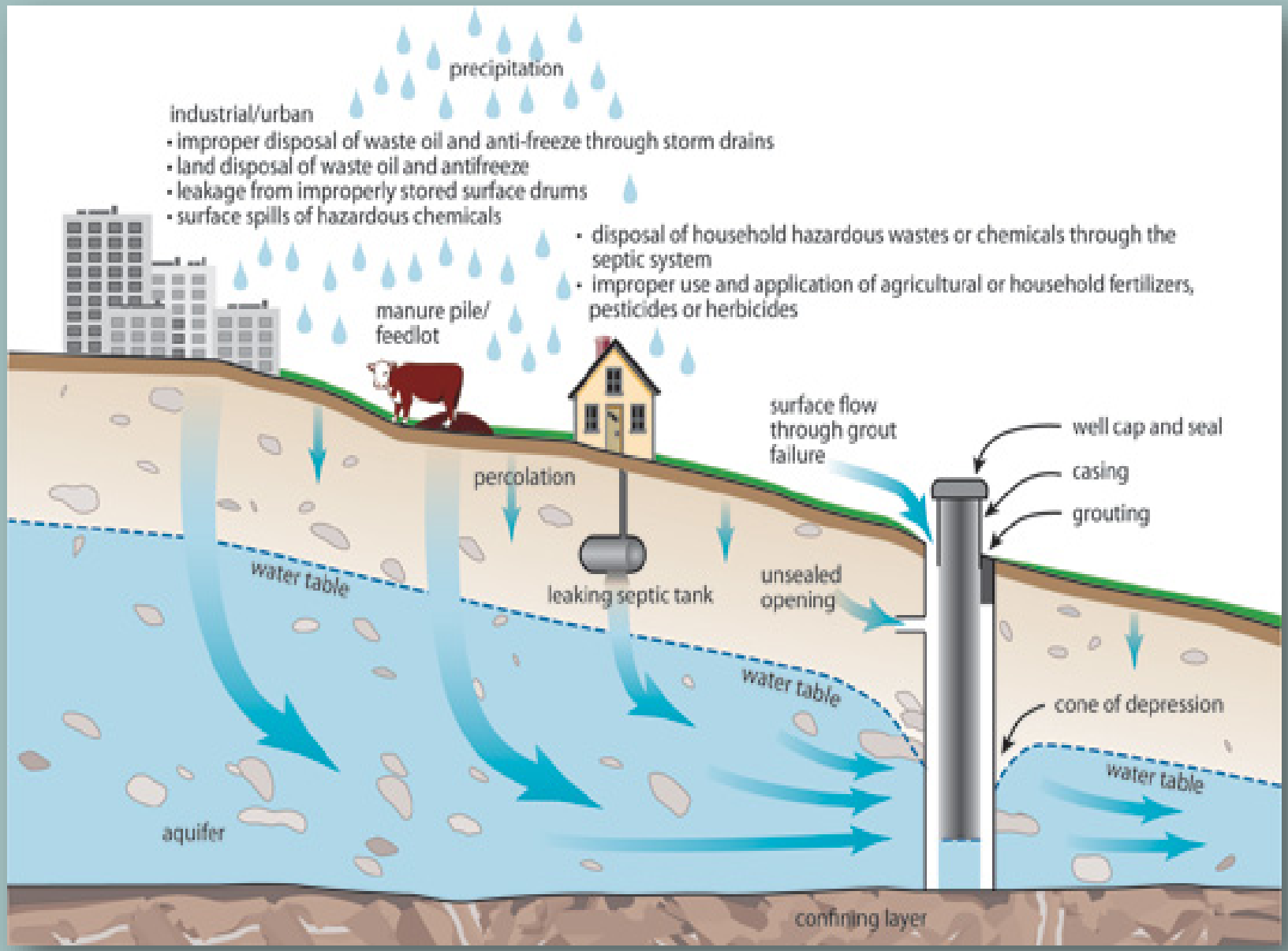
Groundwater Contamination



WHAT'S IN YOUR WATER?

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DRINKING WATER PROTECTION IN NEW JERSEY

Private Well Test Act

- Requires testing of private residential wells when sold or leased
- Proposal to add required testing for:
  - 1,2,3-trichloropropane (TCP)
  - 1,2-dibromomethane (EDB)
  - 1,2-dibromo-3-chloropropane (DBCP)
  - PFOA
  - Arsenic
  - Uranium
  - Gross Alpha

Safe Drinking Water Act

- Requires periodic testing by public water utilities
- Established Drinking Water Quality Institute (DWQI)
- Proposal to add required testing for:
  - 1,2,3-TCP
  - EDB/DBCP
  - Perfluorononanoic Acid (PFNA)
  - Radiologicals

Federal and NJ State Primary and Secondary Drinking Water Standards as of February 2005

Volatile Organic Compounds

Contaminants	Maximum Contaminant Levels [MCL] [µg/l or ppb]
Benzene	1*
Carbon Tetrachloride	2*
1,2-Dichlorobenzene	600
1,3-Dichlorobenzene	600*
1,4-Dichlorobenzene	75
1,1-Dichloroethane	50*
1,2-Dichloroethane	2*
1,1-Dichloroethylene	2*
cis-1,2-Dichloroethylene	70
trans-1,2-Dichloroethylene	100
1,2-Dichloropropane	5
Ethylbenzene	700
Methyl tertiary Butyl Ether	70*
Methylene Chloride	3*
Monochlorobenzene	50*
Naphthalene	300*
Styrene	100
1,1,2,2-Tetrachloroethane	1*
Tetrachloroethylene	1*
Toluene	1,000
1,2,4-Trichlorobenzene	9*
1,1,1-Trichloroethane	30*
1,1,2-Trichloroethane	3*
Trichloroethylene	1*
Vinyl Chloride	2
Xylenes [total]	1,000*

* N.J. MCL [A-280]

Key: One milligram per liter [mg/l] = one part per million = one cent in $10,000 or one second in 12 days.
One microgram per liter [µg/l] = one part per billion = one cent in $10,000,000 or one second in 32 years.

Trihalomethanes 80 µg/l [ppb] running annual average
Total of Dichlorobromomethane, Chlorodibromomethane, Bromoform and Chloroform.

Haloacetic Acids 60 µg/l ppb running annual average
Total of Monochloroacetic, Dichloroacetic, Trichloroacetic, Bromoacetic and Dibromoacetic acids.

Bromate (plants using ozone) 10 µg/l (ppb) running annual average

Chlorite (plants using chlorine dioxide) 1,000 µg/l (ppb) daily/follow-up monitoring

Radionuclides Combined radium 226/228 mcl is 5 picocuries/l (pCi/l); gross alpha particle radioactivity (including radium 226 but excluding radon and uranium) MCL is 15 pCi/l; beta/photon emitters MCL is 4 mrem/yr; uranium MCL is 30 µg/l.

Turbidity No more than 5% of the samples may exceed 0.3 NTU, nor any sample exceed 1 NTU.

Coliform bacteria standards are based on the presence or absence of coliforms in a sample. The number of samples collected by a public water system is determined by the size of the population served. A system collecting at least 40 samples/month can have coliform in no more than 5% of the samples. A system collecting fewer than 40 samples/month can have no more than one coliform positive. Any number exceeding these amounts triggers an MCL exceedence.

Inorganics

Contaminants	Maximum Contaminant Levels [MCL] [µg/l or ppb]
Antimony	6
Arsenic	5 * #
Asbestos	7 X 10^6 fibers/l > 10µm
Barium	2,000
Beryllium	4
Cadmium	5
Chromium	100
Copper	1,300**[AL]
Cyanide	200
Fluoride	4,000
Lead	15**[AL]
Mercury	2
Nickel	+
Nitrate[as nitrogen]	10,000
Nitrite	1,000
[combined nitrate/nitrite	10,000]
Selenium	50
Thallium	2

**An [AL] action level is not an MCL. It is a trigger point at which remedial action is to take place.

+No MCL - Monitoring Required

Effective January 23, 2006

* N.J. MCL [A-280]

Synthetic Organic Compounds

Contaminants	Maximum Contaminant Levels [MCL] [µg/l or ppb]
Alachlor	2
Aldicarb	+
Aldicarb Sulfone	+
Aldicarb Sulfoxide	+
Atrazine	3
Benzo[a]pyrene	0.2
Carbofuran	40
Chlordane	0.5*
Dalapon	200
Dibromochloropropane [DBCP]	0.2
Di[2-ethylhexyl]adipate	400
Di[2-ethylhexyl]phthalate	6
Dinoseb	7
Diquat	20
Endothall	100
Endrin	2
Ethylene dibromide [EDB]	0.05
Glyphosate	700
Heptachlor	0.4
Heptachlor Epoxide	0.2
Hexachlorobenzene	1
Hexachlorocyclopentadiene	50
Lindane	0.2
Methoxychlor	40
Oxamyl	200
PCBs	0.5
Pentachlorophenol	1
Picloram	500
Simazine	4
Toxaphene	3
2,3,7,8-TCDD [Dioxin]	3 X 10^{-8}
2,4-D	70
2,4,5-TP [Silvex]	50

* N.J. MCL [A-280]

+No MCL - Monitoring Required

For a detailed explanation of the Safe Drinking Water Program, refer to the Federal Safe Drinking Water Act regulations [40 CFR Parts 141, 142, 143] and the New Jersey Safe Drinking Water regulations [N.J.A.C. 7:10-1 et seq.].

Secondary Standards

[primarily aesthetic]

Physical Characteristics	Recommended Upper Limit or Optimum Range
Color	10 color units (standard cobalt scale)
pH	6.5 to 8.5 (optimum range)
Odor	3 Threshold odor number
Taste	No objectionable taste

Chemical Characteristics	Recommended Upper Limit [mg/l or ppm]
ABS/L.A.S.	0.5
Aluminum	0.2
Chloride	250
Fluoride	2
Hardness (as CaCO3)	250
Iron	0.3
Manganese	0.05
Silver	0.1
Sodium	50
Sulfate	250
Total dissolved solids	500
Zinc	5

New Jersey Department of Environmental Protection

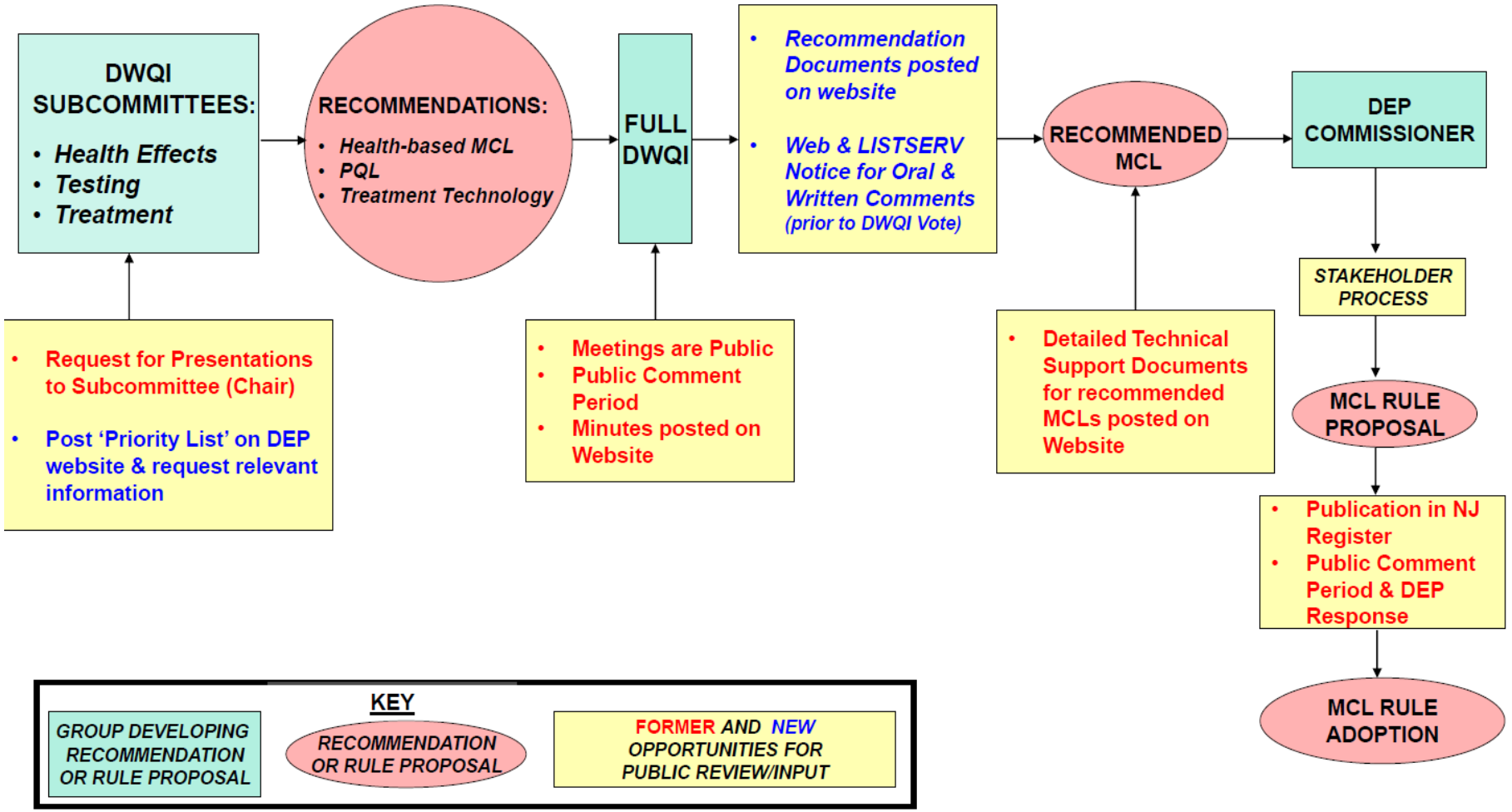
Division of Water Supply

Bureau of Safe Drinking Water

P.O. Box 426
Trenton, New Jersey 08625-0426

Tel. # 609-292-5550
Fax. # 609-292-1654

PUBLIC PARTICIPATION IN MCL DEVELOPMENT PROCESS



New Jersey Drinking Water Watch

Water Syst

PWSID:	NJ2004002	Water System Type:	Community (C)
Water System Name:	NJ AMERICAN WATER - RARITAN	System Status:	A
		System Ownership:	Private
Principal County & City:	UNION, ELIZABETH CITY- 2004	Source Water Type/Operating Category:	SW

WATER SYSTEM INFORMATION | Total Coliform Results | Chemical Results | Monitoring | System Facilities | Site Visits | Violations | Other Data | PRINTER FRIENDLY PAGE

