



# Tasks of A Professional Geologist

## Statement by the National Association of State Boards of Geology

The National Association of State Boards of Geology (ASBOG®) is a non-profit organization, comprised of state boards which license/register geologists. ASBOG® develops national competency examinations used by these Member Boards. The ASBOG® examinations have been adopted by all of the states in the U.S. and the territory of Puerto Rico which have geologic practice acts. The following areas of professional practice contain generalized, and some specific, activities which may be performed by qualified, professional geologists.

Professional geologists uniquely qualified to perform these activities based on their formal education, training and experience. Under each major heading is a group of activities associated with that specific area of geoscience practice. The major areas of professional, geologic practice include, but are not limited to: Research; Field Methods and Communications; Geochemistry; Mineralogy; Petrology; Stratigraphy; Historical, Structural, Paleontology; Geomorphology; Geophysics; Hydrogeology; Environmental, Geochemistry; Engineering Geology, Economic Geology; Mining Geology and Energy Resources. These areas are specifically included in the ASBOG® examinations to assure geologic competency. Again, this list represents only a cross-section of possible activities, and does not include all potential professional practice activities.

Also included in this publication is a listing of "Other related activities which may be performed by qualified Professional Geologists." These activities, although not specifically geoscience in content, may be performed by a qualified, professional geologist.

## RESEARCH, FIELD METHODS AND COMMUNICATIONS

- Plan and conduct field operations including human and ecological health, safety, and regulatory considerations
- Evaluate property/mineral rights
- Interpret regulatory constraints
- Select and interpret appropriate base maps for field investigations
- Determine scales and distances from remote imagery and/or maps
- Identify, locate and utilize available data sources
- Plan and conduct field operations and procedures to ensure public protection
- Construct borehole and trench logs
- Design and conduct laboratory programs and interpret results
- Evaluate historic land use or environmental conditions from remote imagery
- Develop and utilize Quality Assurance/Quality Control procedures
- Construct and interpret maps and other graphical presentations
- Write and edit geologic reports
- Interpret and analyze aerial photos, satellite and other imagery
- Perform geological interpretations from aerial photos, satellite and other imagery
- Design geologic monitoring programs
- Interpret data from geologic monitoring programs
- Read/interpret topographic and bathymetric maps
- Perform geologic research in field and laboratory
- Prepare soil, sediment and geotechnical logs
- Prepare lithological logs
- Interpret dating, isotopic, and/or tracer studies
- Plan and evaluate remediation and restoration programs
- Identify geological structures, lineaments, or fracture systems from surface or remote imagery
- Select, construct, and interpret maps, cross-sections, and other data for field investigations
- Design, apply, and interpret analytical or numerical models

## GEOCHEMISTRY

- Evaluate geochemical data and/or construct geochemical models related to rocks and minerals
- Establish analytical objectives and methods
- Make determinations of sorption/desorption reactions based upon aquifer mineralogy
- Assess the behavior of dissolved phase and free phase contaminant flow in groundwater and surface water systems
- Assess salt water intrusion
- Design, implement and interpret fate and transport models
- Identify minerals and rocks based on their chemical properties and constituents

## MINERALOGY/PETROLOGY

- Identify minerals and their physiochemical properties
- Identify mineral assemblages
- Determine probable genesis and sequence of mineral assemblages
- Predict subsurface mineral characteristics on the basis of exposures and drill holes
- Identify and classify major rock types
- Determine physical properties of rocks
- Determine geotechnical properties of rocks
- Determine types, effects, and/or degrees of rock and mineral alteration
- Determine suites of rock types
- Characterize mineral assemblages and probable genesis
- Plan and conduct mineralogic or petrologic investigations
- Identify minerals and rocks and their characteristics
- Identify and interpret rock and mineral sequences, associations, and genesis

## STRATIGRAPHY/HISTORICAL GEOLOGY

- Plan and conduct sedimentologic, and stratigraphic investigations
- Identify and interpret sedimentary structures, depositional environments, and sediment provenance
- Identify and interpret sediment or rock sequences, positions, and ages
- Establish relative position of rock units
- Determine relative and absolute ages of rocks
- Interpret depositional environments and structures and evaluate post-depositional changes
- Perform facies analyses
- Correlate rock units
- Interpret geologic history
- Determine and establish basis for stratigraphic classification and nomenclature
- Establish stratigraphic correlations and interpret rock sequences, positions, and ages
- Establish provenance of sedimentary deposits

