Real time mineral identification and quantitative analysis is crucial for the drilling of natural gas and is not afforded by legacy analytical instruments. This type of on-site analysis is now possible with a new generation of fully portable compact powder x-ray diffraction (PXRD) instruments utilizing a 2-dimensional area detector. The benefit of having on-site XRD data is the elimination of outside sample analysis costs and the turnaround time for data that can add weeks to a project. Simple sample preparation of bulk material allows for more samples to be analyzed as they appear at the drill site and offers a more complete down-hole lithology of the well every 10-100 feet. Rapid quantitative data is produced for each sample and dictates geosteering of an active drill, an important aspect of locating unconventional gas reserves and increasing profitability of a well site. Within minutes of obtaining a sample, a quantitative analysis is performed to determine key mineral types; clays, siliceous, and carbonate materials. Verification of mineralogy is performed in real time using bench-top XRF data of the same bulk samples, giving confidence to site operators as to how to proceed with the well. With this data geologic maps can be updated and redrawn to represent a more specific understanding of the region in question and strengthen future exploration.