Lead/Copper Results for Monitoring Period: 07/01/2017--12/31/2017

Lead
63 Samples; 90th %ile: 0.003 MG/L

Collection Date	Sample Pt ID	Sample #^	Result*	Analysis Date	Date Received
09/22/2017	PBCU166	36504501	<0.001 MG/L	10/02/2017	10/05/2017
09/21/2017	PBCU159	36504801	0.002 MG/L	09/27/2017	10/05/2017
09/21/2017	PBCU171	36504201	0.001 MG/L	09/27/2017	10/05/2017
09/20/2017	PBCU164	36504101	0.001 MG/L	09/27/2017	10/05/2017
09/20/2017	PBCU10	36504601	0.017 MG/L	10/02/2017	10/05/2017
09/19/2017	PBCU163	36503801	<0.001 MG/L	09/27/2017	10/05/2017
09/19/2017	PBCU79	36503901	<0.001 MG/L	09/27/2017	10/05/2017
09/19/2017	PBCU94	36504001	<0.001 MG/L	09/27/2017	10/05/2017
09/13/2017	PBCU123	36504401	0.001 MG/L	10/02/2017	10/05/2017
09/13/2017	PBCU124	36504701	<0.001 MG/L	09/27/2017	10/05/2017
09/08/2017	PBCU115	36509701	0.001 MG/L	09/15/2017	10/05/2017
08/30/2017	PBCU180	36503601	0.004 MG/L	09/15/2017	10/05/2017
08/30/2017	PBCU139	36509601	<0.001 MG/L	09/15/2017	10/05/2017
08/30/2017	PBCU43	36503701	<0.001	09/15/2017	10/05/2017

Copper
63 Samples; 90th %ile: 0.37 MG/L

Collection Date	Sample Pt ID	Sample #^	Result*	Analysis Date	D
09/22/2017	PBCU166	36504501	0.129 MG/L	10/02/2017	
09/21/2017	PBCU159	36504801	0.104 MG/L	09/27/2017	
09/21/2017	PBCU171	36504201	0.331 MG/L	09/27/2017	

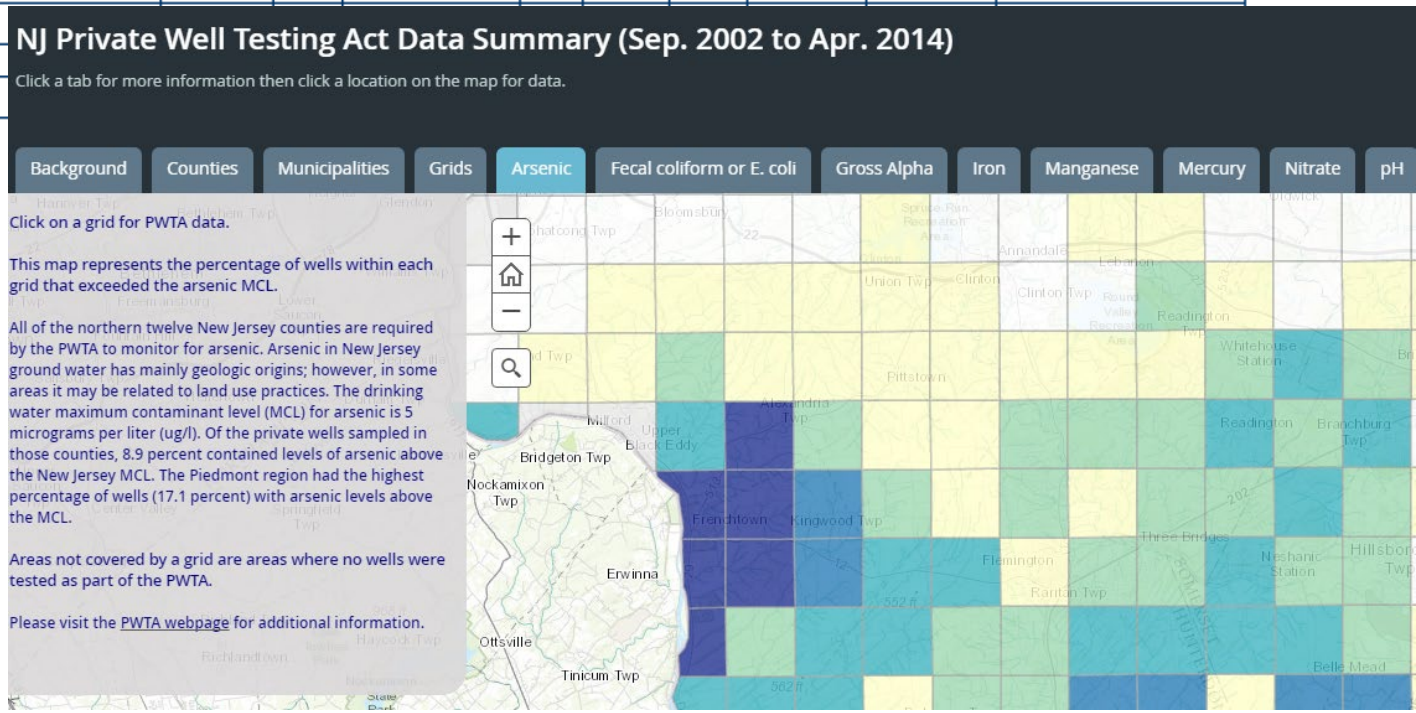
- https://www9.state.nj.us/DEP_WaterWatch_public/NJMap.jsp

List of Required Parameters for Private Well Testing

http://www.nj.gov/dep/dsr/pwta/

	Total Coliform	*Fecal Coliform or E.coli	Nitrate	Iron	Manganese	pH	VOCs	Lead	Arsenic	Mercury	Gross Alpha Particle Activity
Atlantic	X	X	X	X	X	X	X	X		X	x
Bergen	X	X	X	X	X	X	X	X	X		
Burlington	X	X	X	X	X	X	X	X		X	x
Camden	X	X	X	X	X	X	X	X		X	x
Cape May	X	X	X	X	X	X	X	X		X	x
Cumberland	X	X	X	X	X	X	X	X		X	x
Essex	X	X	X	X	X	X	X	X	X		
Gloucester	X	X	X	X	X	X	X	X		X	x
Hudson	X	X	X	X	X	X	X	X	X		
Hunterdon	X	X	X	X	X	X	X	X	X		x
Mercer	X	X	X	X	X	X	X	X	X		x
Middlesex	X	X	X	X	X	X	X	X	X		x
Monmouth	X	X	X	X	X	X	X	X		X	x
Morris	X	X	X	X	X	X	X	X	X		
Ocean	X	X	X	X	X	X	X	X		X	x
Passaic	X	X	X	X	X	X	X	X	X		
Salem	X	X	X	X	X	X	X	X		X	x
Somerset	X	X	X	X	X	X	X	X	X		
Sussex	X										
Union	X										
Warren	X										

Google
"PWTA map"
and find your address!

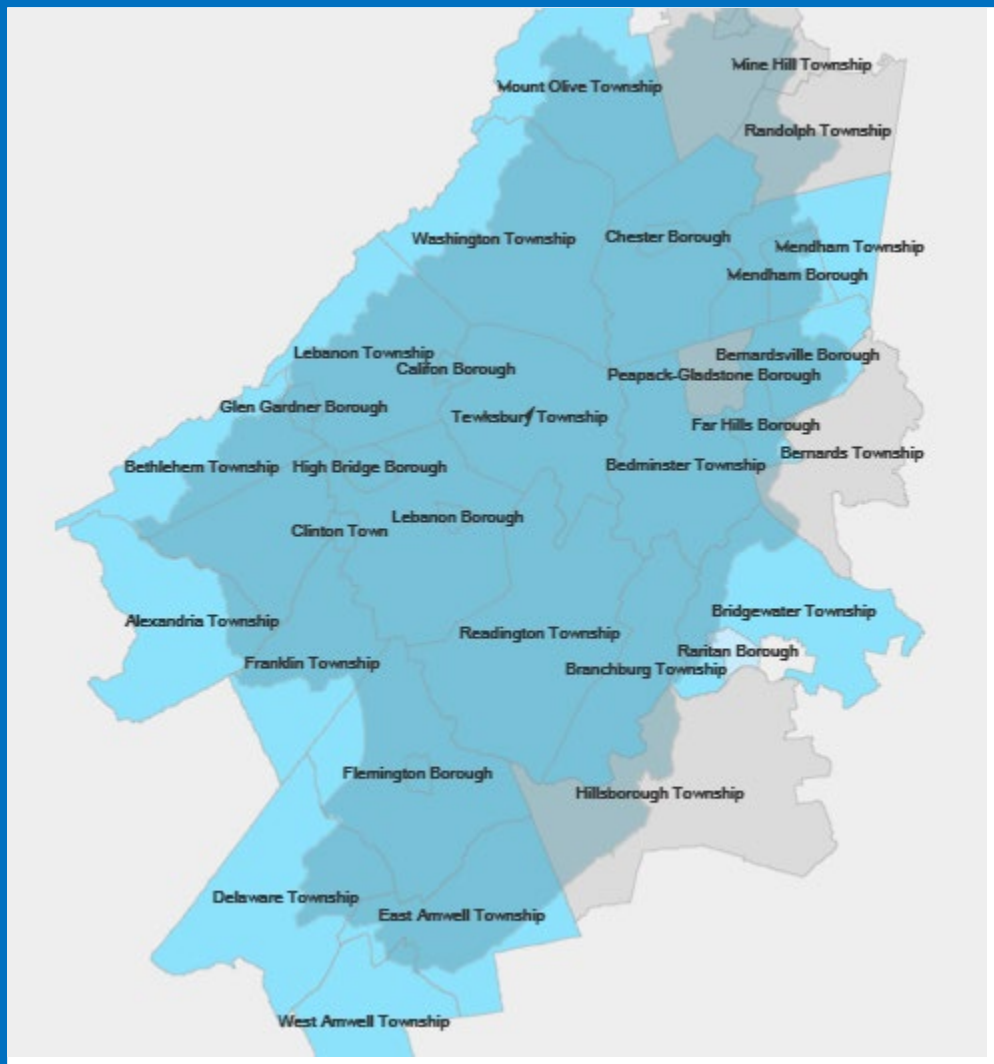


WELL TESTING PROGRAM

- **RHA partners with municipalities throughout the region to offer residents the opportunity to test their well water.**
- **Testing is done by a state-certified laboratory for analysis.**
- **Test results come directly to us, and we share the results directly with residents.**

partnership * community service * convenience * affordability * privacy

The only way to know your well water is safe is to test it!



~1,300 wells tested annually

Well Testing Throughout the Watershed

- ✓ Established in 1974
- ✓ Over 15,000 records
- ✓ 80% of residents rely on well water

CWT Participating Municipalities

- Alexandria Township
- Bedminster Township
- Bernardsville Borough
- Bethlehem Township
- Branchburg Township
- Califon Borough
- Chester Township
- Chester Borough
- Clinton Township
- Delaware Township
- East Amwell Township
- Far Hills Borough
- Franklin Township
- Kingwood Township
- Lebanon Township
- Mendham Township
- Mount Olive Township
- Peapack-Gladstone
- Raritan Township
- Readington Township
- Tewksbury Township
- Union Township
- Washington Township
- West Amwell Township

Raritan Headwaters

Our community of private well owners is growing!

The RHA Well Testing Program continues to be a reliable resource for residents to monitor their drinking water.

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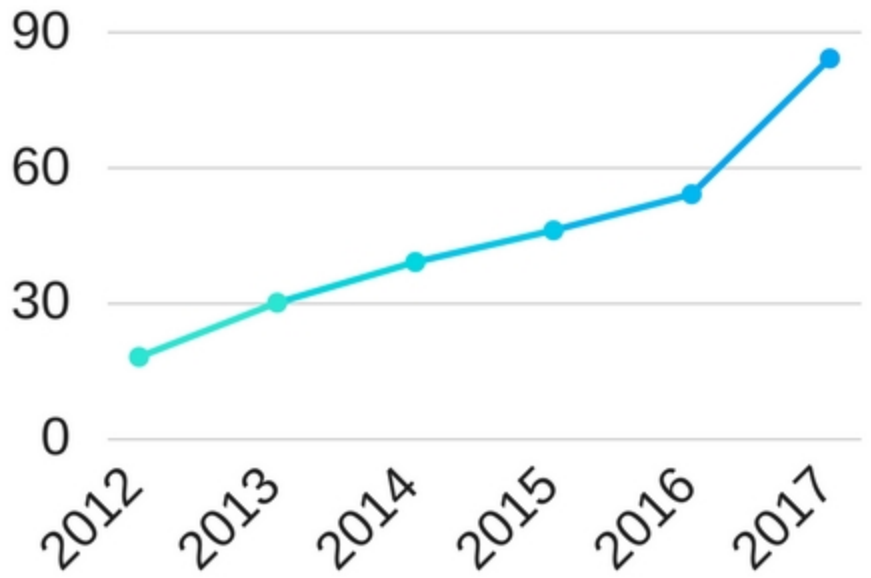
Lebanon Twp. Community Well Testing Participation



18 wells tested in 2012
84 wells tested in 2017!

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WHAT WORKS?

Convenience

Residents find the program's accessibility and affordability appealing. This is key to increasing participation rates.

Communication

Township generated messages are an effective means of communicating with the public. Residents need reminders to test!

Community

Health professionals and groundwater professionals can work together to help well owners.

Education

Well owners come from every social, economic and educational class. Many homeowners are new to rural life and the responsibility that comes with a well.

