



# THE LEGALITIES OF PROPER SAMPLE COLLECTION

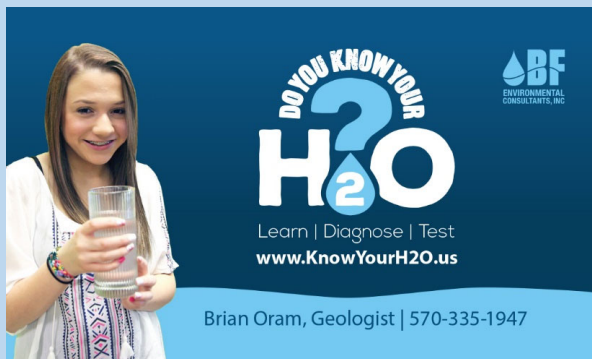
By  
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<http://www.bfenvironmental.com>



**KEYSTONE**  
Clean Water Team



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<http://www.bfenvironmental.com>



<http://www.water-research.net>

# Sampling / Testing/ Screen – The Toys !



To Be Honest – A lot of the Samples I collect  
Look Like This:







## B.F. Environmental Consultants Inc.



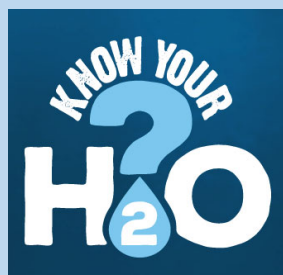
- Professional Consulting Services in the areas of water quality, soils, stormwater, geology, aquifer analysis, and land-development.
- Baseline – Chain-of-Custody
- Expert Testimony
- Facilitate Distance Learning and Custom Training Programs
- <http://www.bfenvironmental.com>



# B.F. Environmental Consultants, Inc. Network



Training Professionals -Training Portal  
<http://online-training-courses.info>



Know Your H2O? Program  
<http://www.knowyourh2o.us>



B.F. Environmental Consultants Inc  
<http://www.bfenvironmental.com>



Keystone Clean Water Team (501c3)  
<http://www.pacleanwater.org>



Water Research Center (Education Portal)  
<http://www.water-research.net>

# Conference Announcements

- Launched Our New Website – <http://online-training-courses.info>
- Updated Phone Apps – Do YOU Know Your H2O?
- Neighborhood Environmental Hazard Reports.

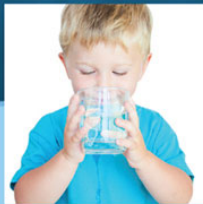


Online Courses  
Many Categories!



**NEIGHBORHOOD  
ENVIRONMENTAL  
REPORT FOR**

Your Address



[www.KnowYourH2O.us](http://www.KnowYourH2O.us)

Recently Released – Two New Mobile Apps  
for IOS and Android

Know Your H2O?

Baseline Water Testing – Pennsylvania Perspective

Go To – <http://www.knowyourh2o.us>



#### Indoor

 Get Informed

 Get Tested

 Get Treatment

 Get Tools

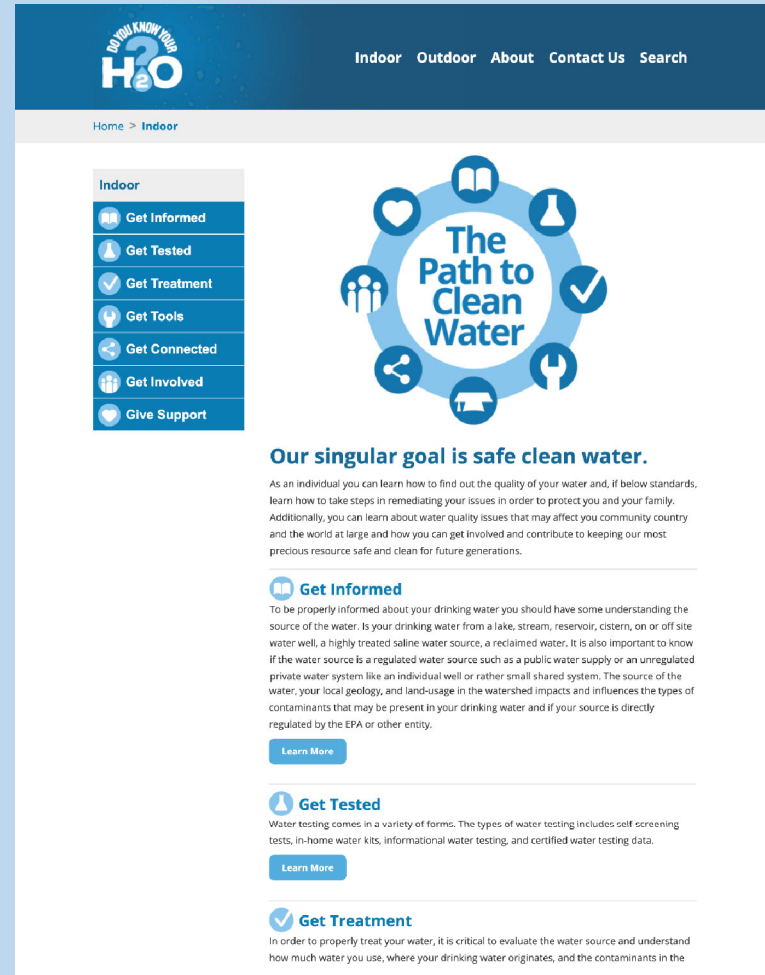
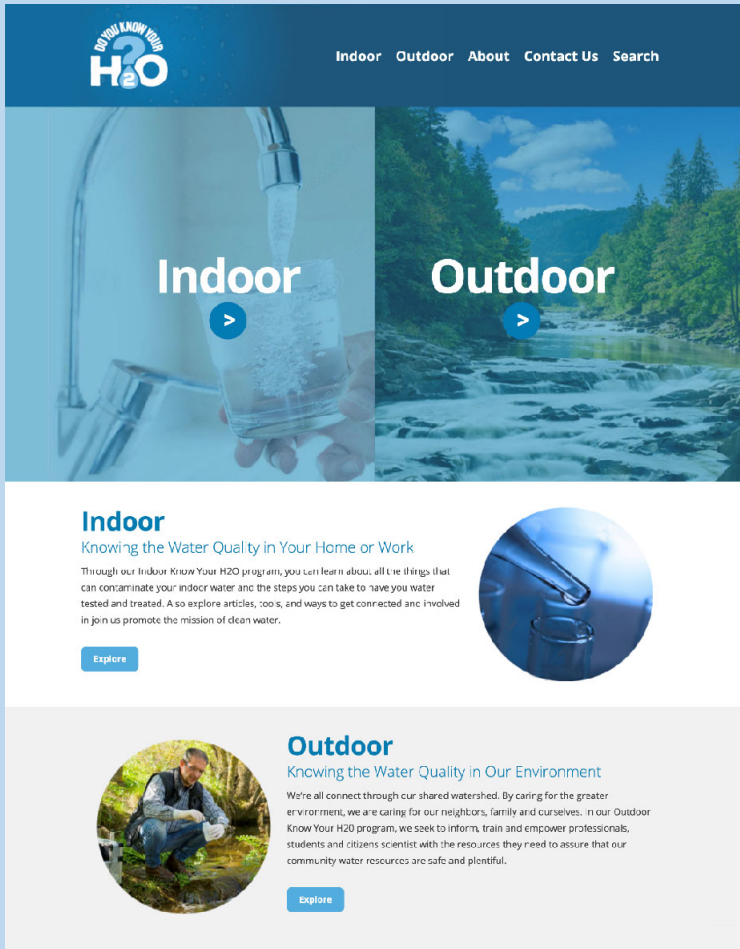
 Get Connected

 Get Involved

 Give Support



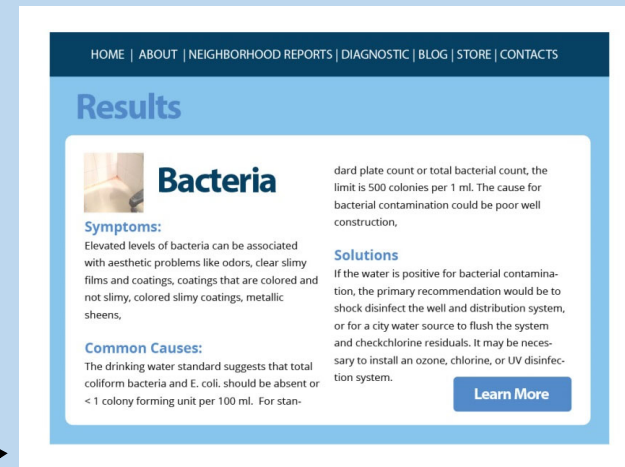
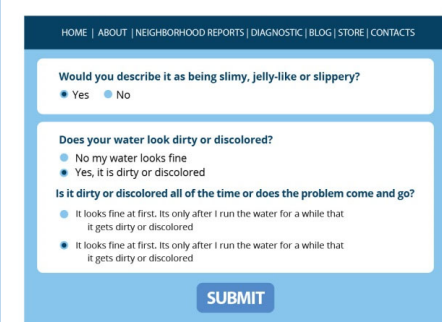
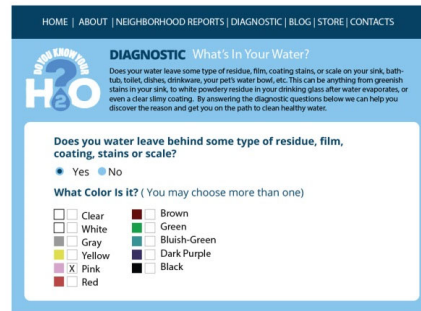
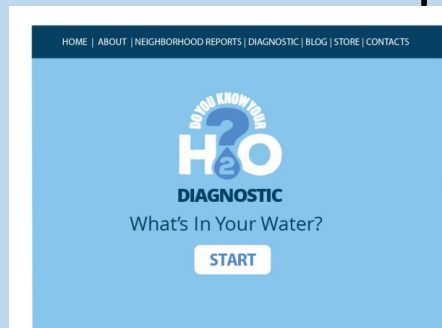
**Our singular goal is safe clean water.**



Get Diagnosed



# New Web App – Check out Our Booth



General Recommendation  
Depending on Water Source

Testing Laboratory  
(certified /  
informational)

Water Supplier

Report to Supplier

Local Professional  
or DIY Site

Testing Recommendation

Possible Treatment Action

# Sampling Procedures – “Working in the Water Landscape”



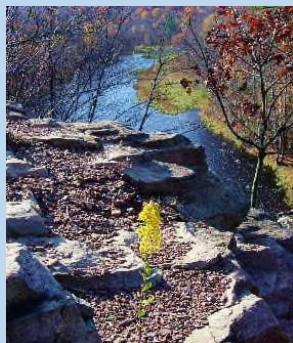
Private Wells



Real Estate Transfers



Baseline Testing Investigations



Environment  
Pond / Lake  
Bathing Beach



“Certified Water Professionals”



Environmental Monitoring



Compliance Monitoring

Role of the Sampler / Professional?

# Topics For Today !

- Reasons for Water Sampling and Monitoring (Sampling Point)
- Ethics – “Being an un-biased Professional”
- Types of Samples - Video Montague
- Chain-of-Custody
- Sampling / Field Monitoring (Follow SOPS)
- Introduction to Field Monitoring Equipment
- Coliform Rule
- Lead and Copper Rule
- PFOS



# Reasons for Water Quality Sampling

- Regulatory Requirements
- Users Complaints or Reported Nuisances
- Facility Operations – Performance or System Monitoring
- Troubleshooting a System
- Real Estate Transfers
- Public Health Concerns
- Point of Entry or Use Water Treatment Systems
- Litigation

Others?



No matter the purpose – All of these reasons – Requires a Professional !

# Types of Clients / Activities

- Compliance Monitoring (NPDES Process)
- Individuals – Private Well Owners / Watershed Groups
- Gov't Agencies and Non-profits
- Regulated Water Supplies
- Environmental Monitoring
- Product Testing
- Legal Baseline Test
- Troubleshooting a System.
- “Ghost Sampling” – Proactive Troubleshooting.



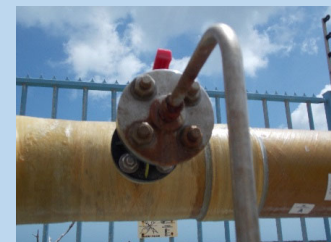


# Compliance Monitoring (Known Matrix)

- Who, What, Where, and How Often?
- Copy of Permit Approval or Approvals and Special Requirements
- Summary of the System Components.
- Approved Sampling Plan.
- Is the system managed by a professional operator, a property manager, or Association member?
- Making sure you have suitable sampling sites and how to operate parts of system.
- Any out of compliant issues?

# Regulated Systems – Trouble Shooting

- Be a Resource! If plant is having issues, maybe be proactive with operator and engineer.
- Problem may be how “client” is sampling or not sampling or where and how storing “bottles”.
- Consider using field screening tests to help identify the problem  
= Generate Information with out Generating a Regulatory Violation, such as BART Testing.
- Help Client with Calibrating Equipment and Checking Equipment  
– Offer a “Lab/Sampler Audit”.



# Environmental Monitoring (Matrix?)

- Who, What, Where, How Often, and How Fast ?
- Nature of the potential pollutants of concern- What Safety Precautions or training is needed?
- Unknown matrix issues – typically insufficient money to conduct this analysis.
- Environmental Exposure Risk to field or laboratory staff.
- Need for additional QC/QA Program



# Legal Baseline – All the Risk No Money

## Triggers

Pipelines  
Large Earth Moving  
Blasting  
Natural Gas Related  
Drilling  
Development  
Waste Management  
Landfills  
Stormwater  
Agricultural  
Industrialization

- What or Is there a Standard?
- What level of testing? (Always give more than one option – recommend at least 4)
- What is the level of data review?
- Are you using additional external and internal checks and controls?
- Do you interpret findings? Or Recommend supplementary testing?
- Who are the gate keepers for this process?
- What happens when there are no standards?
- (May want to review EPA Health Advisories (2018)) and other States??

## Cost to Homeowner

Lab – 30 to 60 %

Third Party – 40 to 70%

## Risk

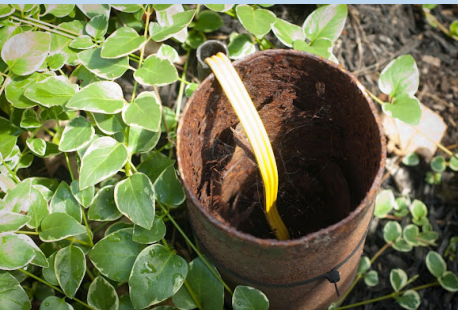
Lab Certification – 90%

Third Party - < 10 %

Phone Apps updated to help community and professionals select screening tests.

# Our Findings - Legal Baseline for Private Well Owners

- Not a one size fits all approach.
- Individuals are Getting Lots of Bad Advice !
- If sampling, field document site conditions, observations, take digital photos, and add a sample information sheet to chain-of-custody form.
- Be prepared to recommend supplementary testing.
- Work with a professional.
- Train Staff in SOPs and Best Practices.



It is important that the Water Does NOT Have a Color, Odor, Turbidity, or other Aesthetic Issue. It should be noted on your documents. I like to call these negative findings.



[www.KnowYourH2O.us](http://www.KnowYourH2O.us)

Hirer Us to Run  
a Community Hazard  
Report !

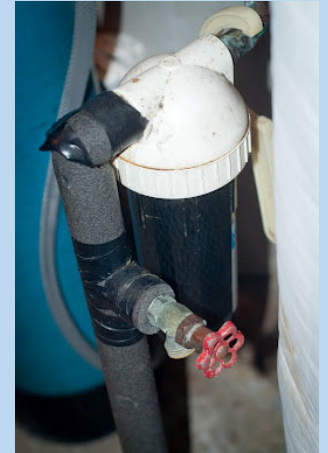




# Inspectors and Water Treatment Professionals

- Attempt to partner with licensed or certified professional, such as the Water Quality Assoc. Licensed Well Drillers (NGWA), or National Association of Home Inspectors, and licensed professionals.
- Have written SOPs! Field staff must note observations.
- Maintain a record of any training of these individuals your offer and ask them to sign a Code of **Ethics document and submit a “CV” and they reviewed the SOPs, and any safety information you provide.**
- **Update Annually.**

Remind them to use  
WET ICE !



# Real Estate Transfers



- If possible work with an unbiased professional that knows the region.
- In general, the housing industry and banking community requires only minimal testing as part of a real estate transaction. In most cases, this testing is completely inadequate and it is my professional opinion a more elaborate testing program should be conducted and we should tell our client.
- Basic Loan - Normally only requesting total coliform (this is not adequate).  
VA Loan - Total Coliform, Nitrate/Nitrite, Iron, Total Dissolved Solids, Lead, and Hardness (this is not adequate).  
FHA Loan - Nitrate/Nitrite, Total Coliform, e. coli, Lead (this is not adequate)
- VA “Tests on private wells are valid for up to 90 days if completed before a formal Notice of Value is issued for the property”. Requires 3 party.
- Certified Labs –“You are certifying the well water is safe”.
- You must manage this liability and risk.
- Great Opportunity to suggest informational water testing or additional field screening.

