Use of handheld XRF for Uranium Mine Soil Analysis by New Mexico Abandoned Mine Land Program

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OSM TIPS loaned out a Niton® XL3t GOLDD+ analyzer, a portable x-ray fluorescence analyzer, XRF. The goal was to use the XRF to measure soil samples that were being sent out to a laboratory for analysis so that a side by side comparison could be made. If the comparison is similar, then the XRF could be used to substitute some or all of the future laboratory soil sampling analysis. This would save time and money.

After receiving the unit from OSM it took a few hours of playing around testing different rock samples to get comfortable with using the unit. There are two options for how the unit handles data collection general soil sample or mining. Both these options give results but the difference is in the units for the data either in parts per million (ppm) or percent (%) respectively. Since lab results would be ppm or mg/kg that was the setting for soil that I chose. There are also several choices for how many elements the unit reads. The best choice would be for the largest number of different elements but some choices like uranium are on the less used options. Elements in each option can be reviewed and options then chosen. Choosing multiple options is OK but the results take longer. Length of readings can be adjusted but I am not sure how much accuracy is lost with a shorter reading.

Method for testing and collection was as follows: A background sample was taken from an undisturbed area to get a baseline for local soil constituents. Samples were composite samples from five locations within a 20 foot square or 400 square feet. Since samples were to be collected for lab analysis it made sense to test the samples after they had been collected and combined in the plastic bag. On a future trip, I collected composite samples into plastic bags and then did the XRF readings back in the office. The XRF has the ability to average samples which is a helpful tool considering that it looks at a very small sample and multiple readings on the same sample will give better results.

Photo: Taking XRF Field Reading on collected composite sample and GPS Location

Results and conclusions:

The comparison does not match up perfectly as per parts per million but there is enough correlation to allow the XRF results to stand on their own. A regression analysis will need to be properly performed to get a true comparison. For the most part, it seems that the values for Uranium came out higher on the XRF than as a result of the lab analysis. The XRF cannot replace the leachate analysis because of the process to leach out minerals in solution but I believe there is enough validity in the XRF results to eliminate many of the soil tests. I definitely plan on using the XRF during construction as a way to monitor real time clean up and realize sizeable savings.