STEPS TO BETTER PARTICIPATION

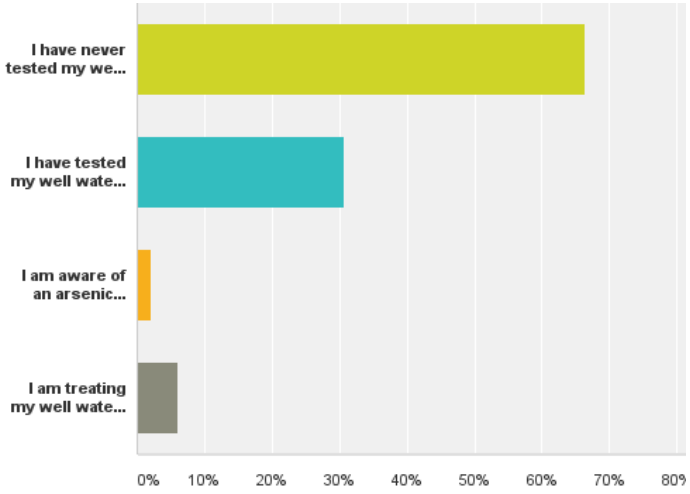
1. **Support** township partners in communication efforts and provide resources for education and outreach
2. **Emphasize** convenience, privacy and affordability
3. **Disseminate** information to the public regarding local contamination risks and the need to test. Work with partners in healthcare fields for broader reach

Informational Survey for Private Well Owners

Community Well Test Participant Pilot Study, Fall 2016

A Joint Project of Raritan Headwaters and Columbia University Superfund Research Program (Community Engagement and Research Translation Cores)

- 88% heard about the program through a township communication
- 64% tested through RHA out of convenience
- 70% of respondents have never tested their well for arsenic



What is your experience with arsenic? Please choose all that apply

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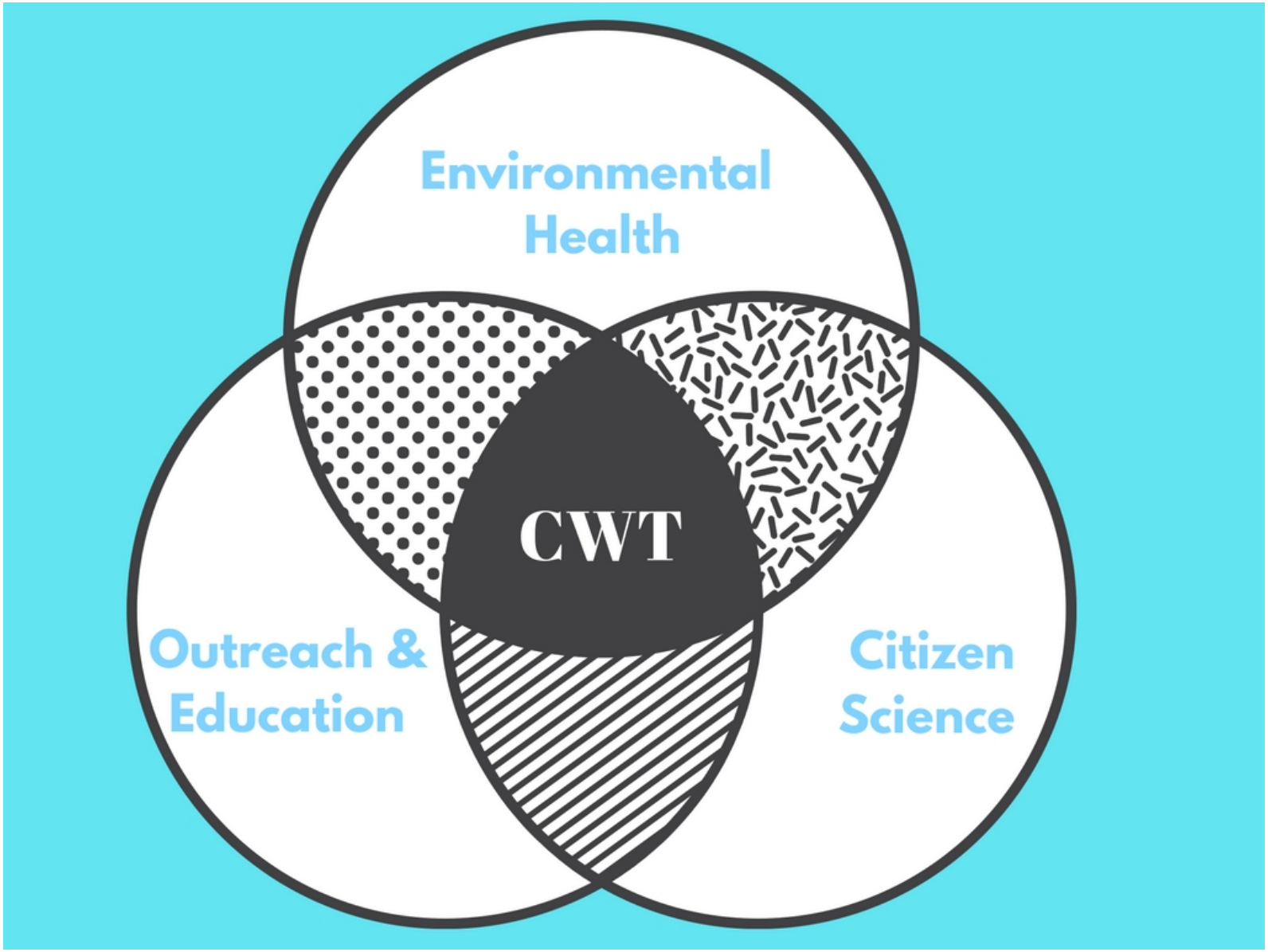
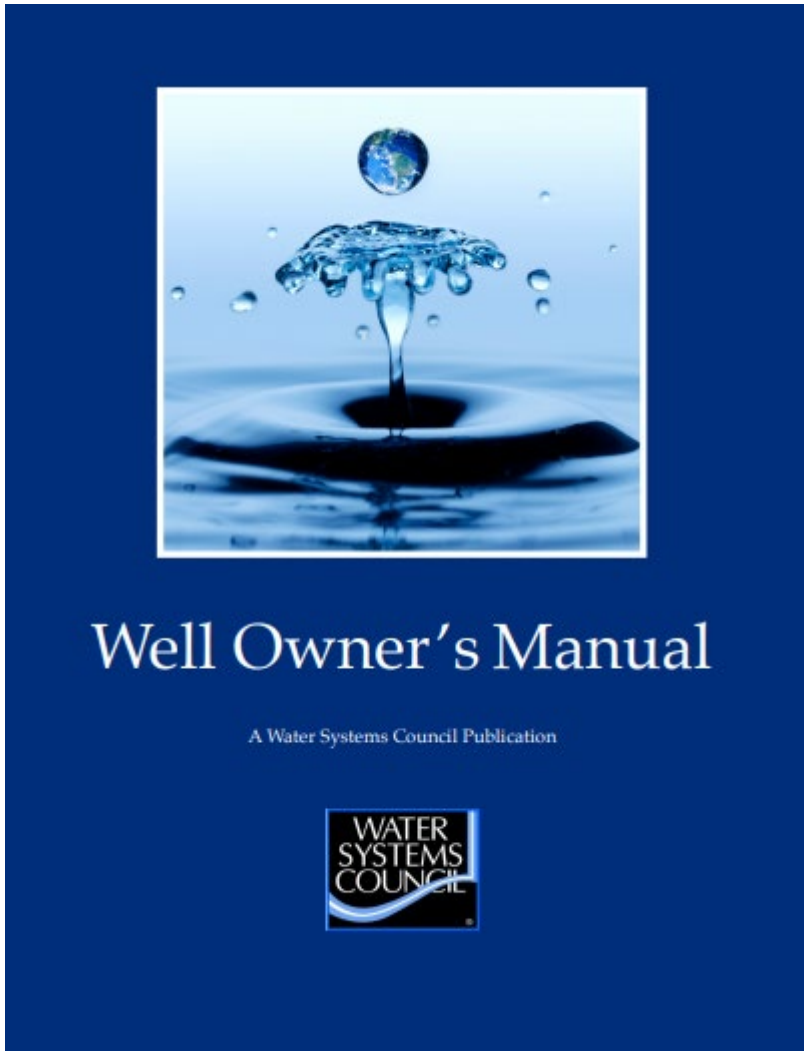
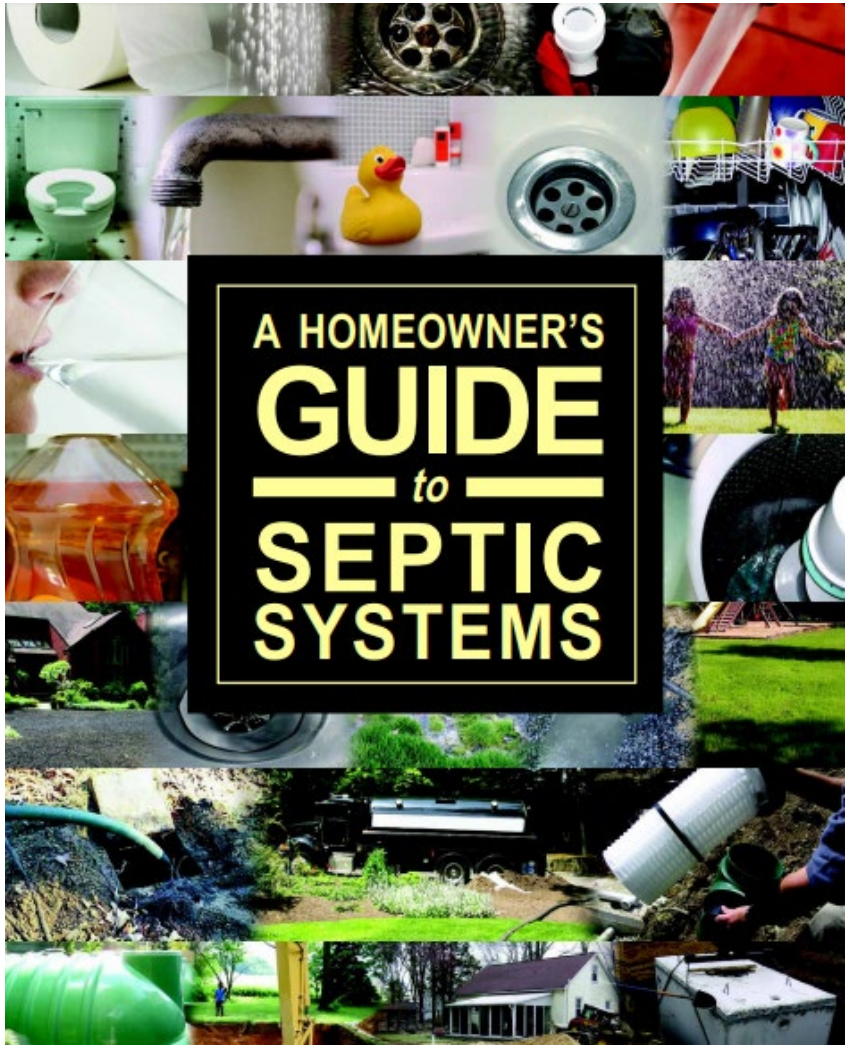


