

Curriculum vitae
Roger D. Sharpe PG

Contact Information:

Roger D. Sharpe PG, CPG, LPG, SME-RM
5357 Hyland Place
Bloomington, MN 55437
Cell: 847-471-6869
Email: Rdsharpe409@gmail.com

From 1980 to 2021, I was employed by the United States Gypsum Company (**USG**), the largest producer of gypsum-based products in North America. I began my career as Staff Geologist and subsequently held the positions of Senior Staff Geologist, Manager of Geological Services, and Director of Geotechnical and Mining Services. Since retirement in 2021, I have continued my relationship with USG as a consultant for special projects.

Projects undertaken during my career vary from the initial exploration for mineral resources, development of new quarries, environmental compliance for the development and implementation of closure and reclamation programs. In recent years I have assisted in due diligence of corporate acquisition targets as well as in the sale of assets. USG's Geological Services has provided geological and mining assistance to more than twenty underground mines and quarries, some of which have been in operation since the mid-1800s.

On-going activities included management of mineral reserves, rock mechanics programs (mining design and subsidence monitoring), water resource management, and mine planning. Maintenance of business activities, such as determination of the effects of impurities on the manufacturing process and QA/QC.

As my experience increased, I became involved in more complex, multi-disciplinary projects, such as site selection for new manufacturing plants, due diligence geological investigations of mineral deposits acquisition, large-area subsidence monitoring techniques, and evaluation of water resources. These projects involved interaction with the Corporate Engineering, Legal, Manufacturing, Safety, Taxation, Environmental, and Property departments.

I frequently interact with the Strategic Sourcing and Product Safety departments to qualify externally purchased raw materials, such as calcium carbonate, perlite, and vermiculite used in various products, such as joint compound and construction plasters. These materials are evaluated for the presence and amount of impurities such as asbestos, respirable silica, sulfur, heavy metals, *etc.*

Much of my career has been associated with mining subsidence. USG was formed by the merger of smaller mining companies, some that were active as far back as the 1860s. Early underground gypsum mining was shallow and thus susceptible to subsidence. Four mines have experienced major subsidence events during my employment.

"On-the-job" experience was gained in many aspects of subsidence monitoring and remediation including development and use of numerous monitoring technology and methods, underground backfilling and surface remediation, relocation of roads, plant facilities, and public utilities to move public traffic away from high-risk subsidence zones.

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I testified as an expert witness in an insurance lawsuit in the Fourth Circuit United States Federal Court. I testified about pre-existing mining stability conditions, history of subsidence monitoring, and analysis of subsidence monitoring data. The lawsuit resulted in an award of \$38 Million to USG.

Much of my consulting activities for USG are associated with the investigation of sites for new mining and/or manufacturing plants. Geological Services provides a liaison with specialized geotechnical engineering firms and USG's management regarding the location of new operations and/or acquisitions.

During my career with USG, I was intimately involved in investigations that resulted in the development of four new gypsum quarries. I conducted the majority of field mapping, as well as diamond core-drilling campaigns, to characterize these projects. The **Santa Cruz** and **Tecoman Quarries** are located in **Mexico**. Originally evaluated for gypsum to make industrial/construction plaster products, the size and quality of the deposits were suitable to justify the construction of two new Sheetrock® plants.

The **Thumrait** deposit, located in the **Sultanate of Oman** in the Middle East, was initially a joint venture offering. Little geological information was available on the geological characteristics. I performed the initial field investigations, consisting of reconnaissance geological mapping and limited diamond core-drilling in late 2011 for a high-level overview. Results were favorable, additional drilling and mapping were done, and the joint venture was consummated in 2014. A three million tonnes annual production quarry and Sheetrock® is currently operating to supply India and other western Asian countries.

The **Alabaster Quarry** in Michigan has been in continuous operation since 1862. By 2024, the deposit was approaching its end of life. Gypsum was known to be present on adjacent land owned by the State of Michigan. Acquisition of the State Land increased the resources/reserves by at least 75 years. Development and operation of a new quarry began in late 2024.

Two large gypsum deposits are located on Mexico's **Baja Peninsula**. In 1995, I performed due diligence field mapping and a widely spaced diamond core drilling program. The project resulted in very favorable results and plans proceeded to acquire the deposit. Unfortunately, negotiations to acquire the deposit were unsuccessful. However, an opportunity to acquire the company reemerged in 2024 and, this time, the acquisition was successful, and the second deposit was also acquired. These acquisitions will allow USG to supply the entire Pacific Rim.

Throughout my 40+ year career I have been involved in many types of projects, both in surface and underground mining. My experience base has spanned from "greenfield" exploration for resources, through definition and development, long-term operational issues, site closure, and reclamation. The small geological and mining staff necessitated the development of many skills and cross-functionality.

