

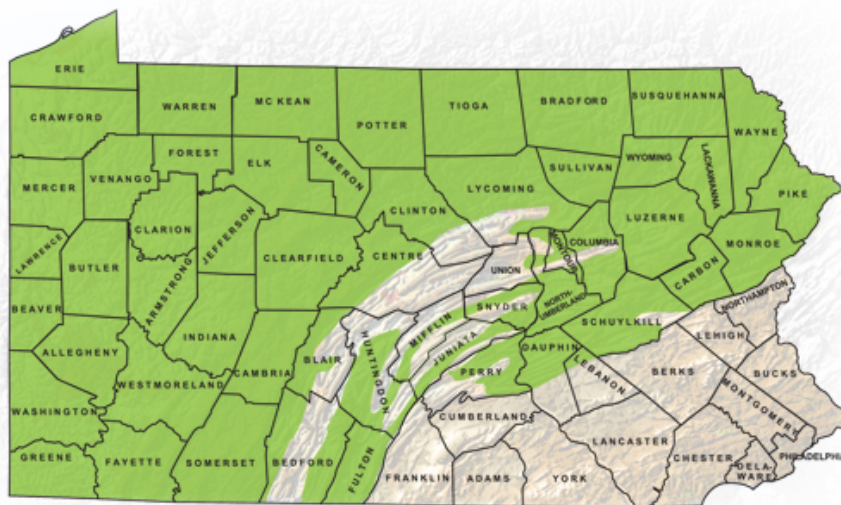
Getting The Waters Tested The Marcellus Shale Factor



Water Resources



Environment



Marcellus Shale Formation



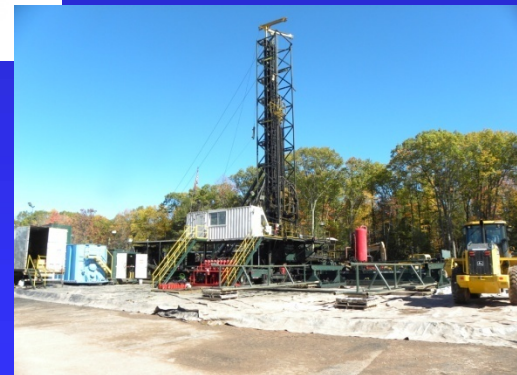
Industry



Citizens



Old Issues



New Issues

Water Professional – “What We are NOT Doing”

Presented by:



Mr. Brian Oram, Professional Geologist
(PG),
Soil Scientist, Licensed Well Driller,
IGSHPA

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

Water Research Center
<http://www.water-research.net>

This is my Normal Attire.
(photo by: Samantha Oram-10 yrs)





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
- Water Treatment Process/ Product Development
- <http://www.bfenvironmental.com>

B.F. Environmental Consultants Inc.

Environmental Scientists, Hydrogeologists, & Environmental Education Specialists
Located in Northeastern Pennsylvania

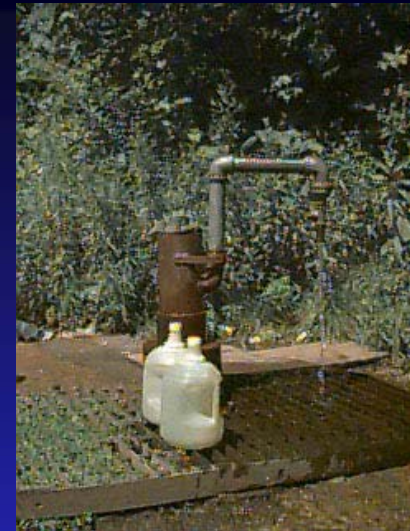
water reuse

hydrogeology

soil testing

Water-Research Center

Education and Outreach Program funded by
B.F. Environmental Consultants Inc.



Education and Outreach Programs

- Environmental and Professional Education and Training for Citizens and Local Municipalities
- Community and Business Outreach Programs
- Citizen Monitoring Programs and Web-Based Training

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



Announcements

- New Methane Gas Migration and Mitigation Website

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

- New Information Guide for Private Well Owners will be available in April 2012.

<http://www.bfenvironmental.com>

Legacy
Issues



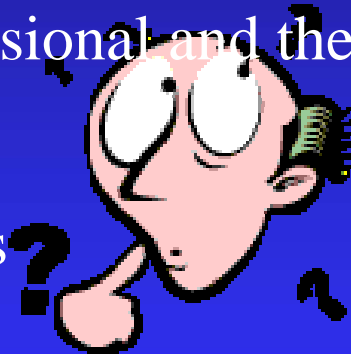
Environment

Non-Point



The Professional and the Marcellus Shale

Do You
Feel This
Way?



Citizens

Movements

Drinking
Water



Shale Gas
Industry

All Other Industries

As a Professional – We are in the Middle Getting Hit From All Sides Goals for This Talk

- What Parameters are we missing?
- Major Concerns Related to Baseline Testing Parameters / Process Few Examples
- We are Not Using Baseline Data to Make Decisions
- Private Well Construction Standard – Great – but this does not Solve Most of Our Problems.