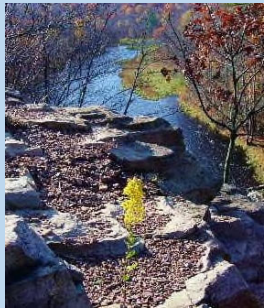
“VA home financed with a veterans’ loan can have well water as long as the well and the water is tested to be safe.” Note: About 50% of the time, additional work is needed, such as shock well disinfection.

The Water Professional

Legacy  
Issues



Environment



Non-Point



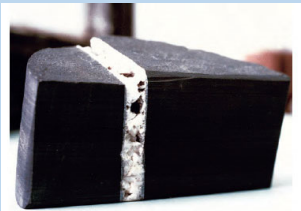
Do You  
Feel This  
Way?



Citizens

Movements

Drinking  
Water



Shale Gas  
Industry

All Other Industries

# Sample Site Nightmare – What is this?



Why checking the pH, conductivity, temperature, and wearing gloves is important !

# When Conducting Field Sampling – Use Your Best Sensors – Eyes, Ears, Nose, and Brain Functioning

1. Remember to Follow (SOPS) – Standard Operating Procedures
2. You must maintain “Custody” of all bottles and samples.
3. Collect samples in areas that are dust free, clean, free of contamination, and not cluttered. Wear gloves !
4. If possible avoid: aeration devices, swiveled faucets, screens, hoses, or leaking faucets
5. Make sure to not only have chlorine and alcohol for disinfection, but a spill containment kit.
6. If sampling point is not optimal, recommend a new sampling location. (May require a change in the SOP or Sampling Plan.)
7. Conduct field monitoring for at least pH, conductivity, total / free chlorine, and temperature (Drinking Water). Record results on a field data sheet – Not a Notebook.
8. Be observant – stains, odors, films, coatings, etc.
9. Complete all paper work and clean up.

Step 1 : Get the Information and Pick the Best Sample Site.



# Sampling Sites

This Tastes Great – Sample Here !





# What is a Bad Sample Site?



# Bad Sampling Points (Not Recommended)





# Bad Sampling - Site Challenges



Possible Solution – Bring your own sampling hose !

Is this a ghost with a rifle ?  
Do Not Turn Around too Fast!  
How Much is that System?



# Sampling Locations To Avoid- One Reason to Tour the Facilities !



- Identify and Avoid sampling sites in areas that **may adversely affect** the microbiological quality or general quality of the water. These include high use areas such as taps serving: **wait staff stations, bar sinks, bathroom taps, near fuel storage, taps in food preparation areas, or areas that are very damp.**
- Sampling sites should also consider **cross connections**, varying user densities, **low-pressure zones**, sites of **deteriorating water lines**, shared connections, near mixing valves, **dead ends**, areas of low-velocity water movement, **base of pressure tank**, and other trouble spots in the distribution system. (Especially Dead Ends !)



# Undesirable Faucet Locations

- **Swivel-type faucets** that have a single valve for hot and cold water.
- Faucets with **leaky packing material** around the stem and/or excessive corrosion.
- Faucets located in areas with **high bacterial contamination**, such as **janitorial or commercial kitchen sinks**.
- Faucets close to or below ground level or from a sprayer.
- Faucets that point **upward like drinking fountains**.
- Faucets that have **threads on the inside of their spouts**.
- **Faucets that have aerators**. (If such faucets are to be used, the aerators must be removed before a sample is collected.)





# Stuff YOU Find When You Bother to LOOK



Iron Bacteria  
(Iron/Manganese/Sulfur)

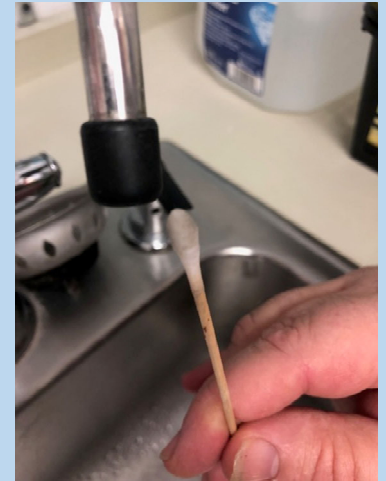


Toilet Tank- Slime Bacteria /  
Standard Plate Count  
Confluent Growth

Not Discolored  
because of the  
fixture –"Biofilm)



What is on the  
Aerator screen?  
(Is that Gold?)



# Why First Flush Sampling is Critical and Why Should we Care about the Source?

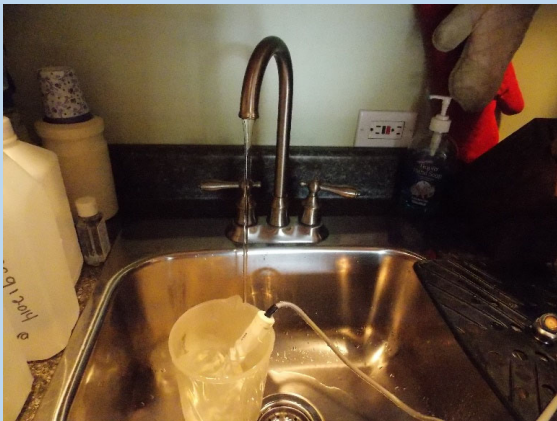




# Better Sampling Points

For compliance monitoring:

1. Sample should be representative of the water being produced and collected from a discrete and dedicated sampling tap.
2. Ideally, these taps and lines should not be connected to any other equipment or used for other purposes.



But make sure to look for a point-of-entry, particle filter or other treatment unit (smooth-bore taps).

# Proper Hand Washing



- **Wet** your hands with clean, running water (warm or cold), turn off the tap, and apply soap.
- **Lather** your hands by rubbing them together with the soap. Be sure to lather the backs of your hands, between your fingers, and under your nails.
- **Scrub** your hands for at least 20 seconds. Need a timer? Hum the "Happy Birthday" song from beginning to end twice.
- **Rinse** your hands well under clean, running water.
- **Dry** your hands using a clean towel or air dry them. Use a paper towel not an old rag ! Wear the Proper Glove !

# Do We Really Need To Wash Hands/ Disinfect Space ?

Parameter	Dirty Hands (No Gloves)	Washed and Dried Hands (NO Gloves)	Washed and Dried Hands (Gloves)	Cleaned Space Wash Hands, and Wearing Gloves	Samples in Dirty Cooler with Wet Ice
Total Coliform	Positive	Positive	Negative	Negative	Positive
E. coli.	Positive	Negative	Negative	Negative	Negative
Standard Plate	350 colonies per ml	120 colonies per ml	150 colonies per ml	20 colonies per ml	100 colonies per ml

“Dirty” hands (NO Gloves) – This was after the person had lunch and working on other equipment with hands, fingernails apparently dirty, and uncleaned sample site/area.

“Washed and Dried Hands” (NO Gloves) – The same person after the hands were washed and air dried, but area not cleaned or sanitized and no gloves.

“Washed and Dried Hands” (Gloves) – The same person after the hands were washed and air dried wearing gloves, but area not cleaned or sanitized.

“Cleaned work surfaces and other surfaces” that are touched by the gloved hand.

“Sample bottles put in dirty cooler without putting sample in a plastic bag”.

# How the Sampler Can Impact Results ?

Parameter	Original Sample	Dandruff	Dirty Containers	Sweat
Total Coliform	< 1	< 1	5	1
E. coli.	< 1	< 1	< 1	< 1
Standard Plate	40	300	120	80

pH (units)	6.30	6.35	6.81	5.81
Conductivity (uS/cm)	60	90	210	400
Turbidity (ntu)	< 0.2	10	2.1	< 0.2



## Ethics - The Yellow Flag – “Flint”.



# Being an un-biased Professional Ethics (Full Definition)

- the discipline dealing with what is good and bad and with moral duty and obligation.
- a set of moral principles.
- the principles of conduct governing an individual or a group.
- a guiding philosophy.

General Comment – We all want to do a good job, earn a living, protect the public and more importantly not end up in JAIL – See Flint !

# Water Quality Association Code of Ethics

- The Water Quality Association is dedicated to promoting the **highest principles of honesty, integrity, fair dealing and professionalism** in the water quality improvement industry. It is equally dedicated to preserving the **consuming public's right** to quality water. This Code of Ethics sets standards of conduct for industry members in their dealings with **their customers**, among themselves, with members of related industries, and the **public at large**.
- Conduct themselves as **informed, law-abiding citizens** dedicated to **ethical business** practices.
- Be informed of and **adhere to all laws**, statute, ordinances, codes, and regulations applicable to the industry including those dealing with restraint of trade, consumer protection, truth in advertising, truth in lending, intellectual property protection, selling, registration, sanitation and effluent disposal.
- **Accurately represent** credentials, training, experience and abilities of all employees and agents.
- Ensure that their products or services are properly applied or installed when they are responsible for such application or installation. **Inform customers** of the general maintenance, service requirements and related costs

[https://www.wqa.org/Portals/0/Governance/2014\\_WQA\\_CodeOfEthics\\_FINAL.pdf](https://www.wqa.org/Portals/0/Governance/2014_WQA_CodeOfEthics_FINAL.pdf)

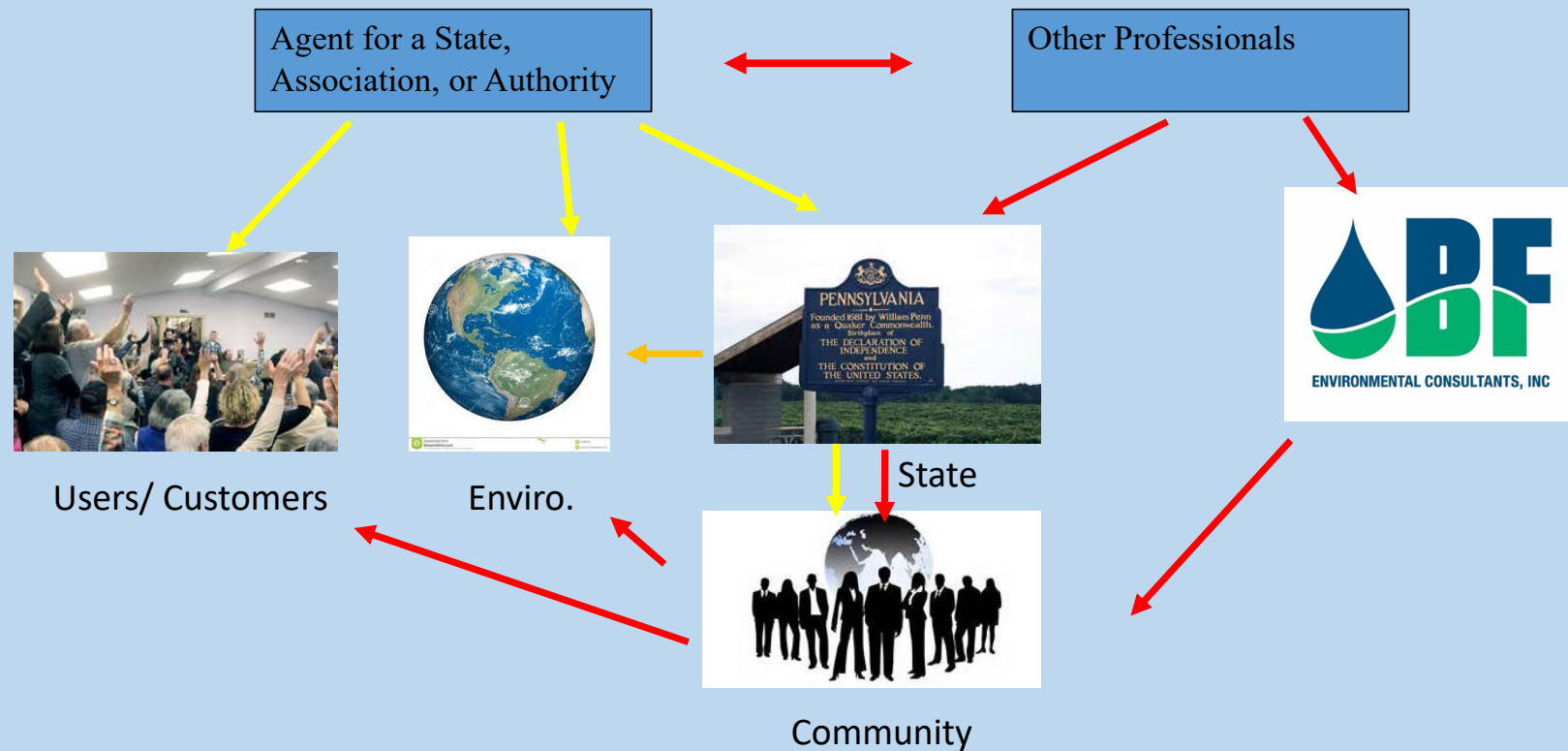


# PA Licensed Water and Wastewater Operators

- As a drinking water or wastewater treatment operator, you are a clean water **professional** in an occupation that requires **education, training, experience, and attainment of State Certification** to practice. In this profession, operators must be responsible for and dedicated to the protection of **public health** and the **environment**. Operators must act skillfully and conscientiously in a timely fashion. Operators have a direct impact on our environmental and public health, the preservation and protection of which affects the **quality of life** and safety of all **residents and visitors**.

[http://www.pwea.org/docs/Operator\\_Code\\_of\\_Ethics\\_Adopted\\_by\\_PWEA\\_12-10-2015.pdf](http://www.pwea.org/docs/Operator_Code_of_Ethics_Adopted_by_PWEA_12-10-2015.pdf)

# Code of Behavior Special Provisions



## PA State- The Ethics Act and the Commission

- The Ethics Act was further amended by Act 134 of 2006.
- The Ethics Act was passed to strengthen the faith and confidence of the people of the Commonwealth in their government.
- The State Ethics Commission was established to administer and enforce the provisions of the Ethics Act and to provide guidance regarding the standards established by the Ethics Act.
- **Employed by** - Used in any capacity, with or without compensation. This definition is only used in the context of section 6(d)(5) of the act (65 P.S. §406(d)(5)).
- **Employer** - One who uses the services of others and pays their wages, salaries or other compensation.
- Attached Memo – Dated December 29, 2009
- Training is Available:
- <http://www.ethics.state.pa.us/portal/server.pt/community/ethics/8995/training/642644>





# Words of Note – What is a Public Employee?

## ***Public employee –***

(i) The term includes an individual who is employed by the Commonwealth or a political subdivision and who is responsible for taking or recommending official action of a non-ministerial nature with regard to one or more of the following:

(A) Contracting or procurement.

(B) Administering or monitoring grants or subsidies.

(C) Planning or zoning.

(D) inspecting, licensing, regulating or auditing any business, governmental body, individual, corporation, union, association, firm, partnership, committee, club, or the interests of any business, governmental body, individual, corporation, union, association, firm, partnership, committee, club or other organization or group of persons .

(E) any other activity where the official action has an economic impact of greater than *a de minimis* nature on the interests of any person



# Public Health Degree – Bachelor of Science Degree Program

## **Public Health**

### **What is Public Health?**

Public health is an exciting and growing field of study that challenges its professionals to confront complex health issues in local, national, and international communities.

### **Bachelor of Science in Public Health**

The **Bachelor of Science** in Public Health strives to prepare students for progressive independence, maturity, knowledge of the world, understanding of diverse inhabitants, and respect for their differing points of view. This degree is intended to convey technical detail and analytic skills, but with the liberal arts philosophical base, it also has the educational objectives of nurturing critical thinking, analysis, and synthesis of information, and recognizing the historical and societal associations of current trends in public health and health care delivery.

[http://www.keystone.edu/academics/majors/bachelors\\_degree/](http://www.keystone.edu/academics/majors/bachelors_degree/)

# “The Hidden Health Crisis – Drinking Water?”

My First Answer – The “Three (May Not So Wise) Monkeys”



- “In Buddhist tradition, the tenets of the proverb are about not dwelling on evil thoughts.

- In the Western world both the proverb and the image are often used to refer to a lack of moral responsibility on the part of people who refuse to acknowledge **impropriety**, **looking the other way** or feigning **ignorance**.

- It may also signify a **code of silence** in **gangs**, **industry**, **govt**, **social groups**, religious orders, cultures, or **organized crime**.” (wikipedia.org – 2016)

"see no evil, hear no evil, speak no evil"



Disclaimer:

Please Note – Not suggesting to anyone to become or not become a Buddhist.

If you need a safe zone, please move to Aisle 3 (baby powder WO asbestos and blankets may be available – there may be a charge).

The Third Monkey- Speak NO Evil Monkey  
This can be the Worst  
(Lack of Information / Withholding Information)  
But Also Stops Open Discussion / Debate

This Monkey expressed in a number of ways:

1. We know we have a problem, we will try to fix without informing the “Other Group, Citizens, Regulatory Agency”. This is the wink wink group.
2. We know what we are talking about is not a real threat, but it scares the public and gets them to act. (Causing Fear = Change We Support)
3. I know what I know – I do not know what I do not know. If I ask, I may lose my job. (So Do NOT Ask)
4. That information is wrong, but if I speak out – I will be labelled as a \_\_\_\_\_. (add negative stereotype.)
5. We can use this crisis to sell \_\_\_\_\_, but the real problem may be environmental exposure lead paint, foreign made toys, contaminated soil, cosmetics, and cookware.

I think a Good Example is Flint Michigan and Lead Levels in PA Children!