I cooperated with NASA and the Jet Propulsion Laboratory on two projects related to gypsum and Mars. The NASA project was a preliminary investigation on the feasibility of extracting water from the crystal structure of gypsum to sustain human occupation of Mars. The Jet Propulsion Laboratory project involved testing remote drilling technology integrated with microscopic and analytical instrumentation, such as X-Ray fluorescence.

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Education

- **University of North Carolina at Greensboro** – B.A. Physical Geography, minors in chemistry and philosophy of science (August 1976)
- **University of Georgia** – M.S. Geology (June 1979) – Thesis: *Sharpe, Roger. D, 1979, Petrology, geochemistry, and metamorphic history of the Henson Creek Dunite, Mitchell County, North Carolina, University of Georgia, 190 pp.*

Professional Licenses

- Virginia – CPG #2801000178 (2/1/1984)
- American Institute of Professional Geologists – CPG #10882 (7/15/2003)
- Indiana – PG #2111 (7/15/2003)
- California – PG #8136 (5/30/2006)
- Minnesota – PG #63662 (12/30/2024)
- Society for Mining, Metallurgy, and Exploration – Registered Member #2916380RM

Affiliations and Memberships

- Society for Mining, Metallurgy, and Exploration, Inc.
- Association of Engineering and Environmental Geologists
- American Institute of Professional Geologists
- Geological Society of America

Mineral Exploration and Evaluation Programs

Planned, supervised, and executed rotary and diamond core drilling programs throughout North America: (**Virginia, Oregon, California, Nevada, Utah, Iowa, Michigan, Indiana, New York, Texas, Florida, Wyoming, Ohio, and Oklahoma**); Mexico (**Baja California Sur, Colima, Coahuila, and Nuevo Leon**) and Canada (**Nova Scotia and British Columbia**). I managed the drilling programs from inception through completion and preparation of final reports.

Drilling programs are conducted for (1) the definition and extension of reserves at operating properties, (2) greenfield exploration of mineral reserves for new mining operations and (3) geotechnical drilling in support of subsidence monitoring and civil engineering projects.

Due diligence drilling and geological mapping of a potential joint venture in the **Sultanate of Oman**. Subsequent drilling and geological mapping resulted in acquisition of the deposit, development of a 3-Mtpa gypsum quarry, and construction of a wallboard plant.

Worldwide Gypsum and Other Raw Material Resources

Developed computer databases of worldwide gypsum, perlite, and vermiculite resources. Conducted an extensive literature review to identify potential foreign development opportunities. Prepared briefing presentations for upper management regarding the distribution of gypsum resources in foreign countries and their geological and potential mining characteristics. Inspected gypsum mines in mainland **China, Cyprus, and Sultanate of Oman**.

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Raw Material Safety

Performed safety assessment audits of externally purchased raw materials used in wallboard and/or joint compound, including vermiculite, pyrophyllite, perlite, and calcium carbonate. On-site audits were performed in **North** and **South Carolina, Virginia, Brazil, and South Africa**.

Corporate Reporting

Annually compiled USG's mineral reserves information for inclusion in the Securities and Exchange Commission (SEC 10K) report, Internal Revenue Service, state agencies, etc. Signatory on USG's BATFE license. Prepared triennial reviews of the Corporation's mineral resources and reserves. In recent years, I became more involved in reporting the status of mineral resources/reserves to upper management to aid in decision-making for significant capital investment in existing mining/manufacturing operations and the construction and/or acquisitions of new operations. Certified to prepare NI43-101 reports in Canada.

Reclamation and Plan of Operations

I have prepared Plans of Operation and Reclamation Plans for gypsum and perlite operations in Utah, Nevada, and California. I have worked with third-party consulting firms in the preparation of Plans of Operation and Reclamation Plans in New York, California, and Utah. The tasks have included (1) the delineation of historical mining disturbances for the classification of reclamation responsibility (*i.e.*, grandfathered), (2) development of computer models of final mining configuration, (3) computation of reclamation costs for financial surety bonding and (4) liaison with consultants in the development of revegetation plans and mitigation of impacts on cultural resources.

Hydrology

- Conducted investigations to ensure adequate water supplies for manufacturing, fire protection, and potable needs for new manufacturing operations. Some specialized drilling done to install cathodic protection for a natural gas pipeline in **Oregon**. Installed monitoring wells for detection of saltwater intrusion in southern **California**.
- Performed investigations of water sources in **Florida, Virginia, Iowa, Michigan, California, Nevada, Pennsylvania, Puebla (Mexico), Tecoman (Mexico), and Thumrait (Oman)**.
- Investigations of hydrologic conditions for the location and drilling of water wells at numerous mining and manufacturing sites.
- Installed cathodic protection wells for a 12-mile natural gas pipeline in **Oregon**. Installed saltwater intrusion monitoring wells in **California**.
- Supervised the drilling of production water wells, pump tests to determine hydrologic parameters, and rehabilitation of existing wells to increase water production.

