

**User Guide
for Radium Monitoring of Drinking Water
Using PA DEP's Water Data System**



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Introduction

The Pennsylvania Department of Environmental Protection (DEP) is charged with the responsibility of monitoring the state's sources of public drinking water. The intensity of shale gas and oil development has made this responsibility more important than ever. In particular, the movement of radioactive material brought on by shale gas extraction has raised serious public health concerns. Radium and its breakdown elements Ra-226 and Ra-228 are emitted from well pads, contaminate the waste stream, and can make their way into the public water supply system. The water tests the DEP conducts are infrequent, and private well water is not monitored at all. Publicly available data from DEP's surveillance is difficult to find and interpret. We hope this guide will allow you to more easily access the information you need.

To skip to directions on how to access radionuclide test results in drinking water for your area, go to page 8.

Why Monitor Radium in Water in Southwestern Pennsylvania?

Radium is a water soluble radionuclide. It is readily transported by groundwater. Moreover, water soluble compounds like radium are easily absorbed into the blood stream and distributed within cells to DNA, the cellular site of carcinogenic changes.

Radioactive compounds naturally exist in Marcellus shale, where oil and gas extraction occurs. Chemicals used in hydraulic fracking react with naturally occurring minerals in the shale, some of which contain radioactive elements. This radioactive material is brought to the surface through drill cuttings and flowback water. Because exposure to radioactive material—including radium, Ra-226, and Ra-228—can cause cancer and other health conditions, we are interested in tracing it.

Research has shown that solid fracking waste, mostly drill cuttings, are transported from fracking sites to landfills.¹ There, radioactive compounds can seep into the landfill leachate—the liquid waste that is extracted from landfills. This leachate is subsequently taken to water

¹ Hill, L. A. L., Czolowski, E. D., DiGiulio, D., & Shonkoff, S. B. C. (2019). Temporal and spatial trends of conventional and unconventional oil and gas waste management in Pennsylvania, 1991–2017. *Science of The Total Environment*, 674, 623–636. <https://doi.org/10.1016/j.scitotenv.2019.03.475>

treatment plants in Pennsylvania and discharged into streams and rivers. Liquid waste has been, and in some cases continues to be, stored in waste ponds and tanks near well pads. Waste ponds and tanks leak or the liquid waste is spilled in transfer to trucks, threatening exposure to the local water tables and streams.

With this guide, community members, researchers, and NGOs can more quickly access and compile existing DEP data on radium levels in surface water and public drinking water supplies. (Note: there are other pathways of human exposure, such as through air emissions, not discussed here.) This guide answers questions such as:

- What type of monitoring is being done for radium in Pennsylvania’s streams and public water supplies?
- How frequently are tests conducted? Who conducts them?
- When and where has radium been detected? At what levels? When and where has it not been detected?

Drinking Water Source Information

Recent news articles have mapped the outflows where landfill leachate is discharged into Pennsylvania waterways.^{2,3} Some Pennsylvania waterways are sources for public drinking water. Intake pipes take water from rivers and streams and send it to centralized treatment plants before piping it to residences.

The specific locations of intake pipes where water flows from waterways into the public drinking water supply system are protected for security reasons. However, some resources can give insight into which streams and rivers may have intakes and where different suppliers operate. The PA DEP’s [2020 Integrated Report](#) on water quality includes a GIS layer for “Streams Potable Water Supply Supported.” The DEP [Public Water Supplier’s \(PWS\) Service Areas](#) site maps all the service areas of public water suppliers.⁴

To investigate radium levels in public drinking water supplies, use the [Drinking Water Reporting System](#). Most water samples are taken immediately after the water purification process is completed at a treatment plant. This database works well for individual public water systems and singular years. For data that include multiple years or more than one county, you may want to reach out to the DEP to request the data.

² <https://publicherald.org/pennsylvania-is-discharging-radioactive-fracking-waste-into-rivers-as-landfill-leachate-impacting-the-chesapeake-bay-ohio-river-watersheds/>

³ <https://publicherald.org/pennsylvania-regulators-wont-say-where-66-of-landfill-leachate-w-radioactive-material-from-fracking-is-going-its-private/>

⁴ The 2020 integrated report is available here: http://www.depgis.state.pa.us/2020_Integrated_Report/

How Often Are Drinking and Surface Water Radioactivity Tests Conducted?

Surface water, such as that found in a river or stream, is not required to be tested for radioactive contaminants because it is viewed as raw source water that will be treated before it reaches the public as drinking water. Nevertheless, some related sampling has been done by the PA DEP. Previous DEP studies have investigated bioaccumulation in fish and radium levels in sediment near water treatment plant (WTP) outflows. The DEP also completed a study of TENORM (technologically enhanced naturally occurring radioactive material) in 2015.

While surface water is not regularly tested, the state requires that public drinking water systems that serve Pennsylvania communities be tested routinely for radium and other radionuclides. Specifically, water authorities must sample for Ra-226 and Ra-228 at each entry point every three years. However, if a water authority meets certain exceptions, then they are legally allowed to delay testing to once every six or nine years.

As an example of how this exception works, state regulations require that radium tests be conducted four times in a yearly monitoring schedule (once every quarter). However, if the first two tests show radium levels below the detection limit, the water authority does not need to conduct the remaining half of the yearly monitoring. According to the [Pennsylvania legal code](#):

(V) If the first 2 quarterly samples for a radionuclide at an entry point have results below the detection limit, as defined in 40 CFR 141.25(c)(1), the final two quarterly samples for that radionuclide at that entry point are waived.

Further, if a water authority tests reveal a radionuclide below the detection limit, then the [regulation](#) stipulates that the authority is not required to conduct a radionuclide test for another nine years:

(II) For entry points where the average of the initial monitoring results for a radionuclide is below the detection limit as defined in 40 CFR 141.25(c)(1), the repeat monitoring is reduced to one sample for that radionuclide at that entry point every 9 years.

This means that, for many public drinking water sources in Pennsylvania, legally required radium testing could be limited to approximately two samples per decade.

By contrast, some other water contaminants are tested every one, two, or three years. Some bacterial contaminants like E. coli are monitored every month, and some chemicals, such as nitrates, are tested on an annual basis. Other chemicals are commonly sampled every three years.⁵

⁵<http://files.dep.state.pa.us/PublicParticipation/Advisory%20Committees/AdvCommPortalFiles/TAC/Guidance2.pdf>

To read the section of the Pennsylvania state code that addresses water monitoring, click here <http://www.pacodeandbulletin.gov/Display/pabull?file=/secure/pabulletin/data/vol34/34-14/552.html>.

Where Did This Monitoring Schedule Come From?

In the early 2000s, the U.S. Environmental Protection Agency (EPA) published national guidelines for radium testing that included the exceptions that allow water authorities to test every nine years. Many states, like Pennsylvania, adopted this guidance. California and Massachusetts have monitoring schedules and exemptions almost identical to Pennsylvania, while Vermont stipulates that radium must be tested every three years without these exceptions.^{6,7,8}

This EPA poster clearly lays out the monitoring schedule including exemptions: <https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=30006644.txt>.

