

# HW-02

## EPA Radiological Data Summary Report

### Dimock Residential Sampling

Sample Date: 1/25/2012

Sample Number	Analyte	Result	2σ Uncertainty	MDC	Unit	Trigger Level		EPA / DEP Primary MCL	
HW02	Alpha	2.89E+00	2.00E+00	1.40E+00	pCi/L			1.50E+01	pCi/L
HW02z	Alpha	3.56E+00	2.20E+00	1.40E+00	pCi/L			1.50E+01	pCi/L
HW02	Beta	2.32E+00	1.40E+00	2.00E+00	pCi/L				
HW02z	Beta	2.27E+00	1.40E+00	2.00E+00	pCi/L				
HW02	Th227-AS	1.53E-02 U	6.80E-02	1.30E-01	pCi/L				
HW02z	Th227-AS	3.26E-02 UJ, J*	7.00E-02	1.10E-01	pCi/L				
HW02	Th228-AS	4.78E-02 UJ	6.70E-02	1.00E-01	pCi/L	4.90E+01	pCi/L		
HW02z	Th228-AS	-3.06E-02 R	3.00E-02	1.00E-01	pCi/L	4.90E+01	pCi/L		
HW02	Th230-AS	2.78E-02 UJ	5.00E-02	7.80E-02	pCi/L	5.80E+01	pCi/L		
HW02z	Th230-AS	8.16E-02 J, J*	6.20E-02	4.40E-02	pCi/L	5.80E+01	pCi/L		
HW02	Th232-AS	2.38E-02 UJ	4.20E-02	5.20E-02	pCi/L	5.20E+01	pCi/L		
HW02z	Th232-AS	6.70E-03 U, J*	3.00E-02	5.80E-02	pCi/L	5.20E+01	pCi/L		
HW02	U234-AS	3.53E+00	5.20E-01	7.60E-02	pCi/L	7.50E+01	pCi/L		
HW02z	U234-AS	3.39E+00 J*	4.90E-01	7.20E-02	pCi/L	7.50E+01	pCi/L		
HW02	U235-AS	7.46E-02 UJ	8.00E-02	9.20E-02	pCi/L	7.60E+01	pCi/L		
HW02z	U235-AS	1.45E-01 J, J*	1.00E-01	8.60E-02	pCi/L	7.60E+01	pCi/L		
HW02	U238-AS	1.09E+00	2.60E-01	7.60E-02	pCi/L	8.30E+01	pCi/L		
HW02z	U238-AS	1.37E+00 J*	2.90E-01	9.10E-02	pCi/L	8.30E+01	pCi/L		
HW02	Bi212-GS	-6.68E-01 U	1.20E+01	2.10E+01	pCi/L	7.45E+03	pCi/L		
HW02z	Bi212-GS	2.48E+00 U	1.20E+01	2.10E+01	pCi/L	7.45E+03	pCi/L		
HW02	Bi214-GS	7.82E+02 J*	3.20E+02	4.30E+02	pCi/L	2.76E+04	pCi/L		
HW02z	Bi214-GS	7.11E+02 J*	3.20E+02	4.40E+02	pCi/L	2.76E+04	pCi/L		
HW02	K40-GS	8.87E+00 UJ	1.10E+01	1.70E+01	pCi/L	2.14E+02	pCi/L		
HW02z	K40-GS	7.82E+00 UJ	1.10E+01	1.80E+01	pCi/L	2.14E+02	pCi/L		

HW02	Pb214-GS	4.02E+02 UJ, J*	3.60E+02	5.20E+02	pCi/L				
HW02z	Pb214-GS	8.28E+02 J*	4.00E+02	5.40E+02	pCi/L				
HW02	Ra226-GS	-1.25E+01 UJ, J*	7.80E+01	5.30E+01	pCi/L				
HW02z	Ra226-GS	6.98E+00 U, J*	2.90E+01	5.00E+01	pCi/L				
HW02	Ra228-GS	1.47E-01 U	2.90E+00	5.10E+00	pCi/L				
HW02z	Ra228-GS	-1.70E+00 UJ	5.20E+00	6.00E+00	pCi/L				
HW02	Th234-GS	-1.57E+02 UJ	3.70E+03	3.30E+02	pCi/L	2.29E+02	pCi/L		
HW02z	Th234-GS	-1.58E+02 UJ	4.50E+03	4.10E+02	pCi/L	2.29E+02	pCi/L		
HW02	U235-GS	2.06E+00 U, J*	1.10E+01	1.80E+01	pCi/L	7.60E+01	pCi/L		
HW02z	U235-GS	-1.07E-01 UJ, J*	1.10E+02	1.70E+01	pCi/L	7.60E+01	pCi/L		
HW02	Ra226-RS	1.82E-01 J	1.20E-01	1.10E-01	pCi/L				
HW02z	Ra226-RS	1.32E-01 J	1.00E-01	7.10E-02	pCi/L				
HW02	Ra228-RS	1.55E-01 U	3.80E-01	6.50E-01	pCi/L				
HW02z	Ra228-RS	6.41E-01 UJ	5.00E-01	7.80E-01	pCi/L				
HW02	Ra226 + Ra228	3.37E-01			pCi/L	5.00E+00	pCi/L	5.00E+00	pCi/L
HW02z	Ra226 + Ra228	7.73E-01			pCi/L	5.00E+00	pCi/L	5.00E+00	pCi/L
HW02	Total Uranium	3.28E+00			ug/L	4.70E+01	ug/L	3.00E+01	ug/L
HW02z	Total Uranium	4.14E+00			ug/L	4.70E+01	ug/L	3.00E+01	ug/L

Sample Number – Code that is used to identify the particular sample. See additional information below:

HW## – Identifies the sample location and indicates that it was collected at well head or closest point to the well head.

