SOUTHWEST PENNSYLVANIA ENVIRONMENTAL HEALTH PROJECT

NOW AVAILABLE

A NEW, EASY TO USE, WATER MONITORING DEVICE

If you live in an area of shale gas drilling and development and use private well water, your home is at risk for well water contamination.

You can easily monitor your well water for changes in quality…

with a CATTFish!

The CATTFish, which stands for Conductivity and Temperature in your Toilet, is an instrument that measures conductivity in water, allowing you to monitor the quality of the water inside your home. It is designed with sensors that sit in a toilet tank. With a push of a button, it takes a measurement each time the tank refills after a flush.

Conductivity is a measure of the ability of water to conduct electrical current, and this can change when a well becomes contaminated with water from deep shale deposits or from other contaminants. If flowback or produced water from the deep shale deposits enters your well or spring, a major increase in conductivity will warn you of contamination. Both types of wastewater have very high conductivity. You would then know when to stop using the water and have it tested for specific contaminants.

The potential for contamination from shale gas fluids is well documented.[i] And while the risk may be small that any one well will be affected, EHP believes that homeowners can easily reduce the risk of health impacts by continuously monitoring for changes in the quality of their water.

2001 Waterdam Plaza Drive, #201, McMurray, PA 15317
Office: 724.260.5504 Cell: 724.249.7501
www.environmentalhealthproject.org

How to use the CATTFish

- Once the monitor is in the tank (instructions are provided), allow it to run for a couple of weeks to establish the “baseline conductivity” for your home. Measuring conductivity regularly, over time, provides a range of readings specific to your water well -- your "baseline". Each household has a unique "baseline conductivity". The normal range for southwestern PA is <775 µs/cm.[1]

There will always be some variation in the conductivity readings because this measurement is affected by 3 main factors: what’s in the water at any given time, changes in the volume of water in the well and changes in water temperature.

- WHAT'S IN THE WATER

Well water normally contains natural substances. Many dissolved **inorganic solids** are found in soil and rock and are released into the water when it flows through or over them. These are specific to an area's geology. The presence of certain dissolved inorganic solids can increase conductivity. Examples include sulfate, nitrate, phosphate, sodium, calcium, magnesium, iron, chloride, and aluminum. Examples of dissolved solids common to Washington County are iron and calcium. Other dissolved inorganic solids are used in industrial or agricultural activity and end up in surface (streams and ponds) or groundwater (water table). Examples of these are chloride, which is used in well drilling fluid and increases conductivity, and nitrate, used in fertilizers.

Note that the presence of **organic compounds** does **not** increase conductivity. Examples include oil and grease, volatile organic chemicals (VOCs), glycols, and pesticides. Water tests are needed to identify these compounds.

- CHANGES IN WATER VOLUME

The addition of rain and snowmelt decreases conductivity by diluting dissolved solids. Droughts or periods of low precipitation increase conductivity as dissolved solids become more concentrated. A spill from an industrial source that leaks into

[1] The basic unit of measurement of conductivity is the mho or siemens. Conductivity is measured in micromhos per centimeter (µmhos/cm) or microsiemens per centimeter (µs/cm).

groundwater may also cause an increase in conductivity. Contaminants that leak into groundwater can travel slowly or quickly through the water table, depending upon local geology and water volume. This makes it difficult to predict when nearby springs, wells, streams or ponds may be affected.

- CHANGES IN WATER TEMPERATURE

Conductivity is also affected by temperature: the warmer the water, the higher the conductivity.

What is a normal range for conductivity?

While each private water well has a unique baseline, here are some typical measurements for comparison:

In southwestern PA most well water is less than 775 µs/cm.

- Publicly and commercially treated water generally ranges from 75 to 500 µs/cm.
- Distilled water has a conductivity range of 0.5 to 3 µmhos/cm.
- The conductivity of rivers in the United States generally ranges from 50 to 1500 µmhos/cm. Studies of inland fresh waters indicate that healthy streams have a range between 150 and 500 µhos/cm.
- Some industrial waters can range as high as 10,000 µmhos/cm.
- ***The produced water from wells drilled in the Marcellus shale can reach as high as 700,000 µmhos/cm.***[ii] The conductivity levels are extremely high mainly because the Marcellus shale contains very high levels of salts (brine) - a natural component of shale deposits.

How do you know when to be concerned?

Once you have established the normal range of conductivity for your water – the baseline - just watch for a large increase in conductivity. **An increase of 200 units (µs/cm) that lasts for more than a day or two warrants getting your water tested by a certified laboratory.** It is best to stop drinking and cooking with your water when the conductivity reaches this high level.

What to test for when conductivity is high

If you live near shale gas wells and the conductivity in your well water reaches high levels, we recommend the following water tests:

- VOCs
- strontium
- barium
- arsenic
- potassium
- surfactants
- sodium
- glycols
- calcium
- oil and grease
- ethane/methane
- fluorides
- iron

If you decide to test your water, EHP team members are available to help you understand the results. Contact EHP for more information. For a more comprehensive approach to monitoring water near shale gas development see EHPs document: *Well Water Contamination: SWPA-EHP Ranking System and Monitoring Strategy* found on our website:

http://www.environmentalhealthproject.org/health/water/

Where can you get a CATTFish?

The CATTFish was developed by the Carnegie Mellon University CREATE Lab and Robotics Institute specifically for use in the home. It is now commercially produced by MellonHead Labs of Pittsburgh, PA.

EHP has a number of CATTFish available for residents, particularly those with documented health-related concerns and an observable or probable exposure source from water contamination. Our team can also offer support for getting your monitor set up and for tracking and understanding the readings on the meter. When EHP no longer has monitors, they can be ordered from Mellonhead Labs at a discount.

Mellonhead Labs is currently offering the CATTfish water monitoring kit at a $50.00 discount of $199.00 per kit. All that is needed to obtain the discount is to go to the website and enter our code:

Go to www.CATTfish.com then click on “shop”.

Enter “SWPA-EHP” on the address line under company information.

The discount ($50) will then be deducted from the price.

---

[i] For information on well water contamination from shale gas wells see:

http://www.epa.gov/region8/superfund/wy/pavillion/EPA_ReportOnPavillion_Dec-8-2011.pdf ; see also R. B Jackson,. Vengosh, A.; Darrah, T. H.; Warner, N. R.; Down, A.; Poreda, R. J.; Osborn, S. G.; Zhao, K.; Karr, J. D. Increased stray gas abundance in a subset of drinking water wells near Marcellus Shale gas extraction. Proc. Natl. Acad. Sci. U.S.A. 2013, DOI: 10.1073/pnas.1221635110.

For information on the potential for gas well leakage see:
A. R. Ingraffea, Martin T. Wells, Renee L. Santoro, and Seth B. C. Shonkoff. Assessment and risk analysis of casing and cement impairment in oil and gas wells in Pennsylvania, 2000–2012 PNAS 2014 ; published ahead of print June 30, 2014, doi:10.1073/pnas.1323422111

[ii] T. Hayes, Gas Technology Institute, Sampling and Analysis of Water Streams Associated with the Development of Marcellus Shale Gas, report prepared for Marcellus Shale Coalition, December 2009, http://www.bucknell.edu/script/environmentalcenter/marcellus/default.aspx?articleid=14