Why Is Radium Testing So Infrequent?

When the EPA rules were drafted in the early 2000s, scientists and policymakers thought nine years was sufficient to test for radium in water because radium is found deep underground and is not likely to suddenly migrate close to the Earth's surface and into human drinking water. In short, radium was not likely to naturally move from the Marcellus Shale layer on its own.

Oil and gas exploration frequently transports radium and other radioactive materials from their geologic home to the Earth's surface. With this increased movement, more frequent testing is necessary.⁹ However, in some parts of the U.S., nine years would be sufficient to determine whether radium has entered public drinking water.

What Are the Standards for Radium?

The PA DEP sets limits for annual exposure of Ra-226, Ra-228, and alpha particles. Ra-226 and Ra-228 are specific chemical isotopes of radium that give off alpha particles. To learn more about radiation, radioactivity in fracking waste, and the difference between radium and radon, see [this discussion](#) on the Center for Coalfield Justice's website.

⁶ <https://www.healthvermont.gov/health-environment/drinking-water/radioactive-elements>

⁷ [https://govt.westlaw.com/calregs/Document/129898BC27579472F89C1ABEB9C3E842A?viewType=FullText&originContext=documenttoc&transitionType=CategoryPageItem&contextData=\(sc.Default\)](https://govt.westlaw.com/calregs/Document/129898BC27579472F89C1ABEB9C3E842A?viewType=FullText&originContext=documenttoc&transitionType=CategoryPageItem&contextData=(sc.Default))

⁸ <https://www.wilbraham-ma.gov/DocumentCenter/View/2149/Massachusetts-Drinking-Water-Regulations-310-CMR-22?bidId=>

⁹ <https://www.nrdc.org/sites/default/files/Fracking-Wastewater-FullReport.pdf>

The table below was taken from a DEP-linked document that details acceptable limits for many contaminants for Pennsylvania drinking water.¹⁰

Radionuclides:

Beta Particles and photon emitters	4	millirems/year	Radium 226 and Radium 228 (combined)	5	pCi/L
Gross Alpha* (Alpha Particles)	15	pCi/L	Uranium	30	µg/L

* Gross Alpha MCL excludes Radon and Uranium particle activity.

Who Conducts the Tests?

The entity that provides your water is responsible for conducting tests. The water provider may be a municipal government, private company, or housing authority. That entity takes the physical samples and sends them to a lab. (Occasionally the lab will take the sample themselves.) That lab runs the radium tests and reports the results to the PA DEP.¹¹ Labs are accredited and regulated by the state.

More Resources

- Additional PA DEP databases and reports:
 - 2015 TENORM study:
<https://www.dep.pa.gov/Business/Energy/OilandGasPrograms/OilandGasMgmt/Oil-and-Gas-Related-Topics/Pages/Radiation-Protection.aspx>
 - 2020 Integrated Water report:
<https://www.dep.pa.gov/Business/Water/CleanWater/WaterQuality/IntegratedWatersReport/Pages/2020-Integrated-Water-Quality-Report.aspx>
- Academic articles for radium and other chemicals related to the fracking waste stream:
 - Good, K. D., VanBriesen, J. M. (2017). Power Plant Bromide Discharges and Downstream Drinking Water Systems in Pennsylvania. *Environmental Science & Technology*, 51(20), 11829–11838. <https://doi.org/10.1021/acs.est.7b03003>

¹⁰<http://www.depgreenport.state.pa.us/elibrary/GetDocument?docId=1675228&DocName=MAXIMUM%20CONTAMINANT%20LEVELS%2c%20MAXIMUM%20RESIDUAL%20DISINFECTANT%20LEVELS%2c%20AND%20TREATMENT%20TECHNIQUE%20REQUIREMENTS.PDF%20%20%3cspan%20style%3D%22color:green%3b%22%3e%2a%3c/span%3e%20%3cspan%20style%3D%22color:blue%3b%22%3e%28NEW%29%3c/span%3e%204/29/2022>

¹¹<http://files.dep.state.pa.us/PublicParticipation/Advisory%20Committees/AdvCommPortalFiles/TAC/Guidance2.pdf>

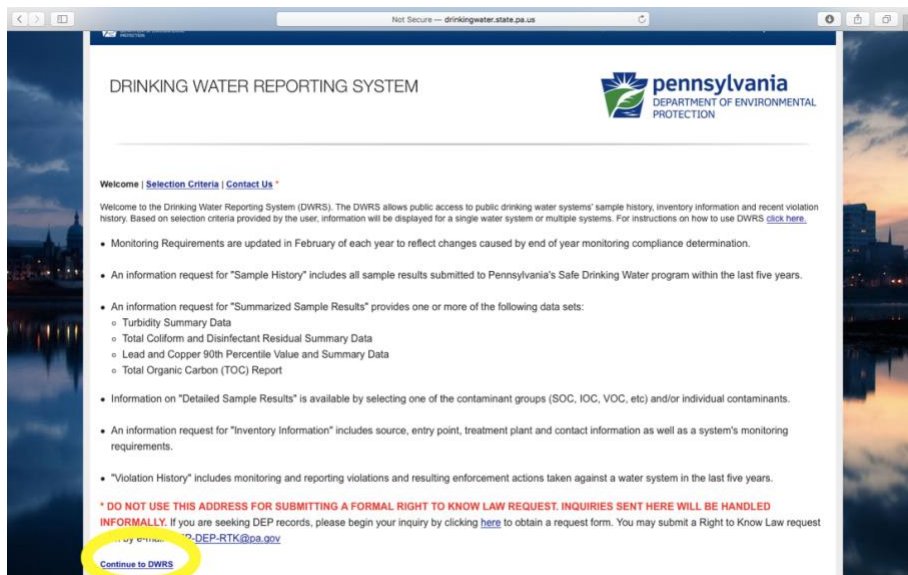
- Hill, L. A. L., Czolowski, E. D., DiGiulio, D., Shonkoff, S. B. C. (2019). Temporal and spatial trends of conventional and unconventional oil and gas waste management in Pennsylvania, 1991–2017. *Science of The Total Environment*, 674, 623–636. <https://doi.org/10.1016/j.scitotenv.2019.03.475>
- Lauer, N. E., Warner, N. R., Vengosh, A. (2018). Sources of Radium Accumulation in Stream Sediments near Disposal Sites in Pennsylvania: Implications for Disposal of Conventional Oil and Gas Wastewater. *Environmental Science & Technology*, 52(3), 955–962. <https://doi.org/10.1021/acs.est.7b04952>
- Swiedler, E. W., Muehlenbachs, L. A., Chu, Z., Shih, J.-S., Krupnick, A. (2019). Should solid waste from shale gas development be regulated as hazardous waste? *Energy Policy*, 129, 1020–1033. <https://doi.org/10.1016/j.enpol.2019.02.016>
- Wilson, J. M., VanBriesen, J. M. (2012). Research Articles: Oil and Gas Produced Water Management and Surface Drinking Water Sources in Pennsylvania. *Environmental Practice*, 14(4), 288–300. <https://doi.org/10.1017/S1466046612000427>
- If you know which treatment plant handles your drinking water, you can use the EPA ECHO database to view water quality reports from that plant: <https://echo.epa.gov/>
- Water authority reports can be a good resource. For example, Pennsylvania American Water publishes yearly water quality reports that aggregate some data on water quality: <https://amwater.com/paaw/water-quality/water-quality-reports>

These reports occasionally do not capture all the contaminants tested or include older years, one reason to access the Pennsylvania Drinking Water Reporting System.

