

## Geo-Risk

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### Title - Geo-Risk Mitigation for Mining Highly Stressed Ore Bodies at Depth (“GeoRisk”)

**Purpose** - The GeoRisk Strategic Research Project (SRP) is focused on evaluating and mitigating the risks associated with underground mining in high stress, structurally complex ore zones. Mining investors are increasingly sensitive to risk when making large capital expenditures. This can be alleviated if the time required to develop a mine and ramp-up production can be shortened significantly and if the most appropriate mining method, means of access and equipment type can be selected with confidence.

The project is part of a four-year strategic program (SRP#2; see [www.miningexcellence.ca](http://www.miningexcellence.ca)) that will cost in the range of \$1M to complete.

**Context** – Worker safety is of paramount importance to mining in Canada. As mining progresses to greater depth, however, geologic structures become more sensitive to mining interactions. Hence, identifying the risks associated with mining at depth as early as possible and developing new and innovative ways to mitigate and manage those risks is of strategic importance for mining in the Canadian Shield.

Could these risks have been anticipated sooner and consequently more appropriate risk mitigation strategies implemented? This project will help address these issues.

### Objectives

1. Reduce the risk profile associated with planned mining of highly stressed underground ore bodies by defining ways to identify, mitigate and manage the risks associated with them.
2. Develop site characterization techniques that include addressing the identification of geological architecture and critical fault detection.
3. Use Xstrata Nickel’s Craig Mine Zones 10-11 as an example mine location to catalogue and develop learnings from past mining in high stress underground conditions.
4. Use Vale Inco’s crown pillar extraction monitoring program to enhance complex structure identification procedures.
5. Identify fault slip control techniques
6. Develop a GoCAD-based geohazard assessment tool to assess ground fall hazard related to fault-slip rockburst mechanisms.
7. Develop a best practice manual for future mining in highly stressed underground ore bodies.

### Current Sub-Project Listings

1. Flac Modeling of Fault Development in Zones 10/11 of Craig Mine
2. Mine Design Review
3. GeoHazard Map Validation and Sensitivity Analysis

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4. Site/Rock Mass Characterization Improved Process
5. Back Analysis of Ground Instability (in prep.)
6. Quantifying the Cost of Fault Slip Event Disruptions
7. Variability Tool Development

### **New!**

*Progress to date on the GeoRisk project strongly suggests the need for significant new research work related to Fault Slip research- specifically in the areas of:*

- *understanding what combination of geotechnical conditions make some ground more prone to it than others and*
- *how to control the energy released as a result of fault slip-induced ground failure*

*Plans are underway to develop the scope of a major research project in this area. We envisage multiple researchers from related cross disciplines and international company participation through the provision of test sites. Significant opportunities for government funding are anticipated.*

### **Industry Sponsorship**

Additional industry participation in the GeoRisk project is welcomed through sponsorship and collaboration.

- a) The current company and other program sponsors and solution team members are:
  - Xstrata Nickel, Vale Inco and Rio Tinto, with Ontario Government-leveraged funding.
  - Research/Consulting organizations such as Mira Geoscience, Golder Associates, Itasca Canada, Lassonde Institute at the University of Toronto (in prep), Laurentian University, MIRARCO, and other mining universities (under development).
- b) New program sponsors can join as:
  - A single strategic research program (SRP) sponsor and contribute \$50,000 per year for 3 years. If the program is extended, new sponsors will be expected to contribute at a higher rate to buy into previous achievements (\$75,000/year). Program sponsors are also expected to make in-kind contributions by providing access to data and information and by designating an active program participant.
  - Multiple strategic research program sponsor and CEMI membership (as per bylaws) at \$100,000 per year for 3 years. CEMI Membership allows the member to participate in



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up to two SRPs and to assume technical advisory functions within CEMI's program management structure.

### **Benefits to Strategic Research Program (SRP) Sponsorship**

- Free access to the all products of the research (e.g., data, software tools, handbook, etc) for the duration of the project and for use at all of its operations (some confidentiality, IP or copyright rules may apply)
- Receive final reports in electronic form for free use within all their operations.
- Members have the ability to focus the research on sponsor specific sites, data and case studies.