Misconception 1: Past Water Quality Issues are Not Being Communicated



100 % Pure Water – No Problems

The Real Facts on Drinking Water



50%

Other
50%

Corrosion



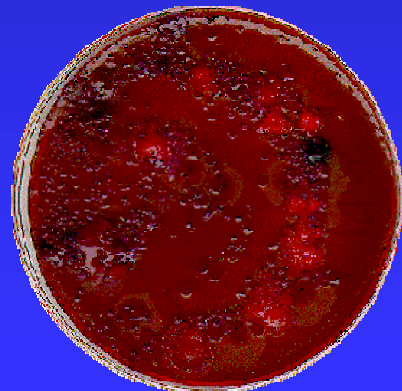
Iron / Manganese

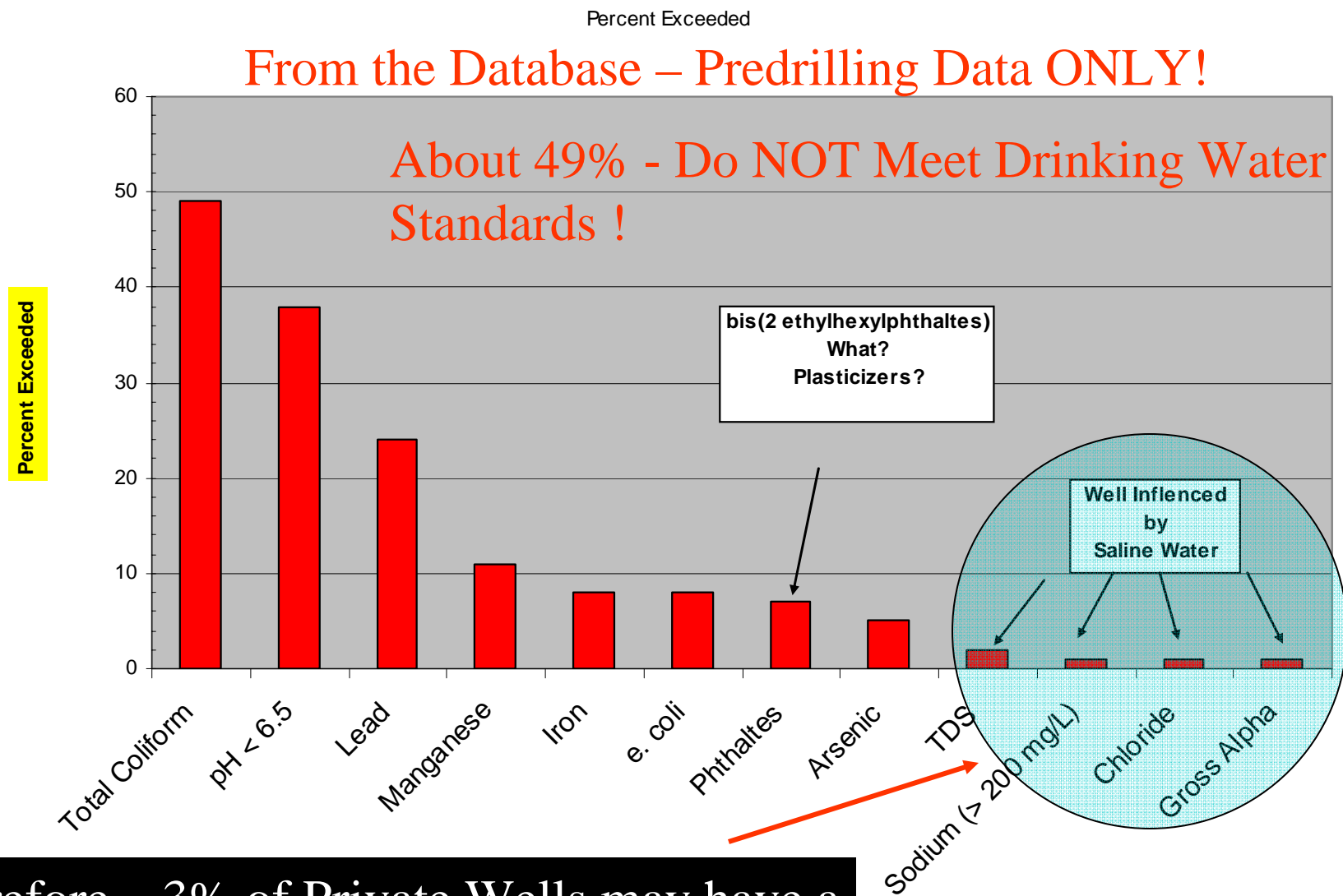


Sediment / Gases



Bacteria





Therefore – 3% of Private Wells may have a Saline water fingerprint.

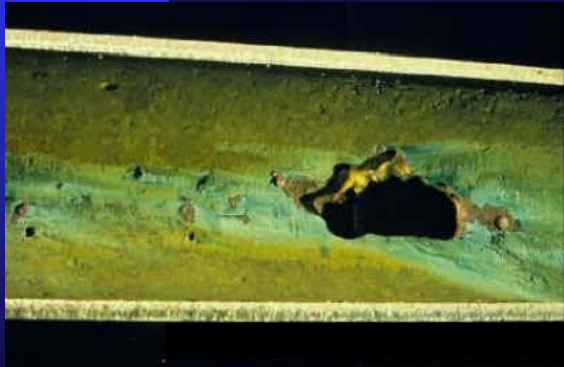
Lets Be Honest – We have Problems in Pennsylvania with Private Wells

- Wells Poorly Constructed – either poor casing, inadequate casing, or annular space not grouted.
- Wells Too Deep – Mixing Fresh and Saline Aquifers
- Wells in the Wrong Place

Proposed Answer- Private Well Construction Standards !
(Yeah)

New Private Well Construction Standards will Not
Fix this Problem !

Corrosion, pH, Iron, Manganese



38 % < pH 6.5

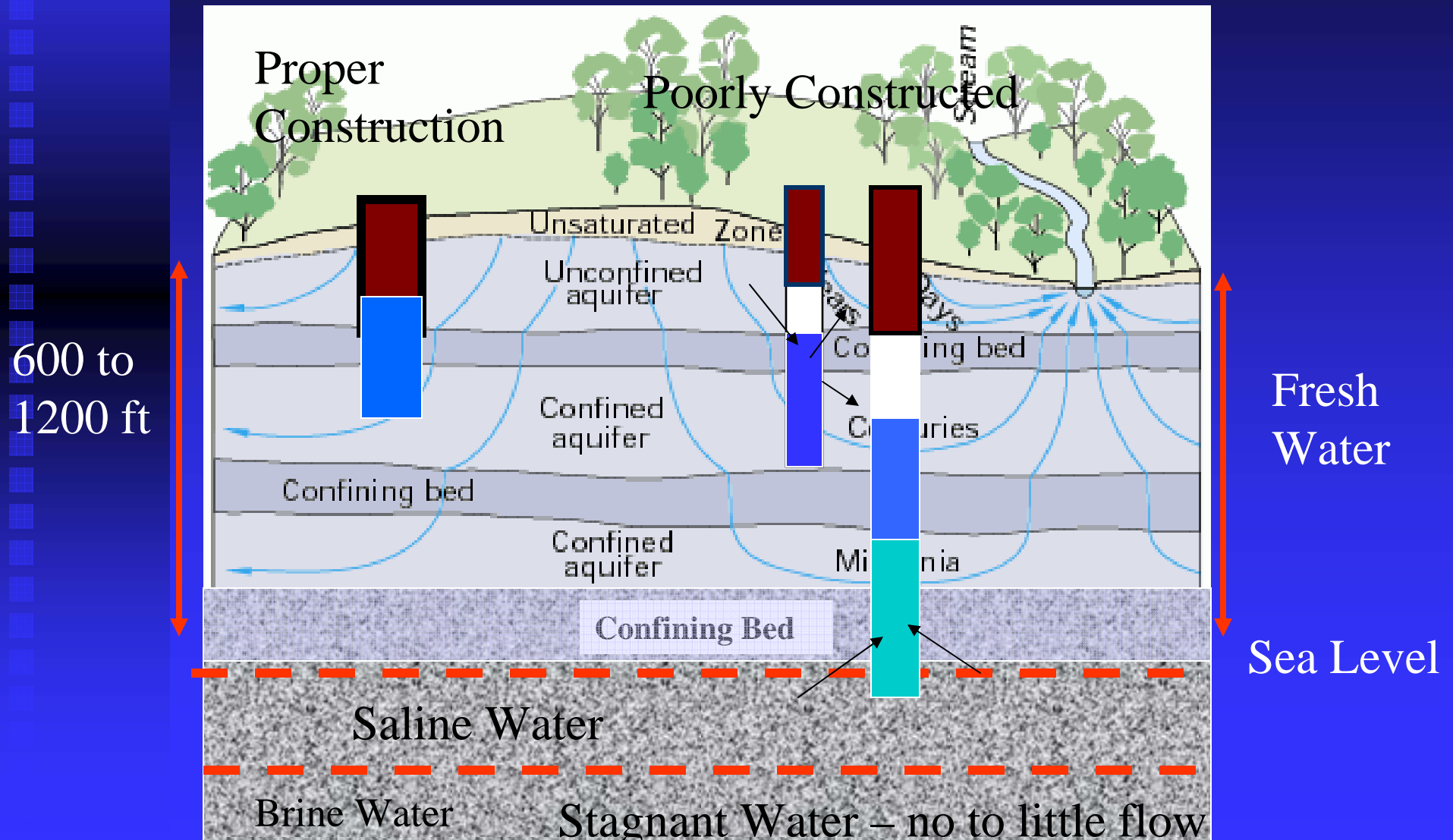
< 3 % > pH 8.5 (saline water)

Leaching Metals- Copper,
Lead, Zinc, and Aluminum

Secondary Drinking Water Standard
Iron – 0.30 mg/L (red or black) **8 %**
Manganese – 0.05 mg/L (black) **11%**

If you are not doing it, add Copper, Lead, Zinc, and Aluminum to
Baseline Testing – Especially if there is evidence of Corrosion.