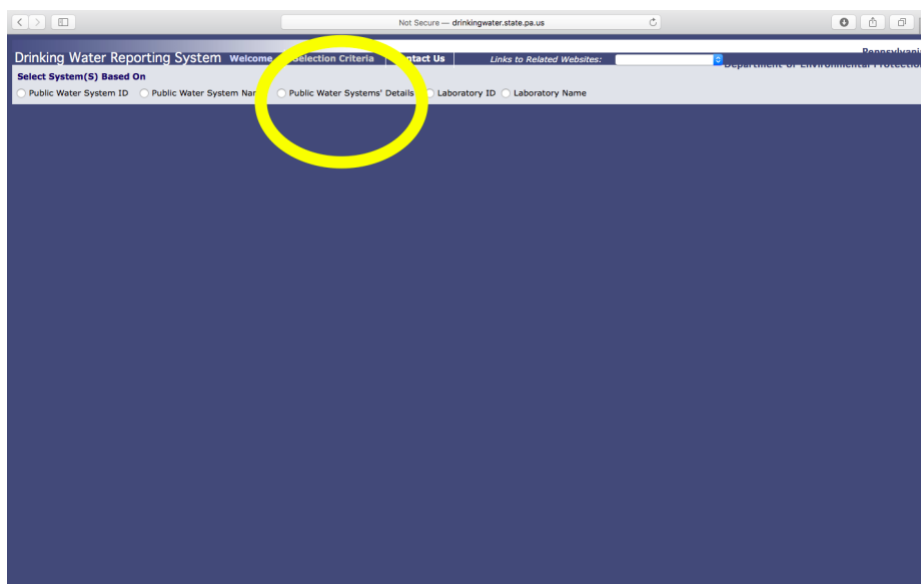
Getting the Data: Public Drinking Water

Follow the steps below to get the radium monitoring test results for drinking water in your area.

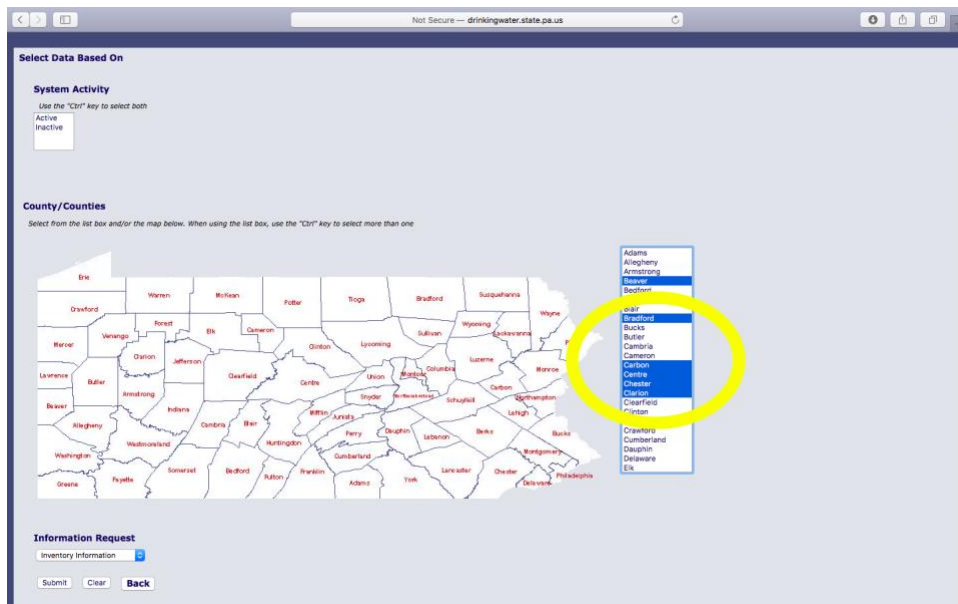
1. Use Safari or Internet Explorer. Google Chrome is not easily compatible with this website.
2. Go to the [Drinking Water Reporting System](#) on the PA DEP website. Select “Continue to DWRS”



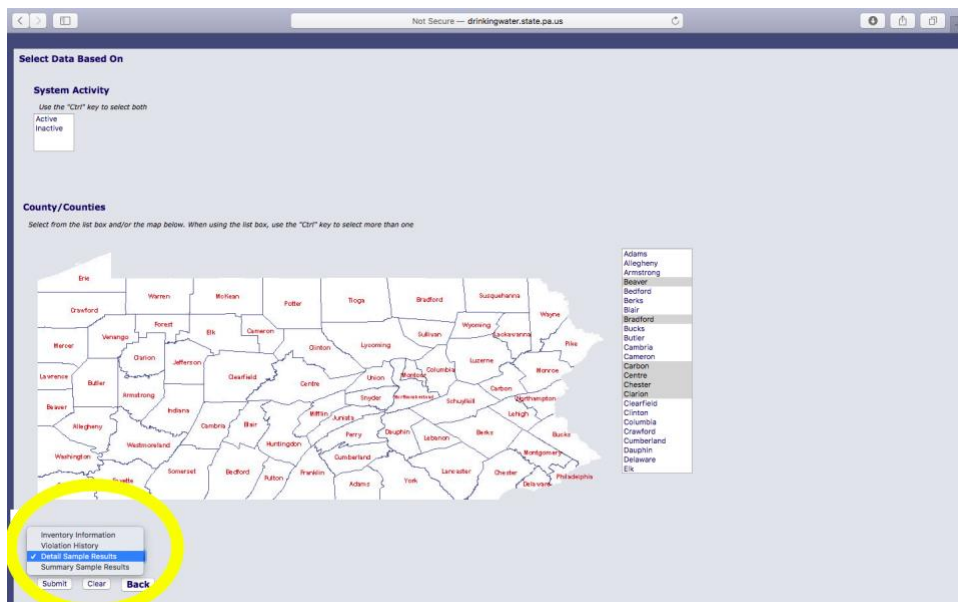
3. Check “Public water system details.” This will pull up a map of Pennsylvania.



- Click on the county you want on the map or select multiple counties by using “control click” on the list on the right-hand side of the screen.