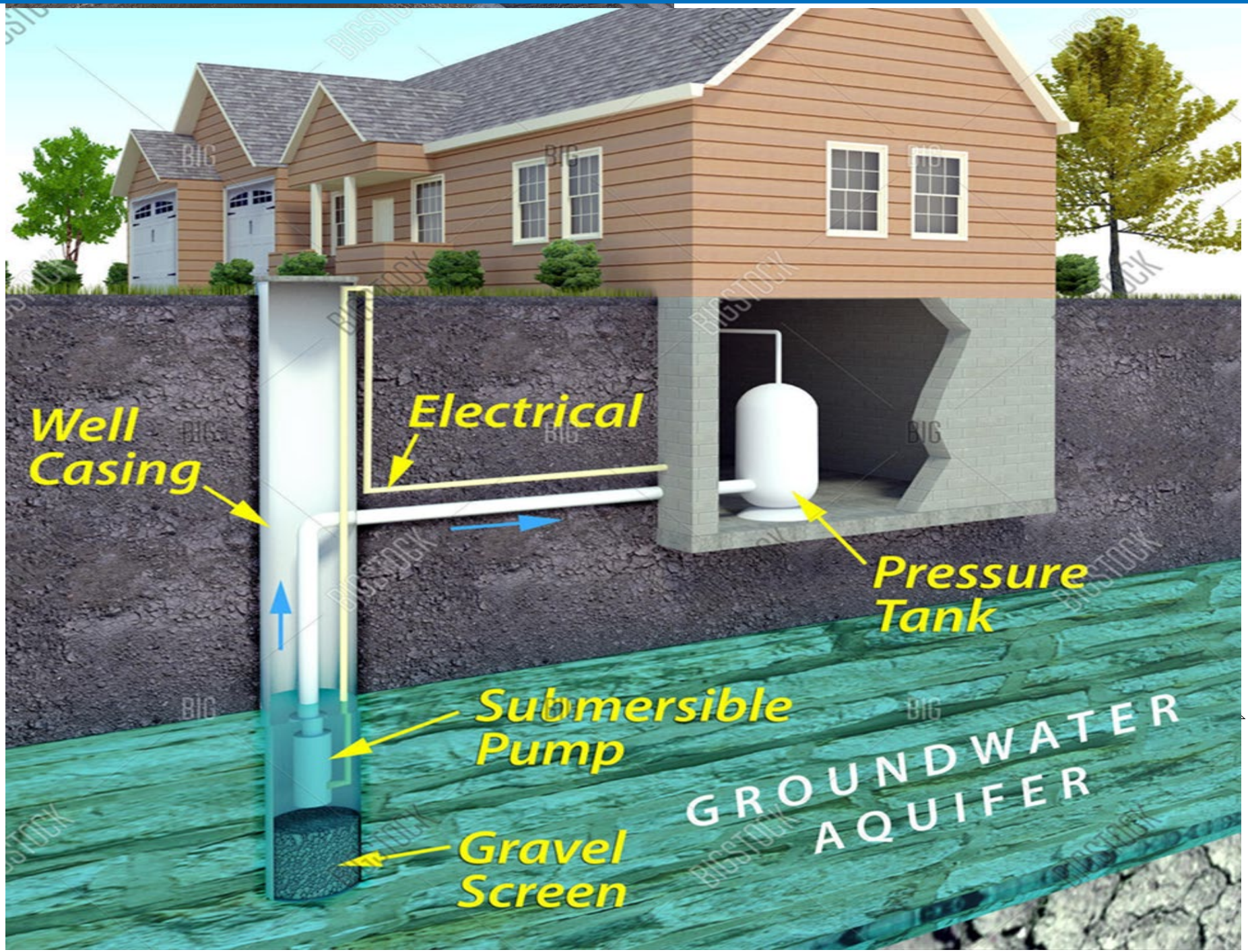
Community Well Testing

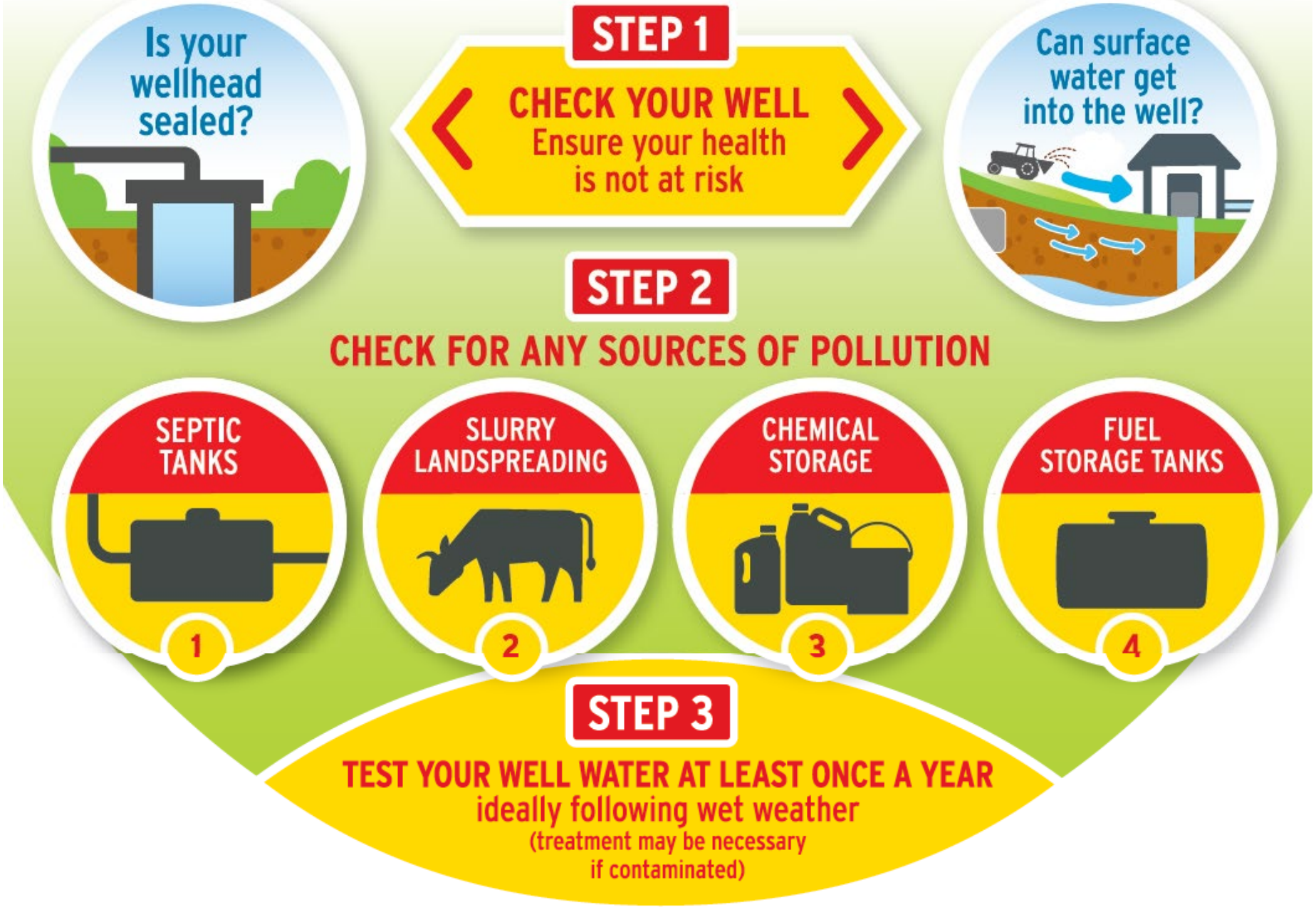
Raritan Headwaters

Homeowner Education:
Well and Septic Maintenance






Well Casing
Electrical
Pressure Tank
Submersible Pump
GROUNDWATER AQUIFER
Gravel Screen



http://erc.epa.ie/water/wells/#.WsQjGi7wbIU

WATERSHED-WIDE RESULTS
WELL TESTING

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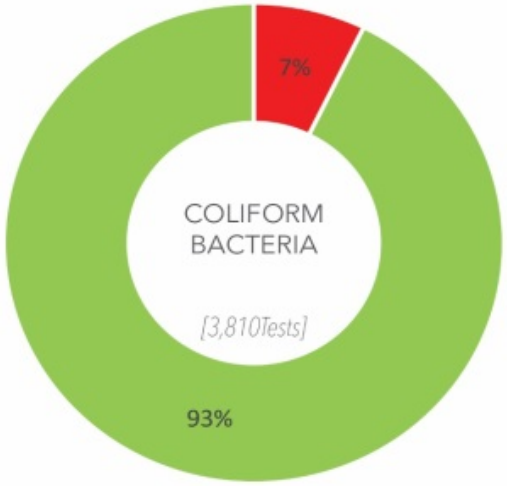
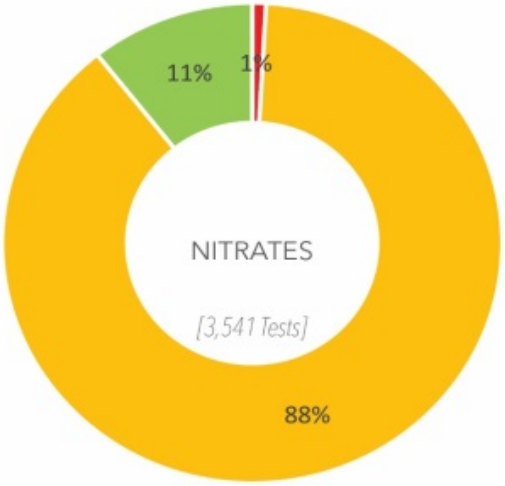
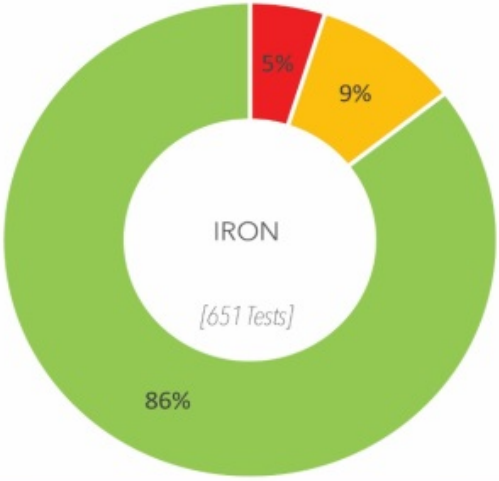
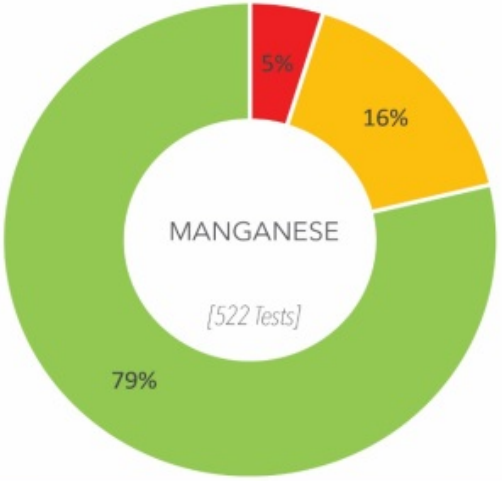
Your water is our mission.

Non-Detect Present Failed









Your water is our mission.

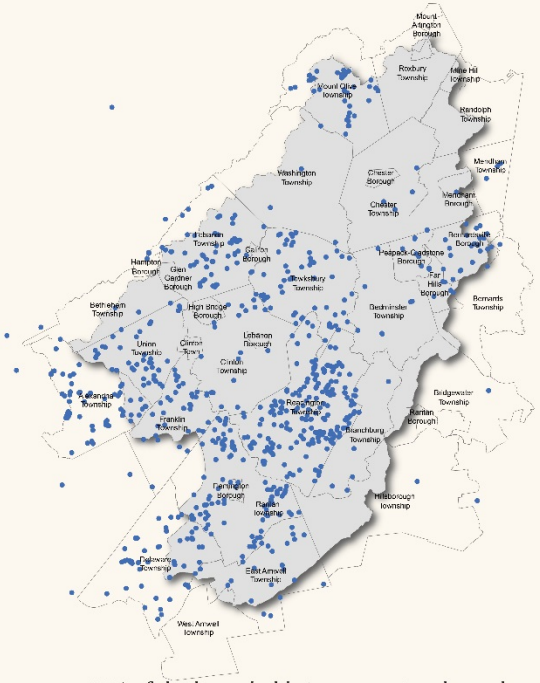
www.RaraitanHeadwaters.org | 908.234.1852 x401 | WellTesting@RaritanHeadwaters.org

WELL TESTING PROGRAM

Fall 2015 & Spring 2016

What you test is what you drink!

What's in your water? Make sure the water flowing from your tap is pollutant-free. If your water comes from a private well, it's up to you to make sure it is safe to drink!



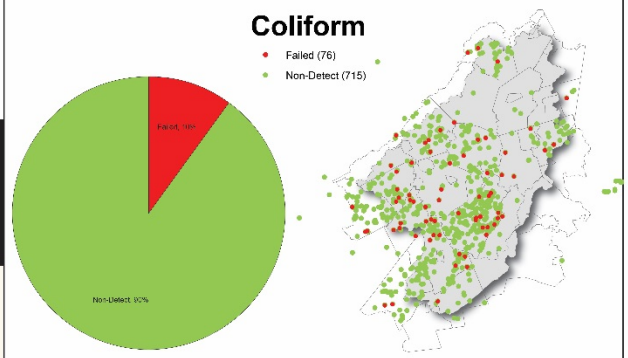
80% of the households in our region depend upon wells for drinking water

Raritan Headwaters

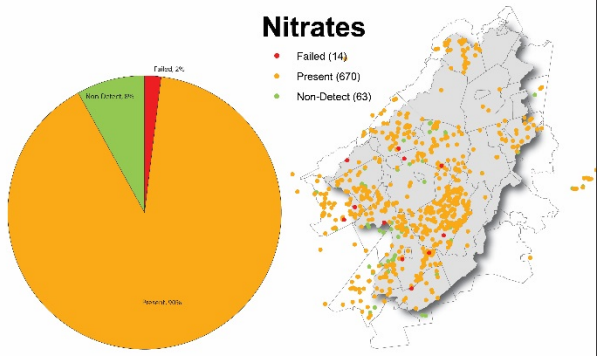
Your water is our mission.

www.RaritanHeadwaters.org

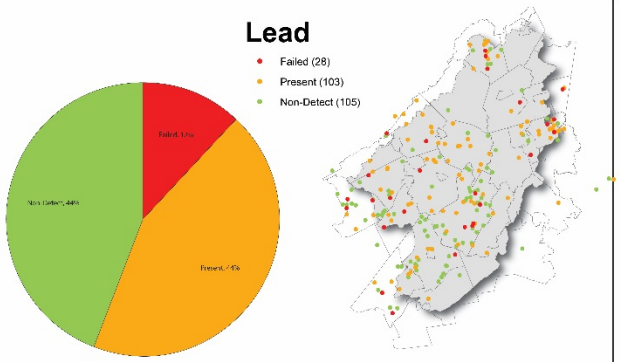
Coliform



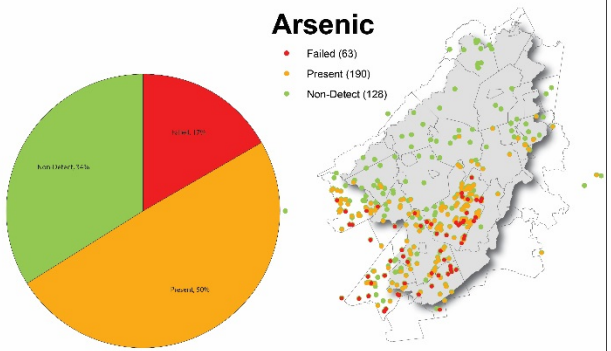
Nitrates



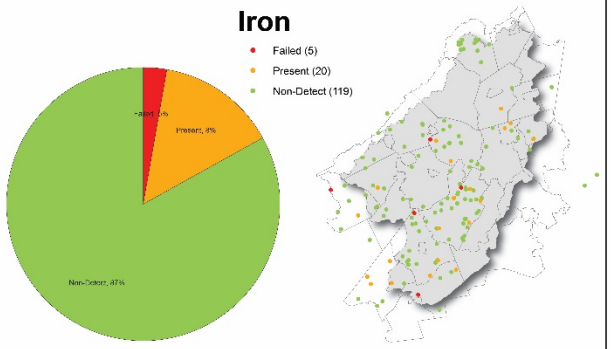
Lead



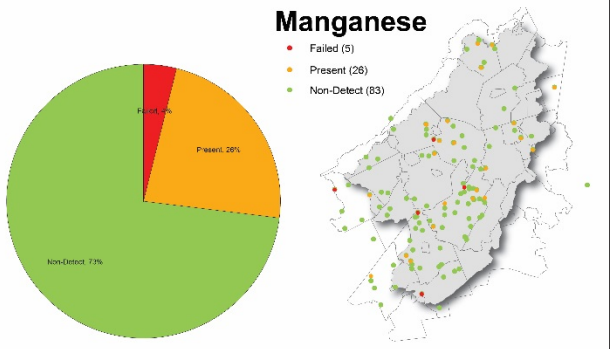
Arsenic



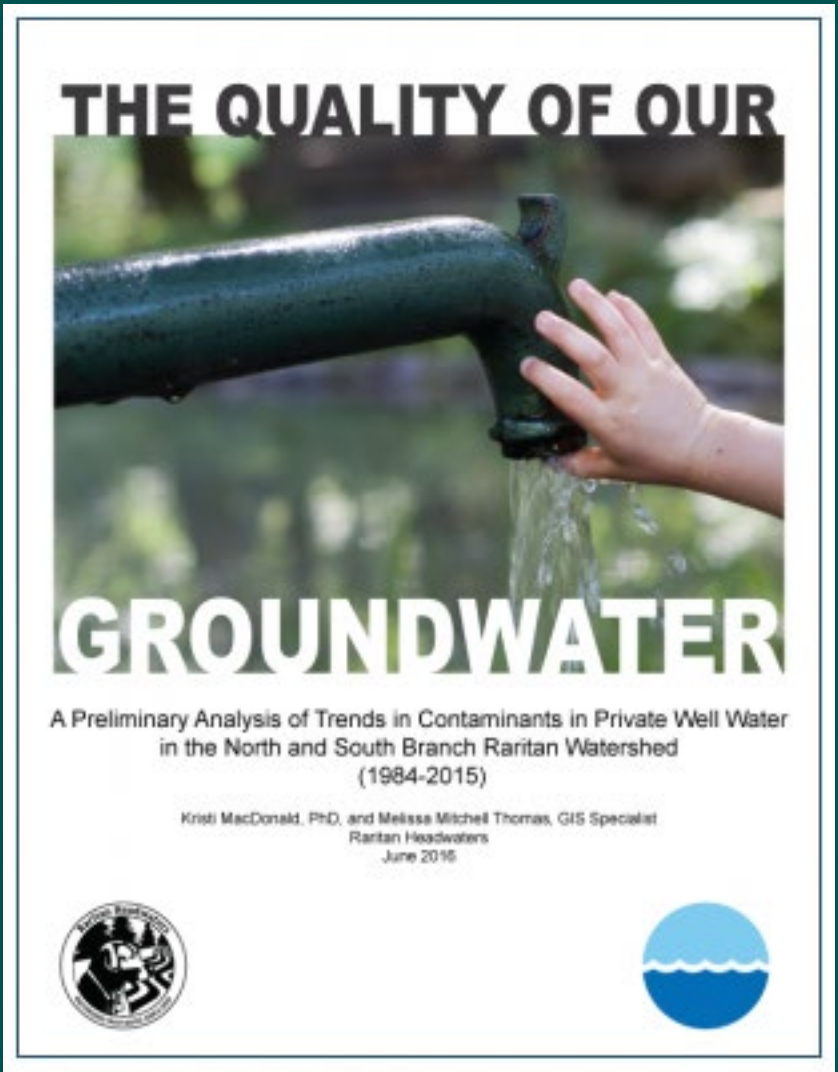
Iron



Manganese



Long-term Trend Analysis of Groundwater Data



Purpose:

- To determine whether water quality in private wells has changed
  - Analyze how the amount of category 1 contaminants, arsenic, nitrate, coliform bacteria, and lead have changed over the past 30 years

- Long-term trend analyses detect changes
  - that occur slowly or lag and cyclic trends
  - due to multiple stressors
  - response and recovery from rare or extreme events

- Identify causes of change


READINGTON TOWNSHIP
Environmental Commission


Well Test
Purchase Kits Here
Oct 3 - 21 Mon-Thurs
9:00am - 1:00pm & 2:00 - 4:00
Oct 11 & 18
5:00 - 8:00pm
Readington Twp Office

What are we testing for?

