What does a Professional Geologist do for

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What Does a Professional Geologist Do
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PA COAL MINING INDUSTRY

A Professional Geologist (PG) investigates and characterizes the hydrogeology of an area for an underground or surface coal mine long before any mining begins in PA and monitors the site long after mining is completed.

- A PG determines the economic potential for a coal mine by planning a drilling program in a target area.
- The PG is responsible for logging the boreholes to describe the rock lithology and thickness, coal seam depths, fracture abundance and orientation, water conditions and the competency of the rock layers.
- Samples are collected and analyzed to determine the coal quality for the mine's economic potential and the coal and rock layers are analyzed for sulfur, acidity and alkalinity for environmental purposes.
- The PG correlates all the boreholes and determines the geologic structure including the dip or slope of the seam(s) which is important in designing the mine operations.
- The PG also collects or oversees an inventory and water sample on every well, spring, stream, wetland and any public or private water supply in the proposed mining area. In PA, a minimum of six months to two years of monthly data is collected depending on the type of mining.
- The water samples are analyzed for specific indicator parameters to establish the pre-mining water quality and pumping tests on some wells are performed to calculate the aquifer permeability.
- Detailed flow measurements along with macroinvertebrate studies may be done on perennial streams to determine the health of the watershed.
- The PG defines the limits of any wetlands and identifies avoidance measures or areas where additional wetlands could be constructed.

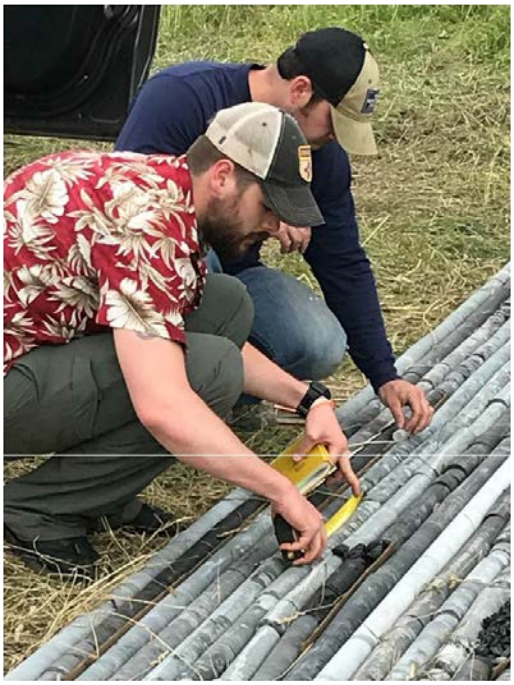

PHOTO COURTESY OF RON MUSSER, P.G.

A coal exploration borehole is logged by examining, describing and taking measurements on a continuous rock core.

- The PG analyzes and models all the water data collected along with drilling information to get a total picture of the pre-mining hydrogeology of the project area.
- A PG may help engineers design the erosion and sedimentation plans for disturbed areas. Water is collected during operations and directed into ponds for settling and/or treatment, as needed, to control sediment prior to releasing into a stream. A PG will identify low permeability natural clays that can be used to line these ponds to prevent water seepage into the groundwater.
- The mining plan is designed and reviewed with the pre-mining hydrogeology and adjustments are made to avoid or minimize any potential environmental impacts. If the coal or rock analysis showed acidic material, the plan includes measures to neutralize any acidy.

- The PG develops a comprehensive environmental monitoring plan to verify mining has no negative impacts. Some monitoring locations will be checked weekly, monthly or quarterly depending on the type of point and method of mining. The PG also identifies potential alternate water supplies.
- The PG compiles all hydrogeologic information including the analysis of potential effects and mitigation plans into the permit application. The PG applies their professional seal and signs the documents indicating they are taking ownership of the analysis and conclusions for submittal to the PA Department of Environmental Protection (DEP).
- The PG maintains communication with DEP personnel to clarify or provide any additional information, if needed, to meet all environmental regulations before a permit is issued.
- During and after mining the PG reviews and evaluates the monitoring data to determine if there are any mining effects and works with engineers and state regulators to correct any problems.
- A PG also investigates potential acid mine drainage (AMD) issues from old abandoned mines. An investigation involves researching old mine maps, measuring mine pool levels, collecting and analyzing water from the pool and nearby streams and determining how the acid water migrated to the surface.
- The PG works with a team of professionals to design an AMD treatment system that neutralizes acid mine water which can include injection of alkaline material, water filtration and settling ponds and/or construction of a wetland passive treatment system for low flow water conditions.
- Land subsidence can be an issue near historic abandoned mines. Professional geologists work closely with engineers to investigate, propose and help design corrective actions.

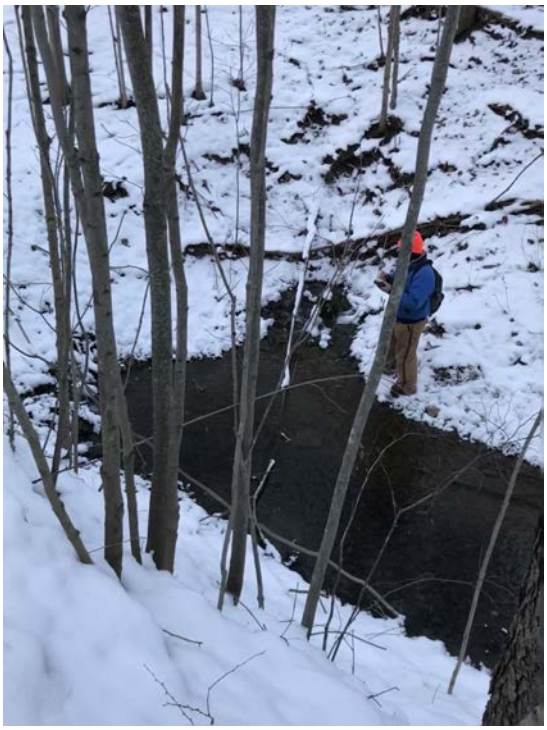

PHOTO COURTESY OF RON MUSSER, P.G.

Stream monitoring is done all year and in all weather conditions for a coal mining operation.

The PG typically works with engineers (civil, mining & environmental) chemists, soil scientists, biologists, construction specialists, and drilling professionals.

Work Resources:

AutoCAD/GIS and mapping software, current and historic map databases (geologic, topographic and underground mine maps), historical state and federal mineral resource reports, modeling and analysis software.

Work Environment:

Office and field work. Field work may entail irregular or evening/weekend hours visiting property owners and working in varying weather conditions throughout the year.

Helpful Skills & Experience:

Attention to detail, research skills, ability to speak professionally and cooperatively with the public, state and federal regulators, ability to compile and analyze large amounts of data, ability to visualize a map drawing in three dimensions.

Tools of the Trade:

Pumping and water sampling equipment, water bailers, flow meters, water level gauges, pH & conductivity meters, alkalinity/acidity test kits, chain of custody documentation. Various types of drilling rigs, i.e. rotary, core, auger, along with rock chip, core and split-spoon samples.