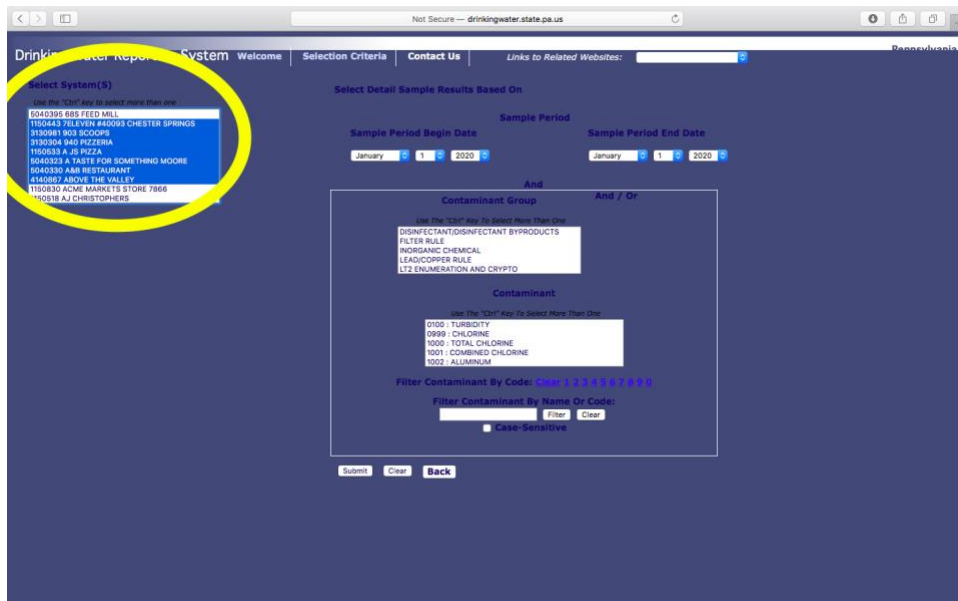
- Under the “Information request” drop-down menu, select “Detailed sample results.”



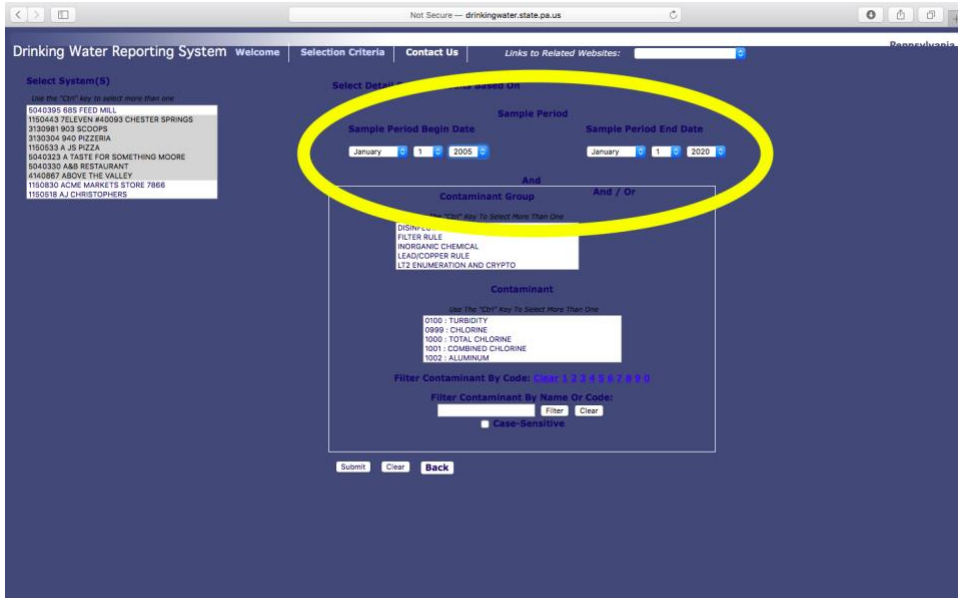
6. Then click "Submit."



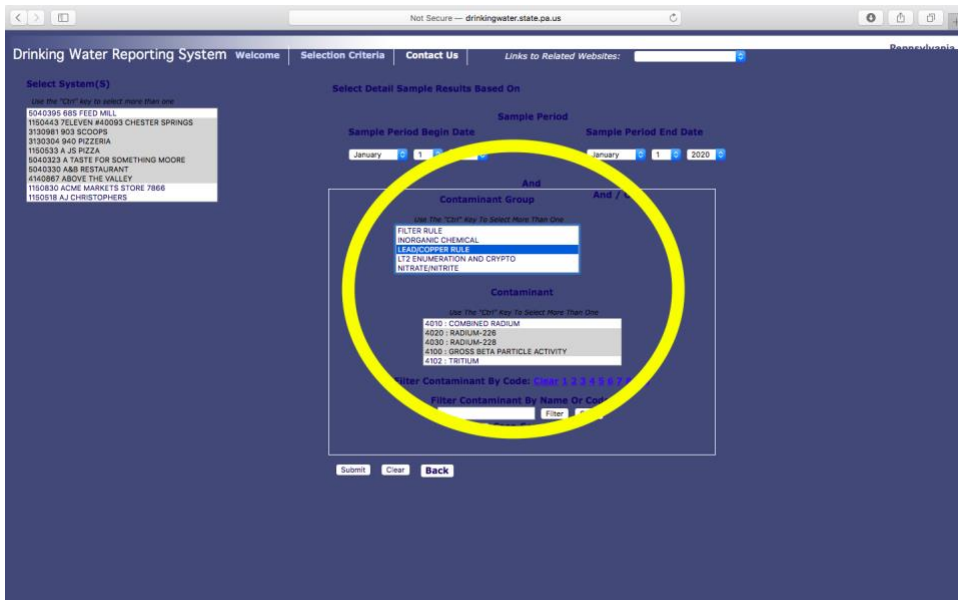
7. Under the "Select system(s)" drop-down menu, click on the one or multiple systems you are interested in.



8. Change the sample period to the time frame you are interested in.



9. Select the contaminant you want from either the “Contaminant group” drop-down menu or “Contaminant” menu. You can select multiple contaminants if you are interested.