## STRUCTURAL GEOLOGY

- Plan and conduct structural and tectonic investigations
- Develop deformational history through structural analyses
- Identify structural features and their interrelationships
- Determine orientation of structural features
- Map structural features
- Perform qualitative and quantitative structural analyses
- Correlate separated structural features
- Develop and interpret tectonic history through structural analyses

## STRUCTURAL GEOLOGY (Continued from previous column)

- Map, interpret, and monitor fault movement
- Identify geological structures, lineaments, fracture systems or other features from surface or subsurface mapping or remote imagery

## PALEONTOLOGY

- Plan and conduct paleontologic investigations
- Correlate rocks biostratigraphically
- Identify fossils and fossil assemblages and make paleontological interpretations for age and paleoecological interpretations

## GEOMORPHOLOGY

- Evaluate geomorphic processes and development of landforms and soils
- Identify and classify landforms
- Plan and conduct geomorphic investigations
- Determine geomorphic processes and development of landforms and soils
- Determine absolute or relative age relationships of landforms and soils
- Identify potential hazardous geomorphological conditions
- Identify flood plain extent
- Determine high water (i.e. flood) levels
- Evaluate stream or shoreline erosion and transport processes
- Evaluate regional geomorphology

## GEOPHYSICS

- Select methods of geophysical investigations
- Perform geophysical investigations in the field
- Perform geological interpretation of geophysical data
- Design, implement, and interpret data from surface or subsurface geophysical programs including data from borehole geophysical programs
- Identify potentially hazardous geological conditions by using geophysical techniques
- Use wireline geophysical instruments to delineate stratigraphic/lithologic units
- Conduct geophysical field surveys and interpretations, e.g.: petrophysical well bore logging; seismic data (reflection and refraction); radiological, radar, remote sensing, electro-conductive or resistive surveys. Includes delineation of mineral and hydrocarbon deposits, interpretation of depositional environments, formation boundaries, faults, salt water contamination-intrusion, contaminant plume delineation and other structural/stratigraphic interpretations.
- Identify and delineate earthquake/seismic hazards
- Interpret paleoseismic history



#### HYDROGEOLOGY/ENVIRONMENTAL GEOCHEMISTRY

- Plan and conduct hydrogeological, geochemical, and environmental investigations
- Develop and interpret groundwater models
- Design and interpret data from hydrologic testing programs including monitoring plans
- Utilize geochemical data to evaluate hydrologic conditions
- Apply geophysical methods to analyze hydrologic conditions including geophysical logging analysis and interpretation
- Determine physical and chemical properties of aquifers and vadose zones
- Define and characterize groundwater flow systems
- Develop water well abandonment plans including monitoring and public water supply wells
- Develop/interpret analytical, particle tracking and mass transport models
- Design and conduct aquifer performance tests
- Define and characterize saturated and vadose zone flow and transport
- Evaluate, manage, and protect groundwater supply resources
- Potentiometric surface mapping and interpretation
- Design and install groundwater exploration, development, monitoring, and pumping/injection wells
- Develop groundwater resources management programs
- Plan and evaluate remedial-corrective action programs based on geological factors
- Evaluate, predict, manage, protect, or remediate surface water or groundwater resources from anthropogenic (man's) environmental effects
- Characterize or determine hydraulic properties
- Interpret dating, isotopic, and/or tracer surveys
- Determine chemical fate in surface water and groundwater systems
- Make determinations of sorption/desorption reactions based upon aquifer mineralogy
- Assess the behavior of dissolved phase and free phase contaminant flow in groundwater and surface water systems
- Assess and develop well head protection plans and source water assessment delineations

#### ENGINEERING GEOLOGY

- Provide geological information and interpretations for engineering design
- Identify, map, and evaluate potential seismic and other geologic-geomorphological conditions and/or hazards
- Provide geological consultation during and after construction
- Develop and interpret engineering geology investigations, characterizations, maps, and cross sections

#### ENGINEERING GEOLOGY (Continued from previous column)

- Evaluate materials resources
- Plan and evaluate remediation and restoration programs for hazard mitigation and land restoration
- Evaluate geologic conditions for buildings, dams, bridges, highways, tunnels, excavations, and/or other designed structures
- Define and establish site selection and evaluation criteria
- Design and implement field and laboratory programs
- Describe and sample soils for geologic analyses
- Describe and sample soils for material properties/geotechnical testing
- Interpret historical land use, landforms, or environmental conditions from imagery, maps, or other records
- Conduct geological evaluations for surface and underground mine closure and land reclamation
- Laboratory permeability testing of earth and earth materials

#### ECONOMIC GEOLOGY, MINING GEOLOGY, AND ENERGY RESOURCES (including metallic and non-metallic ores/minerals, petroleum and energy resources, building stones/materials, sand, gravel, clay, etc.)