# My Take (ME) on Flint Michigan



- Existing System - Used a Water Source that required corrosion control. This means the scale in the piping **had decades of chemical coatings that contained mineralized metals** (lead, iron, manganese, etc.).
- Switched to a new water source – No apparent water quality problems with the source, but the water had a **different corrosion potential**.
- New Source – **No Corrosion Control/ Ineffective Initial Disinfection** – Bioslimes form and the old scale begins to come off the inside of the piping. **Bacterial problems results in boil advisories – Concentrating metals in water.**
- Result – **Discolored Water Initially**, Mostly Likely Old Infrastructure/ Homes Not Recently Remodeled, Problems Could be **Highly Concentrated in Communities and Spotty**, Very High Metal Content (Can we see lead in water? – NO).
- Protective coating containing legacy metals removed – Now we have physical erosion of the piping.



By the way – **Service Lines are the Homeowners responsibility** not the water company or utility-  
Guess What -Source of Lead is the Scale and Old Lead Service Lines.

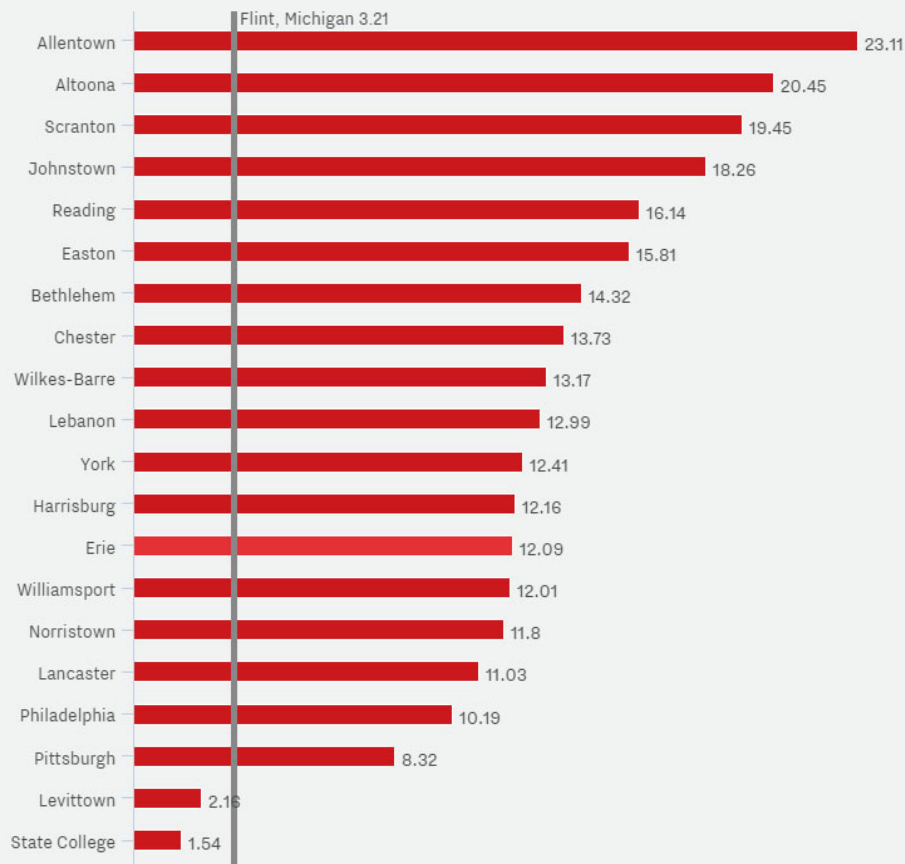
“This is not Our Problem – but Yours.” The Monkeys engage. “Finger pointing and politicians/ utility looking for handouts begin ! “





## This group of 20 cities in Pennsylvania had an elevated blood lead level rate 22 percent higher than the state

■ Elevated BLLs  $\geq 5$   $\mu\text{g}/\text{dL}$  as % of children tested



Source: Pennsylvania Department of Health, 2014  
Credit: Sarah Frostenson

Vox

<http://www.vox.com/2016/2/3/10904120/lead-exposure-flint-pennsylvania>

Headline:

**“18 cities in Pennsylvania reported higher levels of lead exposure than Flint”**

Since it is tied to Flint, Michigan – the Public Thinks this is related to a Water Issue.

How many actually read anything past the headline?

Quote:

“The Pennsylvania Department of Health reported that the primary source for childhood lead poisoning in Pennsylvania is exposure to aging, deteriorating lead-based paint (chips and dust)”

This is really about environmental exposure – lead paint, dust, but could also include cookware, toys, crayons, etc.

Did Anyone Say – the Blood Level Warning Levels Changed? In 2012, went from 10  $\mu\text{g}/\text{dL}$  or to 5  $\mu\text{g}/\text{dL}$  or 0.05  $\text{mg}/\text{L}$  in blood.

[http://www.cdc.gov/nceh/lead/ACCLPP/blood\\_lead\\_levels.htm](http://www.cdc.gov/nceh/lead/ACCLPP/blood_lead_levels.htm)



# Old News – Arsenic Texas



Report: There Are 65 Flint, Michigan-Type Water Systems in Texas

Despite the health risks, **Texas fails to tell consumers** to stop drinking the water and instead implies that it is safe.

When local water utilities find violations, federal law requires local water utilities to tell consumers that lifetime exposure to arsenic concentrations above 10 [parts per billion] may increase cancer risk. **But Texas also requires the advisories to state: “This is not an emergency...You do not need to use an alternative water supply.”**

“Unlike in Flint, lawmakers trying to save a buck didn’t manufacture the toxic-water problem. Arsenic exists naturally in Texas’s soil, and state law requires arsenic groundwater tests every three year.”

The Three Monkeys Strike Again !  
Just wait – A New Story, the others Monkeys will be on the Scene Soon.

Source: <http://www.houstonpress.com/news/report-there-are-65-flint-michigan-type-water-systems-in-texas-8296477>

# Ethical Theories

A person, the **agent**, performs an **action**, which leads to certain results, or **consequences**.

- **Consequentialist Theory**- focuses on the external results of an action.  
"the ends justify the means"
- **Deontological Theory**- theory attempts to evaluate actions as right or wrong.
- **Virtue Theory** - focuses on the agent and issues of character and integrity.
- **Rights Theory** - Society's goals and ethical priorities are linked (Ethics by popular demand).

## Ethical Theories

Actor/Agent	Action (Deontology)	Results (Consequentialism)
Virtue Ethics (Aristotle)	Ethical Duties (Kant)	Utilitarianism (J.S. Mill)
Focuses on what a person of character would do	Determines what action best fulfills one's duty	Weighs harms and benefits resulting from an action
A moral action exemplifies the virtues of a person of character	A moral action fulfills a duty or obligation one owes to oneself or society	A moral action provides the best net balance of benefits over harms for most people
Useful to assess skills and abilities needed for success	Duties defined in terms of moral principles or maxims	Implicit in cost/benefit or risk/benefit assessments
Reliability, trustworthiness, competence	Autonomy, justice, equity, human rights	Long versus short term harms and benefits, undue burdens

# How to Make a Ethical Decision

Step 1:	Compile the available information – Try to separate fact from fiction and spin.
Step 2:	Who are the players and what are their individual roles.
Step 3:	What are the motivation of the individual players and compile the information and identify the facts.
Step 4:	Determine what information is missing or lacking or data that appears to be biased and fill in the gaps.
Step 5:	Develop a short list of reasons for the problem and possible corrective actions.
Step 6:	If your not sure – ASK ! Seek additional assistance, as appropriate - engineering codes of ethics, previous cases, peers, and reliance on personal experience- Seek Advice from others with more or different expertise.
Step 7:	Select the best course of action specific to the project and conditions.
Step 8:	Implement the selected solution - take action as warranted.
Step 9:	Monitor and assess the outcome - note how to improve the next time

# We are all Scientists!

- Good Ethics also means good science, i.e., ethically correct.
- I like the POT Method
  - Prepare
  - Observe
  - Translate
- Before we make a professional opinion, we should:
  - Prepare: Get the facts – all the facts.
  - Observe: Take an un-biased look before jumping to conclusions, maybe conduct some tests.
  - Translate: Convert findings into a series of ideas and test or confirm. Such as: If the Problem is A, then if I do C, I would get D. If I get E, something is not correct about my hypothesis.

Many times we lack the original observations or data, because no one is taking a picture.



# Scientific Principle for the Environmental Professional

- Be a **fact-based professional**, who is **open-minded (Good Scientist)**.
- **Believe and follow the scientific method** of trying to identify the potential causes for a problem. Think **proactively**. If this was done – we would not have the MTBE Problem.
- Develop a **hypothesis**, conduct the proper testing, finding the cause of a problem, and fix it. **Realize and accept, you may be wrong**, but have some idea about what wrong might look like.
- Use this data and findings to modify hypothesis and with sufficient information potentially use to change or update regulations and practices.
- Step aside and allow the lawyers to do the rest of the work, because this is not always fact based, but based **on perception and feelings**. No place for the science based professional. Give your expert opinion, but stay out of the political or legal debate. Stay Fact Based and DO NOT Pick a Side !
- Remember – When it comes to a **disagreement between two parties, the answer or solution is typically in the middle**. If you pick a side – You are Wrong.

# Break ! Educate and Inform the Community!

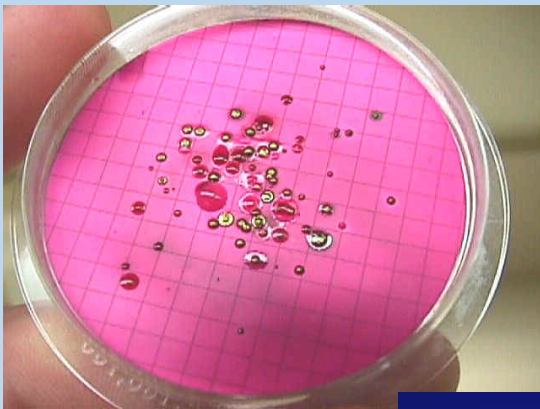


The Water Cycle as Jewelry !

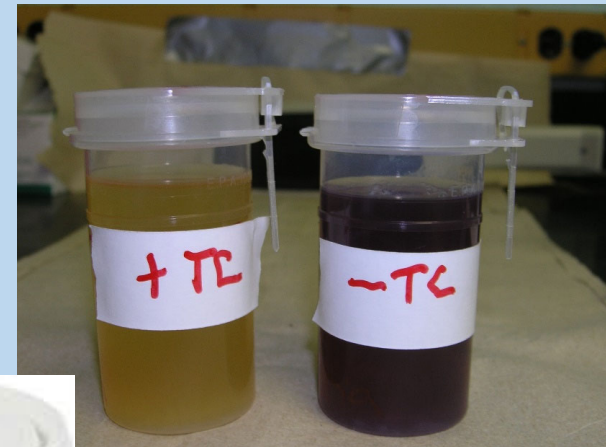


# Type of Samples You May Need to Collect

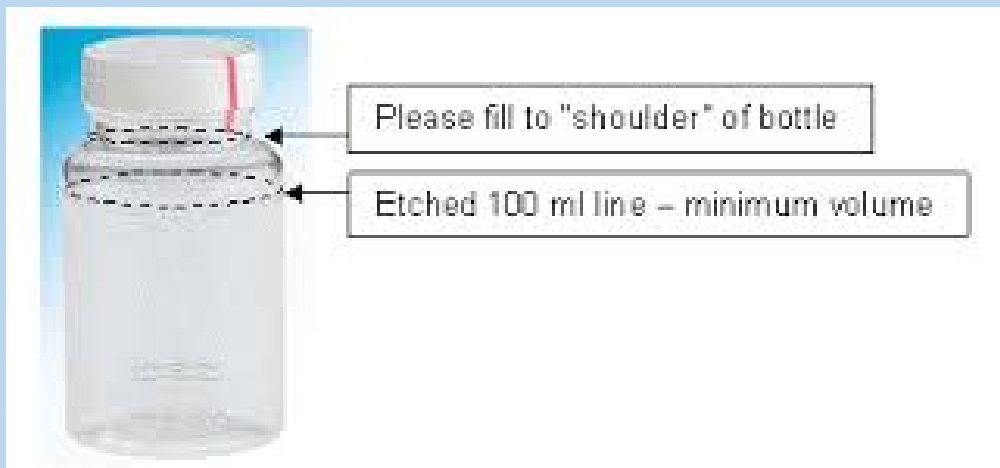
- Bacteria



Total Coliform, E. coli, Fecal  
Coliform, Heterotrophic Bacteria,  
Coliphage, Enterococci



# Please !



When Sampling – Please clean sample site with 10 mg NaOCl/L or 91 % alcohol or both on inside and out. This most likely will require well screen to be removed.

Use a swab, spray bottle, or baggy/ small container that can go over faucet.

Wash hands/ Dry hands – Decon Sampling Area.

Wear gloves.

Purge line for 3 to 5 minutes+ at a higher velocity .

When sampling, reduce flow stream so it is About the size of a pencil (1/4-inch diameter) without splashing.

Remember – Bacteria is mostly located on the inside of the piping, i.e., sessile.

Does any one have a problem with this protocol?  
Ask about the Use of Alcohol – I started using because of stainless piping and  
I was trained at a University Microbiological Laboratory !

# Bacteria (continued)

- Typically – Use 125 ml plastic bottle that is sealed – pre-sterilized containers that may contain sodium thiosulfate to dechlorinate samples.
- Bottles should be stored in a clean dry area and preferably inside a plastic bag.
- Handle the Bottle Wearing Gloves, Label Containers, and when remove cap do not put it down and if possible keep it facing down. Sample Cold Water !
- Fill as Directed– do not over fill ! After closing, wipe off excess water.
- Transport -  $< 10\text{ C}$  ( $< 50\text{ F}$ ), but do not freeze.
- Transport on Ice add Cold Packs in a Clean Cooler, but it may be best to put the ice in a plastic bag with a little water and the sample in a separate plastic bag (Wet Ice).



## Transport Times

8 hours – source water

30 hours – drinking water

48 hours – coliphage

If a chlorinated source, measure the chlorine residual in the water in the field. A value of  $< 0.1\text{ mg/L}$  is not detectable.



# Standard Methods – 9060A: Microbiological Sampling

- When collecting leave at least 2.5 cm to facilitate mixing of the sample via shaking.
- Collect samples that are representative of the water being tested and use aseptic techniques.
- If tap cleanliness is questionable, choose different tap or disinfect faucet (“inside and out”) with 100 mg NaOCl/L sodium hypochlorite solution before sampling.
- Do not sample leaking taps.
- If the sampling site is a mixed faucet (hot/cold), remove screen and splash guards, run hot for 2 minutes, and then run cold for 2 to 3 minutes or more, and then collect sample.

# Do You Remove the Aeration Device? and is the Base of the Pressure Tank OK?

- “Select a cold water faucet for sampling which is free of contaminating devices such as screens, aeration devices, hoses, purification devices or swiveled faucets.”

\*\*\*\*\*

Remove Aeration Device – Big YES !

- “Collect samples from faucets which are **high enough to put a bottle underneath**, generally the bath tub or kitchen sink, without contacting the mouth of the container with the faucet.”

\*\*\*\*\*

My Answer is Base of Pressure Tank – NO! (Find better location)

Source: EPA – “Quick Guide to Drinking Water Sample Collection– 2015, 2<sup>nd</sup> edition” you have a copy in the notes.



# Using the “Regulated” Sampling Method Could We Be Missing Problems?

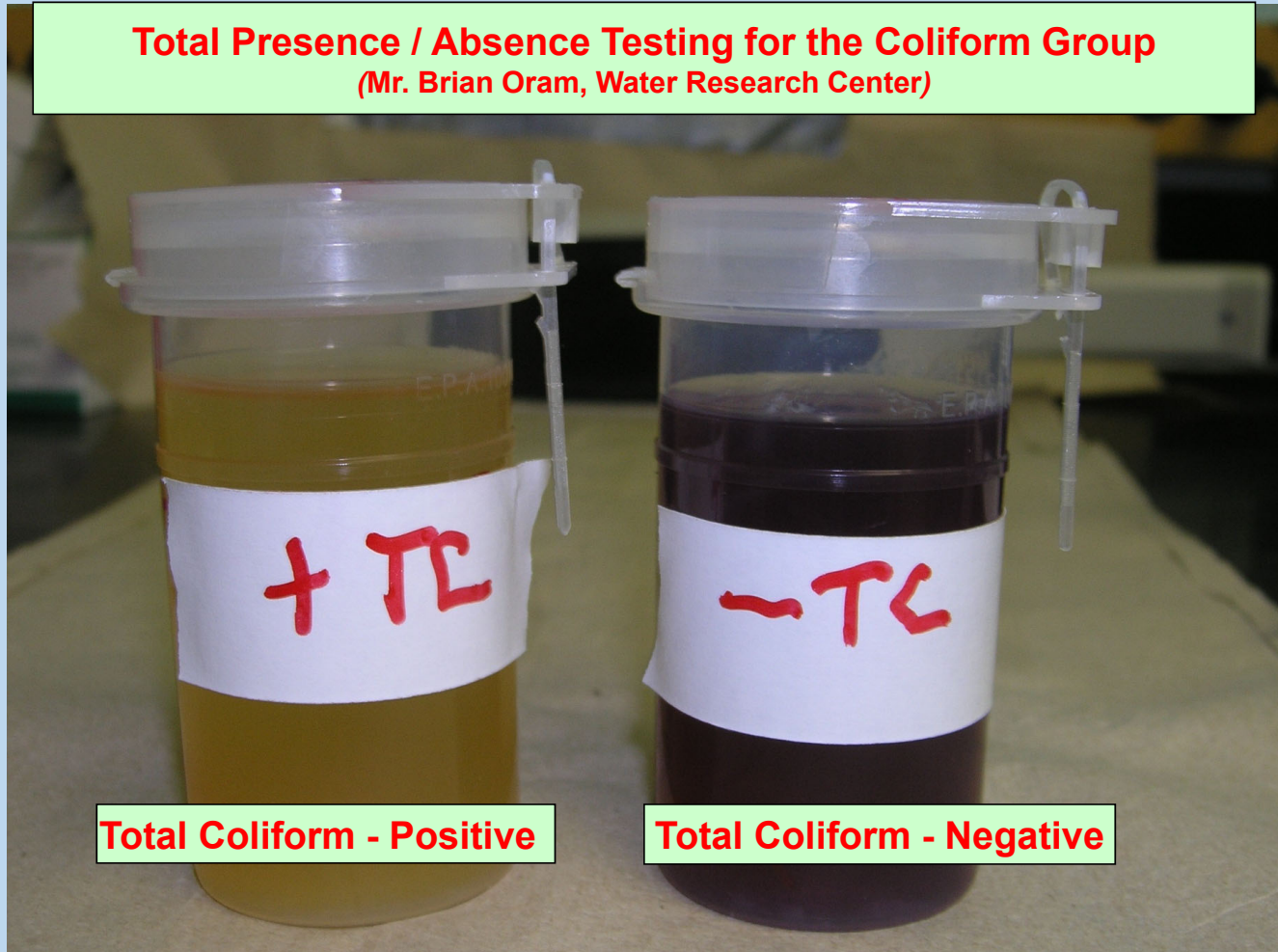
What information are we losing when we flush the line ?