Z – Identifies a duplicate sample. Duplicate samples are collected for every ten samples collected to test the reproducibility of sampling and analytical procedures.

P – Indicates that the sample was collected at the kitchen tap. In some cases this may be following any treatment that the residence may have.

A/B – Designates which residence the sample was collected for sample locations with multiple residences using the same water source (may be a well or a spring).

Analyte – General term for a substance in the sample. The lab does testing to find specific analytes, or substances in the water sample. The report lists each analyte that the lab tested for and what amounts were found. The analytes in the attached report includes radionuclides.

-AS Alpha Particle Spectroscopy, which is a method of measuring alpha particles

-GS Gamma Ray Spectroscopy, refers to Gamma Ray Spectroscopy, which is a method of measuring gamma radiation

-RS Radionuclide Specific Activity, is a measurement of the amount of radioactivity or the decay rate of a particular radionuclide per unit mass or volume of the radionuclide

Ra226 + Ra228 is a combined result of specific radionuclides for direct comparison with the combined MCL in drinking water of 5 pCi/L

Total Uranium U (ug/L) - estimate calculated based on Uranium alpha spectrometry results and uranium isotopic specific activity. Calculated by:

Total U (ug/L) = (U-234 pCi/L)/(6254) + (U-235 pCi/L)/(2.163) + (U-238 pCi/L)/(0.3362)

Result and Units – identifies the actual result for the particular analyte and the measurement used for the particular type of sample. Results are expressed in scientific notation. For example: 4.32E+03 = 4,320; 2.75E-02 = 0.0275

The results include the following units for radionuclide water sample analyses:

pCi/L - picocuries per liter; measurements of the radioactive decay or activity. Activity in water is expressed in units of picocuries per liter.

ug/L - micrograms per liter; measurements of the mass of the substance per liter of water. This measurement is commonly known as parts per billion or ppb.

Drinking water results are usually reported in micrograms per liter.

MDC - Minimal detectable concentration, expressed as an activity concentration. If the result is equal to the MDC, there is a 95% chance that the radionuclide analyte will be detected in the sample.

Uncertainty - Measurement of total error associated with the counting/measuring process. The uncertainty is expressed as two standard deviations (two sigma [ $\sigma$ ]) of the mean.

Trigger Level – established for this project, the trigger levels are based on risk-based screening levels and/or standards for public water supplies. A yellow highlighted result represents an analytical result greater than the established trigger level. Results exceeding a trigger level are referred to an EPA toxicologist for further review.

EPA Primary MCLs – the primary maximum contaminant levels (MCLs) are legally enforceable standards established under the Safe Drinking Water Act to protect public health by limiting the levels of contaminants in public drinking water systems. The MCL is the amount of an analyte (substance) that can be present in a water sample that the government considers acceptable to drink. EPA considers the MCLs when evaluating results from residential drinking water wells.

DEP Primary MCLs – Chapter 109, Pennsylvania Safe Drinking Water Regulations, defines MCL as the maximum permissible level of a contaminant in water which is delivered to a user of a public water system, and includes the primary and secondary MCLs established under the Federal Safe Drinking Water Act, and MCLs

Validation Result Qualifiers - EPA performs a quality check on the lab results. This quality check evaluates the sample results at the 95% confidence level (the  $2\sigma$  counting uncertainty). This information can apply to 1) how certain EPA is that the lab detected the analyte and 2) how certain EPA is of the measurement of the analyte once detected. If there is no qualifier by the result, the sample result is greater than its MDC and/or greater than its  $2\sigma$  counting uncertainty.

U – The sample result is less than its MDC (the data user is accepting a 5% probability of a false negative result) and the sample result is less than its  $2\sigma$  counting uncertainty.

J – This means that the analyte was detected, but the value of the result is an estimate.

J\* - Laboratory indicates that this result may be significantly under or overestimated. Pb-214 and Bi-214 activity concentrations should be considered a gross estimate only. According to the laboratory performing the analyses, the half life for Rn-222 (3.842 days) was utilized to calculate activity and decay corrected to the individual sample collection date/time.

UJ - The U before the J means that the analyte was close to the MDC, however, some analyte may be present.

R – Indicates that the data has been rejected. Calculated negative results indicate that the activity is at or below the instrument background. Results are less than the 95% confidence interval MDC value.