

Radon monitoring at Yuma Proving Ground

Studies of near-ground radio frequency (RF) propagation performed at both the Yuma Proving Ground (YPG) and within the Mojave (Desert) National Preserve in California produced inconsistent results at some testing locations when performed at different times of the day. Although this finding did not occur across all geomorphic surfaces tested or at each testing location, the inconsistencies did occur often enough to warrant further investigation. The goal of this project was to determine how radon and soil gas change at various heights above the ground, throughout the day. The project was conducted at Yuma Proving Ground, AZ in 2018 and 2019. Our analyses showed that that radon concentrations are greatest in the soil and nearest the ground surface. We concluded that adjustments to the gas monitoring system inlet ports be made to account for radon and soil gas fluctuations near to the ground.

Summary of Project Details: We designed, fabricated and installed a radon and soil gas monitoring system at YPG near the Countermine (CM) soil test plots. The intake valves were set to heights of 0.5m, 1m, and 2m above ground. We first determined the measurement latency of the system and then began to conduct the experiment to measure the radon boundary layer. We found that radon and other soil gases are present at near-surface and showed that changes to barometric pressure affects their concentrations.

Management Implications: Based on the results showing radon concentrations are highest at ground surface, we recommended adjusting the sampler inlet port heights as follows:

1. Move the 0.5m inlet port to 0.2m inside an inverted 5-gallon plastic bucket;
2. Move the 1m inlet port to 0.25m; and,
3. Move the 2m inlet port to 0.5m.

We recommended that YPG conduct additional analysis of radon measurements at different times of day at the different measurement heights to further confirm the diurnal cycle of soil gas releases, as well as to attempt to determine how the upper boundary of the near-surface air layer changes as temperatures warm throughout the day.

We recommended moving the system to other areas previously identified as having RF attenuation issues to further evaluate the correlation between soil gas emissions and RF attenuation. We also recommended that the RF analyses equipment be co-located with the radon monitoring equipment to correlate RF attenuation and soil gas emissions.