Natural Gas Pipelines

- **Bridgeport, Alabama** – Prepared a geological hazard assessment for the construction of a 14-mile pipeline in Tennessee and Alabama. Compiled information from the Tennessee, Alabama, USGS, and Tennessee Valley Authority regarding geological hazards such as landslides, karst features and flooding. The information was submitted to the Federal Energy Regulatory Commission (FERC).

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- **Rainier, Oregon** – Well-site geologist for installation of cathodic protection wells along a 12-mile pipeline. The pipeline developed numerous gas leaks and significant corrosion because of its construction adjacent to high tension electrical transmission lines. Worked with a corrosion control contractor to determine an appropriate stratum to install zinc sacrificial electrodes. Drilled through ~600 feet through massive Columbia River Basalt and into older alluvial sediments rock.
- **Empire, Nevada** – Managed the planning and permitting of a 65-mile natural gas pipeline in northern Nevada. Worked with USG personnel to survey a preliminary alignment for the pipeline. Coordinated the permitting process between USG and the Bureau of Land Management (BLM), U. S. Army Corps of Engineers (USACOE), Washoe County Planning Commission, Nevada State Office of Historical Preservation (SHIPO), and the Pyramid Lake Paiute Indian Reservation. Despite the involvement of numerous agencies, permitting and construction was completed in eighteen (18) months.

Mine Development and Reclamation

- **Sperry, Iowa** – Developed, executed, and managed geotechnical studies for the construction of a 650-foot ventilation and escape shaft at the Sperry underground mine.
 - Modeled and analyzed geologic conditions to identify target location for new shaft.
 - Managed shallow geotechnical drilling program to identify soil engineering conditions, bedrock topography, determine a final location for shaft construction.
 - Oversight of a pressure-grouting program to reduce groundwater inflow. Pre-grouting test well pump-test data produced about 300-gpm from a 10-inch well. Inflow into the final ventilation shaft (14-foot diameter) is less than 50-gpm.
- **Abandoned Mine Reclamation** – Closed two underground mines and adjacent quarries in Riverside County, California. Mining occurred from the early 1920s through 1966. **Over 100 shafts, stopes, adits, and open cuts were identified, assessed, and permanently sealed.** Various methods of closure included:
 - Drilling and blasting of adits and shallow stopes.
 - Polyurethane foam to seal numerous small diameter ventilation shafts.
 - Cast-blasting rock to fill adjacent tunnel entrances and open quarry cuts.
 - Haulage of waste rock to fill open cuts, tunnel entrances, etc.
 - Installed gates into selected shafts to allow access to the non-migratory California Leaf-Nosed bat.
 - Restricted site access through installation of fences, gates, trenches, signs, etc.
- **Dump Pad and Haulage Road Network** – Created preliminary designs for initial access roads, primary crusher dump pad, and benches for the Thumrait, Oman quarry.
- **Preliminary Quarry Design** – Prepared geological and quarry development models for gypsum deposit at Dutch Settlement, Nova Scotia, Canada.

Subsidence Monitoring and Rock Mechanics

- **Plasterco, Virginia**

Managed the subsidence monitoring program for the deepest underground gypsum mine in the world. The Plasterco Mine is almost 1,500 feet deep and consists of 16-levels of stope-type workings. Mining occurred from the early 1800's until 1979. Significant subsidence

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events have occurred throughout its life following the deactivation and partial flooding the mine in the late 1970s. The mine experienced a major subsidence event in 1984. The subsidence affected the manufacturing plant overlying the mine, as well as county and state roads, municipal water and sanitation pipelines, and a railroad spur.

I provided on-site management of the subsidence monitoring activities from 1982 to 1986 as the resident geologist. From 1986 until the present time, I have continued to monitor and analyze subsidence data. I developed the initial computerized methods of collecting and analyzing both surface and subsurface data.

Initiated numerous ground deformation monitoring methods, including inclinometers, tiltmeters, downhole television surveys, Time Domain Reflectometry (TDR), and LIDAR. Performed underground surveys and inspections to detect and measure deformation of the mine workings.

Prepared exhibits and provided expert testimony in an U. S. Federal Court insurance lawsuit resulting in a \$38 million award to U. S. Gypsum.