"Basic Kit" of Water Quality Indicators:

Coliform Bacteria & E.coli

Nitrates

Iron

Manganese

Arsenic

Lead

Pesticides

Volatile Organic Compounds

Gross Alpha

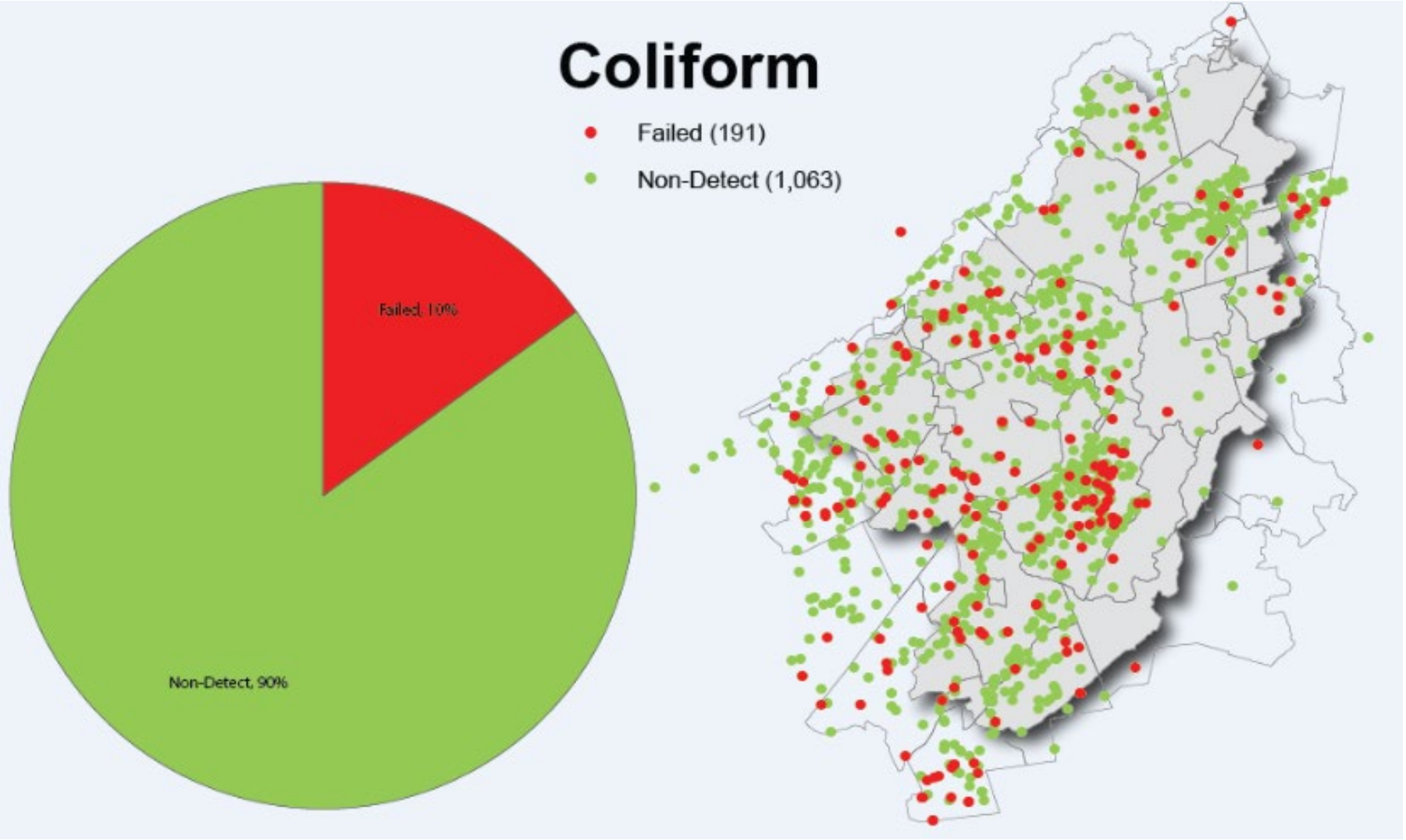
Radon

Maximum Contaminant Levels:

- Coliform zero
- Lead 0.015 mg/L
- Arsenic 0.005 mg/L (NJ)
- Nitrate 10 mg/L
- Gross Alpha 15 pCi/L
- Iron 0.3 mg/L
- Manganese 0.05 mg/L

Raritan Headwaters

Watershed-Wide Results Fall 2016-Spring 2017

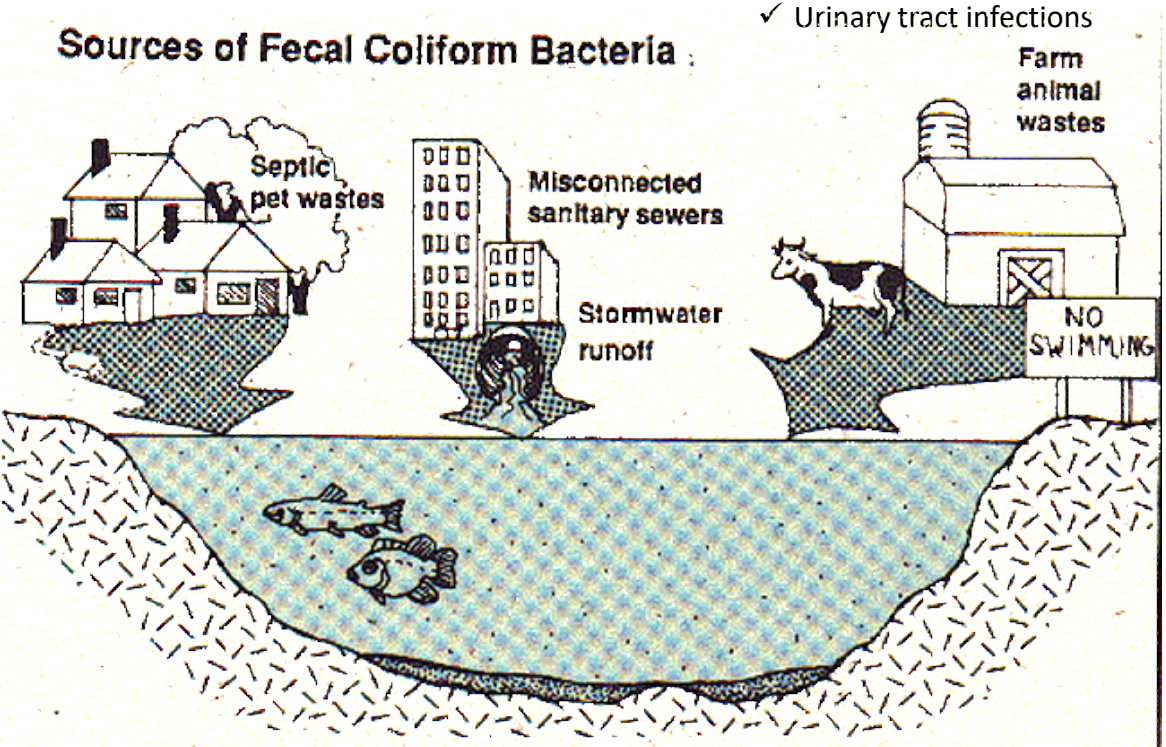


- 5% coliform detection rate in Chester
- 20% coliform detection rate in Readington
- 35% coliform detection rate in West Amwell

Raritan Headwaters

- Commonly found in soil and surface water
- As well as in the intestines of animals and humans
- Indicator of Water Quality

- Defective well cap or casing
- Flooding
- Close proximity to septic tanks, drains or animal feedlots
- Health Symptoms include:
  - ✓ Mild digestive upset
  - ✓ Gastroenteritis (food poisoning)
  - ✓ Urinary tract infections



What Can Be Done

- Regularly service septic system
- Maintain a properly functioning well
- If Positive:
  - ✓Do not drink the water (use bottled) or boil water for 1 minute before using
  - ✓Disinfect your well or call a plumbing professional
  - ✓UV light

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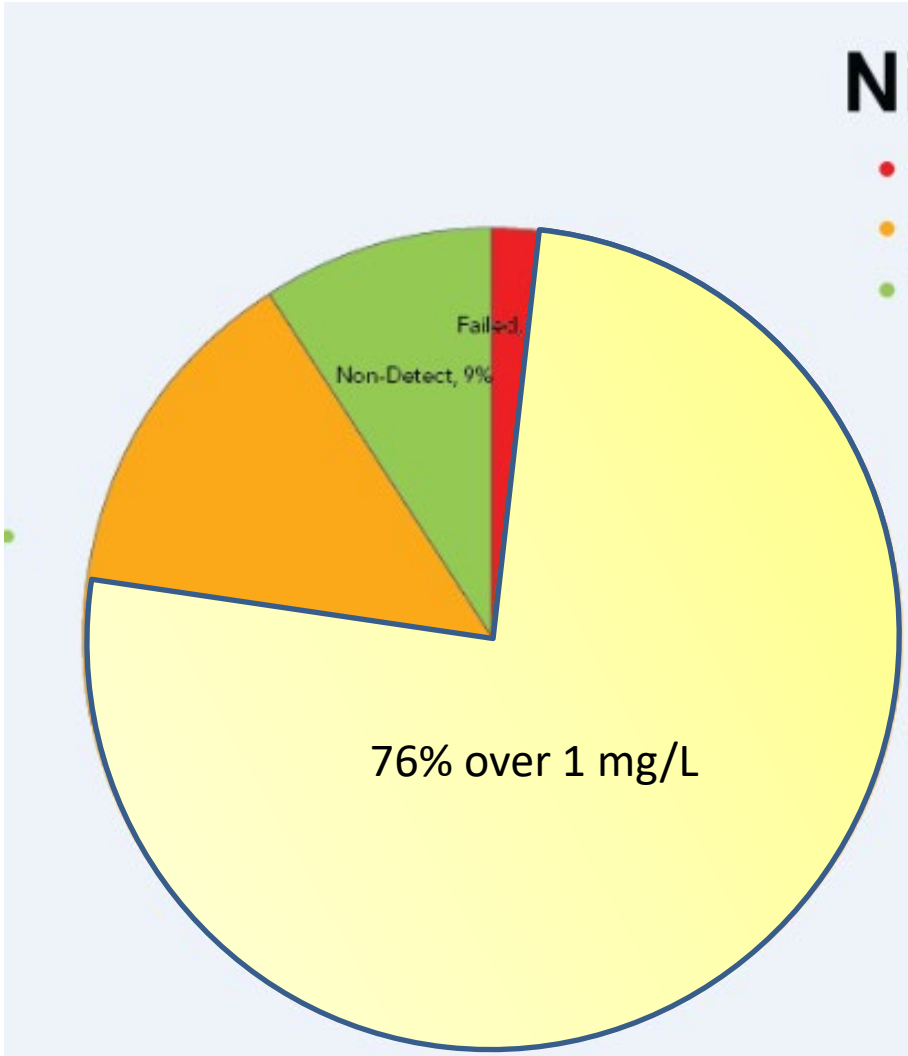
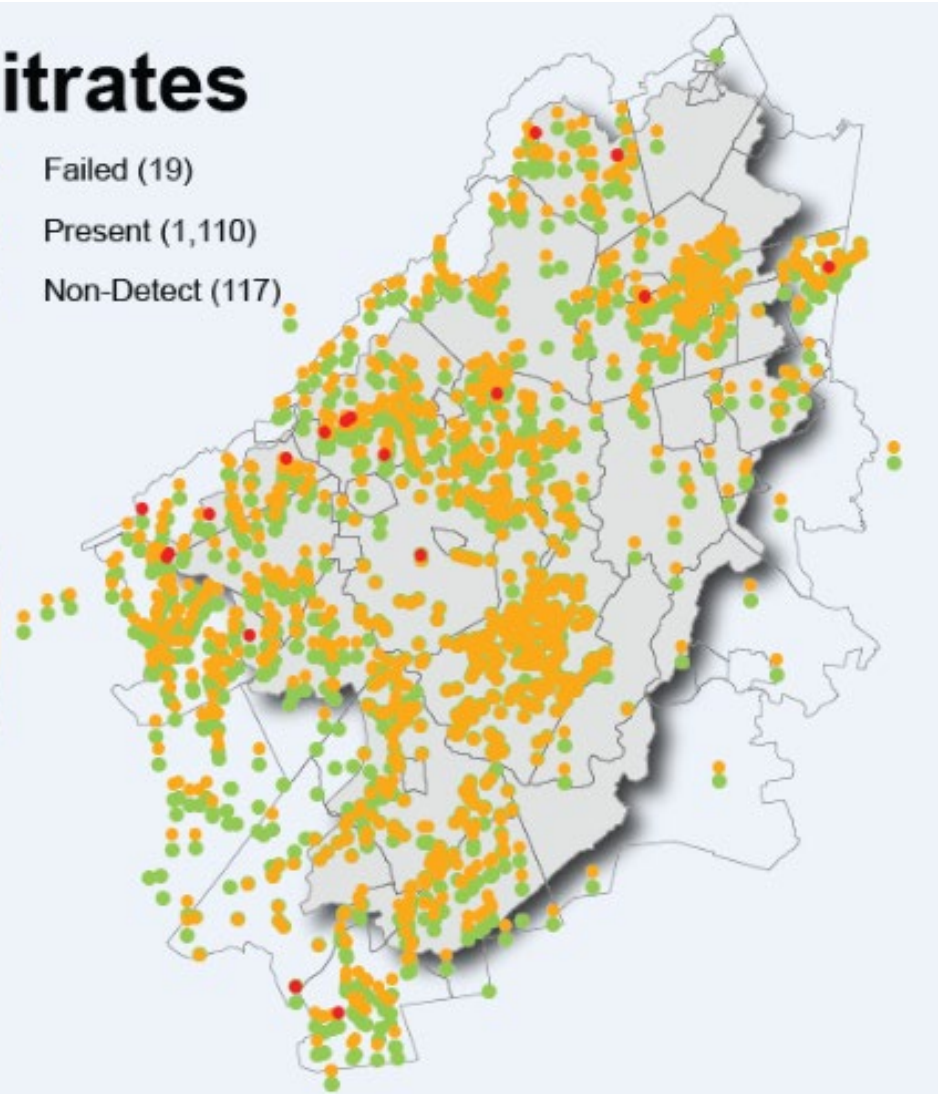