10. Then select "Submit."

Drinking Water Reporting System

Select System(S)

Select Detail Sample Results Based On

Sample Period

Sample Period Begin Date: January 1, 2005

Sample Period End Date: January 1, 2020

Contaminant Group: LEAD/COPPER BLUE

Contaminant: 4010 - COMBINED RADIUM, 4020 - RADIUM-226, 4030 - RADIUM-228, 4100 - GROSS BETA PARTICLE ACTIVITY, 4102 - TRITIUM

Filter Contaminant By Code: 0000 1 2 3 4 5 6 7 8 9 0

Filter Contaminant By Name Or Code: [Filter] [Clear]

Case-Sensitive

[Submit] [Clear] [Back]

11. The next page will display a summary table of the number of tests conducted by year.

Drinking Water Reporting System

Department of Environmental Protection

Detail Sample Results - display for each year

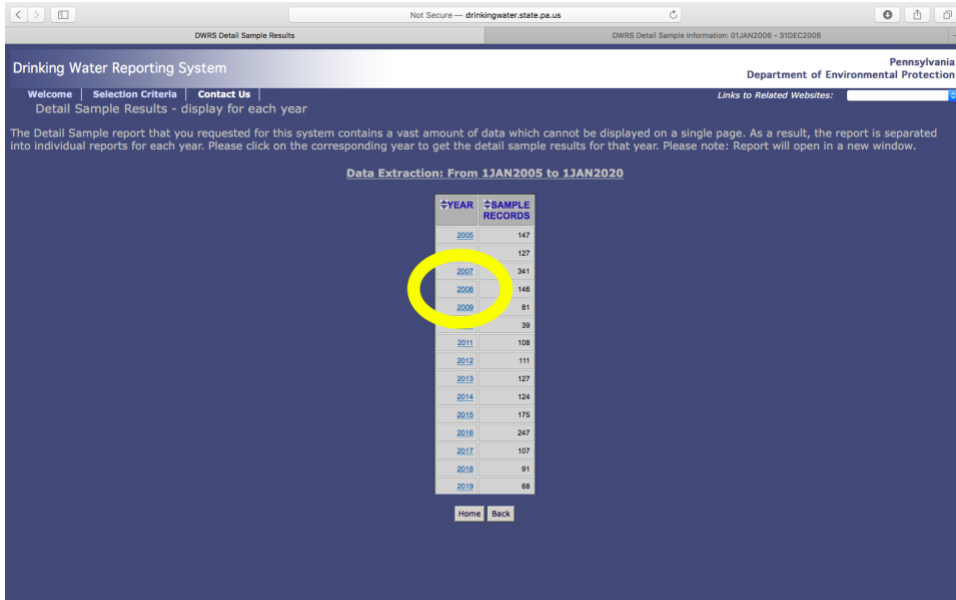
The Detail Sample report that you requested for this system contains a vast amount of data which cannot be displayed on a single page. As a result, the report is separated into individual reports for each year. Please click on the corresponding year to get the detail sample results for that year. Please note: Report will open in a new window.

Data Extraction: From 1JAN2005 to 1JAN2020

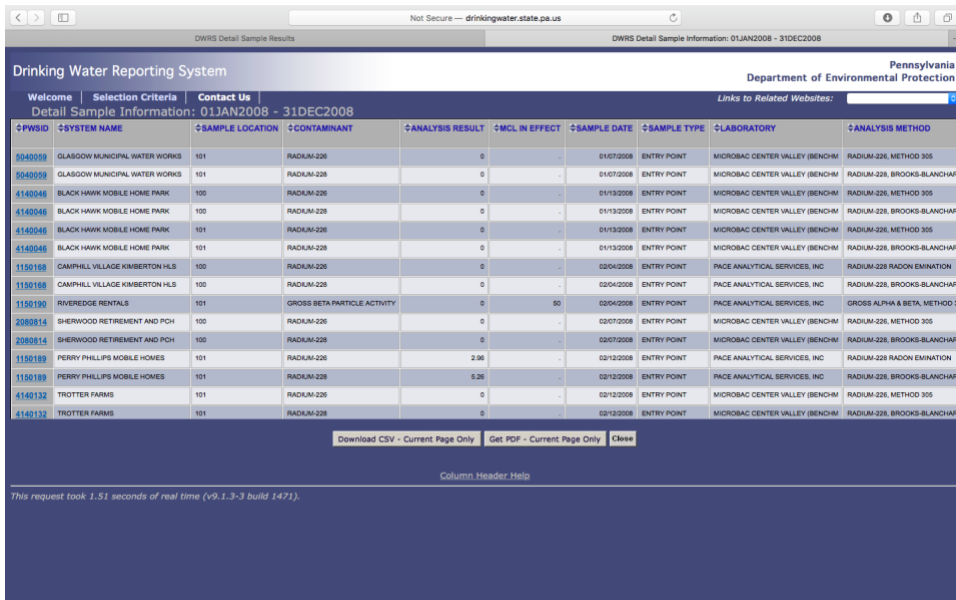
YEAR	SAMPLE RECORDS
2005	147
2006	127
2007	341
2008	148
2009	81
2010	39
2011	108
2012	111
2013	127
2014	124
2015	175
2016	247
2017	107
2018	91
2019	68

[Home] [Back]

12. Select a specific year.



13. This will open up a new page, which displays the level of radium in the "Analysis result" column. The contaminant type, sample location, and analysis method, as well as other information, are also displayed here.



14. Then you can download the data as an csv file (save as Excel) or a pdf.

The screenshot shows the Pennsylvania Drinking Water Reporting System interface. At the top, it displays 'Not Secure - drinkingwater.state.pa.us' and 'DWRS Detail Sample Information: 01JAN2008 - 31DEC2008'. The main header includes 'Drinking Water Reporting System' and 'Pennsylvania Department of Environmental Protection'. Below the header, there are navigation tabs: 'Welcome', 'Selection Criteria', and 'Contact Us'. The 'Detail Sample Information: 01JAN2008 - 31DEC2008' is displayed. A table of data is shown with columns: PWSID, SYSTEM NAME, SAMPLE LOCATION, CONTAMINANT, ANALYSIS RESULT, MCL IN EFFECT, SAMPLE DATE, SAMPLE TYPE, LABORATORY, and ANALYSIS METHOD. The table contains 18 rows of data. At the bottom of the table, there are two buttons: 'Download CSV - Current Page Only' and 'Print PDF - Current Page Only'. The 'Download CSV - Current Page Only' button is circled in yellow. Below the buttons, there is a 'Column Header Help' link and a footer note: 'This request took 1.51 seconds of real time (v9.1.3-3 build 1471)'.