Case: Rural Customer on a Private Well with a Water Treatment System with Operational/ Aesthetic Issues with UV Disinfection (Class B UV Disinfection)

Parameter	Raw Water (UT) FF	Raw Water (UT) F	Cold Water (T) FF	Hot Water (T) FF	Spray Nozzle (T) FF	Cold Water (T) F	Storage Tank (FF)
Total Coliform (#/100 ml)	Positive	Positive	Positive	Negative	Positive	Negative	Positive
E. Coli (#/100 ml)	Positive	Negative	Negative	Negative	Negative	Negative	Negative
Standard Plate (#/ml)	> 800	140	100	80	> 2500	< 1	> 2500

UT – Untreated; T – Treated, FF- First Flush, F- Flushed Sample

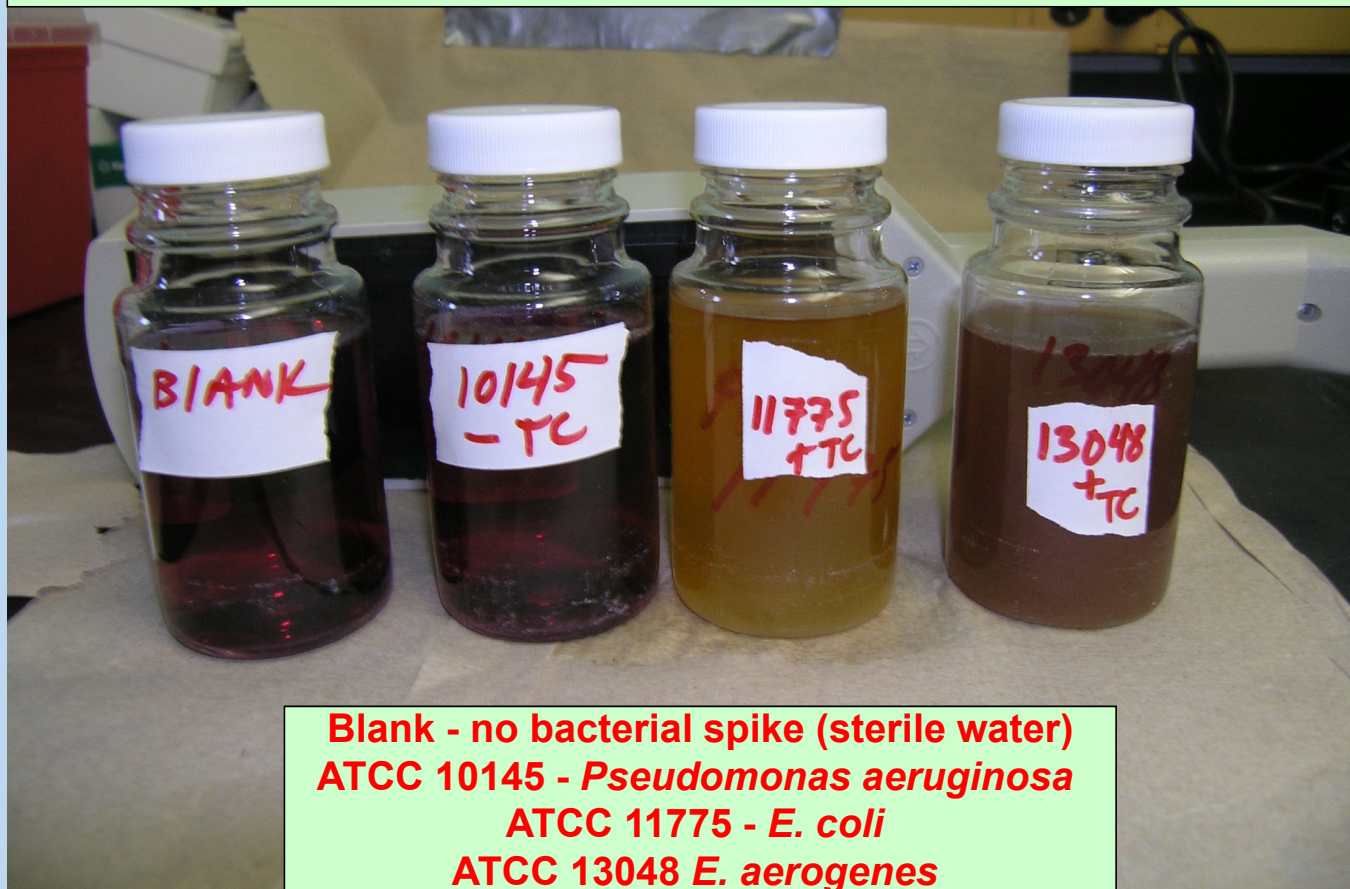
**Total Presence / Absence Testing for the Coliform Group**  
(Mr. Brian Oram, Water Research Center)



**Total Coliform - Positive**

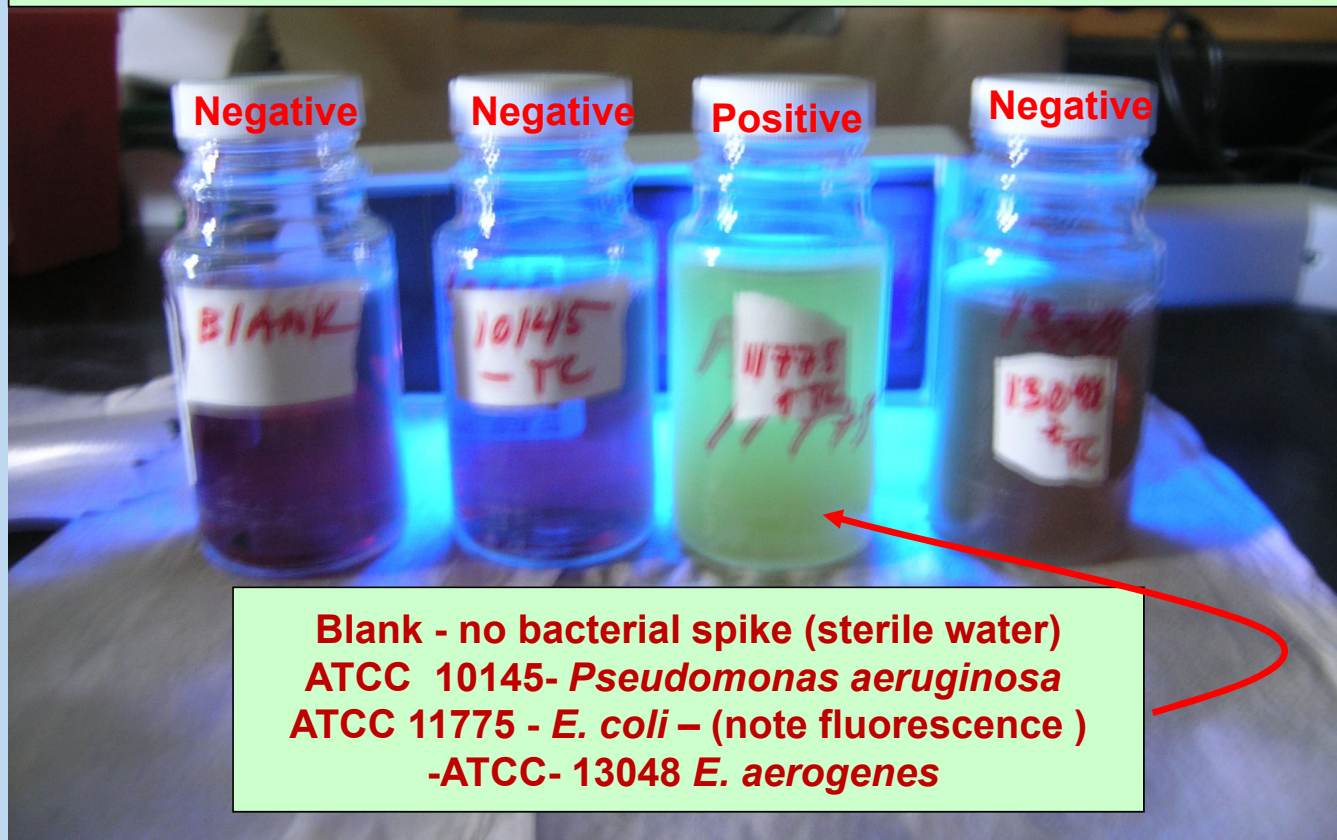
**Total Coliform - Negative**

**Presence/ Absence Media with MUG**  
(Mr. Brian Oram, Water ResearchCenter)

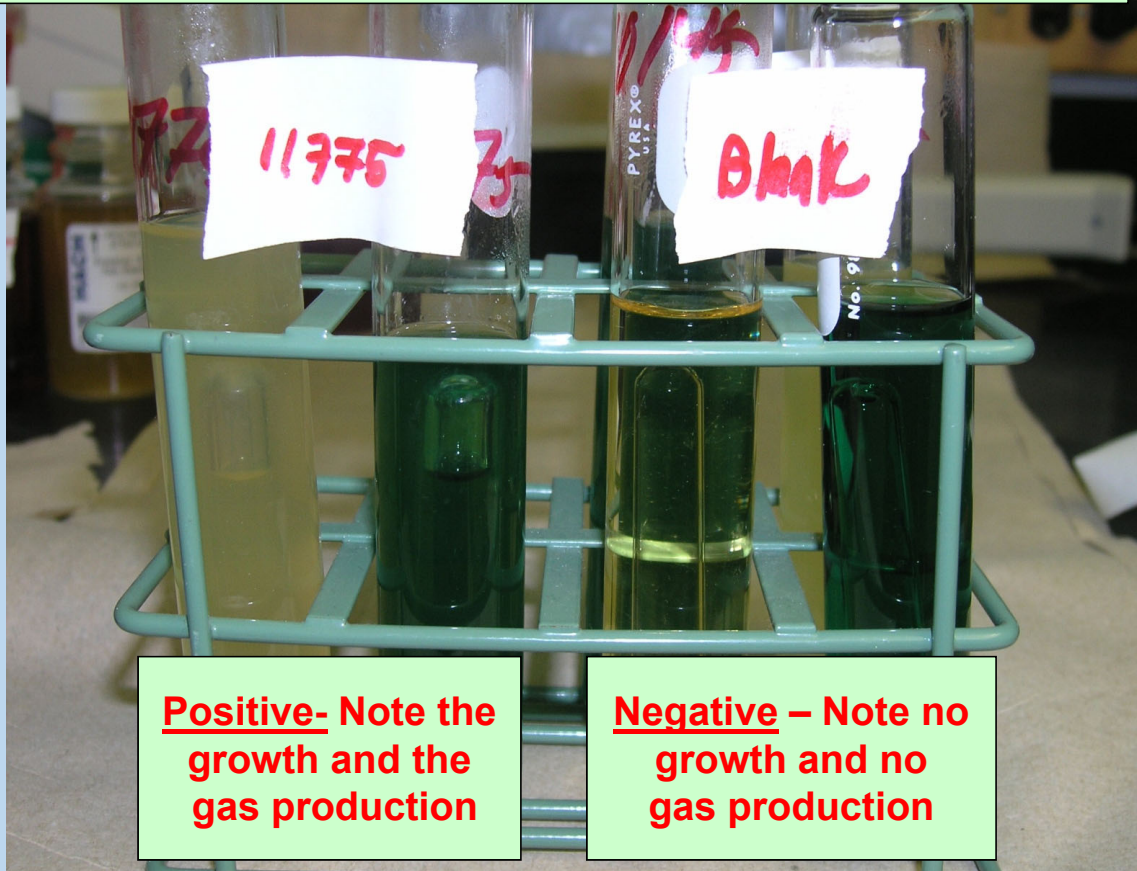


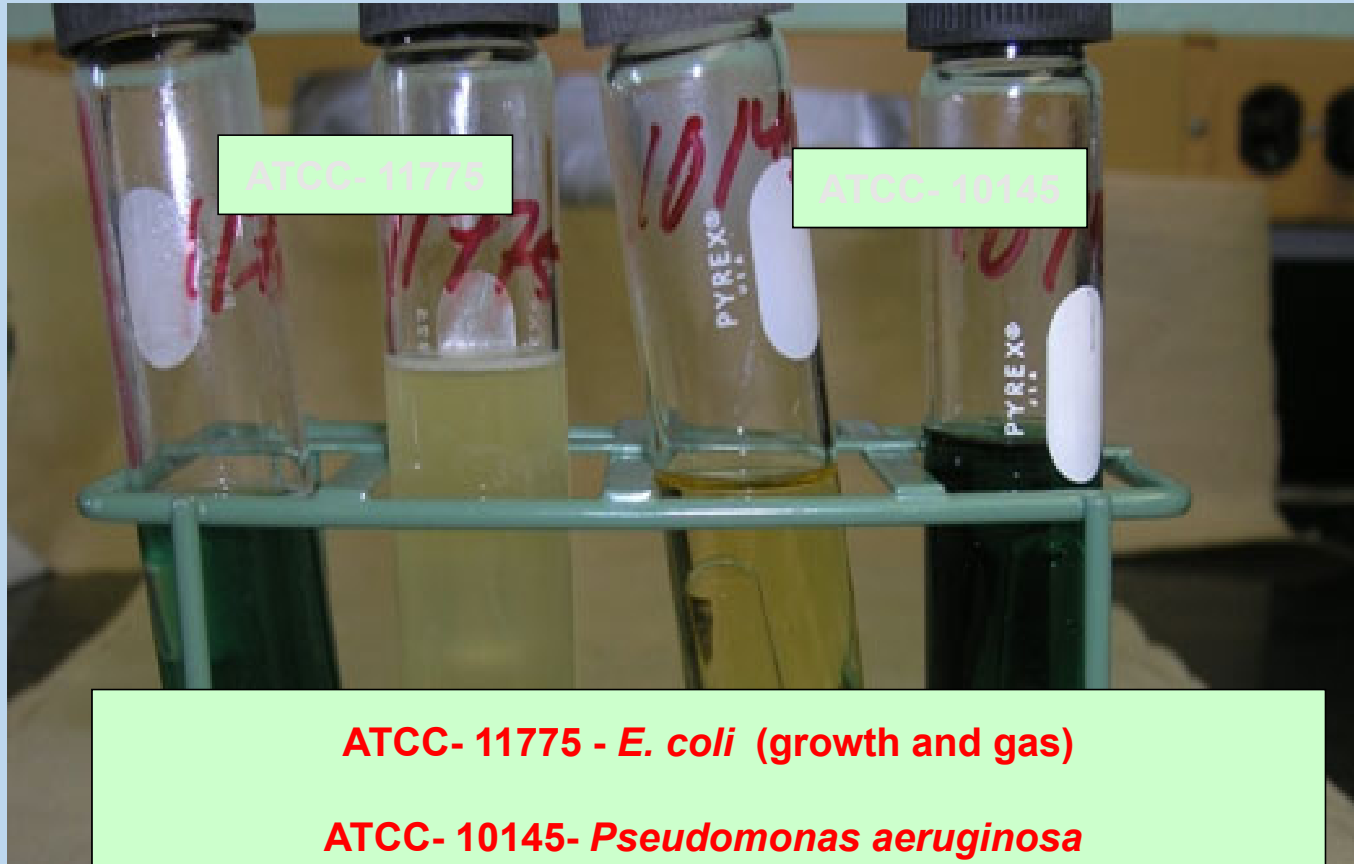


**Presence / Absence Testing with MUG  
E. Coli Confirmation- Positive Samples Fluoresce  
(Mr. Brian Oram, Water Research Center)**



