

# Integrating Engineering & Environmental Concepts for Mine Development

By Greg Smyth, Senior Project Manager, Knight Piésold Ltd

Designers of modern-day mines must consider and incorporate nearly endless aspects of a project so that it is technically, economically, environmentally and socially balanced. Technical and economic feasibility continue to be the key drivers behind development decisions. However, environmental and social considerations are growing in their influence on both the design and ultimately the decision to move a project past concept and into construction and operation.

Environmental assessment of mining projects within Canada and beyond has grown in complexity in a short timeframe. Within the past few decades, data requirements to support mining environmental assessments has increased in duration, as well as the breadth of data that must be collected. Today, it is not uncommon for multiple years of comprehensive baseline studies to be mandatory across all environmental disciplines. And all this data must be collected prior to conducting an impact assessment of the proposed project on the baseline conditions at a given site. Many clients of Knight Piésold have been working to streamline development schedules by simultaneously collecting multiple years of data to support the environmental assessment application, as well as advance the design aspect of the project from scoping through to feasibility. The challenge faced by mine designers is to infuse enough social and scientific information at the scoping level design phase such that the extensive (and expensive) baseline studies are primarily focused on the eventual project that will be taken to feasibility level design. Mine developers are therefore having to take greater risks in allocating funds prior to making a formal development decision, so that projects are not stalled following a feasibility study, waiting for the baseline studies and impact assessment process to be completed.

Accomplishing a balanced review of a project requires input from geologists, engineers (elec-

trical, mechanical, civil, geological, mining, geotechnical, etc...) and scientists (biological, social, etc...), among other specialists, to iterate the design of a mining project such that it will have the least negative effects (social and environmental) with the maximum positive effects (social, environmental and economic). This approach has required professional staff to step back from their primary area of study and consider many other disciplines that they would normally not think about when either designing a mine or assessing effects for their particular focus. A type of translation service has evolved from this level of integration, as engineers, scientists and geologists do not often speak the same technical language. Engineers focus on the practicality of a design, geologists focus on maximizing the extraction of the mineralized ore body, while scientists are evaluating effects for their particular area of interest and suggesting changes to the design to minimize such effects. Ideally, the objectives of each group come together in a balanced manner and the project can be developed such that it meets each of the technical, economic, environmental and social criteria.

An increasing phenomenon is that projects of tomorrow must go through many more iterations compared to projects of the recent past, in order to find that balance. Project teams that have a stronger environmental and social science influence sometimes develop ideas that surpass technical or economic practicality. Contrarily, teams that have primarily focused on the classical engineering aspects may not consider all environmental design modifications that could reasonably be included to achieve a better overall project. Developing a project team with the right balance of diverse expertise at the conceptual and baseline design phase will assist in achieving an optimized project with the least iterations.

Mine development companies have a challenging position where they must maintain an eco-

nomical design to ensure that investors remain interested in providing hundreds of millions, if not billions of dollars, while at the same time meeting the provincial/territorial and federal regulatory requirements, and simultaneously ensuring that they work proactively to obtain a social license to construct and operate for multiple decades. Finding this balance is not an easy task and requires strong leadership from all parties involved. Mine development and environmental assessment reviewers (regulatory, First Nation, community or other third parties) are often from as diverse backgrounds as those developing the mine designs and conducting the environmental assessments. Effectively communicating the details of the project, whether it be the technical details around the design, the scientific aspects of the baseline studies, or the conclusions of the environmental assessment, have become a key objective of the mine development team. As such, an integrated team of engineers, scientists and geologists that can work together to design and communicate the proposed project is the best approach at succeeding in developing new mine operations. \*

***Knight Piésold** is an international consulting company providing comprehensive engineering and environmental services for the mining, power, water resources, transportation and construction sectors. Founded in South Africa in 1921, the company has expanded worldwide, with over 900 employees based in offices across five continents. Knight Piésold opened its first Canadian office in Vancouver in 1975, and currently employs over 200 people in Canada working on projects worldwide, including in Canada's remote north.*

***Greg Smyth** has 17 years of environmental and engineering experience, allowing him to bring value to mining projects from their inception through to closure. He is a Senior Project Manager in the Vancouver office of Knight Piésold, where he oversees Feasibility Studies and Environmental Assessments related to mine waste management for mining projects. His areas of expertise include: environmental baseline studies, impact assessment, mine waste design, First Nation and public consultation, mine permitting, reclamation design and research, and communication with agencies at all levels of government.*