PWSID	SYSTEM NAME	SAMPLE LOCATION	CONTAMINANT	ANALYSIS RESULT	MCL IN EFFECT	SAMPLE DATE	SAMPLE TYPE	LABORATORY	ANALYSIS METHOD
5040259	GLASGOW MUNICIPAL WATER WORKS	101	RADIUM-226	0	-	01/07/2008	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM)	RADIUM-226, METHOD 305
5040259	GLASGOW MUNICIPAL WATER WORKS	101	RADIUM-226	0	-	01/07/2008	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM)	RADIUM-226, BROOKS-BLANCHARD
4140046	BLACK HAWK MOBILE HOME PARK	100	RADIUM-226	0	-	01/13/2008	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM)	RADIUM-226, METHOD 305
4140046	BLACK HAWK MOBILE HOME PARK	100	RADIUM-226	0	-	01/13/2008	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM)	RADIUM-226, BROOKS-BLANCHARD
4140046	BLACK HAWK MOBILE HOME PARK	101	RADIUM-226	0	-	01/13/2008	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM)	RADIUM-226, METHOD 305
4140046	BLACK HAWK MOBILE HOME PARK	101	RADIUM-226	0	-	01/13/2008	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM)	RADIUM-226, BROOKS-BLANCHARD
1150168	CAMPBELL VILLAGE KIMBERTON HLS	100	RADIUM-226	0	-	02/04/2008	ENTRY POINT	PACE ANALYTICAL SERVICES, INC	RADIUM-226 RADON EMINATION
1150168	CAMPBELL VILLAGE KIMBERTON HLS	100	RADIUM-226	0	-	02/04/2008	ENTRY POINT	PACE ANALYTICAL SERVICES, INC	RADIUM-226, BROOKS-BLANCHARD
1150190	RIVERDIE RENTALS	101	GROSS BETA PARTICLE ACTIVITY	0	90	02/04/2008	ENTRY POINT	PACE ANALYTICAL SERVICES, INC	GROSS ALPHA & BETA, METHOD 305
2080914	SHERWOOD RETIREMENT AND PCH	100	RADIUM-226	0	-	02/07/2008	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM)	RADIUM-226, METHOD 305
2080914	SHERWOOD RETIREMENT AND PCH	100	RADIUM-226	0	-	02/07/2008	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM)	RADIUM-226, BROOKS-BLANCHARD
1150189	PERRY PHILLIPS MOBILE HOMES	101	RADIUM-226	2.96	-	02/12/2008	ENTRY POINT	PACE ANALYTICAL SERVICES, INC	RADIUM-226 RADON EMINATION
1150189	PERRY PHILLIPS MOBILE HOMES	101	RADIUM-226	5.26	-	02/12/2008	ENTRY POINT	PACE ANALYTICAL SERVICES, INC	RADIUM-226, BROOKS-BLANCHARD
4140132	TROTTER FARMS	101	RADIUM-226	0	-	02/12/2008	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM)	RADIUM-226, METHOD 305
4140132	TROTTER FARMS	101	RADIUM-226	0	-	02/12/2008	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM)	RADIUM-226, BROOKS-BLANCHARD

15. To get multiple years, you would need to do this for each individual year and then combine them into a new, single document.

Understanding the Data: Public Drinking Water

1. The .csv file should open in Microsoft Excel

PWSID	SYSTEM NAME	SAMPLER LOC	CONTAMINANT ID	ANALYSIS RESULT	MCL IN EFFECT	SAMPLE DATE	SAMPLE TYPE	LABORATORY ID	ANALYSIS METHOD	ANALYSIS DS SAMPLE RECEIVED DATE
1	504059 GLASGOW MUNICIPAL WATER WORKS	101	RADIUM-226	0.	0.	1/7/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	RADIUM-226, METHOD 305	1/24/08
2	504059 GLASGOW MUNICIPAL WATER WORKS	101	RADIUM-228	0.	0.	1/7/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	RADIUM-228, BROOKS-BLANCHARD	1/24/08
3	414046 BLACK HAWK MOBILE HOME PARK	100	RADIUM-226	0.	0.	1/13/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	RADIUM-226, METHOD 305	2/2/08
4	414046 BLACK HAWK MOBILE HOME PARK	101	RADIUM-228	0.	0.	1/13/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	RADIUM-228, BROOKS-BLANCHARD	2/2/08
5	414046 BLACK HAWK MOBILE HOME PARK	101	RADIUM-226	0.	0.	1/13/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	RADIUM-226, METHOD 305	2/2/08
6	414046 BLACK HAWK MOBILE HOME PARK	101	RADIUM-228	0.	0.	1/13/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	RADIUM-228, BROOKS-BLANCHARD	2/2/08
7	1550168 CAMPBELL VILLAGE KIMBERTON HLS	100	RADIUM-226	0.	0.	2/4/08	ENTRY POINT	PACE ANALYTICAL SERVICES, INC	RADIUM-228 RADON EMINATION	2/27/08
8	1550168 CAMPBELL VILLAGE KIMBERTON HLS	100	RADIUM-228	0.	0.	2/4/08	ENTRY POINT	PACE ANALYTICAL SERVICES, INC	RADIUM-228, BROOKS-BLANCHARD	2/27/08
9	1550390 RIVERDESS RENTALS	101	GROSS BETA PARTICLE ACTIVITY	0	50	2/4/08	ENTRY POINT	PACE ANALYTICAL SERVICES, INC	GROSS ALPHA & BETA, METHOD 30	2/27/08
10	1550390 RIVERDESS RENTALS	100	RADIUM-226	0.	0.	2/4/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	RADIUM-226, METHOD 305	2/27/08
11	2080814 SHERWOOD RETIREMENT AND PCH	100	RADIUM-226	0.	0.	2/7/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	RADIUM-226, METHOD 305	3/12/08
12	2080814 SHERWOOD RETIREMENT AND PCH	100	RADIUM-228	0.	0.	2/7/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	RADIUM-228, BROOKS-BLANCHARD	3/14/08
13	1550189 PERRY PHILLIPS MOBILE HOMES	101	RADIUM-226	2.96	0.	2/12/08	ENTRY POINT	PACE ANALYTICAL SERVICES, INC	RADIUM-228 RADON EMINATION	2/26/08
14	1550189 PERRY PHILLIPS MOBILE HOMES	101	RADIUM-228	5.26	0.	2/12/08	ENTRY POINT	PACE ANALYTICAL SERVICES, INC	RADIUM-228, BROOKS-BLANCHARD	2/26/08
15	1550189 PERRY PHILLIPS MOBILE HOMES	101	RADIUM-226	0.	0.	2/12/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	RADIUM-226, METHOD 305	3/2/08
16	1550189 PERRY PHILLIPS MOBILE HOMES	101	RADIUM-228	0.	0.	2/12/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	RADIUM-228, BROOKS-BLANCHARD	3/4/08
17	6160039 LUONDA WATER CO	100	RADIUM-226	0.	0.	2/12/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	RADIUM-226, METHOD 305	3/4/08
18	6160039 LUONDA WATER CO	100	RADIUM-228	0.	0.	2/12/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	RADIUM-228, BROOKS-BLANCHARD	3/4/08
19	1550200 RIDGEVIEW MHP	101	RADIUM-226	0.	0.	2/13/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	RADIUM-226, METHOD 305	3/10/08
20	1550200 RIDGEVIEW MHP	101	RADIUM-228	0.	0.	2/13/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	RADIUM-228, BROOKS-BLANCHARD	3/7/08
21	1550077 PHOENIXVILLE WATER DEPT	101	GROSS BETA PARTICLE ACTIVITY	0	50	2/14/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	GROSS ALPHA & BETA, METHOD 30	2/18/08
22	2080807 WYALUSING VALLEY RT/MTMT & PCH	100	RADIUM-226	0.	0.	2/15/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	RADIUM-226, METHOD 305	3/5/08
23	2080807 WYALUSING VALLEY RT/MTMT & PCH	100	RADIUM-228	0.	0.	2/15/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	RADIUM-228, BROOKS-BLANCHARD	3/4/08
24	1550048 LAZY ACRES MOBILE HOME PARK	102	RADIUM-226	0.	0.	2/28/08	ENTRY POINT	PACE ANALYTICAL SERVICES, INC	RADIUM-228 RADON EMINATION	3/12/08
25	1550048 LAZY ACRES MOBILE HOME PARK	102	RADIUM-228	0.	0.	2/28/08	ENTRY POINT	PACE ANALYTICAL SERVICES, INC	RADIUM-228, BROOKS-BLANCHARD	3/12/08
26	1550081 WARWICK MOBILE HOME PARK	102	RADIUM-226	0.	0.	2/28/08	ENTRY POINT	GEL LABORATORIES, LLC	RADIUM-228 RADON EMINATION	3/25/08
27	1550081 WARWICK MOBILE HOME PARK	102	RADIUM-228	0.	0.	2/28/08	ENTRY POINT	GEL LABORATORIES, LLC	RADIUM-228, BROOKS-BLANCHARD	3/18/08
28	1550045 BRANDYWINE MOBILE HOME PARK	100	RADIUM-226	0.	0.	3/4/08	ENTRY POINT	GEL LABORATORIES, LLC	RADIUM-228 RADON EMINATION	3/24/08
29	1550045 BRANDYWINE MOBILE HOME PARK	100	RADIUM-228	0.	0.	3/4/08	ENTRY POINT	GEL LABORATORIES, LLC	RADIUM-228, BROOKS-BLANCHARD	3/18/08
30	5040038 MIDLAND BORD MUNI AUTH	101	GROSS BETA PARTICLE ACTIVITY	0	50	3/10/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	GROSS ALPHA & BETA, METHOD 30	3/17/08
31	1550189 PERRY PHILLIPS MOBILE HOMES	101	RADIUM-226	0.	0.	3/11/08	ENTRY POINT	PACE ANALYTICAL SERVICES, INC	RADIUM-228 RADON EMINATION	3/28/08
32	1550189 PERRY PHILLIPS MOBILE HOMES	101	RADIUM-228	0.	0.	3/11/08	ENTRY POINT	PACE ANALYTICAL SERVICES, INC	RADIUM-228, BROOKS-BLANCHARD	3/31/08
33	1550077 MAPLEWOOD MOBILE HOME PARK	101	RADIUM-226	1.96	0.	3/12/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	RADIUM-226, METHOD 305	4/5/08
34	1550130 CALN MOBILE HOME PARK	101	RADIUM-226	1.28	0.	3/12/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	RADIUM-226, METHOD 305	4/7/08
35	1550130 CALN MOBILE HOME PARK	101	RADIUM-228	0.	0.	3/12/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	RADIUM-228, BROOKS-BLANCHARD	4/7/08
36	1550130 CALN MOBILE HOME PARK	101	RADIUM-226	0.	0.	3/12/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	RADIUM-226, METHOD 305	4/5/08
37	4140082 COLLEGE TWP WATER AUTHORITY	103	GROSS BETA PARTICLE ACTIVITY	0	50	3/13/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	GROSS ALPHA & BETA, METHOD 30	3/28/08
38	4140082 COLLEGE TWP WATER AUTHORITY	104	GROSS BETA PARTICLE ACTIVITY	0	50	3/13/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	GROSS ALPHA & BETA, METHOD 30	3/28/08
39	2080027 JACKSON MHP	100	RADIUM-226	0.	0.	3/17/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	RADIUM-226, METHOD 305	6/4/08
40	2080027 JACKSON MHP	100	RADIUM-228	0.	0.	3/17/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	RADIUM-228, BROOKS-BLANCHARD	6/9/08
41	6160021 W FREEDOM WATER ASSN	121	RADIUM-226	0.	0.	3/18/08	ENTRY POINT	HAZEN RESEARCH, INC	RADIUM-226, METHOD 305	4/16/08