**Confirmation Testing with LTB and BGLB**  
**Total Coliform Confirmation Testing –**  
**Air Incubator at 35°C (48 hours)**  
**(Mr. Brian Oram, Water Research Center)**



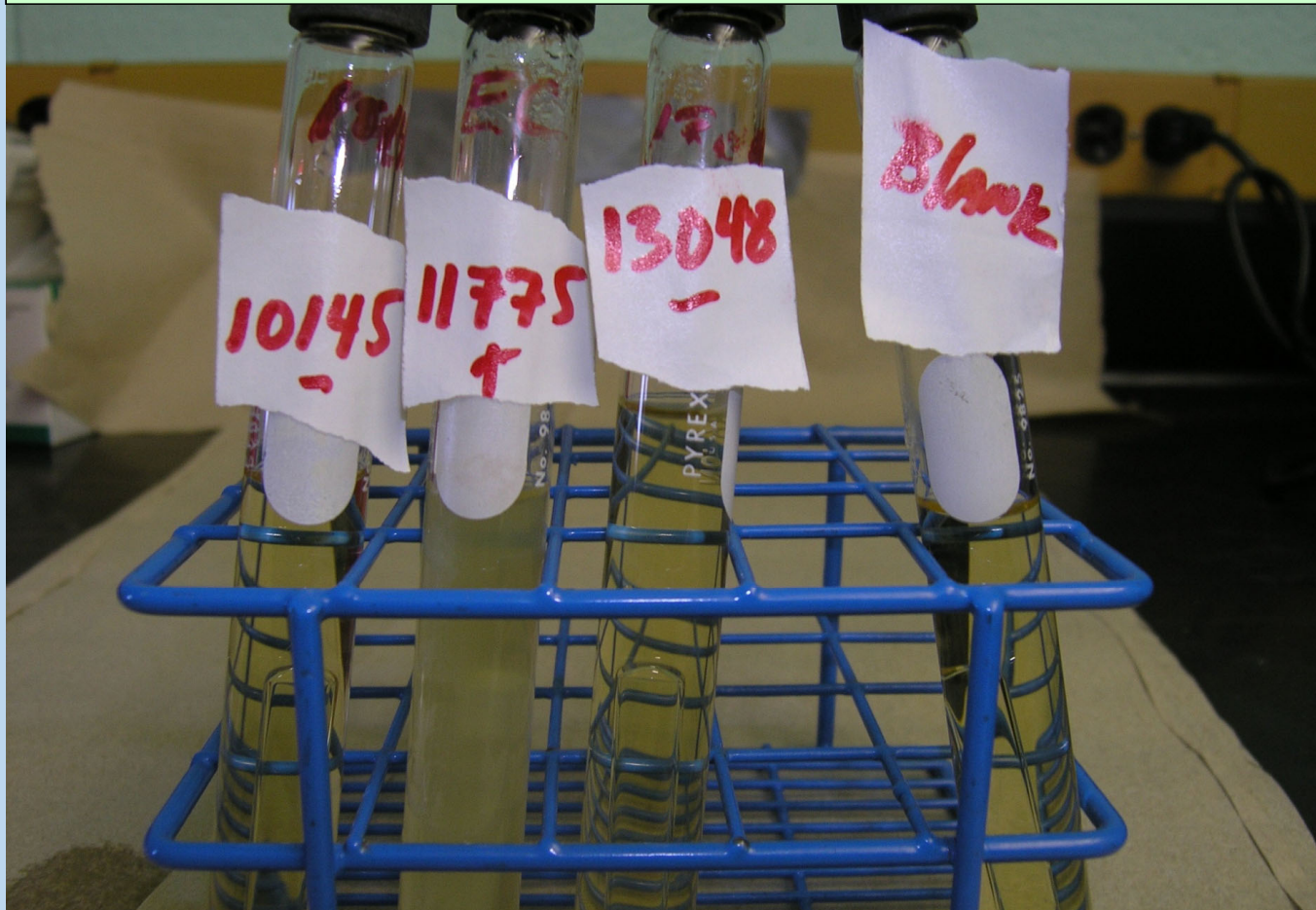


**ATCC- 11775 - *E. coli* (growth and gas)**

**ATCC- 10145- *Pseudomonas aeruginosa*  
(no growth and no gas)**

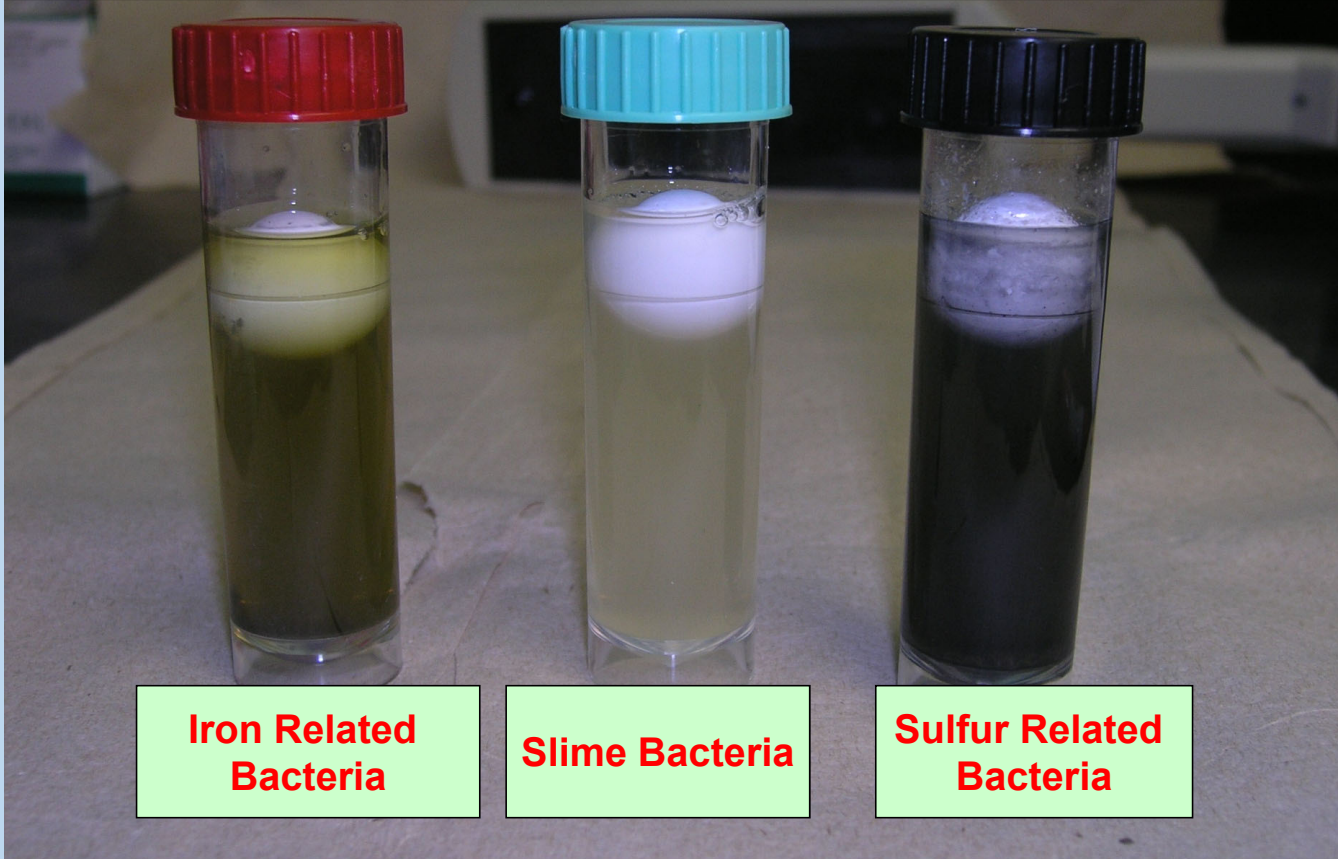
**(Mr. Brian Oram, Water Research Center)**

***E. Coli* Confirmation – Using EC Media**  
(Incubated - Water Bath 44.5 °C)  
(Mr. Brian Oram, Water Research Center)





**Other Bacterial Problems – “Nuisance Bacteria”**  
**Biological Activity Reaction Test (BART™)**  
(Mr. Brian Oram, Water Research Center)



Just because the sample is negative for total coliform – this does not mean the system does not have a microbiological problem.



# Type of Samples You May Need to Collect



- **Metals or (IOCS):** Arsenic, Lead, Copper, Iron, Manganese, Zinc, etc.
- Containers – Typically plastic or glass, but plastic preferred.
- Preservation – Field preservation with Nitric Acid ( $\text{HNO}_3$ ) to  $\text{pH} < 2$ . Typically 1% by volume.
- May need to check pH when the sample is highly alkaline.
- If the preservative is not in the bottle, rinse the bottle prior to collection.
- If preservative is in the bottle, DO NOT Rinse or Overfill!
- Wear gloves and maybe eye protection. When it is humid, you may see acid vapors.
- Do Not Overfill the bottle.
- Transport on Ice ! Maximum holding time is 28 days (mercury) all others 6 months
- It is important to note the lack of color or the color of the sample at the time of sampling.

It may be wise to  
field measure  
turbidity and pH.



# Inorganics

- Susceptible to aeration, oxidation, precipitation, co-precipitation, extraneous contamination and cross-contamination during sampling, filtering, and handling.
- Aeration of a sample, usually caused by excessive turbulence, can alter a sample's water quality. Precipitation of metal oxides can lead to the adsorption, co-precipitation, or both, of other dissolved cations and anions.
- Total and Filtered Samples (0.2 micron) for Metals are advisable and samples should be preserved immediately.



Sample Water Sample – Just add Air !



# Type of Samples You May Need to Collect

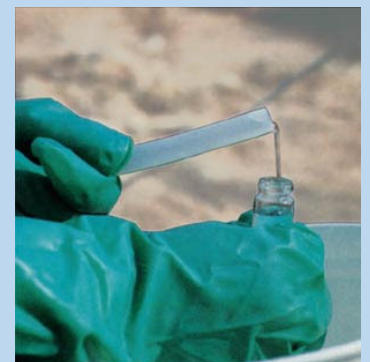
- **Volatile Organic Compounds**

- Clear or amber volatile organic analysis (VOA) glass bottles with Teflon-septum-cap.
- Preservatives – Sodium thiosulfate / ascorbic acid (chlorinated samples) and Hydrochloric acid (pH < 2).
- Check Laboratory Protocols – Many labs already have part of preservative in the container and they want you to fill bottle slowly (no turbulence) collect a split stream sample, no rinsing, and fill half-way or full before adding acid.
- Create a meniscus of water at the mouth of the bottle. Cap the bottle and check for air bubbles. Wipe off excess water and check to see that there is no air bubbles by inverting bottle several times.
- Transport on ice, Cool < 4 C and holding time – 14 days.



# VOCs

- Document suspected but unavoidable extraneous VOC sources when collecting VOC samples.
- These sources could include perfumes and cosmetics, skin pharmaceuticals, suntan lotions, marking pens (e.g., Sharpie), insect repellents, tobacco smoke and automotive products.
- Flow Rate - < 500 ml/ minute (CHECK !)



# VOCs ( $< 500$ ml/min)

- 1. If possible store empty VOC containers on ice, until use.
- 2. Open only one VOC container or one set of containers at a time.
- 3. After you open an empty container, add preservative. Follow laboratory recommend practice.
- 4. When filling a VOC container, tip it at a slight angle and allow a slow steady stream of water to run down its inner wall or fall the SOP provided by the lab.
- 5. Fill the container until a positive meniscus forms at the top.
- 6. Replace cap – there should be No air space – Check the Sample.
- 7. If bubbles are unavoidable, i.e., high methane , collect numerous samples and save the ones with the fewest bubbles. Do not try to reopen
- 8. Remember, one trip blank is required per sample batch (i.e., per cooler) when sampling for VOCs.
- 9. Store Samples in a separate freezer bag during transport.





# SOCs Herbicides Pesticides, etc.

- These organics are typically not very volatile.
- This includes base-neutral extractable, acid-neutral extractable, phthalate esters, PCBs, pesticides and herbicides.
- Susceptible to extraneous background contamination and cross-contamination.
- Susceptible to sorption and desorption reactions with the purging and sampling equipment. Good decontamination procedures are necessary to avoid any cross-contamination.
- These samples are not usually preserved or filtered
- Cool them to 4°C immediately after collection.
- Phthalates common laboratory contaminant – conduct additional laboratory and field blanks and split / duplicate samples.

# Type of Samples You May Need to Collect

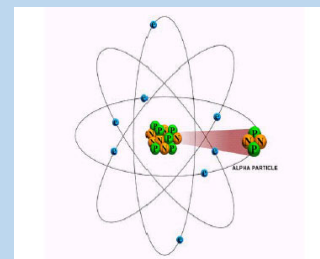
- **Trihalomethanes – Disinfection By-products (TTHMs)**
- Clear or amber volatile organic analysis (VOA) glass bottles with Teflon-septum-cap.
- Preservatives – Sodium thiosulfate / ascorbic acid (chlorinated samples) and Hydrochloric acid (pH < 2).
- Check Laboratory Protocols – Many labs already have part of preservative in the container and they want you to fill bottle slowly (no turbulence) collect a split stream sample, no rinsing, and fill half-way or full before adding acid.
- Create a meniscus of water at the mouth of the bottle. Cap the bottle and check for air bubbles. Wipe off excess water and check to see that there is no air bubbles by inverting bottle several times.
- Transport on ice, Cool < 4 C and holding time – 14 days.



# Type of Samples You May Need to Collect

- **Radionuclides**

- Bottles – Plastic or glass bottles, but plastic preferred.
- Preservation- Typically bottles contain preservative (Hydrochloric acid or Nitric Acid) – Do not rinse or over fill bottle.
- If the bottle does not contain the preservative, rinse the bottle and cap 3 times before sampling. Fill the bottle about half way, then add the preservative. Then continue filling to about 1 to 2 inches from the top of the bottle.
- Transport on ice  $< 4^{\circ}\text{C}$ , Holding Time up to 6 months.
- If collecting radon in water, check the regulations in your state. You may need to be a certified collector or be associated with a certified testing facility.



# Type of Samples You May Need to Collect

- Nitrate, Nitrite, or Nitrate+Nitrite
- Sampling protocol will depend on the analysis being requested and if the sample is from a chlorinated source.
- Nitrate alone & unpreserved— 48 hrs from sample collection If the sample is chlorinated and at 4C, 14 days N.
- Nitrate + Nitrite (i.e. Total Nitrate)— 28 days from sample collection (lab must provide H<sub>2</sub>SO<sub>4</sub> preservative with sample container).
- SPECIAL NOTE: If a sample contains chlorine, it cannot be analyzed for nitrite. Results from these samples will be reported as Nitrate + Nitrite. (This happens when sampling taps are cleaned with chlorine and not properly flushed).

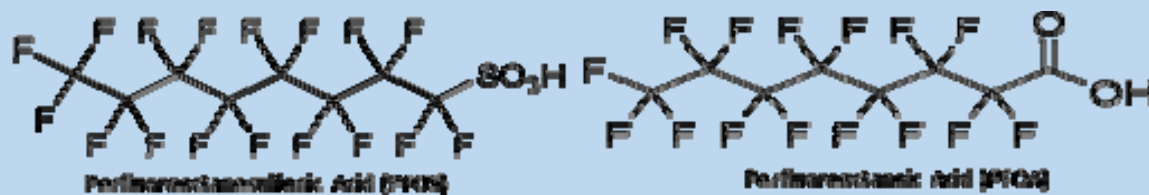
# Types of Samples You May Need to Collect

- Copper / Lead
- Follow laboratory or Specific SOPS for the Project.
- Whenever possible, collect the sample from a cold water kitchen faucet after the water has been in the pipe for at least 6 hours.
- Take the first sample first thing in the morning before any water has been run in the house. If present, do not remove the aerator or strainer from the faucet.
- Being careful not to get the sample bottle dirty or allow it to come in contact with the faucet, remove the bottle cap and place the first bottle under the faucet.
- Turn on the cold water and fill the container to the top but do not allow the bottle to overflow. Cover tightly, mark the bottle as the "First Draw", and include the date and time.
- Run the water for at least two minutes to clear the pipes of standing water. You may want to monitor conductivity and temperature to ensure line is flushed.
- Collect the second sample the same way as the first and mark the bottle as "Second Draw" and include the date and time.
- Ship, mail, or transport the samples to the lab as soon as possible after sample collection.



# Sampling and Testing –PFOS/ PFOA

- **Sampling**
- The sample handler must wash their hands before sampling and wear nitrile gloves while filling and sealing the sample bottles. Contamination – common sources: food wrappers, beverages, food packaging, and some beverages.
- **Do not flush out the preservative. Trizma – 5 g/L – buffering reagent and removes free chlorine**
- **SAMPLE CONTAINERS** – 250-mL polypropylene bottles fitted with polypropylene screw cap bottles. Sample bottles must be discarded after use. Samples must be chilled during shipment. Temperature must not exceed 10 °C during the first 48 hours after collection. Sample temperature must be confirmed to be at or below 10 °C when the samples are received at the laboratory.
- Results of the sample storage stability study indicated that all compounds listed in this method have adequate stability for 14 days.