Properly Constructed Wells and Poorly Constructed Private Wells



Phthalates - How ? Not Sure

Here are Some Ideas – up to 8% exceed Drinking Water Standards

- Trace Level or near Detection Limit may be related to contamination during field sampling or laboratory testing, but this does not appear to account for levels at or above the drinking water standard.

Other Sources

- Private Wells Not Regulated and there are no plumbing codes.
- Sources – PVC plastic piping used in the home.
- Sources – Drop Pipe and Delivery Piping used in the well.



This is only a hypothesis.

Sometimes we also see hits for **Vinyl Chloride** and **Toluene**

(What the electric Tape !!!!)

Arsenic- up to 6 % Above the Standard

- The drinking water MCL is 0.010 mg/L or 10 ppb.
- Arsenic can result in the formation of malignant tumors on skin and lungs and may cause nervous system disorders.
- For this particular parameter within Northeastern Pennsylvania (NEPA), it would be advisable to retest the water for dissolved and total arsenic.
- In many cases, the arsenic has been leached from a colloid or particle that could be more cost effectively removed by standard filtration. It is also typically bound to iron oxide complexes.

Add Arsenic to Baseline Testing

Reminder # 1 - Problems with Iron, Manganese, and Sulfur – May be Bacterially Related



In Northeastern PA- “Nuisance Bacteria may be associated with an Odor, Iron, Manganese, or Sulfur problem. Up to 50% of the time.

Make sure to test for total coliform, standard plate count, and Nuisance Bacteria.



**Natural Gas Companies should add this to their screening tests
Only Costs about \$ 9.00 per test.**

Water has a
Purple Hue !



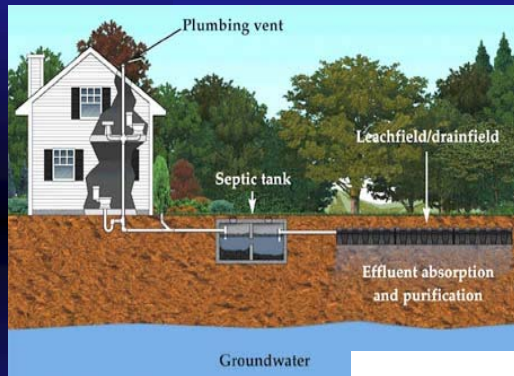
Oram, 2011
Susquehanna County, PA

Example of Nuisance Bacteria

Iron Related Bacteria Count - > 140,000 colonies per ml

Aluminum – 0.511 mg/L, Iron 1.87 mg/L, Manganese – 5.4 mg/L,

Lead 0.029 mg/L, **Methane - < 0.001 mg/L**



Not Just a Marcellus
Shale Issue and in some cases
other Private Wells are Part of the Problem



Action Needed

- Private Wells May Facilitate Contamination
 - ◆ Fix Poorly Constructed Private Wells
 - ◆ Private Well and Water System – Construction Standards- this must include the piping.
- Baseline Testing
 - ◆ Needs to include Bacteria, Arsenic, Bromide, Possibly Nuisance Bacteria, and Phthalates.

Note: We Originally Recommended Bromide in 2009 !

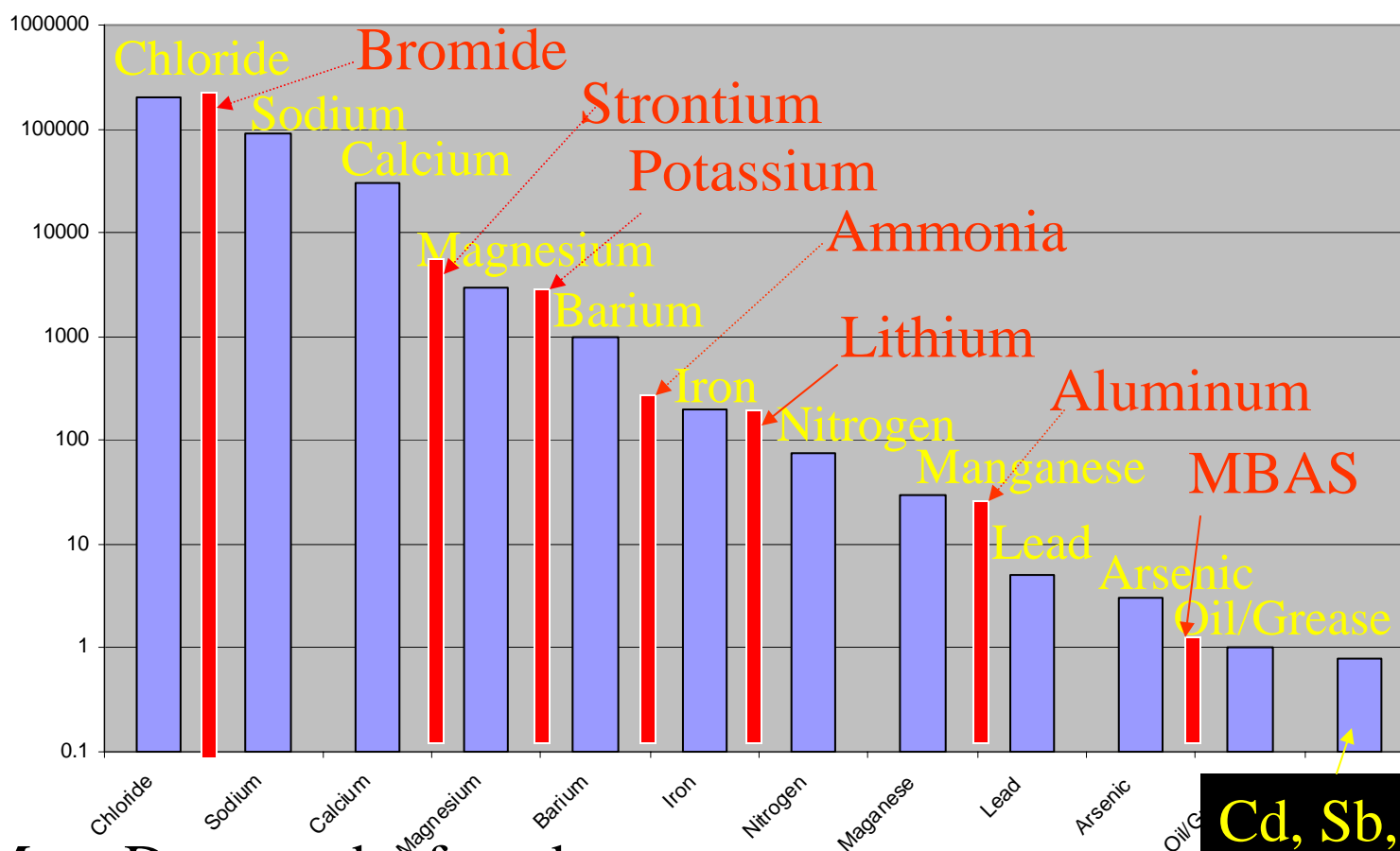
Problem # 2 - Baseline Testing

- More Missing Parameters
 - ◆ Ground Source Factor
 - ◆ Methane Migration
- Problems with the Process
 - ◆ Purging
 - ◆ Chain of Custody
 - ◆ Quality of Data