2. "System name" refers to the institution that provides the water. This could be a municipality, township, mobile home park, private water provider, or something else. Usually, the institution conducts the tests and reports this data to the PA DEP.

PWSID	SYSTEM NAME	SAMPLER LOC	CONTAMINANT ID	ANALYSIS RESULT	MCL IN EFFECT	SAMPLE DATE	SAMPLE TYPE	LABORATORY ID	ANALYSIS METHOD	ANALYSIS DS SAMPLE RECEIVED DATE
1	504059 GLASGOW MUNICIPAL WATER WORKS	101	RADIUM-226	0.	0.	1/7/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	RADIUM-226, METHOD 305	1/24/08
2	504059 GLASGOW MUNICIPAL WATER WORKS	101	RADIUM-228	0.	0.	1/7/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	RADIUM-228, BROOKS-BLANCHARD	1/24/08
3	414046 BLACK HAWK MOBILE HOME PARK	100	RADIUM-226	0.	0.	1/13/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	RADIUM-226, METHOD 305	2/2/08
4	414046 BLACK HAWK MOBILE HOME PARK	101	RADIUM-228	0.	0.	1/13/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	RADIUM-228, BROOKS-BLANCHARD	2/2/08
5	414046 BLACK HAWK MOBILE HOME PARK	101	RADIUM-226	0.	0.	1/13/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	RADIUM-226, METHOD 305	2/2/08
6	414046 BLACK HAWK MOBILE HOME PARK	101	RADIUM-228	0.	0.	1/13/08	ENTRY POINT	MICROBAC CENTER VALLEY (BENCHM	RADIUM-228, BROOKS-BLANCHARD	2/2/08

	A	B	C	D	E
1	PWSID	SYSTEM NAME	SAMPLE LOCATION	CONTAMINANT ID	ANALYSIS ID
125	5260042	NEW MEADOW RUN	101	RADIUM-226	
126	5266486	LAUREL RIDGE MTN SPRING WATER	101	RADIUM-226	
127	5266486	LAUREL RIDGE MTN SPRING WATER	101	GROSS BETA PARTICLE ACTIVITY	
128	5266486	LAUREL RIDGE MTN SPRING WATER	101	RADIUM-228	
129	5260048	NATIONAL PIKE WATER AUTH	100	RADIUM-226	
130	5260048	NATIONAL PIKE WATER AUTH	100	RADIUM-228	
131	5260045	NEMACOLIN WOODLANDS	101	RADIUM-228	
132	5260045	NEMACOLIN WOODLANDS	101	RADIUM-226	
133	5260042	NEW MEADOW RUN	101	RADIUM-228	
134	5260042	NEW MEADOW RUN	101	RADIUM-226	
135	5260042	NEW MEADOW RUN	101	RADIUM-226	
136	5260042	NEW MEADOW RUN	101	RADIUM-228	
137	5260048	NATIONAL PIKE WATER AUTH	100	RADIUM-226	
138	5260048	NATIONAL PIKE WATER AUTH	100	RADIUM-228	

- The column “Sample location” indicates where the water authority takes water samples that are analyzed for radium. In this example using Highridge Water Authority, samples were taken from location number 101 and location number 102. This tells us that they are drawing water from two different locations inside the water distribution system—a vast network of pipes and treatment plants.