- Plan and conduct mineral, rock, hydrocarbon, or energy resource exploration and evaluation programs
- Implement geologic field investigations on prospects
- Perform geologic interpretations for rock, mineral, and petroleum deposit evaluations, resource assessments, and probability of success
- Perform economic analyses/appraisals
- Provide geologic interpretations for mine development and production activities
- Provide geologic interpretations and plans for abandonment, closure, and restoration of mineral and energy development or extraction operations
- Identify mineral deposits from surface and/or subsurface mapping or remote imagery
- Predict subsurface mineral or rock distribution on basis of exposures, drillhole, or other subsurface data
- Evaluate safety hazards associated with mineral, petroleum, and/or energy exploration and development
- Determine potential uses and economic value of minerals, rocks, or other natural resources

#### OTHER RELATED ACTIVITIES WHICH MAY BE PERFORMED BY QUALIFIED PROFESSIONAL GEOLOGISTS

- Provide data and complete permit applications for RCRA, Solid Waste, NPDES/POTW, Storm Water, Sludge, Water supply, Solid Waste Sites, UIC, Wetlands, and Mining
- Conduct water well inventories

#### OTHER RELATED ACTIVITIES WHICH MAY BE PERFORMED BY QUALIFIED PROFESSIONAL GEOLOGISTS (Continued from previous column)

- Implement siting plans for the location of lagoons and landfills
- Environmental contaminant isocontour mapping
- Determine geotechnical aquifer parameters
- Land and water (surface and ground water) use utilized in planning, land usage, and other determinations
- Determine sampling parameters and provide field oversight.
- Environmental Site assessments (Phase I, II, and III)
- Use of Global Positioning Systems (GPS) and/or Geographic Information Systems (GIS) and/or Remote Sensing (RS) instruments, techniques, and software to delineate the following:
  - ◆ Contamination of earth and earth materials
  - ◆ Ore deposits (including sand, gravel, clay and other economic deposits)
  - ◆ Hydrocarbon deposits
  - ◆ Physical, structural and/or other features and components of the earth including topography, naturally occurring or man-made.
  - ◆ Depiction of other spatially dependent data including but not limited to:
    - ▶ Radiometric surveys and analyses
    - ▶ Geochemical surveys and analyses
    - ▶ Electro-conductive or resistive surveys and analyses
  - ◆ Other quantitative, qualitative measurements, surveys and/or analyses
- Computer modeling of all types of statistical data integration of GPS and/or RS and/or GIS data into georeferenced and non-georeferenced sampling maps, geologic maps, geotechnical, and other mapping products
- Expert Witness Testimony, as qualified, before regulatory boards, commissions, evidentiary hearings, public hearings including depositions and other matters of litigation
- Emergency response activities and spill response planning including implementation and coordination with local, state, and federal agencies
- Develop plans and methods with law enforcement, fire, emergency management agencies, toxicologists and industrial hygienists to determine methods of protection for public health and safety
- Provide training related to hazardous materials and environmental issues related to hazardous materials
- Develop plans and methods with biologists for protection of wildlife during spill events
- Prepare post spill assessments and remediation plans
- Develop and implement site safety plans and environmental sampling plans

#### OTHER RELATED ACTIVITIES WHICH MAY BE PERFORMED BY QUALIFIED PROFESSIONAL GEOLOGISTS (Continued from previous column)

- Provide educational outreach related to geological, geotechnical, hydrologic, emergency response and other activities
- Respond to natural disaster events (i.e. floods, earthquakes, etc.) for protection of human health and the environment
- Participate in pre-planning for spill events in coastal or other environmentally sensitive environments.
- Develop resource(s) and infrastructure vulnerability assessment plans and reports related to potable and non-potable water supplies, waste water treatment facilities, etc.



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