- **2% of nitrates tests were at or above 10 mg/L**
- **39% of nitrates tests were at or above 3 mg/L**
- **76% of nitrates tests were at or above 1 mg/L**

Raritan Headwaters

What Is It

- Nitrates are naturally occurring
- All rainfall and groundwater aquifers contain some
- Indicator of Water Quality

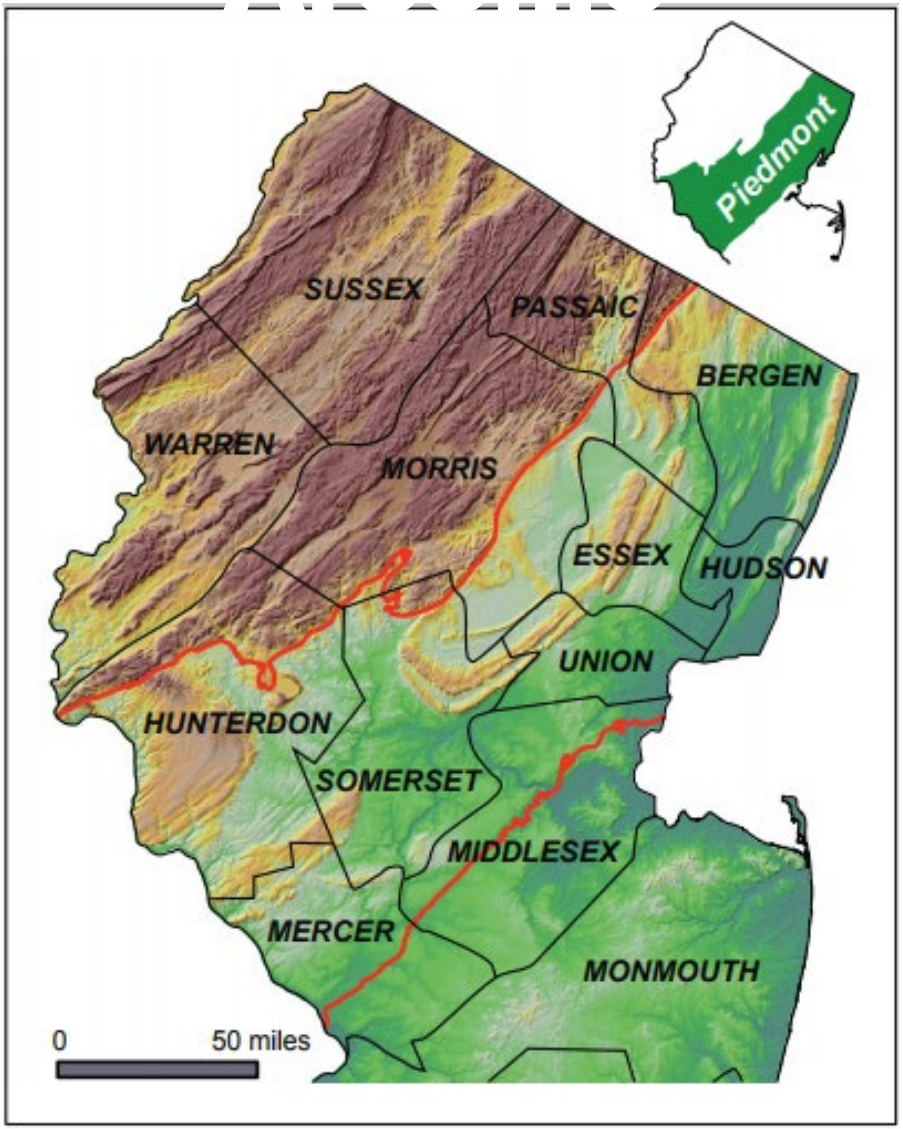
Why

- Fertilizer run-off
- Leaking septic system or sewage
- Excessive levels of nitrates in water:
  - ✓ Can cause shortness of breath
  - ✓ Can result in blue-baby syndrome in bottle fed infants
  - ✓ Can increase acidity of water and make metals, such as mercury, more soluble

What Can Be Done

- No simple way to remove nitrate - does not evaporate
- Caution: boiling water for more than 10 minutes can make it more concentrated
- Remove or reduce the source
- Regularly service septic system

Ion exchange units, reverse osmosis, or distillation all remove **nitrate** from **drinking water**.



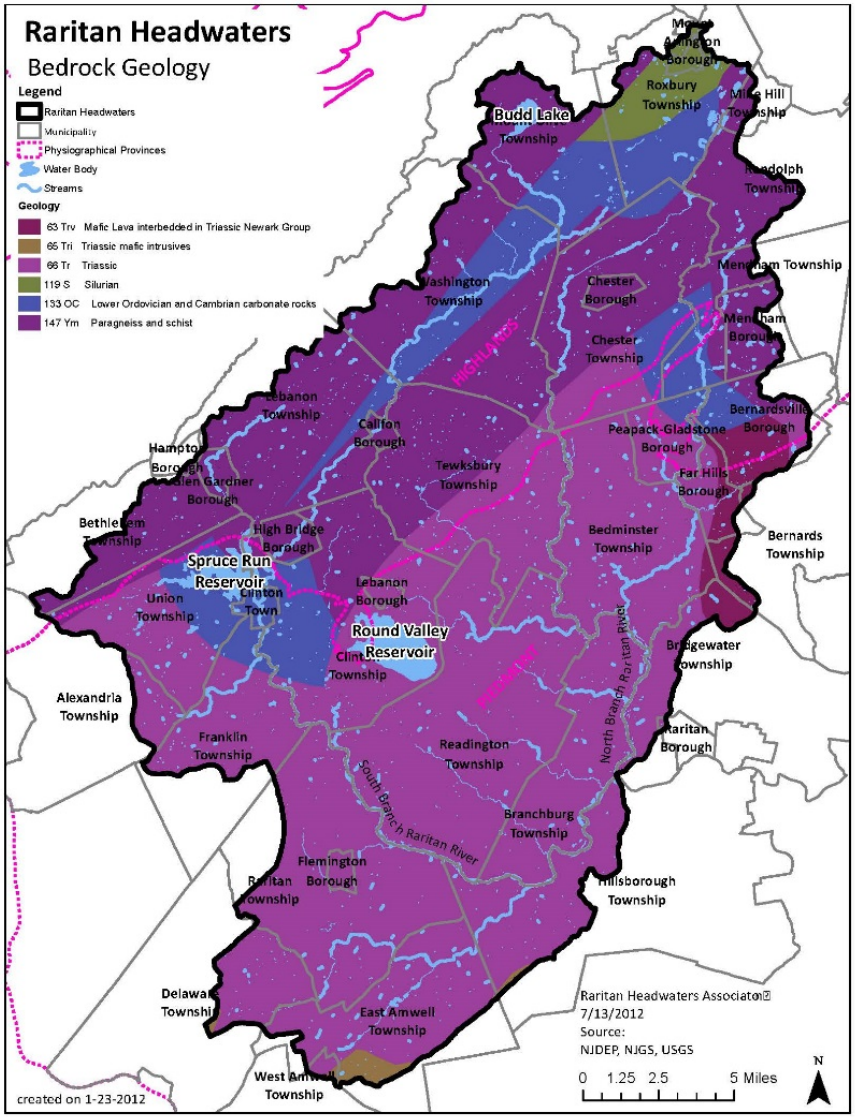


Figure 1. Location of the Piedmont Physiographic Province (shaded area in upper illustration) and color-shaded relief map (lower illustration) of northern New Jersey

Raritan Headwaters

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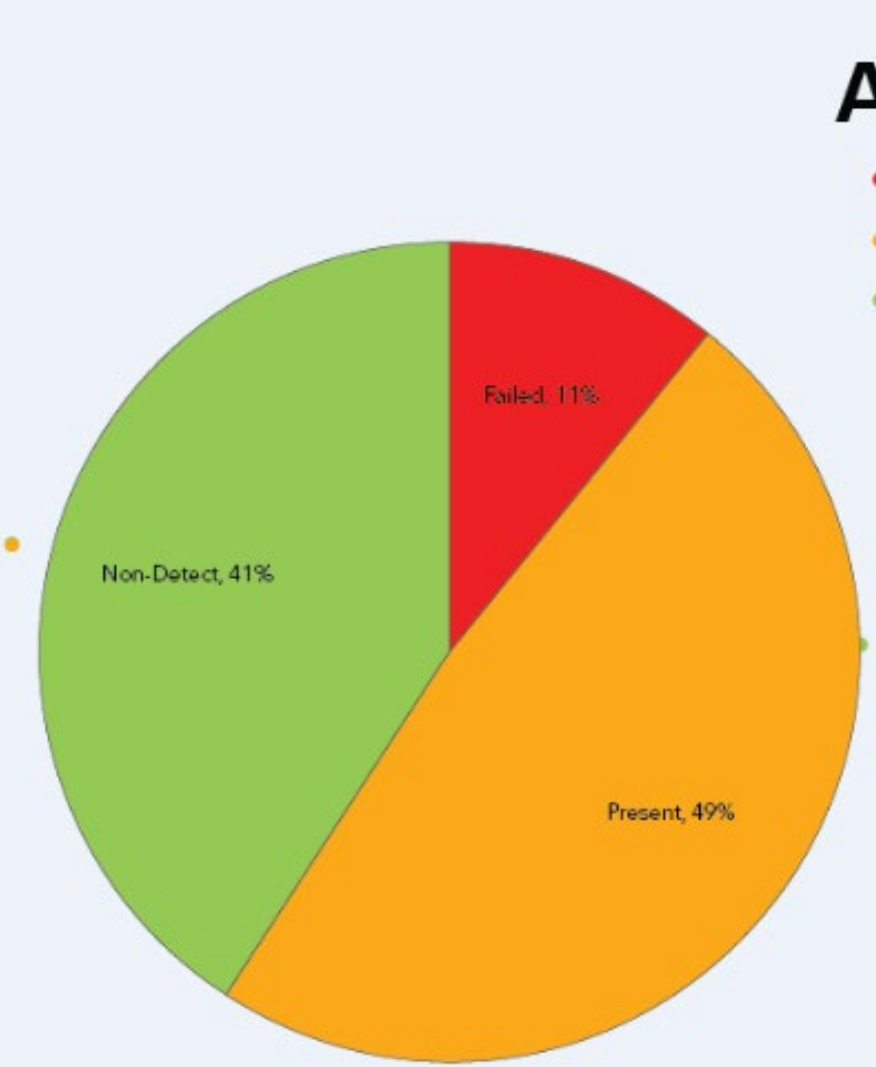
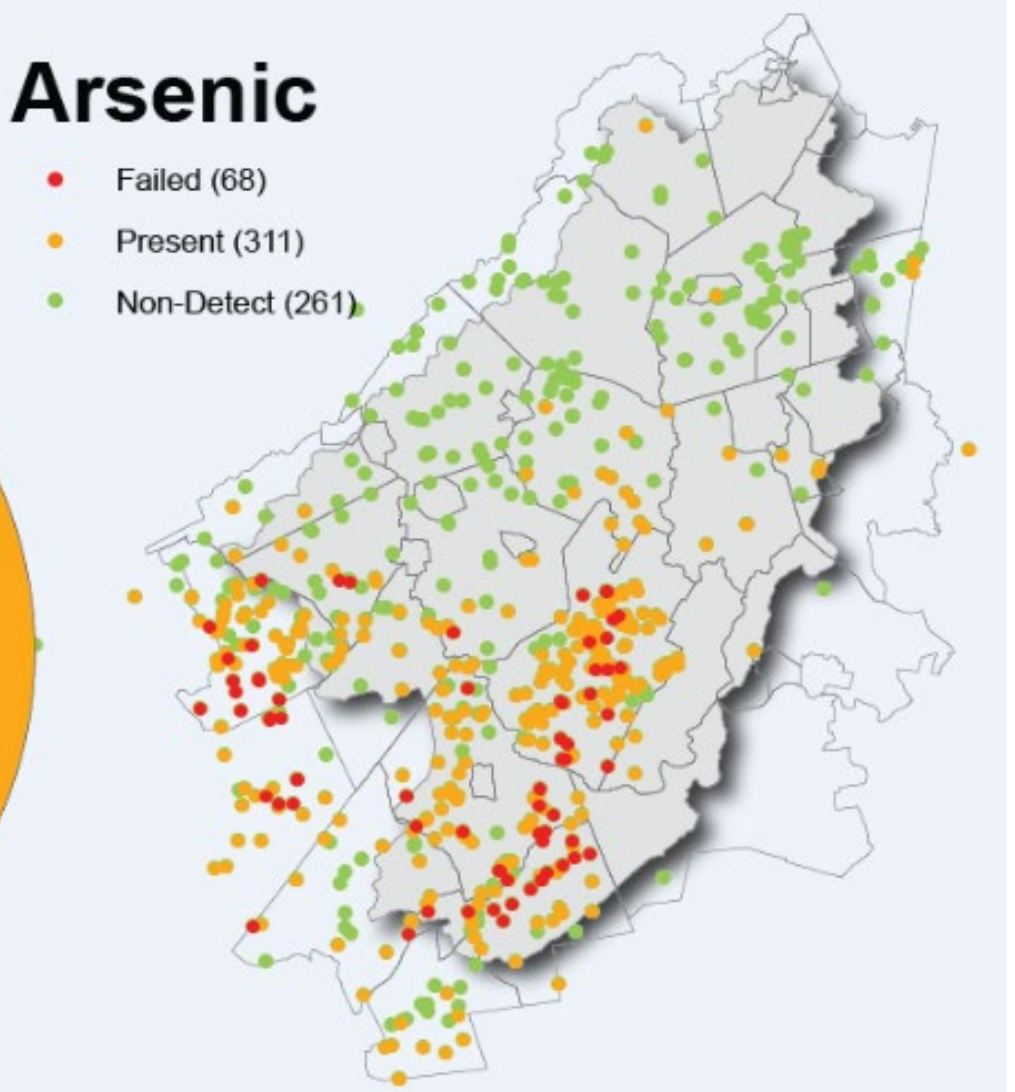