	A	B	C	D
1	PWSID	SYSTEM NAME	SAMPLE LOCATION	CONTAMINANT ID
43	5650032	MAWC SWEENEY PLANT	104	GROSS BETA PARTICLE ACTIVITY
44	5650069	HIGHRIDGE WATER AUTH	101	RADIUM-226
45	5650069	HIGHRIDGE WATER AUTH	101	RADIUM-228
46	5650069	HIGHRIDGE WATER AUTH	102	RADIUM-226
47	5650069	HIGHRIDGE WATER AUTH	102	RADIUM-228
48	5260014	NEWELL MUNI AUTH	100	RADIUM-228
49	5266486	LAUREL RIDGE MTN SPRING WATER	101	GROSS BETA PARTICLE ACTIVITY
50	5650032	MAWC SWEENEY PLANT	104	GROSS BETA PARTICLE ACTIVITY
51	5650070	NEW KENSINGTON MUNI AUTH	101	RADIUM-226
52	5650070	NEW KENSINGTON MUNI AUTH	101	RADIUM-228

We can see that at location number 101, they tested for radium 226 and radium 228.

	A	B	C	D
1	PWSID	SYSTEM NAME	SAMPLE LOCATION	CONTAMINANT ID
43	5650032	MAWC SWEENEY PLANT		GROSS BETA PARTICLE ACTIVITY
44	5650069	HIGHRIDGE WATER AUTH	101	RADIUM-226
45	5650069	HIGHRIDGE WATER AUTH	101	RADIUM-228
46	5650069	HIGHRIDGE WATER AUTH	101	RADIUM-226
47	5650069	HIGHRIDGE WATER AUTH	102	RADIUM-228
48	5260014	NEWELL MUNI AUTH	100	RADIUM-228
49	5266486	LAUREL RIDGE MTN SPRING WATER	101	GROSS BETA PARTICLE ACTIVITY
50	5650032	MAWC SWEENEY PLANT	104	GROSS BETA PARTICLE ACTIVITY
51	5650070	NEW KENSINGTON MUNI AUTH	101	RADIUM-226
52	5650070	NEW KENSINGTON MUNI AUTH	101	RADIUM-228

We can also gain some insight into what location 101 really means. To the best of our knowledge, the column “Sample type” refers to where the sample was taken from within that network of pipes. Most samples are “Entry point.” This means that the water being tested is entering the piped distribution system immediately after leaving the treatment plant. Samples are tested here because this is when the water should be purest and free from contaminants.

Some samples say “Distribution.” This means that the water was taken after it had traveled a bit from the treatment plant. However, distribution or special samples cannot count towards a distributor’s monitoring requirements with the PA DEP. Even if they take distribution samples, they will still be required to follow their monitoring schedule based on entry point data.

	E	F	G	H	I
1	ANALYSIS RESULT	MCL IN EFFECT	SAMPLE DATE	SAMPLE TYPE	LABORATORY ID
47	0.		5/03	ENTRY POINT	HAZEN RESEARCH, INC.
48	0.		3/0/03	ENTRY POINT	HAZEN RESEARCH, INC.
49	IVITY	0.3	50	4/2/03 DISTRIBUTION	HAZEN RESEARCH, INC.
50	IVITY	2.2	50	7/1/03	HAZEN RESEARCH, INC.
51		0.		7/21/03	GEL LABORATORIES, LLC

- “Contaminant ID” refers to which contaminant was analyzed. 4100 is gross beta, 4020 is radium-226, and, 4030 is radium-228.
- Analysis result is the result of the test. In this case it refers to the radium isotope level or gross particle level found in this sample of drinking water.

The MCL refers to the maximum contaminant level in effect for that particular contaminant in the year we are looking at. For gross beta, this is 50 pCi / L. This is the only cell that is populated, but the units for the entire column are pCi / L.

- The column “Laboratory ID” tells us which lab conducted the radium tests.

The screenshot shows an Excel spreadsheet with the following data:

	F	G	H	I	J	
1	SULT	MCL IN EFFECT	SAMPLE DATE	SAMPLE TYPE	LABORATORY ID	ANALYSIS METHOD
124	0.		6/7/07	ENTRY POINT	HAZEN RESEARCH, INC.	RADIUM-228, BROOKS-BLANCHARD
125	0.		6/4/07	ENTRY POINT	HAZEN RESEARCH, INC.	RADIUM-226, METHOD 305
126	0.		7/12/07	ENTRY POINT	PACE ANALYTICAL SERVICES, INC	RADIUM-228 RADON EMINATION
127	0	50	7/12/07	ENTRY POINT	PACE ANALYTICAL SERVICES, INC	GROSS ALPHA & BETA, METHOD 30
128	1.05		7/12/07	ENTRY POINT	PACE ANALYTICAL SERVICES, INC	RADIUM-228, BROOKS-BLANCHARD
129	0.		8/1/07	ENTRY POINT	WASTE STREAM TECHNOLOGY INC	RADIUM-226, METHOD 305
130	0.		8/1/07	ENTRY POINT	WASTE STREAM TECHNOLOGY INC	RADIUM-228, BROOKS-BLANCHARD
131	0.		8/13/07	ENTRY POINT	HAZEN RESEARCH, INC.	RADIUM-228, BROOKS-BLANCHARD
132	0.		8/13/07	ENTRY POINT	HAZEN RESEARCH, INC.	RADIUM-226, METHOD 305
133	0.		8/27/07	ENTRY POINT	HAZEN RESEARCH, INC.	RADIUM-228, BROOKS-BLANCHARD
134	0.		8/27/07	ENTRY POINT	HAZEN RESEARCH, INC.	RADIUM-226, METHOD 305
135	0.		10/1/07	ENTRY POINT	HAZEN RESEARCH, INC.	RADIUM-226, METHOD 305
136	0.		10/1/07	ENTRY POINT	HAZEN RESEARCH, INC.	RADIUM-228, BROOKS-BLANCHARD
137	0.		10/3/07	ENTRY POINT	WASTE STREAM TECHNOLOGY INC	RADIUM-226, METHOD 305
138	1.8		10/3/07	ENTRY POINT	WASTE STREAM TECHNOLOGY INC	RADIUM-228, BROOKS-BLANCHARD

- Sample type refers to where within the water distribution system the water sample was taken from.
- Analysis method refers to the specific type of test that the laboratory conducted. To read more about common radium tests, see this [guidance from the EPA](https://www.epa.gov/cwa-methods/approved-cwa-radiochemical-test-methods).¹²

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¹² <https://www.epa.gov/cwa-methods/approved-cwa-radiochemical-test-methods>