Suggested Baseline- For Citizens from PADEP (11/2010)

- Alkalinity, Chloride, Conductivity, Hardness, Oil and Grease, pH, Sulfate, Total Dissolved Solids, Total Suspended Solids, Total Solids
- Barium, Calcium, Iron, Magnesium, Manganese, Potassium, Sodium, Strontium
- Ethane/Methane
- Total Coliform / E. coli

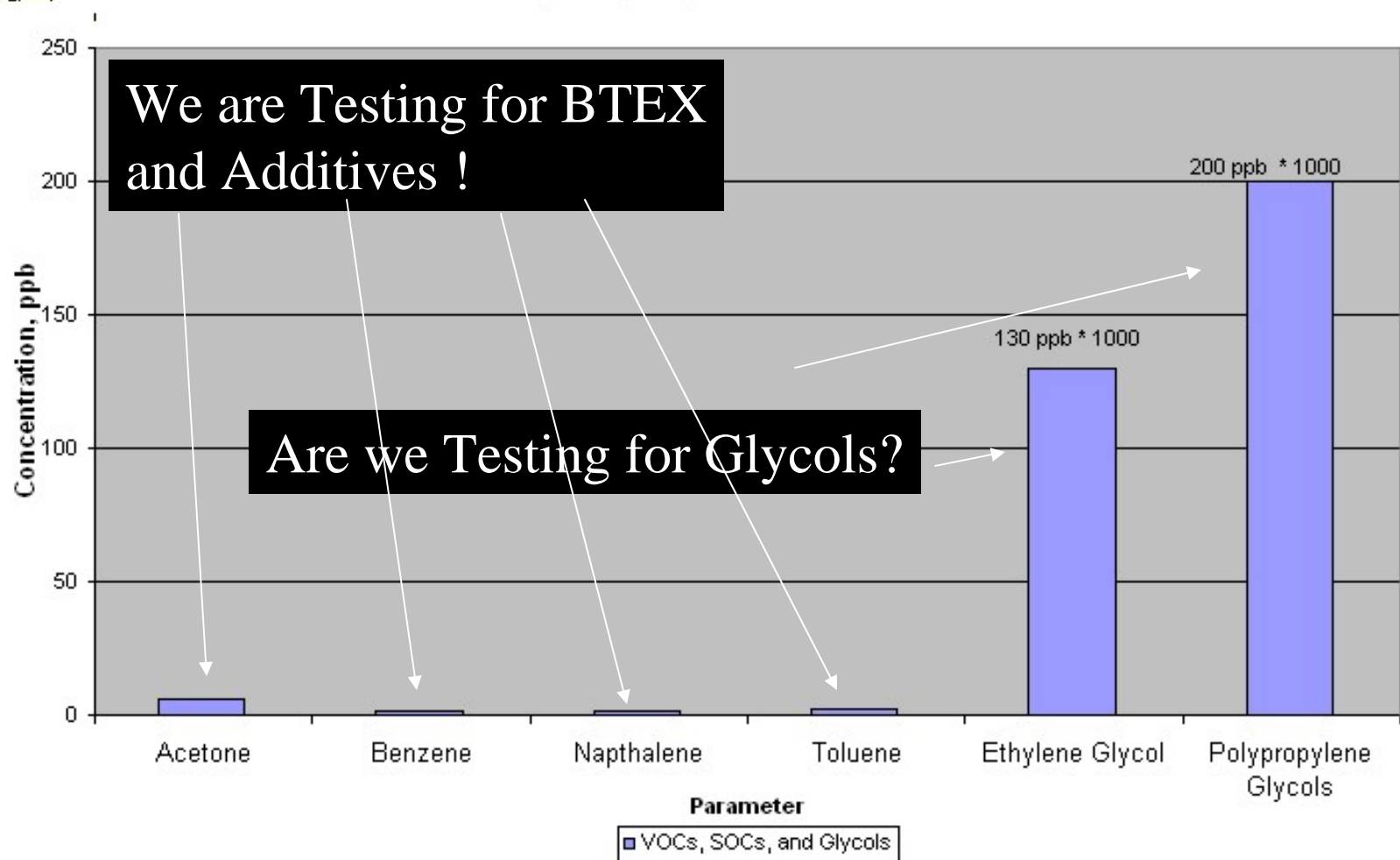
Approximate Flowback Water - Wastewater Chemistry Concentration - mg/L (Source: PSU and Marcellus Shale Coalition)