# Sampling PFOS/PFOA– Do Not USE!

- Pumps or Tubing made of Teflon or fluoropolymer.
- Decon Agents – Decon 90
- Sample Storage / Preservation – LDPE or glass bottles, PTFE or Teflon-lined caps, chemical ice packs
- Field Documentation – Waterproof/ treated paper or field books, plastic clipboards, non-Sharpie markers, Post-It and adhesive paper.
- Clothing – Gore-Tex, Synthetic Water Resistant or Stain Resistant, or Tyvek
- Personal- Cosmetic, Moisturizers, Hand Cream or other Products
- Food / Beverage – Pre-packaged food, fast food wrappers or containers

Based on the New Hampshire (PFC Guidelines) – November 2016 and see guidelines in package.

Break



# The Paper Work ?

- Chain-of-Custody



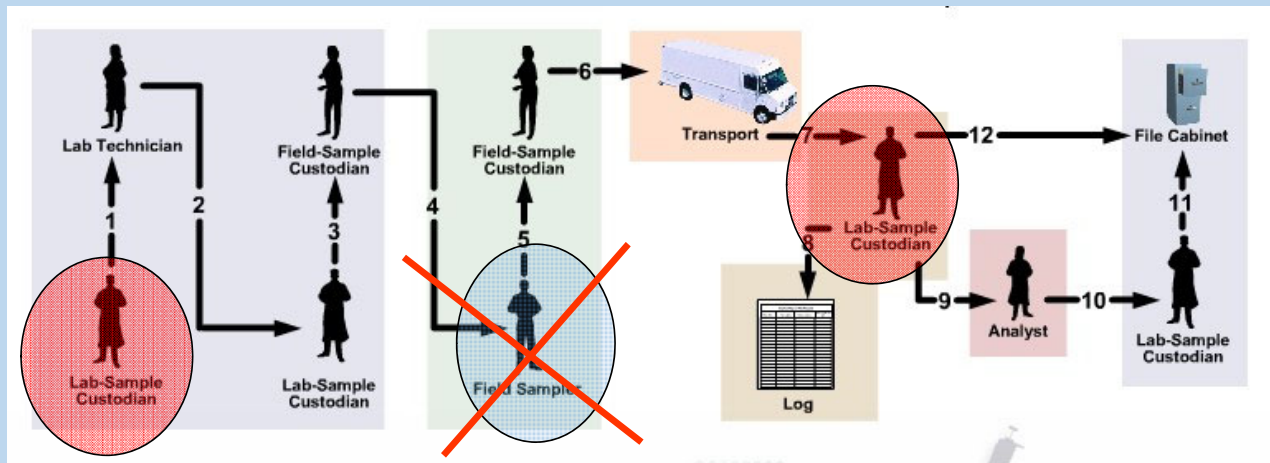
# Chain-of-Custody

- Sampling Procedures
- Sampling Operations
  - Short-Term
  - Long-Term
- Sample Transport
- Receipt, Storage, Transport
- Sample Analysis
- Procedures for Data





## Chain – of Custody- Does Not Start With the Field Professional



Chain-of-Custody – Begins in the Laboratory  
The Laboratory is the Key to a Solid Program.

\_\_\_\_\_

\_\_\_\_\_

[illegible]

See instructions on reverse side →

# What is Chain-of-Custody?

- “This is a legal term that refers to the ability to guarantee the identification and integrity of samples from collection through reporting of test results.
- For the purpose of litigation, it is necessary to prove the legal integrity of all samples and data as part of the chain of evidence. Therefore, it is necessary to have an accurate written history for the sample.
- This history should include sample bottle preparation, bottle possession, handling, and location of samples and data from the time of collection through reporting. This can be conducted by using chain-of-custody procedures.” (EPA Course)
- Chain of custody is a protocol developed to provide a legal record of the persons having contact with a sample from the moment of collection to final disposal. (USGS)

# Chain-of-Custody (ASTM)

- Chain-of-custody procedures are a necessary element in a program to assure one's ability to support data and conclusions adequately in a legal or regulatory situation, but custody documentation alone is not sufficient.
- A complete data defensibility scheme should be followed.

There is an ASTM Standard - <http://www.astm.org/Standards/D4840.htm>

## When Should We Use Chain-of Custody?

- ALWAYS- “Since there is no way to know in advance which samples and data may be involved in litigation, **you should always follow** chain-of-custody procedures whenever samples and data are collected, transferred, stored, analyzed, or destroyed.”
- Samples and data are considered to be in your custody when:
  - they are in your physical possession;
  - they are in your view, after being in your physical possession;
  - they are in your physical possession and then locked up so that tampering cannot occur;
  - they are kept in a secured area, with access restricted to authorized personnel only.



# Keep the Process Simple

- As you learn how to conduct chain-of-custody procedures, remember these general guidelines:
  - Keep the number of people involved in collecting and handling samples and data to a minimum.
  - Only allow people associated with the project to handle samples and data.
  - Always document the transfer of samples and data from one person to another on chain-of-custody forms.
  - Always accompany samples and data with their chain-of-custody forms.
  - Give samples and data positive identification at all times that is legible and written with permanent ink.

# Step 1. Sampling Preparations

- Reagents and materials that will be used during sampling are prepared. (lab)
- Materials and reagents may be used to calibrate sampling equipment or may become part of the sample itself. (lab and/or sampler)
- Keep records, including the preparation **date**, **name** of the preparer, and **location** of the reagents and materials from preparation through use. (lab)
- **Lab-sample custodian** starts the chain-of custody (COC) process by requesting that the **laboratory technician** prepare the reagents and supplies. The lab-sample custodian stores the materials prepared by the lab technician in limited-access locked storage until they are needed in the field. (lab)
- **Field-sample custodian** takes possession of the reagents and supplies. (sampler)
- All exchanges of reagents and supplies are documented on the **Chain-of-Custody Forms**.

## Step 2. Sampling Operations

- The field-sample custodian gives the reagents and supplies to the field sampler.
- Samples Collected using the proper sampling techniques and methods.
- The collected sample is placed in a non-reactive container and sealed. Some use tape, to prevent accidental opening and spillage. I use individual coolers that are closed.
- A legal custody seal is then applied over the top of the lid and down the side of the container to detect unauthorized opening of the sample.
- Each sample container must be labeled with its own unique and permanent identification number to prevent container mix-up.
- Samples should be in the possession of the field sampler or field-sample custodian or in limited-access locked storage.

# Remember

- Samples and data are considered to be in your custody when:
  - they are in your physical possession;
  - they are in your view, after being in your physical possession;
  - they are in your physical possession and then locked up so that tampering cannot occur;
  - they are kept in a secured area, with access restricted to authorized personnel only (Locked Vehicle).

# Record / Document

- Data recordings should be clearly identified with permanent, non-erasable markings that do not interfere with data. Information about the sample should include:
  - **what** (the parameter to be tested),
  - **where** (the location site and sample location),
  - **when** (date and time),
  - **how** (measurement methodology used, including units for reporting and the instrument's full-scale setting),
  - **who** (signature of the sampler), and
  - preservation methods.



## Step 3. Sample Transport

- The **field-sample custodian** is responsible for recovering, preserving (for example, with acid, base, or WET ice), and storing the samples until they are delivered to the lab. Shipment of samples is time critical to ensure their integrity.
- When common carriers are used, packages should be marked “deliver to addressee only.”
- The seal label should read “Chain-of-Custody Sample – Authorization Required to Open”.
- Samples transported by the U.S. Postal Service must be sent by registered mail, return receipt requested. Samples sent by private carriers, such as UPS, require a description of the items on the bill of lading.
- A copy of a Sampling Shipping Form should always accompany the transported samples.
- The field-sample custodian should keep a copy of this form and any other shipping documents for his/her records. If the package is sent by common carrier, make sure the air-bill or package tracking information is included on the form so that samples can be tracked if necessary.

## Step 4. Receipt, Storage, and Transfer

- The **lab-sample custodian** is responsible for maintaining the chain-of-custody procedures as samples are received and handled at the lab.
- Samples should be in the possession of the lab-sample custodian, or in limited-access, locked storage as they await analysis.
- When samples are received, the lab-sample custodian verifies the number of samples, their identification, and their integrity to make sure they have not been tampered.
- Check in process may take 5 to 15 minutes per sample.
- If there is a question, solve it as soon as possible and document issue. Things happen.

## Step 5. Sample Analysis

- Includes chemical analysis of samples according to the appropriate method.
- Samples should be analyzed in a timely manner to ensure the integrity of the results.
- The **analyst** is responsible for maintaining the chain-of-custody procedures during this step. During analysis, samples and intermediary solutions must be in continuous view of the analyst, or in limited-access locked storage.
- NOTE- If you leave the room and the door is not locked – samples are not under your Control.
- After analysis, some samples will be discarded and others will be returned to the lab-sample custodian for secure storage—depending on the objectives of the project involved. If samples are toxic or hazardous, they must be disposed of safely.
- The **lab-sample custodian** is responsible for maintaining the chain-of-custody procedures during Sample-Data Recordkeeping (Archiving).

## Step 6. Procedures for Data

- Chain-of-custody procedures for data are just as important as those for samples.
- If not properly protected and safeguarded, data can be lost, stolen, destroyed, or tampered with. Chain-of-custody procedures for data can be broken down into three steps.
  - **Step 1. Data Acquisition**
  - **Step 2. Data Identification**
  - **Step 3. Data Processing and Recordkeeping**





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[illegible]

1. Chain-of-custody procedures are necessary because
  - A. you do not know which samples and data might be needed in a legal proceeding.
  - B. they help to prove the legal integrity of samples and data.
  - C. in a legal proceeding, both the methods of preparation and competence of the preparer may be questioned.
  - D. All of the above

Answer - D

2. What is chain-of-custody?

- A. A legal term or process that refers to the ability to guarantee the identity and integrity of samples and data from collection through reporting of test results.
- B. A process for discarding samples and data.
- C. A process for allowing public access to samples and data.
- D. A process that tracks the location of, but not who possesses.
- E. Just about how collects the samples and field data.

Answer - A

3. You have samples/data in your custody when

- A. you place them in limited-access locked storage.
- B. Samples in the room, but not in your view or control.
- C. they are in your physical possession.
- D. A and C only
- E. A, B, and C

Answer - D

4. The major steps in chain-of-custody procedures for **samples** include:

- A. Sample Transport.
- B. Sample Analysis.
- C. Data Processing.
- D. A and B only

Answer - D



5. Which action does **not** help preserve chain-of-custody during **Sampling Preparations**?

A. Having the field-sample custodian sign the chain-of-custody form upon receipt of the reagents and supplies.

B. Filling out the Shipping/Receiving Form . Answer - B

C. Recording the preparation date, name of preparer, and the location of reagents.

D. Keeping reagents and supplies in limited-access locked storage until they are needed in the field.

6. During **Sampling Operations**, who is responsible for maintaining chain-of-custody?

- A. Field sampler
- B. Analyst
- C. Lab technician
- D. Lab-sample custodian

Answer- A

7. Which action does **not** help preserve chain of custody during **manual sampling operations**?

- A. Placing the collected samples in non-reactive containers and sealing them.
- B. Labeling the collected samples with a unique and permanent identification.
- C. Keeping the collected samples in limited-access locked storage when not in the possession of authorized personnel.
- D. Leaving an unlocked box of collected samples unattended at the field site until a delivery truck picks them up.

Answer - D

8. Which action does **not** help preserve chain of custody during **Sample Transport**?

- A. Sending samples by standard mail (not registered) when using the U.S. Postal Service
- B. Including the package tracking information on the chain-of-custody form.
- C. Sealing the package containing the samples with custody seal tape.
- D. Sending a copy of the Shipping/Receiving Form with the samples.

Answer - A

9. Which action does **not** help preserve chain of custody during **Sample Receipt, Storage, and Transfer**?

- A. Verifying the number, identification, and integrity of the samples upon receipt at the lab.
- B. Assigning unique identification numbers to each sample using bar code technology.
- C. Entering samples into the Sample Receipt and Record Log.
- D. Recording all transfers of samples within the lab on the Chain-of-Custody Form for Reagents and Supplies.

Answer - D

10. Which action does **not** help preserve chain of custody during **Sample Analysis**?

- A. Using Analytical Data Sheets to record calculations.
- B. Keeping the samples in limited-access locked storage when not in continuous view of authorized personnel.
- C. Always disposing of the sample after analysis is complete.
- D. Documenting all transfers of samples on the Sample Control Record.

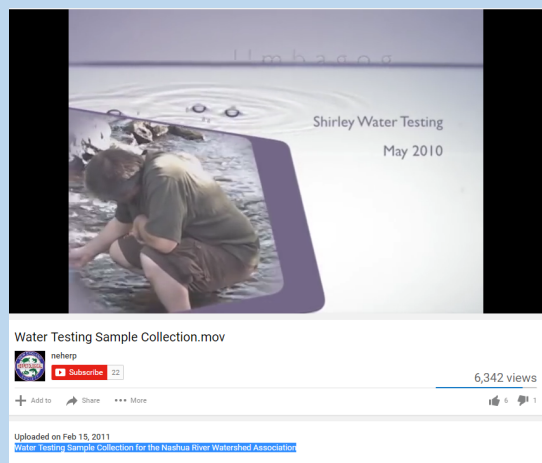
Answer - C



Break

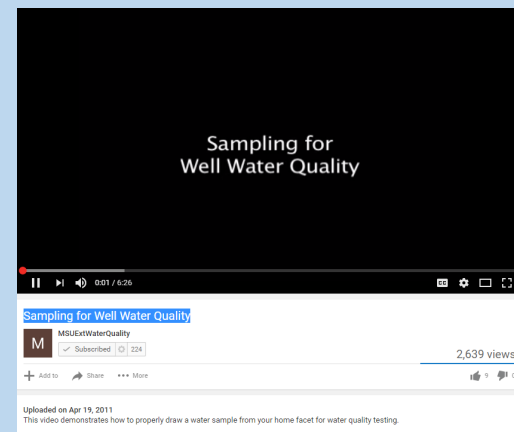


# Water Sampling – A Video Montague



<https://youtu.be/b0rCLv16BWI>

<https://youtu.be/UT50Ymdkxtw>



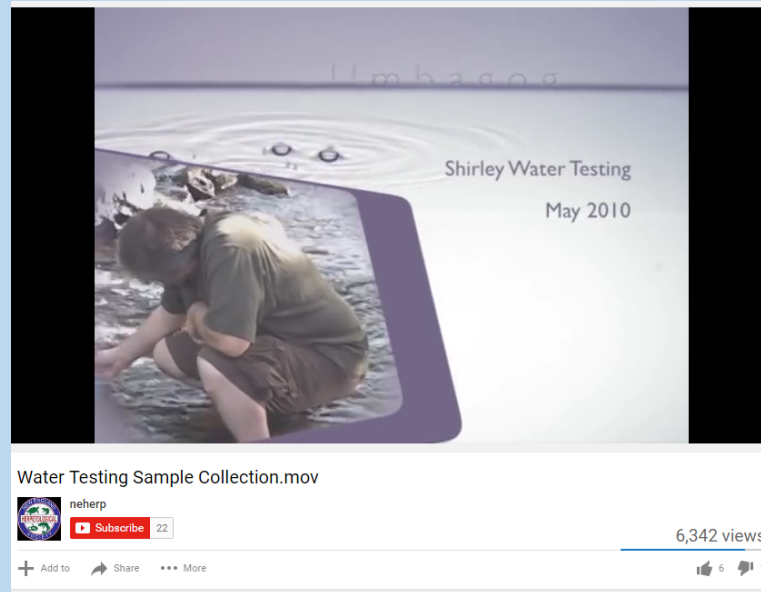
<https://youtu.be/00Gp4llsXCw>

<https://youtu.be/dEQDaPws2xk>



# Water Sampling.Mov “Citizens”

## Water Testing Sample Collection for the Nashua River Watershed Association (5 min)



# AWWA Sampling Techniques (3 min)



<https://youtu.be/00Gp4IIsXCw>

# Public Instructional Video – Thanks Flint ! (5 min)



<https://youtu.be/dEQDaPws2xk>

# AWWA – Coliform (3 min)



[https://youtu.be/yyyk\\_M7ah3c](https://youtu.be/yyyk_M7ah3c)



# AWWA – Organic Contaminants (5 min)



<https://youtu.be/tFssHT4Z1Gg>

Break





Entrance Photo

Comprehensive  
Sampling



Locate Well



Look for Treatment (Bypass System)



Work as a Team



# Look for Treatment



What we have no treatment ?  
Make Sure to By-Pass Treatment Systems

# Look for Treatment – Homeowners that Said “ We have no Treatment”



Reverse Osmosis Unit – Basement Closet on the Floor



System in Garage – Two Rooms Away from the Pressure Tank







# Wellbore Volume- Volume of Water in Storage (WBV)



Well Depth from Drillers Log – 300 feet

Well Diameter – 6 inches

Static Water Level (no pumping) – 51 feet

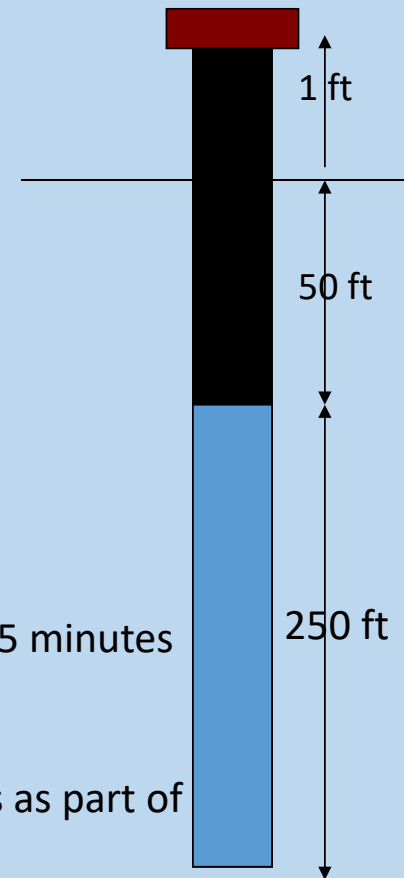
Water Column in the Well – 250 feet

Water in the Well (  $250 \text{ ft} * 1.5 \text{ gal/ft} = 375 \text{ gallons}$  )

1 – Wellbore Volume – 375 gallons

If pump produces 5 gallons per minute, it will take 75 minutes to purge wellbore volume

Normally – we attempt to purge 3 wellbore volumes as part of a monitoring effort.





