What does a Professional Geologist do for

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What Does a Professional Geologist Do
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KARST GEOLOGIC HAZARDS

A Professional Geologist (PG) works as the lead on the investigation team to evaluate the extent along with the current and potential risk of the karst terrain sink-hole(s). Working with a design team the PG helps to remediate the hazardous conditions.

- Any Karst geology work involves a true understanding of how sinkholes and karst terrains are created.
- Karst terrains create hazardous collapse conditions for roads, buildings, homes and people. Impacted drainage systems can amplify the condition.

Arrow denotes location where stormwater from culvert is short-circuiting into the ground and has created surface subsidence (red circles).

Arrows denote open voids in rock into which soil is being flushed, creating loss of support and surface subsidence.

A PG skilled in Karst and engineering geology works with the design team during the planning phase to determine what issues need evaluated from a geologic standpoint including soil, bedrock, and groundwater conditions. This may include a combination of drilling, laboratory testing, geophysical evaluations, or remote sensing.

- The PG develops an investigation best suited to the remedial repair and surrounding conditions
- A typical investigation usually starts by reviewing geologic and topographic maps, historical publications including identifying the karstic terrain subsurface conditions.
- The PG also reviews current and historical aerial photography to identify historical, as well as current sinkholes. Fracture traces, other structural and stratigraphic features are a key component to access current and future potentially hazardous conditions.
- Next will involve either Test Pitting with a backhoe or drilling, preferably with rock coring.
- Soil and rock core samples are collected for subsequent laboratory testing.
- Close attention will be paid to the dissolution features and their patterns. The historical photographs can be very helpful.
- The PG may collect or oversee rock orientation measurements (strike/dip), map the frequency and direction of fractures at outcrops and identify areas with preferred instability.

- Geophysical investigations, including resistivity, seismic refraction, or gravity surveys may be used to identify the depth to and quality of bedrock, the location and orientation of bedrock fractures, or delineate subsurface hazards such as voids associated with karst terrain features.
- It is often necessary to perform follow-up soil and rock borings after the results of the geophysical survey are provided, to physically field truth the inferred model results of the geophysical investigation.
- A PG often needs to work collaboratively with the other experts from related disciplines and needs to understand how the other disciplines "fit" into both site investigation and construction/repair methods. Examples include:
    - Geophysicist – provides options for geophysics and executes the study
    - Surveyors and Civil Engineer – prepares grading and utility plans, and pre and post storm water development plans; provides options (if possible) for modifications to storm water system for sinkhole repair.
    - Structural Engineer – Assesses building damage due to sinkholes and provides structural repair recommendations.
    - Geotechnical Engineer – May assist geologist with subsurface investigation; provides design for subsurface footings and repair for structures.
    - Construction Manager (CM)– Depending on the scope, size, and complexity of the project, a CM may assist with preparation of specifications, bidding services, construction field oversight, etc.
- The PG will work with the above-described design team in developing findings, conclusions, and recommendations; project plans and specifications; and providing project support so that the design is appropriately specified for contractors to bid the project. The PG will often co-sign and seal a report along with the other professionals.

The PG often provides field oversight during site sinkhole remediation. One of the more common sinkhole remediation methods a karst geologist should understand is compaction grouting. Compaction grouting includes: the drilling of multiple boreholes through soil and rock: advancing small-diameter temporary steel casings; and the injection of a low mobility cement grout to stiffen soils and fill voids.

- **Although a specialty contractor completes the physical work, a PG would: monitor drill logs to help determine number and placement of additional borings; monitor amount of grout and pressure in each boring; assess effectiveness of the program and adjust, if necessary.**

Work Resources:
GIS/mapping, various map databases (geologic, topographic, underground mine, karst terrain, and landslide maps), historical reports, aerial photography, modeling and analysis software.

Work Environment:
Office, computers, and field work. Field work is done all year in any weather and may be required during off-peak transportation hours, including weekends or a particular site's off-season.

Tools of the Trade:
Drill rig, Brunton compass, rock hammer, hand lens, and a good set of hiking boots.

Helpful Skills & Experience:
Strong technical understanding of the physical properties of soil/rock/water, ability to think about projects in three dimensions, strong understanding of physics, ability to coordinate with multiple disciplines and understanding various design concerns, and teamwork.