More Data can be found at
<http://www.bfenvironmental.com>

**Cd, Sb, Be, Cr
Ni, Ag, Tl and
other trace
metals**

VOCs, SOCs, and Glycols in Flowback Water

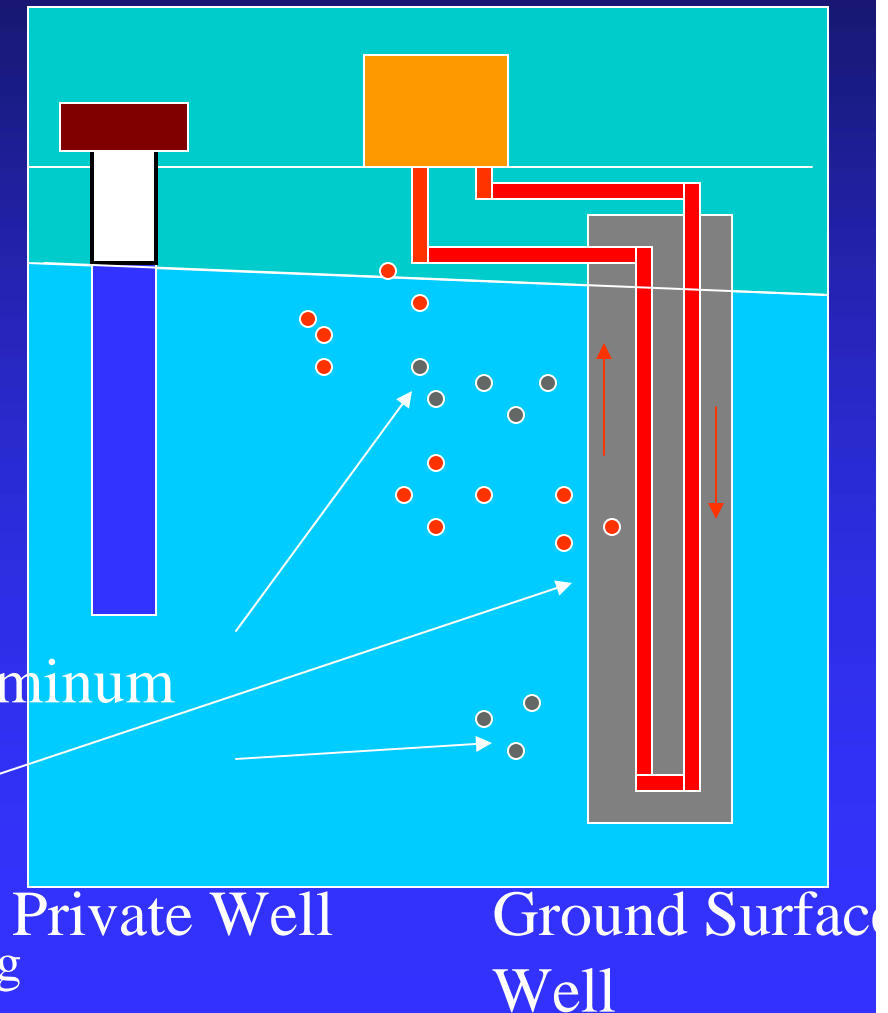


Glycols- not a common problem – no real drinking water standard

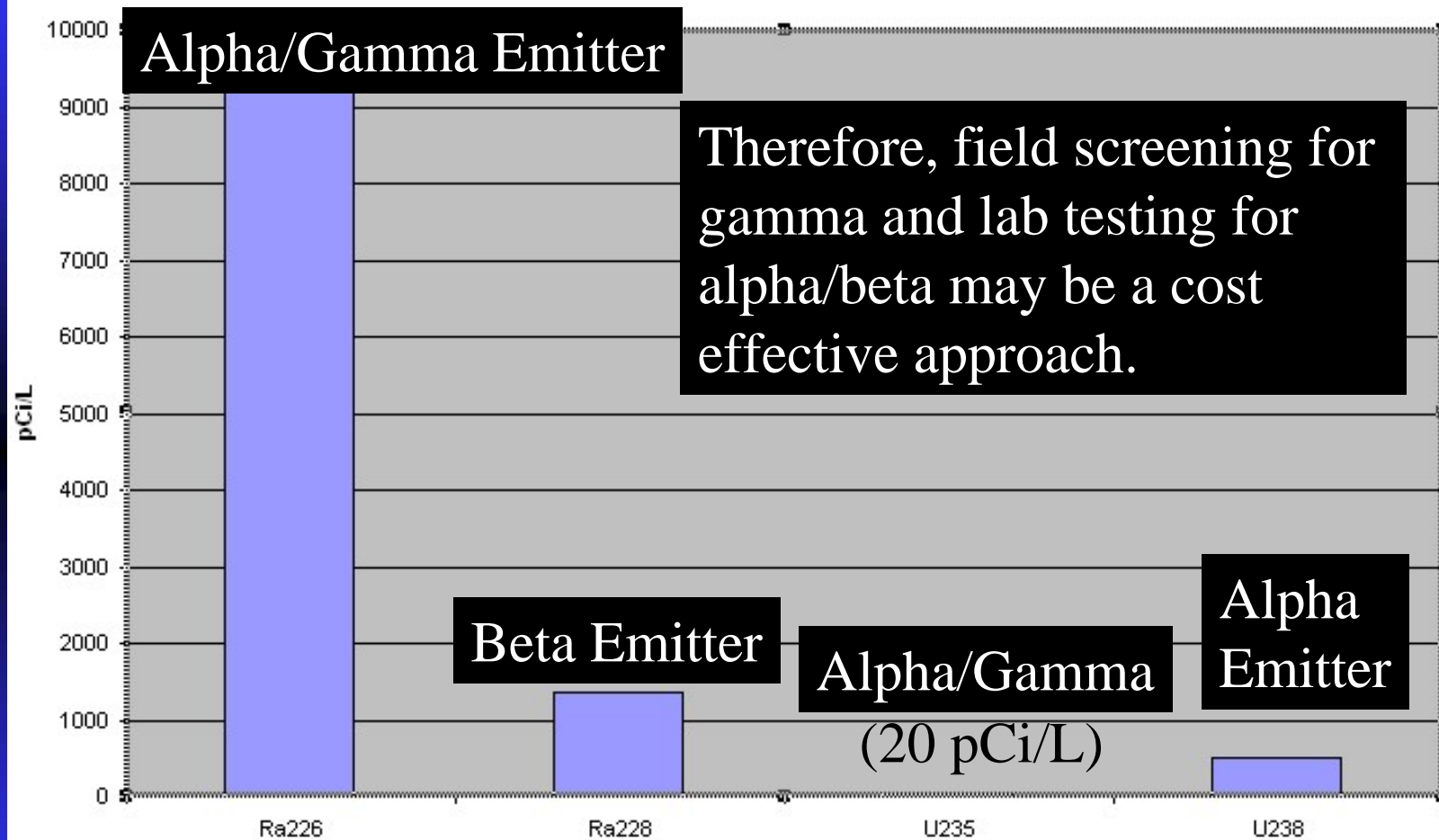
- ground-water heating and cooling systems, deicing agents, and natural gas development
- EPA guidance is ≤ 7000 ppb or 7 mg/L (ethylene glycol)

Recirculated Glycol in Plastic
Piping surrounded by Sand with Clay
No Construction Standards No Protective Casing