I Got to Lose Weight !

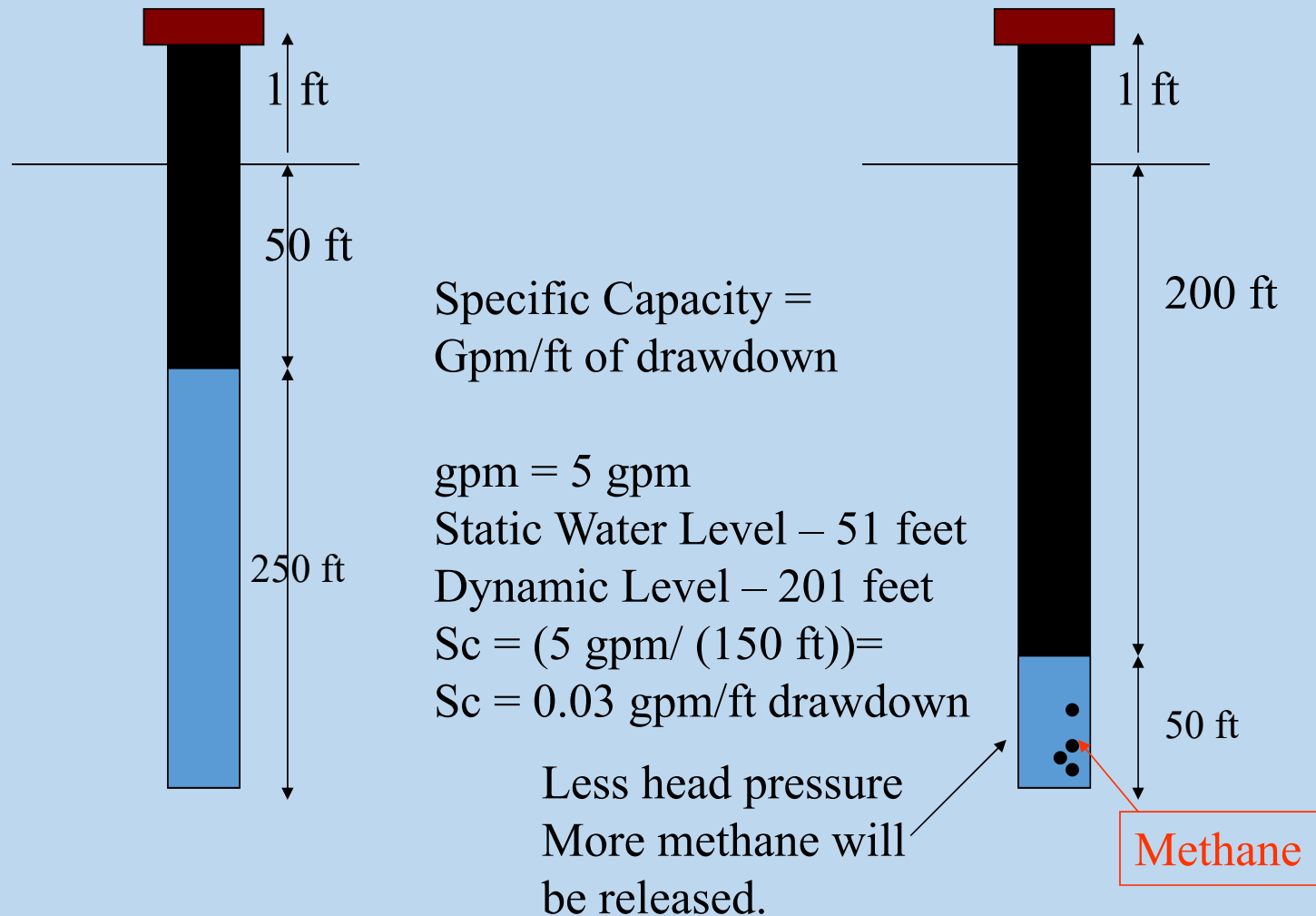
Make sure to complete the Following:

1. Take Notes and Record Observations
2. Label Each Container Name, Site ID, Date, Time, Parameters, Your Initials, Preservation
3. Prepare Chain-of-Custody
4. Record Field Water Quality Data

# Filling Bottles- Just Wait

- 1. Check the sampling area for potential sources of contamination.
- 2. Make sure the area around the well is clean and clear.
- 3. Protect the samples from airborne contaminants such as engine exhaust, blowing dust, organic fumes (e.g., gas cans) and sample upwind.
- 4. Choose gloves appropriate for the contaminants you encounter.
- 5. Change into new, clean gloves every time you sample a new well or suspect your gloves have become contaminated.
- 6. Do not attempt to decontaminate or reuse gloves; use disposables.
- 7. Do not open sample containers until it is time to fill them. Immediately after filling a sample container.
- 8. If you haven't already done so, add any required preservative – filter first, if required – replace the cap. (Maybe a second team member)
- 9. Label the container and place the sample on ice in a cooler.

## Estimating Specific Capacity



C  
O  
N  
C  
E  
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T  
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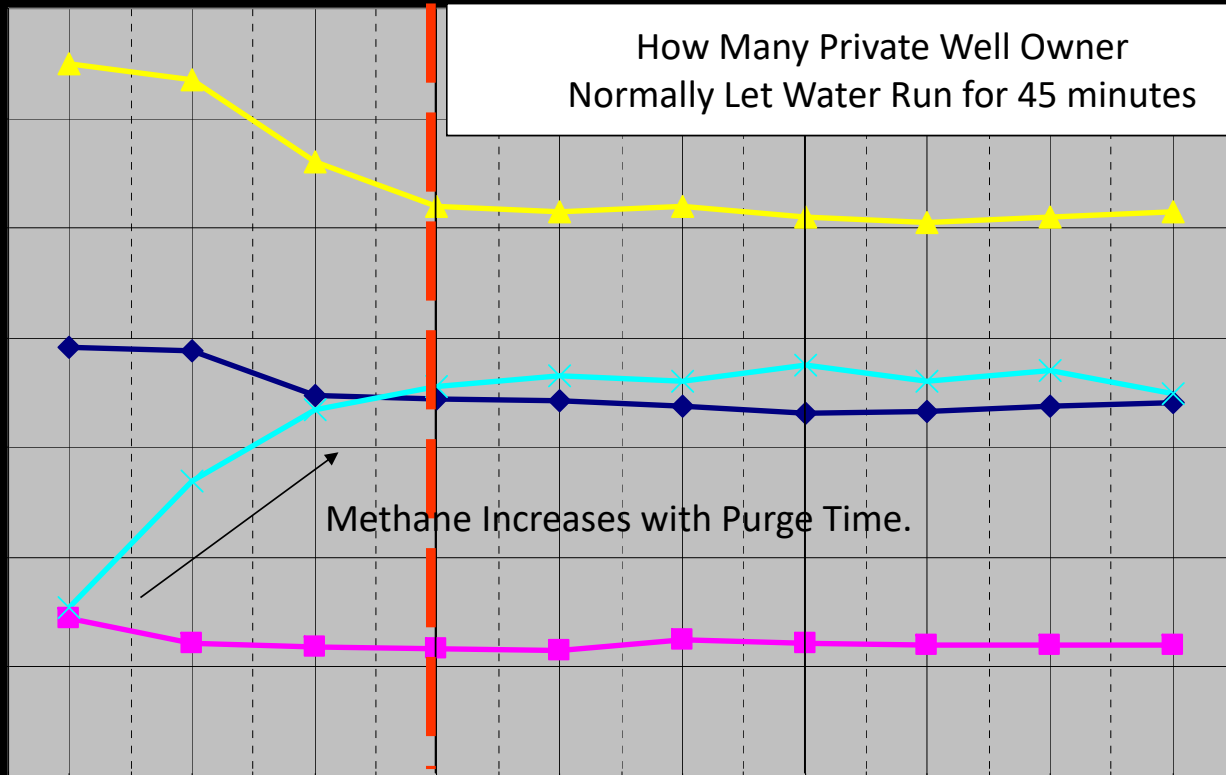
Purge Time, minutes

How Many Private Well Owner  
Normally Let Water Run for 45 minutes

Methane Increases with Purge Time.

◆ pH    ■ Conduct\*100    ▲ Temperature    × Methane

1 WBV = 45 minutes



# Sampling Order

Collect sample parameters in the following order:

- 1. Unfiltered samples for in-field water quality measurements (not necessary if down well or flow-through cell measurements are taken).
- 2. Light Gases (Methane, Ethane, Propane, etc.), Volatile organic compounds (VOCs).
- 3. Non-filtered, non-preserved (e.g., sulfate, chromium VI, mercury, semi- and non-volatiles, pesticides, PCBs, glycols).

Make Sure to Continue Field Screening During the Sampling Process – Just to Make Sure there is No Significant Change !



## Sampling Order (continued)

- 4. Non-filtered, preserved (e.g., nitrogen series [ammonia, nitrates, nitrites, etc.], phenolics, total phosphorous, total metals, cyanide, total organic carbon).
- 5. Filtered, non-preserved.
- 6. Filtered, preserved immediately (e.g., dissolved metals).
- 7. Miscellaneous parameters- including bacteria. Before bacteria test – the sampling point should be sterilized and cleaned with alcohol.
- Always Use a Bacterial Sample Container with a Sodium Thiosulfate-tablet.

See: pg 71- Practical Guide To Ground-Water Sampling

## Notes- Possible Good Practices

- Collect sulfate samples before sulfuric acid preserved samples (e.g., nitrogen series).
- Collect nitrogen series samples before nitric acid preserved samples (e.g., boron, dissolved metals).
- This will prevent accidental contamination of a sample with a preservative intended for another sample (e.g., sulfuric acid preservation contaminating an unpreserved sulfate sample).

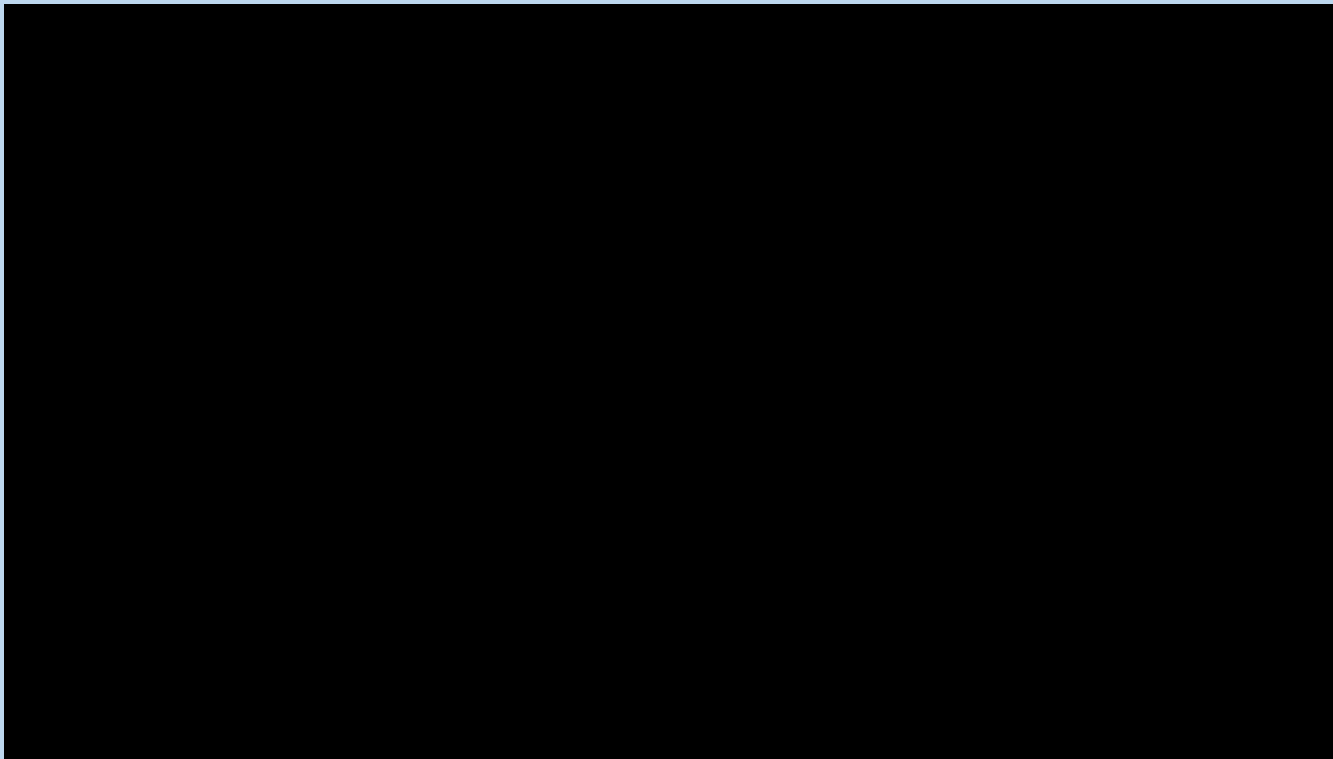
Toys ??

# Playing with the Toys, I mean Tools !



Since 1919, LaMotte has been a [committed leader in providing quality equipment](#) and guidance for water analysis. Today, we produce the broadest line of portable test equipment, and continue our focus on your specific needs by offering improved products, strong technical support and the most extensive [Custom Test Kit Service](#) in the industry.

# Coliform Rule (Video) – Rural Community Assistance Partnership (RCAP)



<https://rcap.org/>

# Any Differences in the Videos??

- Gloves - Needed?
- Bottles – Type of Bottle “Sterile”
- Alcohol / Chlorine Pre-cleaning
- Tap Inspection – No internal threads – Remove Aeration Devices
- Temperature Monitoring – “Stabilize” – “Clear Service Line”
- Change of Flow Rate
- Difference Goals and Objectives - Focus of the sampling is important.
- Ice or Cold Packs – Check with the laboratory – “Wet Ice !”



# Proper Coliform Sampling

- 1. Proper Supplies and Containers
- 2. Select and Use Approved Sampling Site and Locations
- 3. Remove aerators, strainers, or hoses – bypass water softener (Is this an issue?).
- 4. Run water to purge line / Wash and Dry Hands.
- 5. Fill out Chain-of-Custody, Label, and all field forms.
- 6. Adjust flow rate once- Put on Gloves.
- 7. Remove the bottle cap
- 8. Fill the bottle to shoulder.
- 9. Return the cap to the bottle and tighten.
- 10 Turn off Tap.
- 11. Check Labels and Forms and Follow Chain of Custody
- 12. Put sampling container in plastic bag.
- 13. Transport on Wet Ice – “Within Holding Time”.



# Lead and Copper Rule

- EPA Memorandum 2/29/2016
- “EPA issued a memorandum on Management of Aerators during Collection of Tap Samples to Comply with the Lead and Copper Rule on October 20, 2006. This memorandum stated that EPA recommends that homeowners regularly clean their aerators to remove particulate matter as a general practice, but states that public water systems should not recommend the removal or cleaning of aerators prior to or during the collection of tap samples gathered for purposes of the Lead and Copper Rule.”
- “EPA recommends that sampling instructions not contain a pre-stagnation flushing step.”
- “EPA recommends that wide-mouth bottles be used to collect Lead and Copper compliance samples. It has become apparent that wide-mouth bottles offer advantages over narrow-necked bottles because wide-mouth bottles allow for a higher flow rate during sample collection which is more representative of the flow that a consumer may use to fill up a glass of water.”
- “The recommendations in this memorandum are also consistent with the recommendations provided by the EPA 's Flint Task Force. “
- My recommendations
  1. Monitor pH, conductivity, and temperature during purging process and possibly before actually sampling a site.
  2. Inspect system for evidence of corrosion by-product and corrosion and fix.
  3. Remove screen and inspect and upgrade faucet hardware.
  4. Checking piping in the home and upgrade as needed.
  5. Cities or Large Authorities – Stay out of the houses as much as possible and install dedicated sampling stations !
  6. Conduct informational water testing to screen for problems before developing a formal sampling plan.