- 24.5% rate of exceedance for untreated supplies

- 33% exceed MCL in E. Amwell
- 36% exceed MCL in Kingwood
- 17% exceed MCL in Raritan Twp

Raritan Headwaters

Arsenic's Effects on the Human Body

Nervous System

Impaired intellectual function
Impaired motor function
Neuropathy

Cardiovascular System

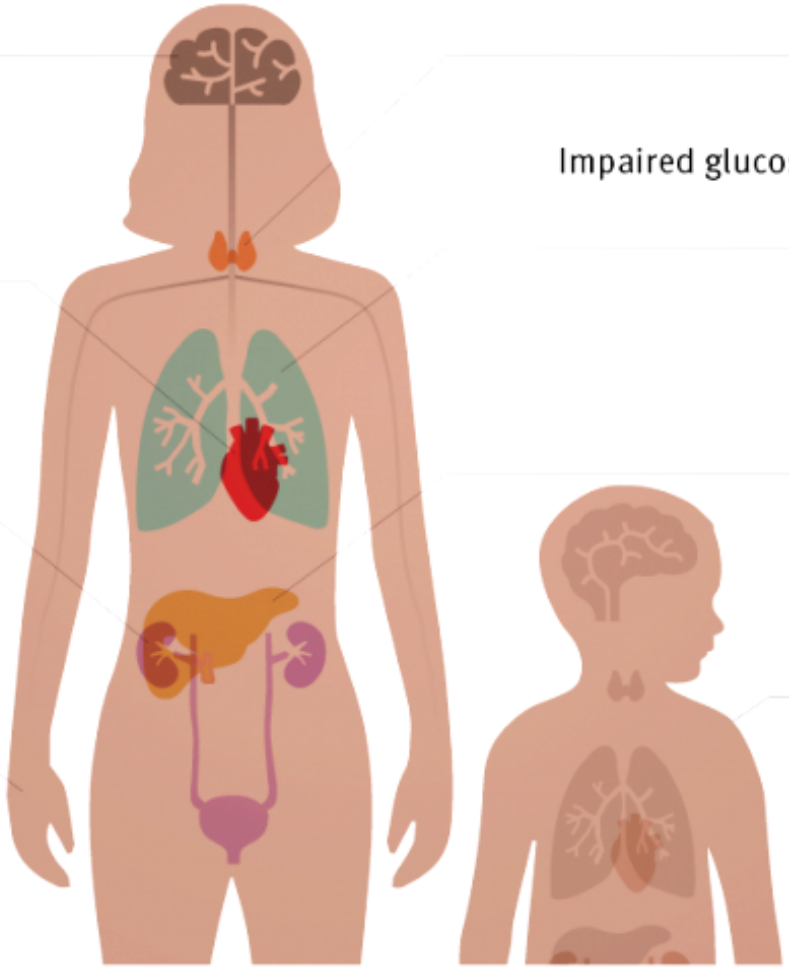
Coronary heart disease
Hypertension
Heart attack

Renal System

Kidney cancer
Bladder cancer

Skin

Skin lesions
Skin cancer



Endocrine System

Diabetes
Impaired glucose tolerance in pregnant women

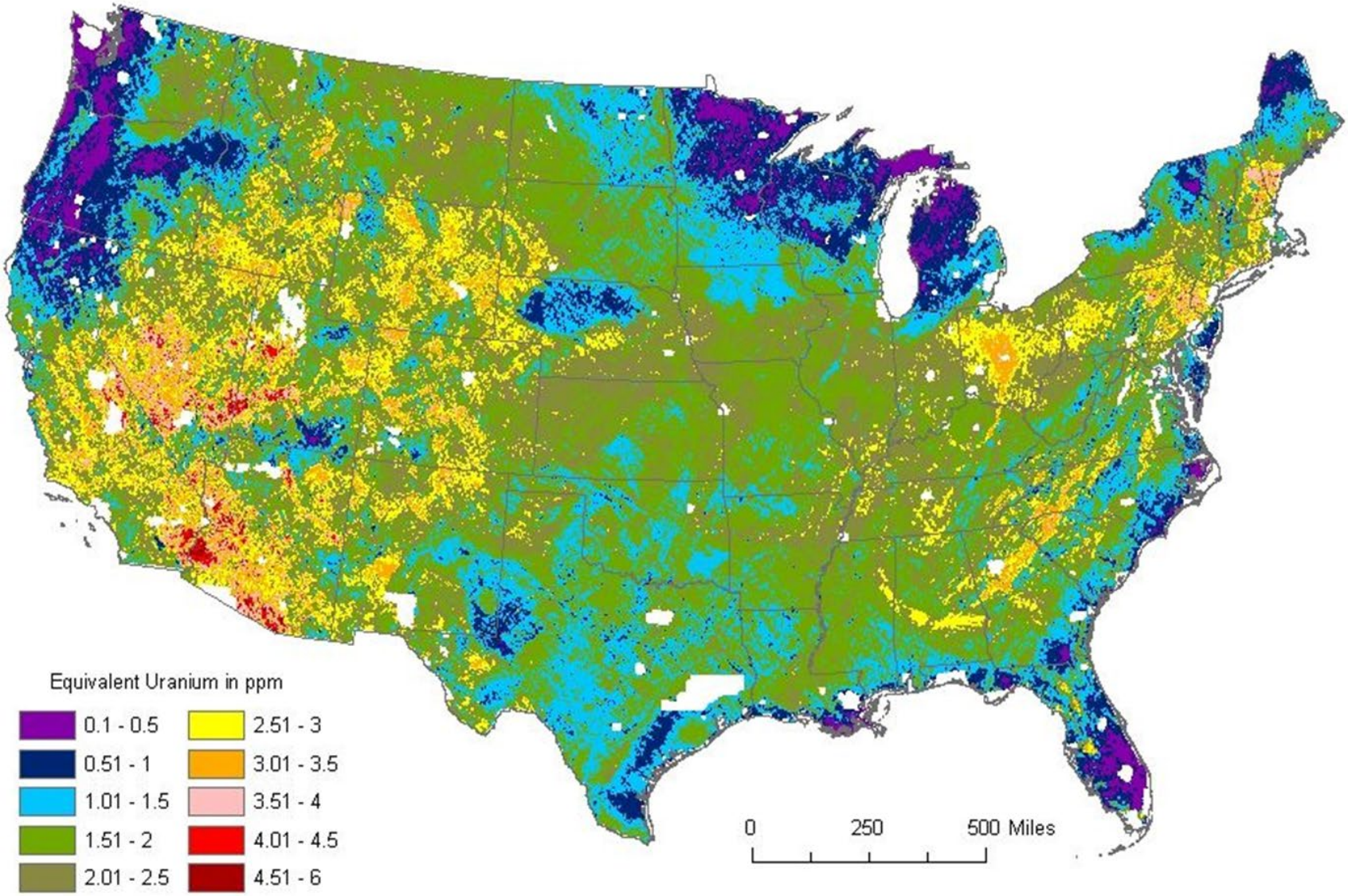
Respiratory System

Pulmonary tuberculosis
Bronchiectasis
Lung cancer

Liver cancer

Developmental Process

Increased cancer risk as adults
Increased infant mortality
Neurological impairment
Reduced birth weight



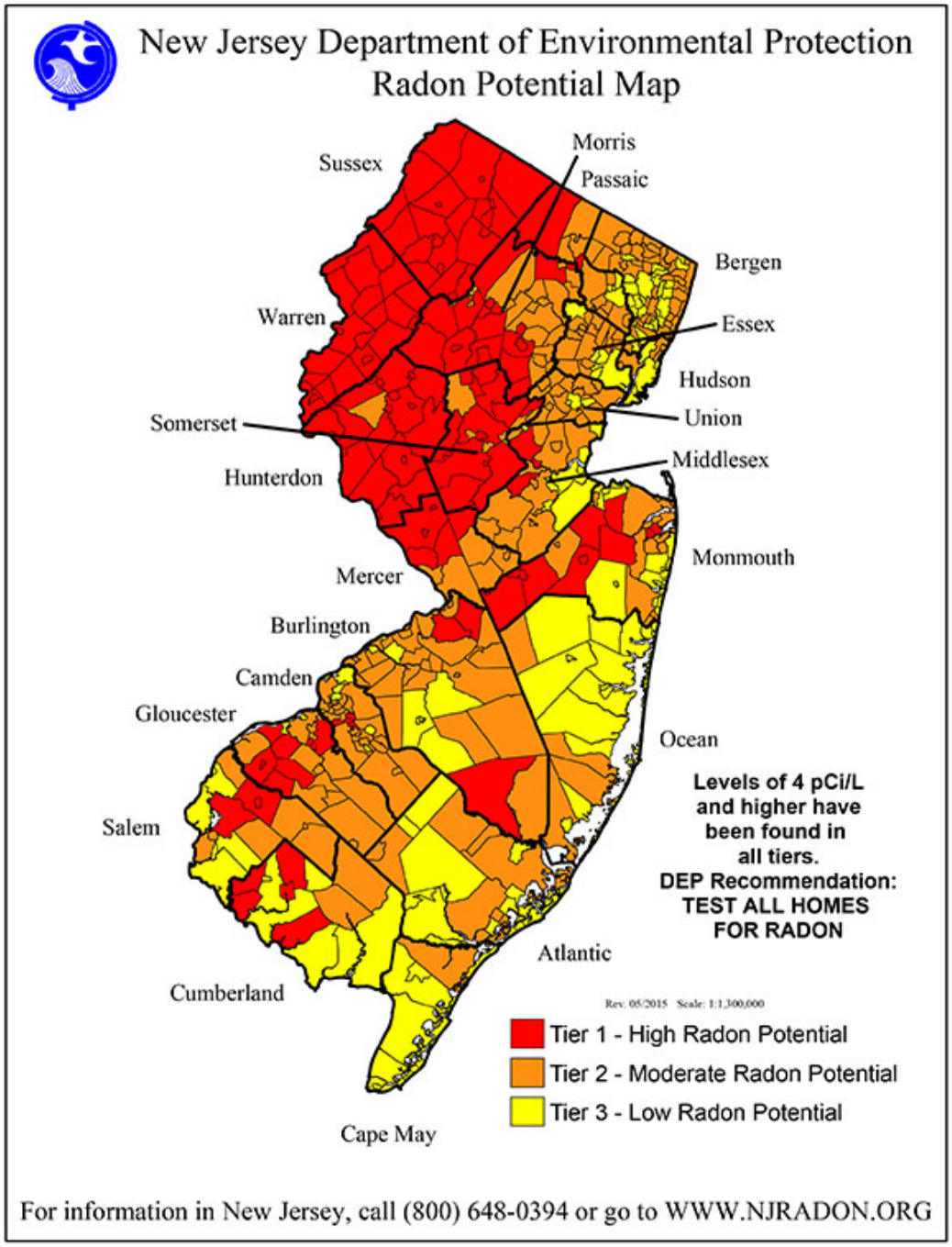
Gundersen and Szabo,1995

Uranium decay

Source: U.S. Environmental Protection Agency

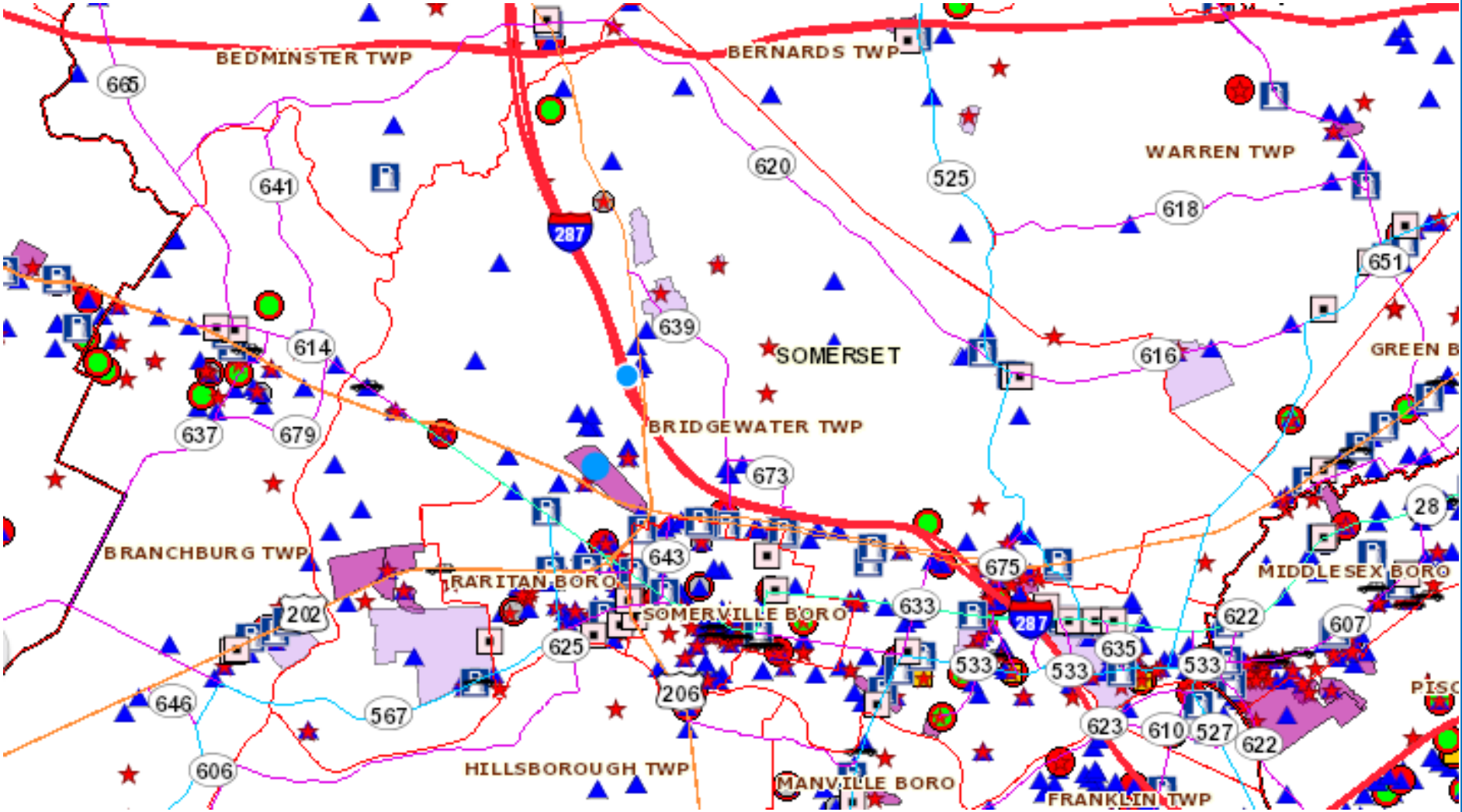
RHA Watershed-Wide Results 2011-2017

- **Radon range= 0 - 62,142 pCi/L**
- **Mean concentration = 2,292 pCi/L**



Volatile Organic Compounds Found in the Home

- 4240 wells in Bridgewater Township (2013 Department of Environmental Protection's (NJDEP) **Data Miner**) 894 of those wells tested under PWTA since 2002 (21%)