Grout- Aluminum
Silicates

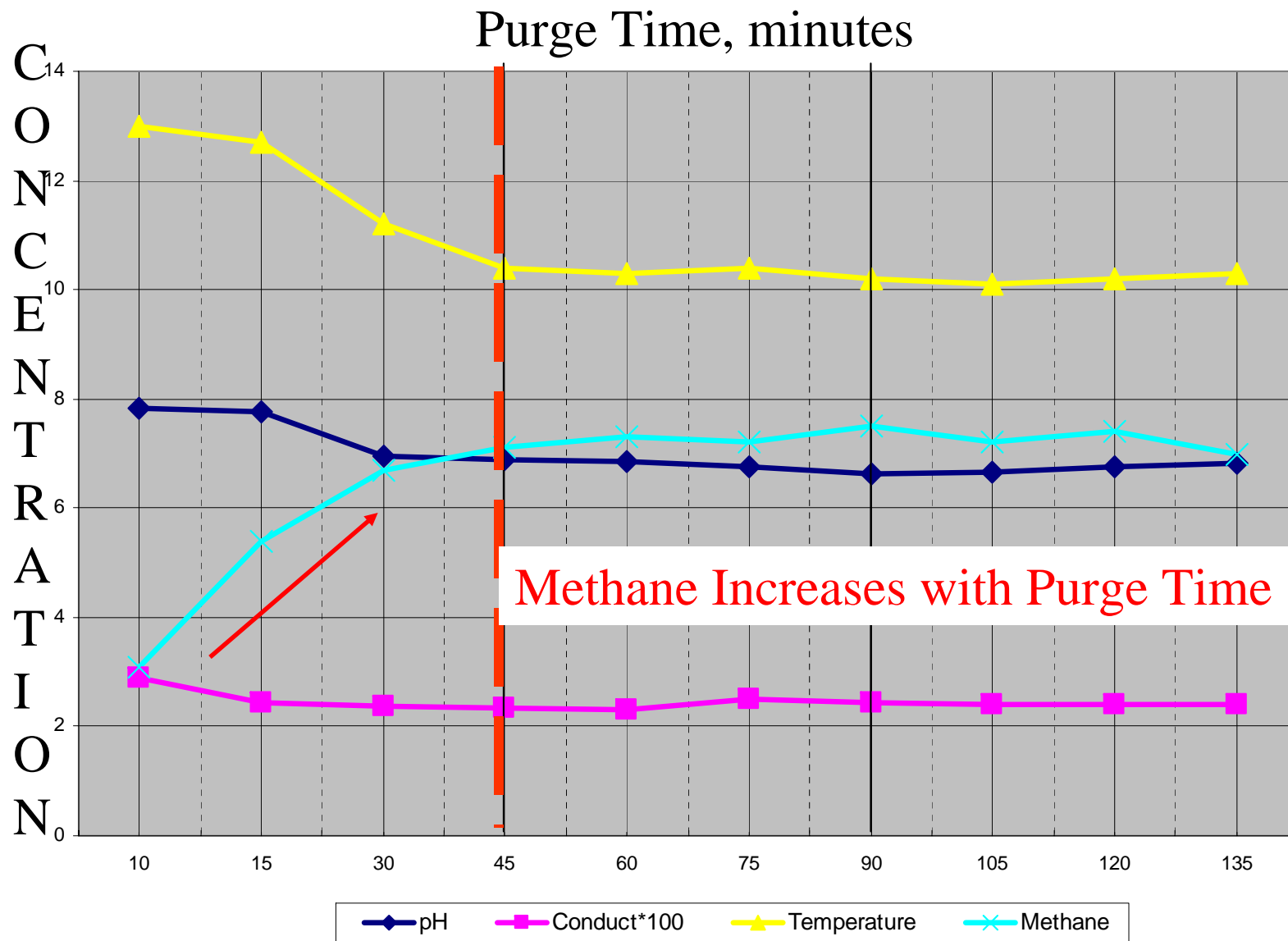


Radiological in Flowback Water



Other Issues with Baseline Testing

- Purging Process – Not long enough!
- Not Conducting Isotropic analysis.
- Not Documenting Water Level or Other Observations During the Collection Process.
- Using wrong methods or detection limits that are not low enough.
- Lack of Quality Control for the Data- Great Surrogates, Blanks, or Spikes – but Geochemically data does not Make Sense.



The Paper Work

- Chain-of-Custody
- Where Does Chain of Custody Start?
 - ◆ The Field Sample – Right??

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SUBMIT LAB REPORT TO: Company: _____ Contact: _____ Address: _____ City: _____ State: _____ Zip: _____ Phone: _____ Fax: _____ Report Delivery: <input type="checkbox"/> Mail <input type="checkbox"/> Fax <input type="checkbox"/> Email (enter address below)		SUBMIT INVOICE TO: Company: _____ Contact: _____ Address: _____ City: _____ State: _____ Zip: _____ Phone: _____ Fax: _____ Invoice Delivery: <input type="checkbox"/> Mail <input type="checkbox"/> Email (enter address below)																																																																																																															
CLIENT PROJECT INFORMATION Project Name: _____ Project/PO Number: _____ Purpose: <input type="checkbox"/> Regulatory <input type="checkbox"/> Informational <input type="checkbox"/> FW/SD Results TAT Requested: <input type="checkbox"/> 6-10 Day (Standard) <input type="checkbox"/> RUSH* (INDICATE DUE DATE): _____ <small>NOTES: *Turnaround times begin at 5pm on the day the samples were received by MICROBAC. Results will be considered due by 5pm on the due date. **RUSH TATs will include surcharge unless otherwise agreed to in writing and must be pre-arranged to ensure the due date can be met.</small>		LABORATORY USE ONLY Samples received on ice? Temp: °C Y N NA Cooler temp. within acceptable limits? Y N NA Correct bottles/through volume for analysis? Y N NA Sample bottles in good condition (unbroken)? Y N NA Samples within required holding time? Y N NA Zero headspace samples collected correctly? Y N NA Samples preserved to pH <2 and/or pH >12? Y N NA Shipping Container: <input type="checkbox"/> Drop Off <input type="checkbox"/> Microbac Pickup <input type="checkbox"/> Outside Courier																																																																																																															
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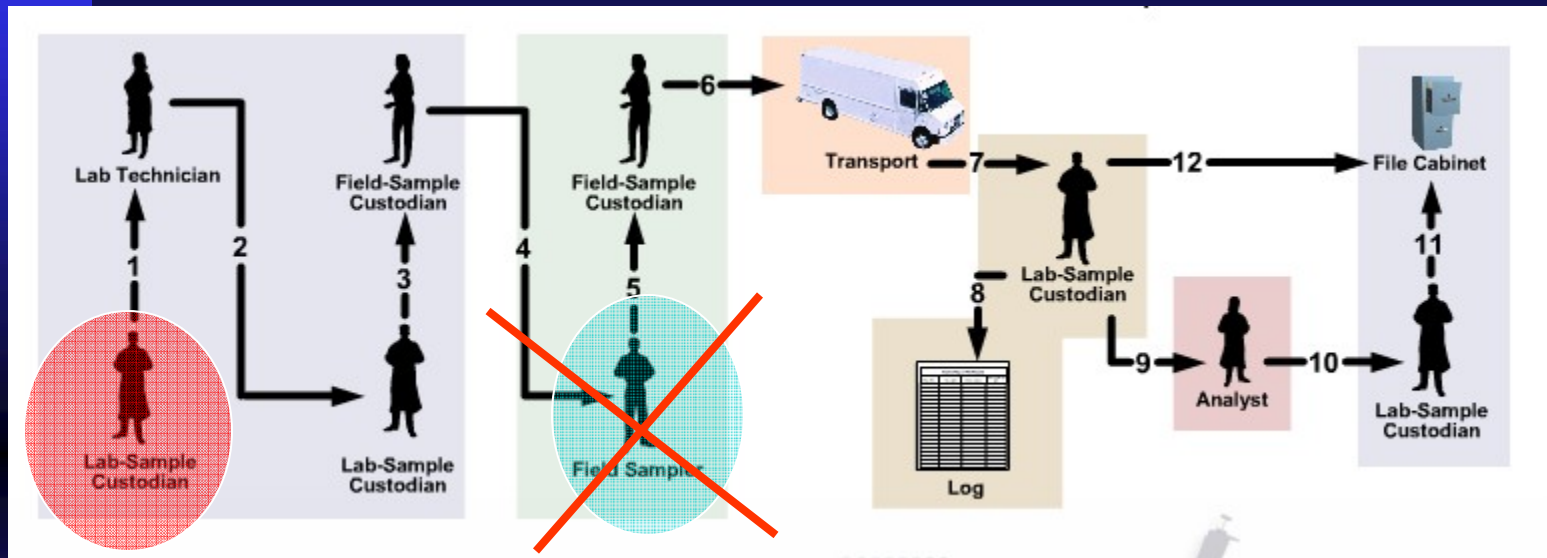
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Company:			Company:						
Contact:			Contact:			Cooler temp. within acceptable limits?		Y N NA	
Address:			Address:			Correct bottles/enough volume for analysis?		Y N NA	
City:	State:	Zip:	City:	State:	Zip:	Sample bottles in good condition (unbroken)?		Y N NA	
Phone:			Phone:			Samples within required holding time?		Y N NA	
Fax:			Fax:			Zero headspace samples collected correctly?		Y N NA	
Report Delivery: <input type="checkbox"/> Mail <input type="checkbox"/> Fax <input type="checkbox"/> Email (enter address below)			Invoice Delivery: <input type="checkbox"/> Mail <input type="checkbox"/> Email (enter address below)			Samples preserved to pH <2 and/or pH >12?		Y N NA	
						Shipping Carrier: <input type="checkbox"/> Drop Off <input type="checkbox"/> Microbac Pickup <input type="checkbox"/> Outside Courier:			
CLIENT PROJECT INFORMATION			MICROBAC Field Services Used? <input type="checkbox"/> NO <input type="checkbox"/> YES (See Field Services Log)			SAMPLE DETAILS		ANALYSIS REQUESTED	
Project Name:			MICROBAC Quote/MSA No:			SS = Solid or Sludge GW = Groundwater WW = Wastewater DW = Drinking Water SW = Storm or Surface Water OL = Oil A = Air O = Other			
Project/PO Number:			Data Deliverables: <input type="checkbox"/> Level I (Standard) OR						
Purpose: <input type="checkbox"/> Regulatory <input type="checkbox"/> Informational <input type="checkbox"/> PWSID:			Additional Fee Deliverables: <input type="checkbox"/> Level I <input type="checkbox"/> Level III <input type="checkbox"/> Level IV						
Results TAT Requested*: <input type="checkbox"/> 6-10 Day (Standard) OR <input type="checkbox"/> RUSH* (INDICATE DUE DATE):									
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LAB ID	SAMPLE IDENTIFICATION / LOCATION DESCRIPTION		SAMPLE DATE	SAMPLE TIME	SAMPLED BY	Total # of Containers	Sample Type	Grab "Q" or Composite "C"	
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CUSTODY CHAIN		PRINT NAME	SIGNATURE	DATE	TIME	COMMENTS, NOTES, OR SPECIAL INSTRUCTIONS			
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Accepted by:									
Relinquished by:									
Received at MICROBAC:									