- **Fort Dodge, Iowa**

Development of a subsidence hazard monitoring, subsidence monitoring, and mine backfilling program and subsidence monitoring plan. Oversight of backfilling programs in an underground mine that operated from the 1870s until about 1927. Worked with plant personnel and corporate geotechnical/legal/safety team to develop a program to backfill beneath critical facilities, such as buildings, railroad, pipelines, and public roads. Monitored progress of backfilling through downhole television and laser surveys. Collaborated with external geotechnical consultants to define subsidence hazards, develop hazard rating matrix, and implement projects to minimize the effects of subsidence and/or exposure of people and property.

- **Sperry, Iowa**

Collaborated with corporate technical staff, plant personnel, and a rock mechanics consultant to implement a change in the room and pillar geometry. Installed roof and pillar convergence monitoring instrumentation. Analyzed historical and current roof convergence data to evaluate the stability of the modified room and pillar geometry, extending over a 25-year period.

- **Gypsum, Ohio**

Investigation of underground mine collapse that affected surface features, such as buildings and roads. Extensive work with plant personnel and outside consulting firms to develop subsidence hazard classification matrix to prioritize areas with respect to potential harm/injury to the public and employees and damage to facilities, roads, railroads, pipelines, etc. Periodic presentations of the progress and success of subsidence mitigation measures to upper management.

- **Oakfield, New York**

Investigated subsidence beneath a New York state highway. Developed and executed a drilling and backfilling plan to stabilize the mine workings. Mining occurred from before 1900 to about 1925 and are about 80-feet deep. There is no means of access to the area and historical maps indicate potentially high extraction of gypsum.

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The highway is an important thoroughfare for local businesses and NYDOT would not allow the road to be closed for any significant length of time. Precise-level survey traverses were installed and monitored throughout the remediation. Remediation consisted of drilling inspection holes for downhole TV inspection and injection of flowable backfill.

Property

- Research of public records of surface, mineral, and water rights throughout the United States and Canada.
- Establishment and maintenance of mining claims on U.S. Public Land.
- Experience in establishing exploration and extraction concessions in Mexico.
- Cataloging of properties owned or controlled by USG, which was formed in 1902 as an association of numerous gypsum producers throughout the US. There are many instances of ownership of properties in states or provinces with no active mining or manufacturing activities.

Legal

- **Plaster City, CA** – Comprehensive review of gypsum reserves added and extracted throughout the history of mining (beginning in 1920s). Reconciliation of historical reserves additions and depletion by mining resulted in a **\$450-k** mineral tax rebate from the Imperial County Tax Assessor.
- **Plaster City, CA** – Preparation of exhibits and studies for a lawsuit with the Sierra Club. Long term legal issues regarding the expansion of the existing Sheetrock manufacturing plant and expansion of the quarry operations, located 26-miles away. Collaborated with external consultants in the preparation of an Environmental Impact Statement, subsequent supplemental documentation, and additional requirements by the California Department of Fish and Wildlife and the U. S. Army Corps of Engineers (USACOE).
- **Plasterco, VA** – Litigation with insurance company following the 1984 mine subsidence event. The lawsuit resulted in an award of **\$38-Million** to USG for damages.
- **Plasterco, VA** – Litigation with Internal Revenue Service regarding the cost of construction of a road cut through a mountain side. The purpose was to relocate public traffic away from areas of potential mine subsidence. This resulted in a **\$14-Million** deduction for the cost of relocation.

Computer Skills

- In the mid-1980s I investigated the availability and capabilities of geologically related software. Software was Introduced to USG's mining/geological personnel and provided technical support and training.
- Trained USG geologists and mining engineers in the use of software to build drilling databases and geological models.
- Developed SQL database applications to manage production, maintenance, consumable, and operation data.
- Experience in **Autocad, Geostat Systems, Gemcom, Carlson, Global Mapper, Golden Software (Surfer)**, and **Rockware** software.

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Geotechnical Skills

- FAA licensed sUAS (drone) – Photogrammetric and volumetric surveys. Documentation of changes in quarry configurations.
- Downhole TV cameras – Inspection of inaccessible underground mine workings.
- Time-Domain Reflectometry (TDR) – Measurement of lateral and vertical strain in boreholes and along roads.
- GPS and Total Station surveying – Photogrammetric ground control surveys, drillholes, subsidence measurement, land surveys, *etc.*

LiDAR

- Initiated the use of LiDAR to monitor/measure subsidence over large, shallow (<150-feet) mines. One of the mines covers an area of almost 12-square miles.
- Currently performing biennial surveys at four inactive gypsum mines in Virginia, Ohio, New York, and Ontario, Canada. LiDAR may allow identify if subsidence is occurring and/or progressing.
- Biennial surveys can detect incipient depressions and monitor both lateral and vertical growth.
- Total subsidence since first survey and incremental subsidence between biennial surveys are measurable using LiDAR.

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