CORPORATE OVERVIEW

An award-winning multidisciplinary consulting firm, Skelly and Loy develops cost-effective, practical, and innovative solutions to successfully address the issues facing our clients today.

Since 1969, our goal has been to provide clients with quality work performed on time and within budget. Our success in achieving this goal is best demonstrated through the continued growth of the firm and our portfolio of repeat clients.

With 6 offices and over 225 employees, Skelly and Loy continues to build our strong foundation and enhance our offering of professional services. As a result, our comprehensive engineering and environmental services are extremely diversified.

MISSION STATEMENT

Skelly and Loy is determined to exceed total client expectations in the performance of quality engineering and environmental services.

CORE VALUES

- To exceed client expectations through the production of quality work, on time, and within budget
- To keep staff members gainfully employed through challenging work
- To earn a reasonable profit

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SKELLYandLOY CONSULTANTS

PORTAL

To the Mining Industry

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Mine Slope Investigation and Design

Comprehensive characterization of subsurface geologic and hydrogeologic conditions is paramount for the proper engineering design and construction of a mine slope. It is necessary to collect sufficient data and complete adequate analyses to ensure slope stability in the open excavation, to determine bearing pressure of the soils to support the proposed overlying structure, and to calculate the volume of groundwater to be handled during both the construction and long-term mine operation.

The foregoing investigations are becoming routine in the industry as operators continue to examine the feasibility of developing mines. As the resulting data impacts highly critical decisions, it is imperative that the fundamental tasks be performed correctly to ensure that accurate and adequate data is collected. The tasks to be implemented to ensure the successful design and construction of a mine slope are discussed in this issue.

Relevant Project Experience

Slope Design

Currently, Skelly and Loy is actively involved in the development and initiation of subsurface investigations to define the geologic and hydrogeologic conditions within the proposed footprint alignment of a two compartment underground slope for a mid-western mining company. The drill hole spacing and depth of core recovery were designed to allow for the correlation of strata between boreholes above and beneath the proposed slope excavation elevations. Representative samples of the bedrock material were selected and submitted to a laboratory for Unconfined Compression Strength (UCS) tests, shear strength tests, and tensile strength tests. The results of these tests will enable Skelly and Loy’s engineers to complete the design and preparation of detail drawings for the slope. A final construction bid specifications package will be prepared and distributed to potential construction contractors.
SOILS INVESTIGATIONS
- Collect continuous split spoon samples of unconsolidated material
- Proceed until refusal with consolidated bedrock material
- Preserve samples in air-tight jars to maintain moisture
- Ship to accredited laboratory for analysis

 Investigative Methodology
A mine slope investigation follows a two step process. The first step is a gap analysis during which available subsurface information is compiled and thoroughly reviewed for accuracy and completeness. Once substantiated, the available data is evaluated and “data gaps” identifying the need for additional data to complete the design are delineated. To collect additional information, a subsurface borings program is developed and implemented. Typically, the subsequent subsurface investigation is composed of three tasks: soils investigation, hydrogeologic conditions characterization, and bedrock core borings program. While the engineering team integrates the information gathered from each task to design of the slope, there are specific design applications associated with each task as discussed below.

The slope engineering team utilizes the soils data to specify compaction requirements, material layer depth, and other material placement details for construction of the slope. In addition to achieving the most stable slope configuration, accurate soil characteristics are used by the engineering team to minimize land disturbances attributed to the disposal of excavation material. Soil analytical results are also used in the foundation design for surface structures. The hydrogeologic characterization establishes a comprehensive understanding of the location of aquifers and the volume of groundwater quantity to aid in water handling need decisions during construction and for long-term operations. Engineers use the hydrogeologic data to design the most effective system which may include one or a combination of alternative technologies such as grout injection, pumping, reinjection, and infiltration.

The bedrock core borings program is critical to developing blast designs, selecting rock blast techniques, and designing the required overhead support systems. Applying the resulting rock strength information, the engineering team specifies the composition and spacing of the slope roof support system which may be comprised of roof bolting, steel arches, buttresses, and timbering. In addition to the typical strength analyses, it is highly recommended that acid/base accounting is performed on core samples to identify the potential for the formation of acid mine drainage from excavated material waste areas and the creation of a costly problem to clean up years down the road.

A well planned and executed mine slope investigation maximizes the engineering team’s ability to design a stable slope and is paramount to the construction of a slope resistant to failure. A comprehensive subsurface investigation results in a detailed bid package minimizing the need for change orders and associated construction delays and reducing the overall cost of construction.

GEOTECHNICAL SAMPLE ANALYSIS
- Grain Size
- Atterberg Limits
- Moisture Content
- Direct Shear

HYDROGEOLOGIC CONDITIONS INVESTIGATIONS
- Install monitoring wells at borehole locations
- Measure groundwater levels
- Conduct aquifer testing and analyses
- Estimate groundwater quantity

Relevant Project Experience (Cont.)
SLOPE STABILITY ANALYSIS—For a quarry in Wyoming, Skelly and Loy evaluated the potential impacts of future mining and final reclamation slope to the stability of the highwalls. Based on field observations, projected mine geometry, and geological conditions, Skelly and Loy developed models to analyze slope stability. These models were based on translational failure of rock wedges in the highwall face. As a result, it was determined that slopes would be stable if pre-split blasting was employed.

HIGHWALL ASSESSMENT—To facilitate development of a 25-acre adjoining property, Skelly and Loy completed a highwall failure risk assessment to delineate the area not suitable for development due to potential negative impacts in case of a highwall failure. In performing this analysis, we completed a site reconnaissance, reviewed mapping and geologic files, and prepared geologic cross sections for critical locations. By evaluating the composition and integrity of the existing highwall, Skelly and Loy determined its stability and the extent to which the adjoining property could be developed.