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



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

Question – What happens to the water bottles after they are picked Up by the Field Sampler??? - Most Laboratories I train - have no idea. This is NOT Good. This is a hole that needs to be filled.

EPA – Can we Afford This ! This is 1 Sampling Team



At Least
5 People

These Photo Ops – Make Us Look Bad !



A Green Garden Hose and a Bucket –
Nice Gloves – Should they be Going
in Your Pocket?



Measuring
Volume of a
Hole – Before
Taking a Sample
for Metals???



Do I have
To Say
Anything?



Hopefully Photo
Op only- But at
Least we have gloves

Another
University
No Gloves
A Pitcher?



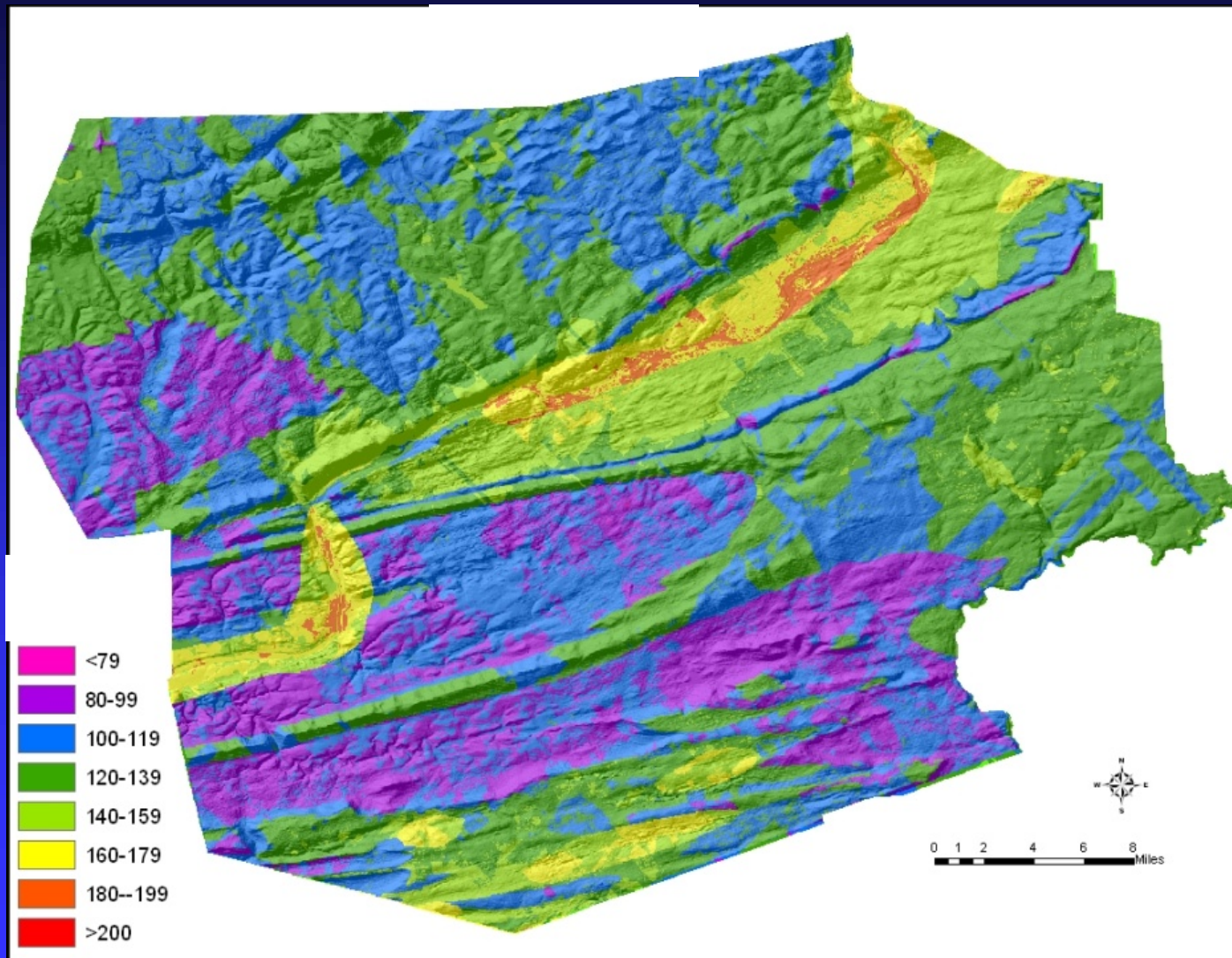
Action Needed

- Add Aluminum, Glycols, and at least Alpha/Beta to Baseline Testing
- Add Surfactants – especially Shallow Wells or wells with very little casing
- Properly Purge Water Wells and Monitoring Quality During the Purging Process
- Review Chain-of-Custody Practices – Complete Chain-of-Custody Training
- Train Your Field Teams !
- Construction Standards for Geothermal Wells !