# AWWA – Lead and Copper Rule (2 min)



<https://youtu.be/YBnwIjRVn4>

# PFOA and PFOS in Water

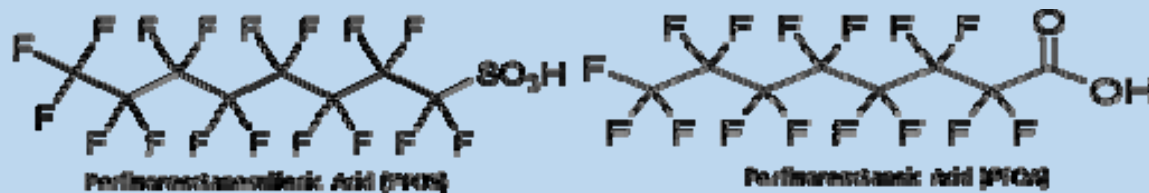
- PFOA – Perfluorooctanoic Acid – “C8”
- PFOS – Perfluorooctane Sulfonic Acid.
- Manmade (Synthetic) Organic Chemicals – used to make products water, grease, and stain resistant, such as” Scotchguard and Teflon. They are also used in carpets, firefighting, airfields, oil and gas, surfactant, emulsifier, and refineries.
- Used to coat food products, such as microwave popcorn bags, and cookware.
- Health Issues - Increase Cholesterol, Low infant birth weights, auto immune disorders, cancer (?), thyroid disruption (?), reproductive (?), liver/ kidney function (?), likely carcinogenic (?)
- Allowable Intake – PFOA 1.5 ug/Kg/day; PFOS – 0.15 ug/kg/day
- EPA set health advisory at 70 part per trillion – 0.00007 ug/L.
  - West Virginia – alternative source when > 0.5 ug/L.
  - Minnesota – Chronic Health Risk limit at 0.3 ug/L.
  - New Jersey – Preliminary Health Based Guidance - 0.04 ug/L

# Testing: (EPA/600/R-08/092)

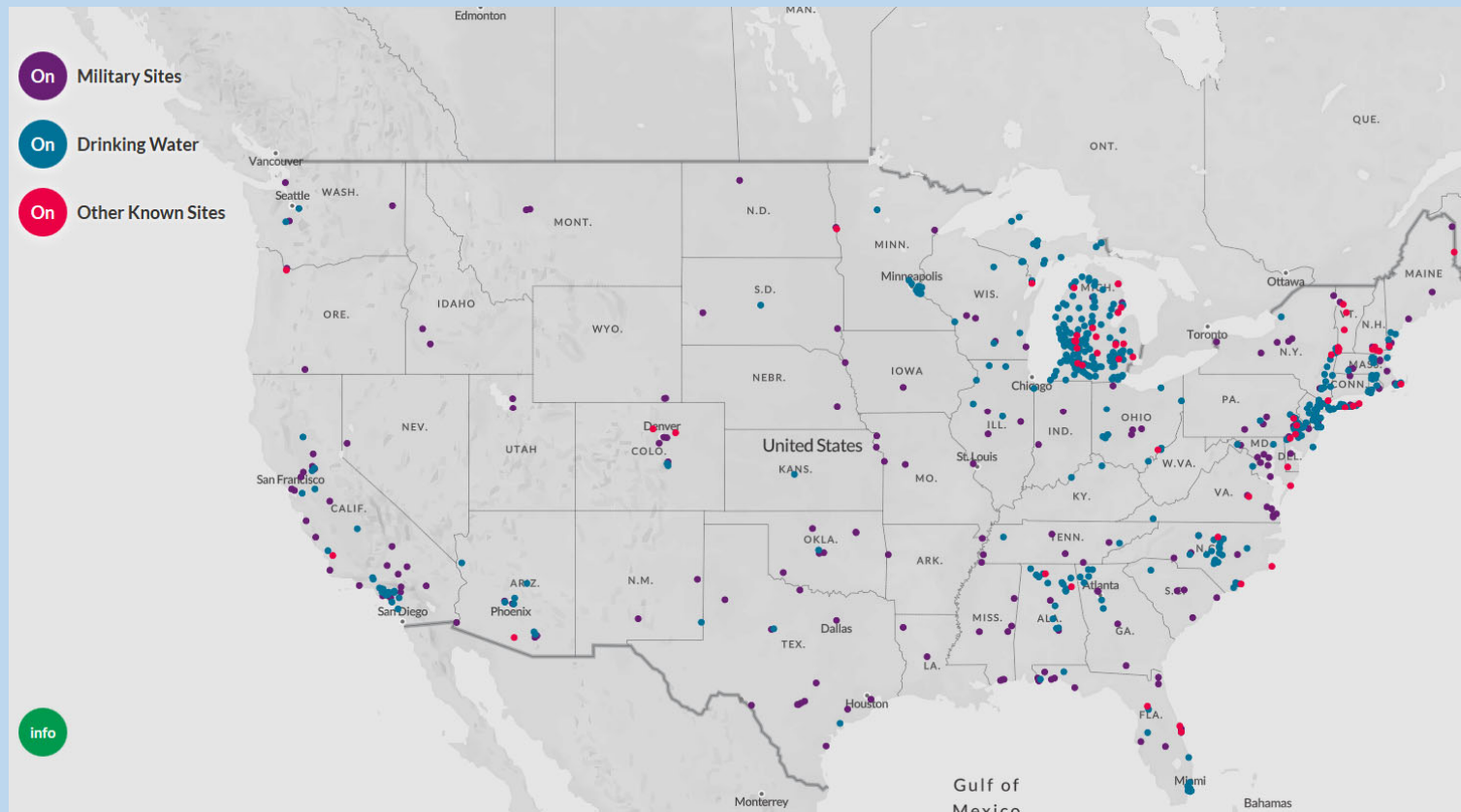
New EPA 537.1– “Determination of Per- and Polyfluorinated Alkyl Substances in Drinking Water”

A 250-mL water sample that is preserved with Trizma serves as a dechlorinating agent and buffer.

- FRB required for all sampling sites.
- Lower Reporting Limit as low as 2 to 5 ng/L.
- Use a cooler that had recently been cleaned with PFAS-free soap such as Alconox and PFAS-free water.
- Have fresh bags of PFAS-free ice ready for use on the day of sample collection.
- Remove any supplies or equipment that contain Teflon or polytetrafluoroethylene (PTFE) or anything with “fluoro” in its name.
- If bringing paper towels to the site, ensure that they are **UNTREATED** paper towels and not PFAS treated paper towels.



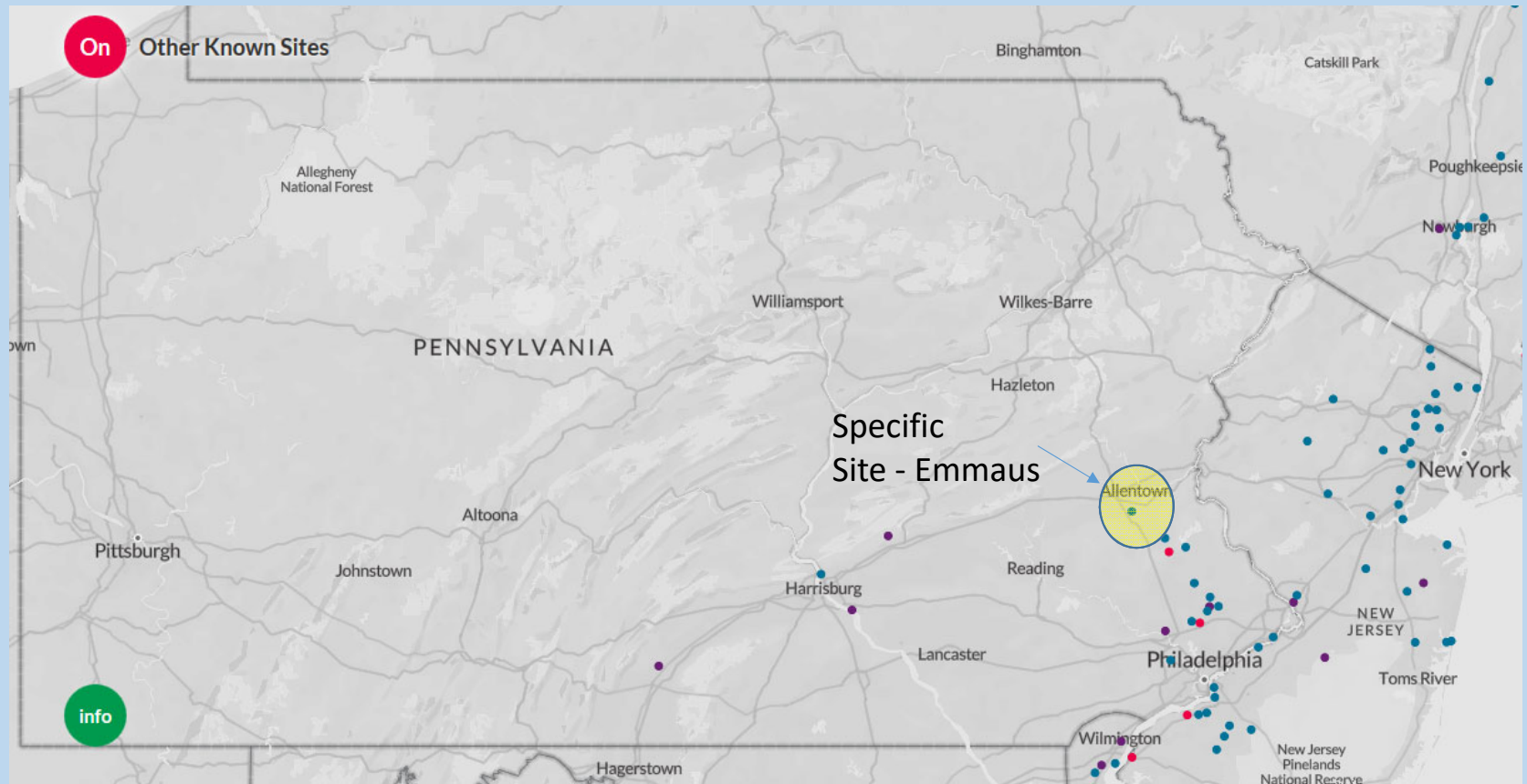
# Interactive Map



[https://www.ewg.org/interactive-maps/2019\\_pfas\\_contamination/](https://www.ewg.org/interactive-maps/2019_pfas_contamination/)



# Zoom in on Pennsylvania



# Zoom in on an Emmaus Site – Specific Results

## PFOS/PFOA Testing of Drinking Water Systems

### KEY FINDINGS

- 1 PFAS compounds are a class of non-stick, waterproof, stain-resistant compounds used in consumer products and industry. Best known are PFOS, formerly used to make DuPont's Teflon, and PFOA, formerly in 3M's Scotchgard.
- 2 Very low exposure to some PFAS chemicals has been linked to cancer, thyroid disease, weakened childhood immunity and many other health problems.
- 3 Tests of tap water, military bases and industrial sites have found PFAS contamination in more than 712 locations in 49 states. Drinking water for up to 110 million Americans may be contaminated with PFAS.

### DETAILS

**System name:** Emmaus Borough Public Water

**State:** Pennsylvania

**Population served:** 14,000

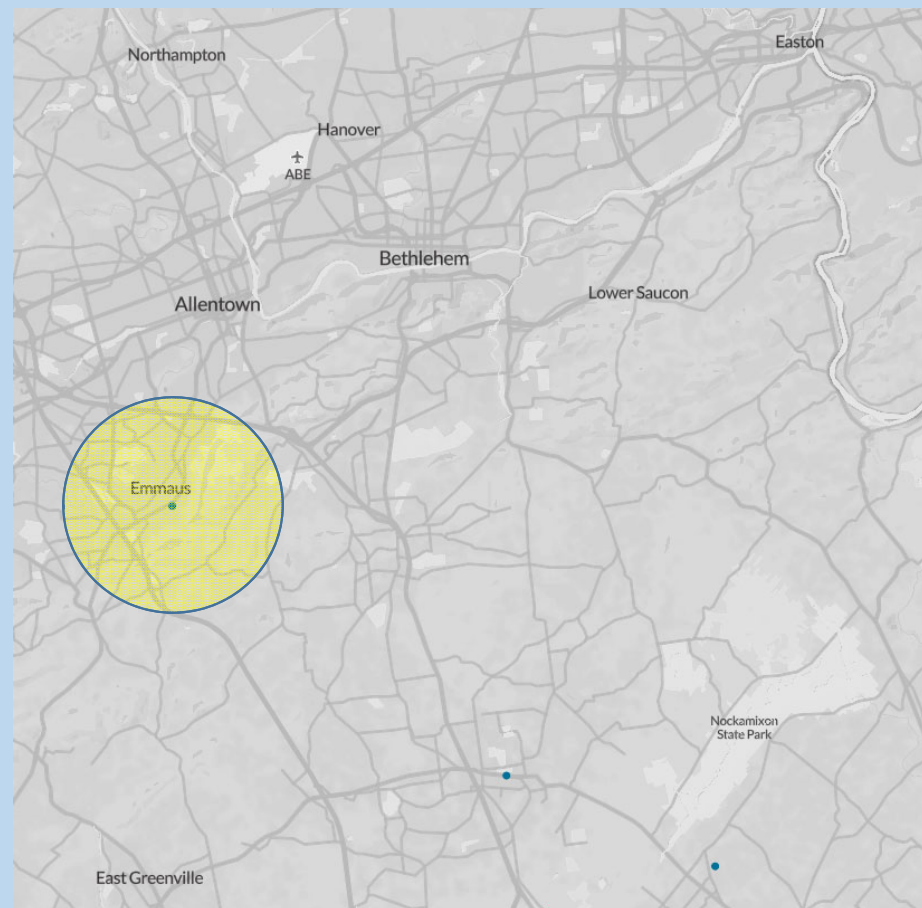
**Testing dates:** 03/24/14 - 03/24/14

**PFAS detected:** PFNA

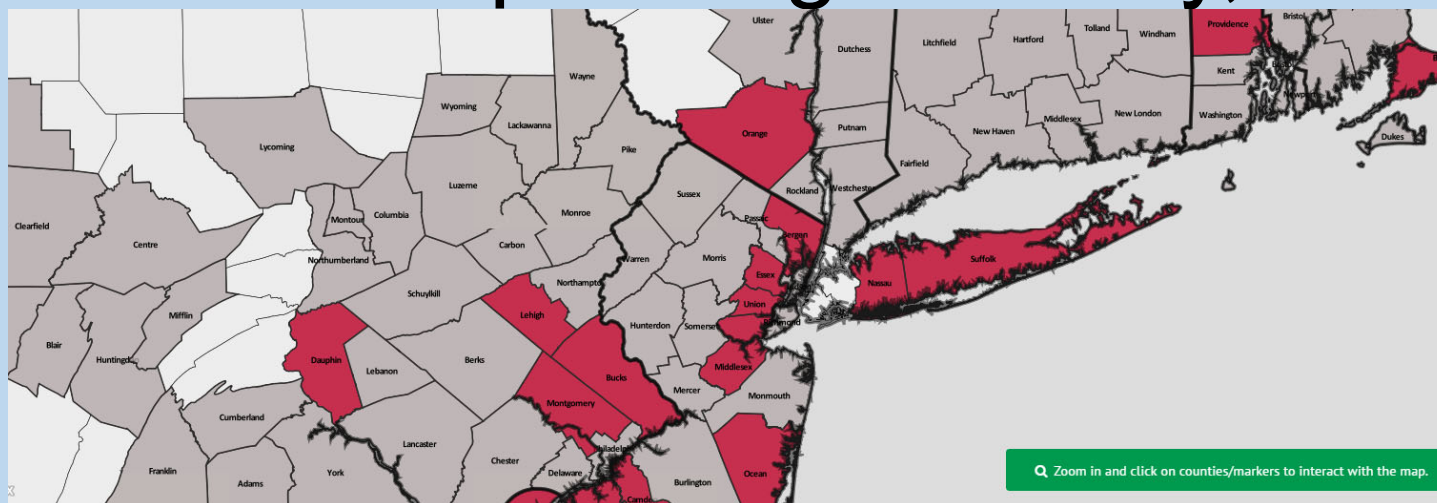
**PFAS min - max:** 0 - 22 ppt

**Source:** EWG from [drinking water test data](#)

*Levels listed are for the range of the total of all PFAS detected at the time of the tests and do not reflect whether a water system is treating the water to reduce levels.*



# Old Map Orange County, NY



Orange County, NY

Contaminants detected = PFHpA, PFHxS, PFOS, PFOA

Maximum concentration = 0.17 µg/L or ppb

Water test results by water utilities serving Orange County, NY  
found 19 contaminants in 58 samples.

- Half-life in water – 92 years ; Half-life in air – 90 days\* – the New MTBE?

\*Source- <https://www.waterboards.ca.gov/gama/docs/pfoa.pdf>

# Things to Remember !

- Be the Solution !
- POT is Good ! (Prepare, Observe, and Translate)
- You are a Professional and a Scientist !
- The Consumer is also your fellow citizen and you have an ethical duty!
- If you do not know, test and ask !
- Wash and Dry Hands and Wear the Proper PPE.
- Most Importantly – Do not Forget the Know Your H2O Program – “Get on the Path to Clean Water” !

Please stop by our booth – Try out Our New Tool !



Get on the Path !

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- 570- 335-1947



<http://www.bfenvironmental.com>



<http://www.water-research.net>



# THE LEGALITIES OF PROPER SAMPLE COLLECTION

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**KEYSTONE**  
Clean Water Team

