INTRODUCTION
This factsheet provides basic information for private water well owners regarding Radium 226+228 in their well water. To determine if water is generally safe to drink, water test results are compared to the US EPA Primary Drinking Water Regulations table of contaminants, the EPA Secondary Drinking Water Standards. The above standards only apply to public water systems, but the quality and health implications are the same for private well owners. In addition, the WDEQ has a set of standards (WQRR Chapter 8 Table 1) for water quality based on class of use, including domestic, agriculture and livestock. Keep your analytical results and your sampling documentation with your well information for future reference if there is a question about change in water quality.

WHAT IS RADIIUM 226+228?
Radium is a naturally occurring radioactive mineral that can exist in several forms, called isotopes. Radium 226+228 is the combined total of the two most common radium isotopes, Radium 226 and Radium 228. It is found in trace amounts in food, air, rocks, soils and groundwater, and is more commonly found at higher concentrations in areas of uranium mining. Radium is formed when other radioactive elements, uranium and thorium, decay.

Up until the 1960s radium was used as a component of the luminous paint used on watch and clock dials, aviation instrument panels, military instruments and compasses.

WHAT IS THE STANDARD FOR RADIIUM 226+228 IN GROUNDWATER?
Radium 226+228 is regulated under the US EPA Primary Drinking Water Regulations. The US EPA has set a maximum contaminant level for Radium 226+228 (combined) at 5 pico Curies per liter (pCi/L).

Wyoming Water Quality Rules and Regulations Chapter 8, Table 1 has set this same standard for drinking water, agriculture and livestock uses.

IS RADIIUM 226+228 IN MY WATER A HEALTH CONCERN?
Radium has been shown to cause effects on the blood (anemia), the eyes (cataracts), and teeth (increased incidence of broken teeth or cavities). In addition, long-term exposure to high levels of Radium 226+228 can increase the risk of certain cancers (bone, liver and breast). Radium is considered a known human carcinogen.

Radium is not absorbed through the skin, so showering or washing with water containing radium does not pose a health threat.

Radium can decay into radon gas, which can also be found in well water. Radon gas is a known human carcinogen, and can accumulate in basements and crawlspaces in homes.

WHAT CAUSES RADIIUM 226+228 IN MY WATER?
The level of Radium 226+228 in groundwater is heavily influenced by geology and the characteristics of the groundwater itself. Some rocks may contain higher levels of uranium, thorium or radium, especially in areas of uranium mining. Groundwater that is acidic (low pH), has a low dissolved oxygen content, high total dissolved solids, and/or moves through rock slowly can dissolve more radium from the parent rock. Higher levels of radium can also be found at radioactive waste disposal sites.
HOW DO I TEST FOR RADIUM 226+228 IN MY WATER?
A list of certified labs can be found on the WDEQ Know Your Well Webpage (deq.wyoming.gov/wqd/know-your-well). Contact your selected laboratory for testing procedures and sample bottles.

The recommended approach for testing is to first have your water tested for gross alpha activity. If the gross alpha result is less than 5 pCi/L, then no additional testing for radionuclides (radium 226, radium 228 or uranium) is necessary since the result will be less than the drinking water standards. If the gross alpha result is greater than or equal to 5 pCi/L then testing for Radium 226+228 should be conducted.

WHAT CAN BE DONE TO TREAT MY WATER FOR RADIUM 226+228?
The information below is intended as an information source only. The WDEQ suggests you discuss appropriate water treatment options with a qualified water treatment specialist, since other constituents in your water may affect the selection of the appropriate water treatment method.

Up to 90% of Radium in groundwater can be removed by the use of a water softener (i.e. ion exchange) or reverse osmosis system. Those on low sodium diets should consider before installing a water softener system since sodium is added to the treated water. Softener systems must also be checked regularly to verify they are properly filtering the radium.

REFERENCES
Agency for Toxic Substances and Disease Registry (ATSDR), July 1999, ToxFAQs Radium CAS# 7440-14-4
Water Systems Council, Wellcare®, June 2007, Information for you about Radium and Groundwater
World Health Organization, 2017, Guidelines for Drinking Water Quality, Chapter 9, Radiological Aspects