Item 3: Stop Using the Data as a Place Holder

- The baseline data has value
 - ◆ Vulnerability Analysis
 - ◆ Are we missing something

Vulnerability Analysis Map



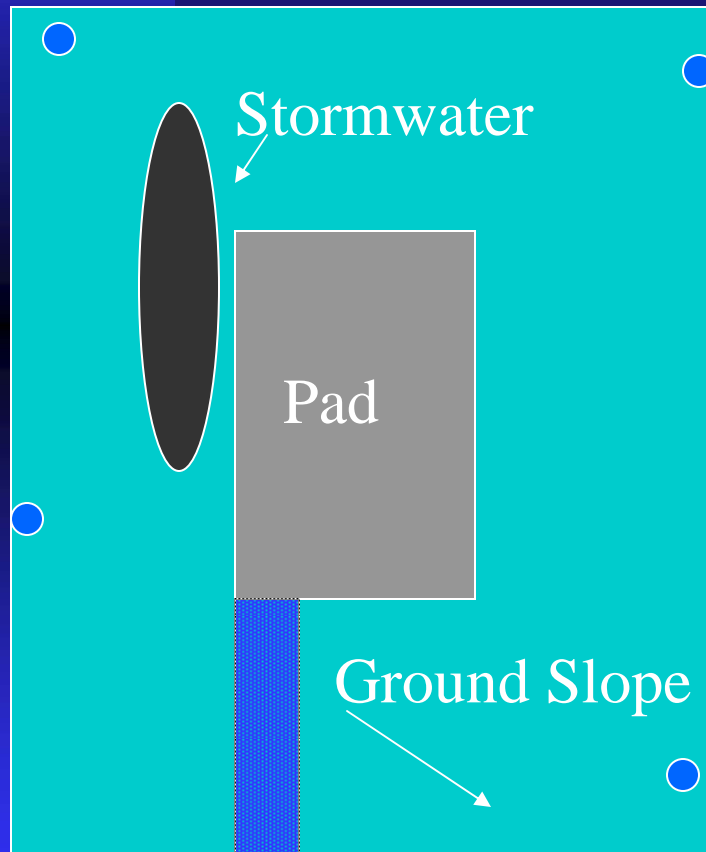
Source- Wilkes University

Consider Vulnerability Analysis

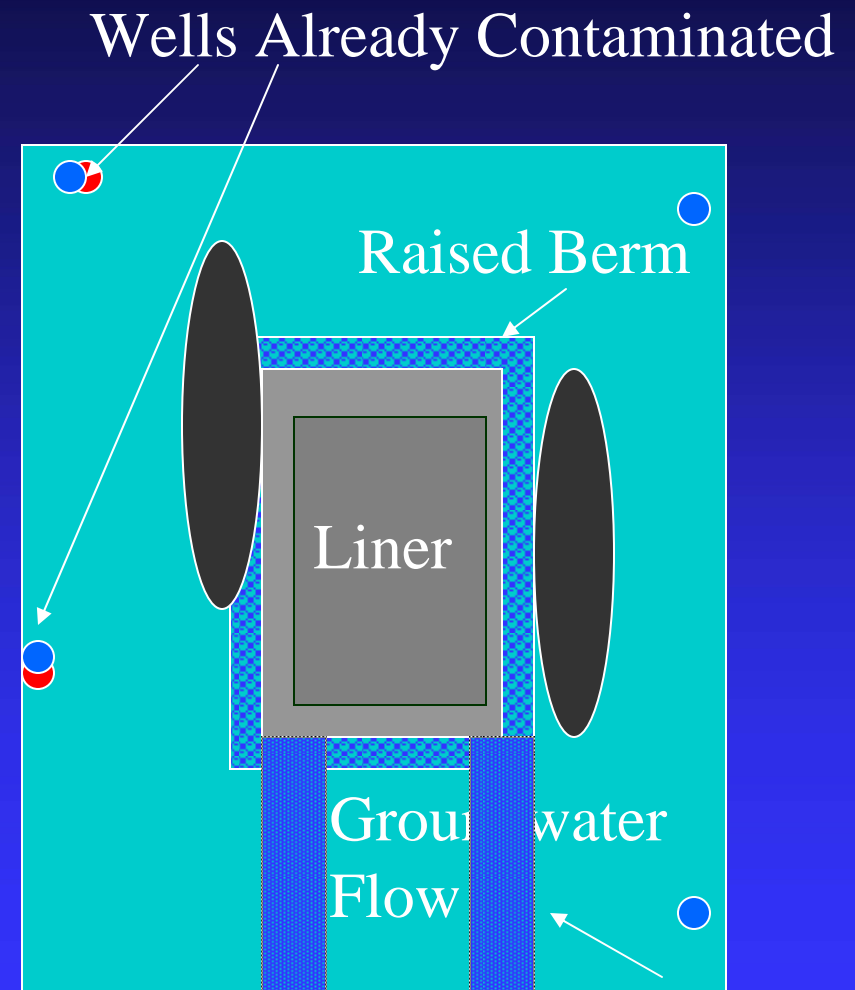
What does the Baseline Testing Tell Us?

- Is the Well Shallow?
- Is the Well Cement Grouted?
- How deep is the Casing?
- Does the Well Show Signs of Saline Water or Elevated Methane ? – Pre-Drilling
- Does the well have an elevated level of bacteria, chloride, sodium, or intermittent discolored water?
- If so – this may be a well that is vulnerable to surfacewater or near surface influence and act as a pathway to contamination or a pathway for “saline water”.
- This well should be inspected, fixed, upgraded, or abandon.

Using Vulnerability Analysis



Pre-Baseline Testing Concept



Maybe More Monitoring or Fix Contaminated Wells – Other BMPS?

Educating the Community



Download a Free Copy (pdf) or Link to a copy at <http://www.bfenvironmental.com>

Also:

1. New Booklet available April 2012.
2. New Web-portal on Methane Gas Migration And Mitigation (available now)



Help Promote the Citizens Groundwater Surfacewater Database to Your Community Partners. Link to:

<http://www.bfenvironmental.com> or
Pennsylvania Groundwater Forum (facebook)

Again

1. Up to 1.5 Million - Citizens in PA Drink Water that may cause Short-term or chronic disease. This has nothing to do with Marcellus Shale Or Unconventional Gas.
2. Use Baseline Testing Results to Help Select or Identify Vulnerable Areas.
3. Private Well Constructions Standards – Good, but will NOT Fix this Problem.
4. Be Part of the Solution with a Positive Headline and “Working With the Community” – Using the Word – “WE”

This is not a Marcellus Shale Issue – It is a Vulnerability and Health Issue and a Great Community Matters Issue!



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- Expert Testimony / Sourcewater Protection
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Environmental Scientists, Hydrogeologists, & Environmental Education Specialists
Located in Northeastern Pennsylvania

water reuse

hydrogeology

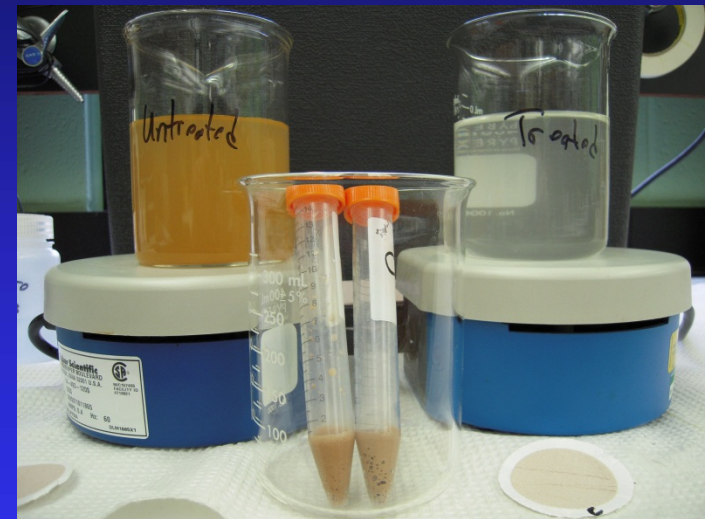
soil testing

Mine Water Treatment System and Water Reuse



BEFORE

POW Process



AFTER





Presented by:

Mr. Brian Oram, Professional Geologist (PG),
Soil Scientist, Licensed Well Driller, IGSHPA

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