LEAD IN THE NEWS

Flint, MI

Newark, NJ

St. Joseph, LA

"Beyond Flint: Excessive lead levels found across all 50 states"

"Public health emergency declared in St. Joseph, Louisiana; water being tested for lead"

"Arsenic, lead levels could crush property values in N.J. town, suit says"

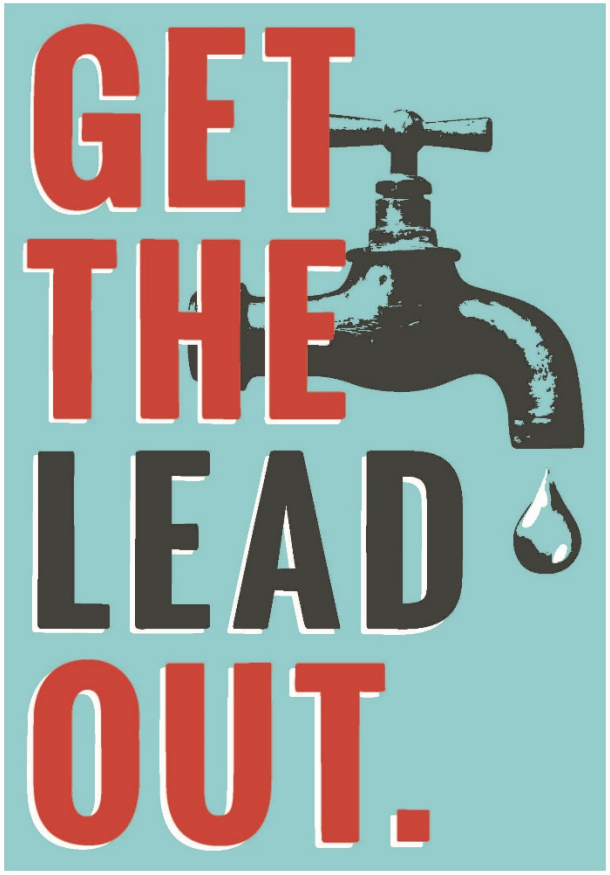
According to the USGS, potential sources of lead in homes can include:

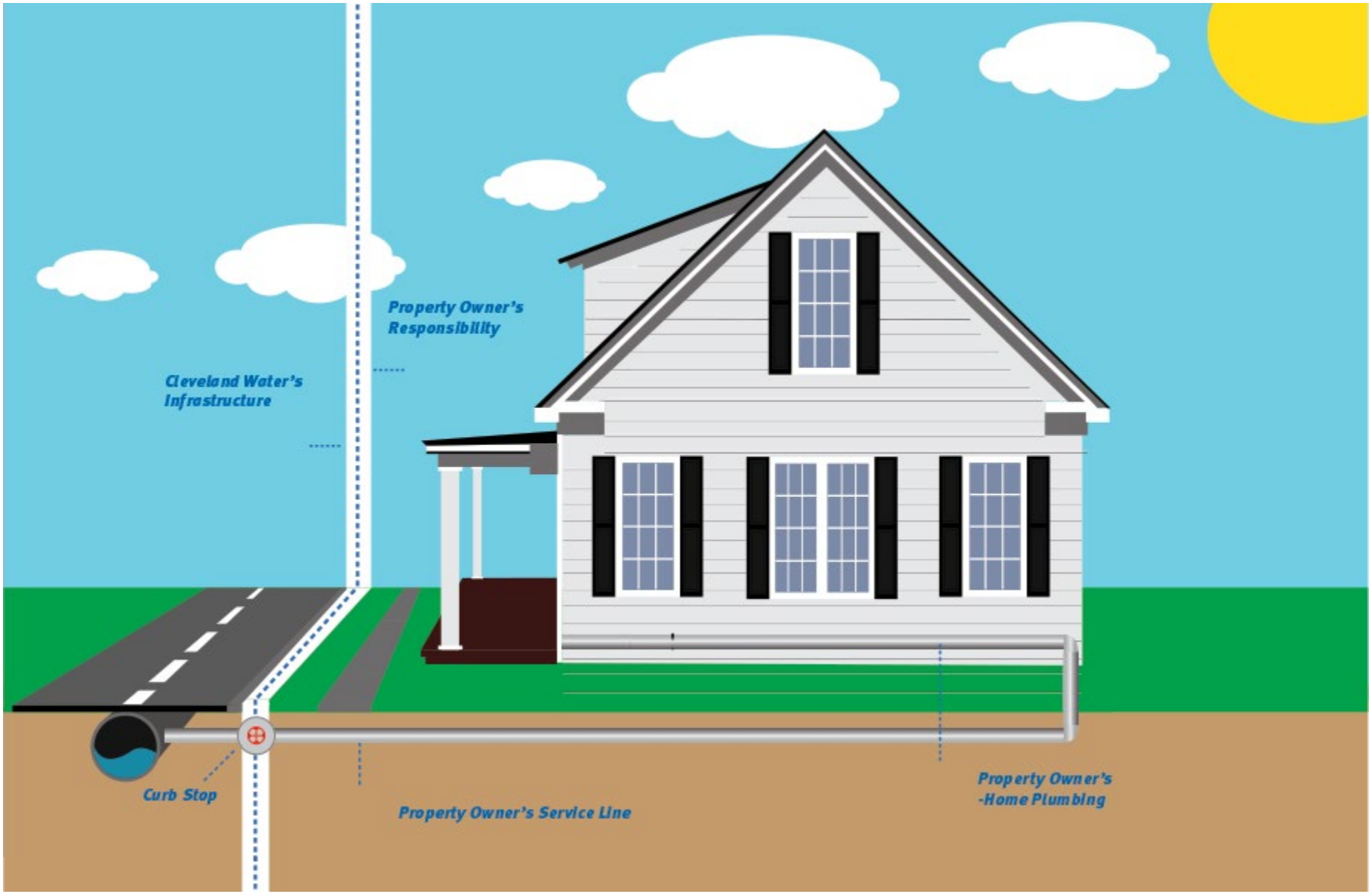
- Lead pipe or fittings used in homes built before 1930

- Lead solder used in copper fittings in homes built before the late 1980s

- Lead-free brass components, which, in all states except for California, may have contained up to 8% lead before 2014

- Galvanized steel that contained 0.5% to 1.4% lead




Property Owner's
Responsibility
Cleveland Water's
Infrastructure
Curb Stop
Property Owner's Service Line
Property Owner's
-Home Plumbing

Health Impacts of Lead

CLEAN WATER ACTION
CLEAN WATER FUND

Exposure to high levels of lead can cause severe damage to the brain, blood and kidneys. Children under six are most at risk from lead poisoning. Even low levels of lead exposure have been found to permanently reduce cognitive ability and cause hyperactivity in children.

ADULTS

Brain
Memory loss, lack of concentration, headaches, irritability, depression.

Body
Fatigue, joint and muscle pain

Cardiovascular
High blood pressure

Digestive System
Constipation, nausea and poor appetite

Kidneys
Abnormal function and damage

Nervous System
Damage including numbness and pain in the extremities

Reproductive System
Men: Decreased sex drive and sperm count, and sperm anomalies. Women: Spontaneous miscarriage

CHILDREN

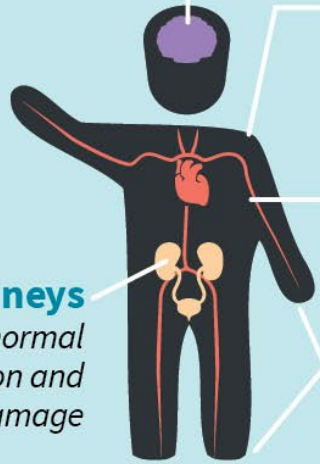
Brain
Behavior problems, lower IQ, hearing loss, learning disabilities

Body
decreased bone and muscle growth

Blood
Anemia

Kidneys
Abnormal function and damage

Nervous System
Damage



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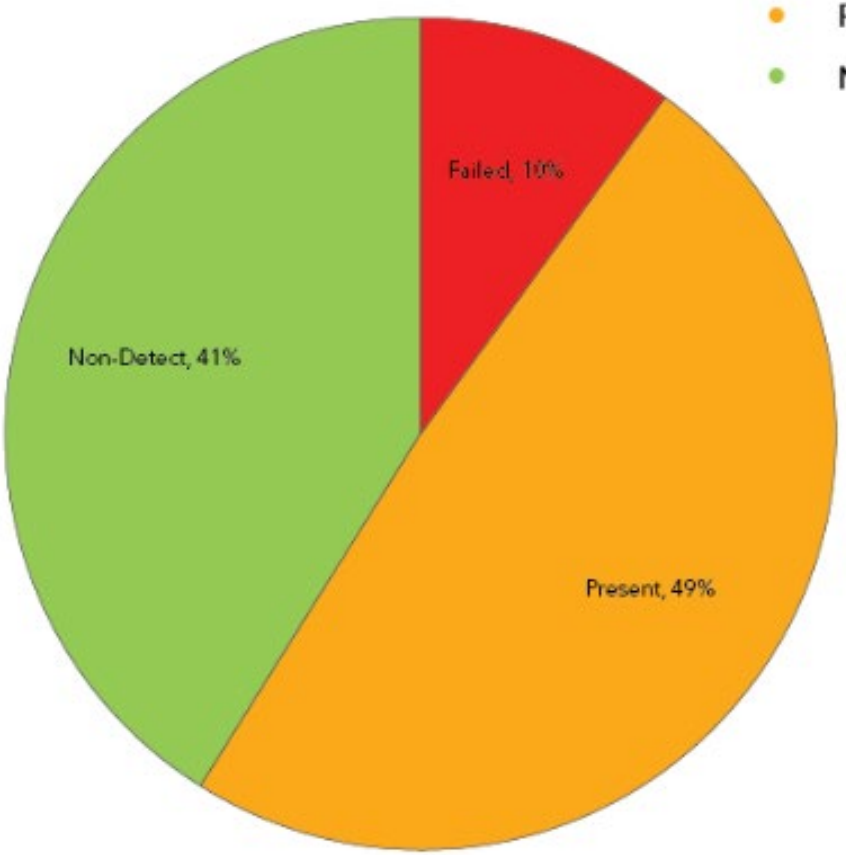

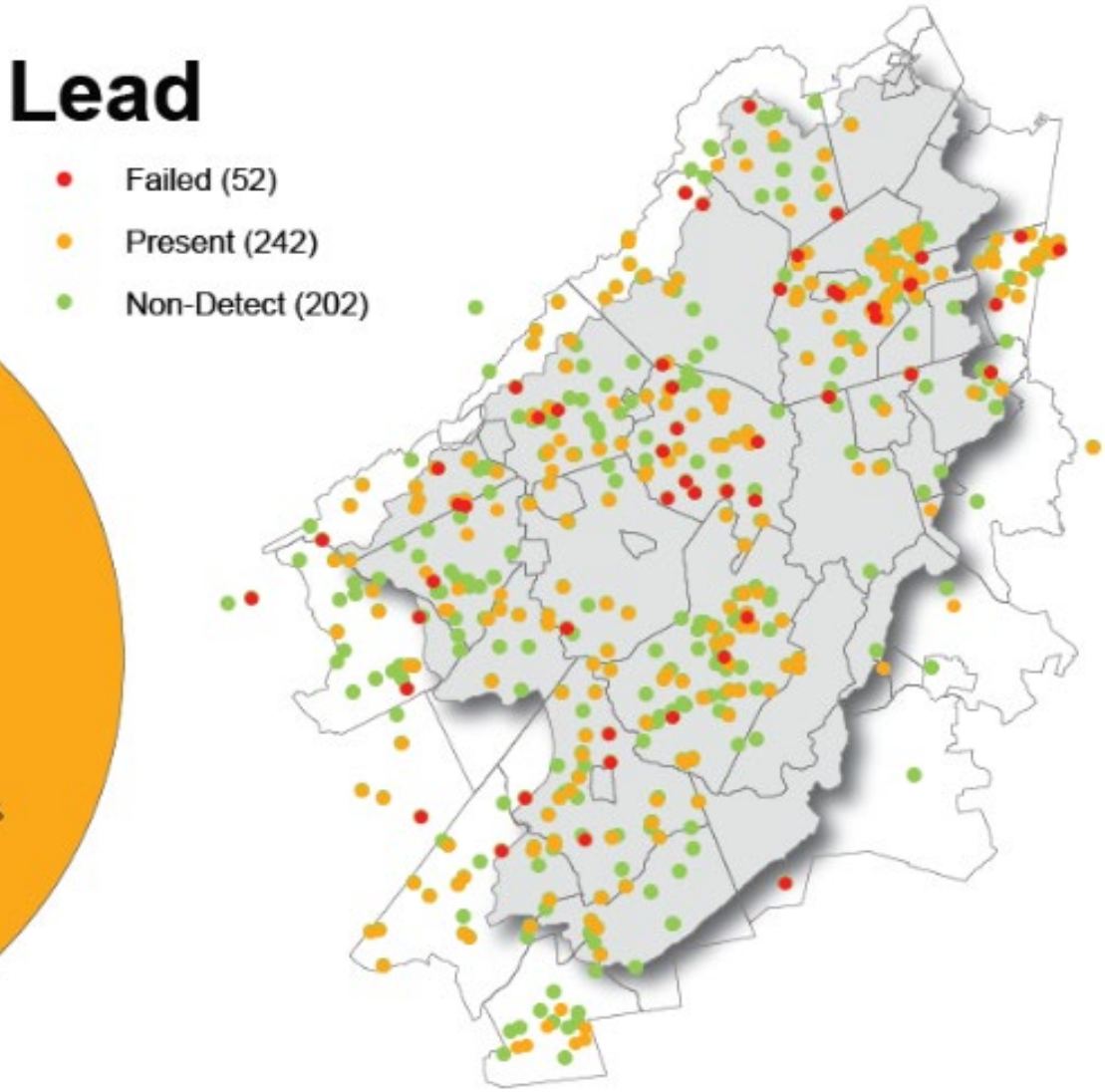

Raritan Headwaters

Interconnected Anthropogenic and Natural Impacts on Water Quality


PROTECT AND CONSERVE GROUNDWATER
• Keep it safe from contamination
• Use it wisely by not wasting it
UN WATER
22 MARCH
WORLD WATER DAY

THANK YOU

and please don't forget to
TEST YOUR WELL!

Mara Tippett
Well Testing Program Manager
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Testmywell.org

Raritan Headwaters