

BARNARD FOO, M.Eng., P.Eng., MBA
Senior Mining Engineer

BACKGROUND

Barnard Foo is a Senior Mining Engineer with Micon International Limited, based in the Vancouver office. He has over 10 years of experience in underground mine operations and in the engineering consulting sector. Barnard has strong technical expertise in underground mine design, rock mechanics and the design of paste backfill systems. He is particularly familiar with the mining industry in South America, having carried out long-term assignments in Brazil and Peru.

PRIOR EXPERIENCE

Hatch Engineering Ltd., Senior Mining Engineer, 2009-2010

Operational and senior review on mining projects in Canada and Brazil.

Wardrop Engineering Inc., Senior Mining Engineer, 2006-2009

Responsible for underground mine design, geotechnical analysis, paste backfill plant design, backfill distribution system, mine design and valuation.

Golder Associates Ltd., Rock Mechanics/Mining Engineer, 2001-2006

Involved in geotechnical and hydrogeological investigations for mining projects in Peru and Brazil relating to underground mine stability and support design.

Minsur SA, Rock Mechanics Engineer, 2000-2001

Resident engineer responsible for integration of the support system for the San Rafael underground mine.

Babcock Consulting Ltd. (Peru), Rock Mechanics/Underground Mine Engineer, 1998-2000

Provided ground control audits, mine planning, contracting and training services to underground mines and management of a base metal mine.

MINE EXPERIENCE

- **Rio Tinto Brasil, Mineração Serra da Fortaleza Ltda., Brazil:** Project and site engineer for rock mechanics services at Serra da Fortaleza nickel mine. Oversaw operation, quality control, mix design and troubleshooting for shotcreting underground. Provided recommendations on support requirements and mine sequencing.

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- **El Dorado Gold Corp., Sao Bento Mineração, Brazil:** Project and site engineer for the underground geotechnical services at Sao Bento gold mine.
- **Cia. Minera Pachapaqui, Peru:** Resident mine engineer and manager responsible for 40 employees and two contractors.
- **Cia. Minera Milpo., Mina El Provenir, Peru:** Project and site engineer for Milpo zinc mine. The assignment included a contract for three years of supervision-related issues regarding ground support and installation of the ground support for the production workings and underground infrastructure.
- **Placer Dome Canada Ltd., Dome Mine, Canada:** Open-pit engineering assistant involved in open-pit drilling and blasting activities, tailings impoundment design and road construction to the tailings impoundment, and blast vibration monitoring and analytical/environment sample preparation.
- **Agnico Eagle Mines Ltd., Canada:** Assistant to ground control engineer. Performed 2D numerical analysis and support designs for shaft, underground openings, and determination of the mining sequence and underground blast monitoring.

MINE DESIGN AND EVALUATION

- **Goldcrop Inc, Peñasquito Project, Mexico:** Underground mine scoping study for Concepcion del Oro.
- **St. Andrews Mining Limited, Sta. Debora and Sta. Elena Projects, Brazil:** Due diligence for alluvial gold and open pit properties.
- **Aurcana Corp., La Negra Project, Queretaro, Mexico:** Project manager and qualified person for NI 43-101 Technical Report.
- **Yamana Gold Inc., Gualcamayo Project, San Juan, Argentina:** Trade-off study for surface and underground ore handling system.
- **Platinum Group Metals Ltd., Western Bushveld Joint Venture, South Africa:** Feasibility study guideline update.
- **Redhawk Resources Inc., ReMac Project, Canada:** Scoping study for the ReMac project.

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ROCK MECHANICS

- **Ferbasa, Brazil:** Established client relation and mining operational review for the Ipueira mines and scoping study for Coitezeiro underground mine. Underground project leader and responsible for geotechnical aspect of the project.
- **Kria Resources, Half Mile Lake Project, Canada:** Geotechnical data analysis, pillar and stope dimensioning, and ground support design.
- **Minco Silver Corporation, Fuwan Project, Guangdong, China:** Geotechnical data collection and analysis, pillar and stope dimensioning, and ground support design.
- **Al Korba Mining Co., Al Masane project, Saudi Arabia:** Preliminary geotechnical data collection and analysis, crown pillar dimensioning, and ground support design.
- **North American Tungsten Corp. Ltd., Mactung Project, Canada:** Geotechnical data collection and analysis, stope dimensioning, support design, pillar dimensioning, backfill selection and mining sequence under permafrost conditions.
- **Eldorado Gold Corp., Efemçukuru Project, Turkey:** Geotechnical evaluation, stope dimensioning and support design on the feasibility study for the underground gold project.
- **Glamis Gold, Cerro Blanco Project, Guatemala:** Geotechnical data collection and evaluation, reviewing stope dimensioning and support design on the scoping study for the underground gold project.
- **Blue Pearl Mining Ltd., Davidson Molybdenum Project, Canada:** Performed preliminary stope dimensioning analysis for the Davidson project.
- **Canadian Salt Company, Mines Seleine, Canada:** Performed numerical analysis with MAP 3D SV to determine the required sill pillar thickness between 5th and 6th level. Analyzed the pillar dimension for the 6th level based on comparisons of numerical stress predictions with established design criteria's and underground observations.
- **The Doe Run Company, Buick North, United States:** Performed numerical analysis with Phases 2D to simulate the back failure at the Buick North mine. The investigation was carried out to investigate the failure mechanisms that caused the fall of ground in the 70N area of the mine.
- **Forrest Kerr Powerhouse Design Review, Iskut River, Canada:** Reviewed the preliminary design for the underground powerhouse at the Forrest Kerr Hydro Project with senior staff.

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- **Ontario Ministry of Northern Development and Mines, Canada:** Supervised the quality control of approximately 2600 m³ of concrete pour and installation of multiple point borehole extensometers.
- **Kinross Gold Corp., Timmins, Canada:** Performed rockmass classification on drilled core associated with abandoned mine workings for surface subsidence investigation.

PASTE BACKFILL PLANT DESIGN

- **Alexco Resources, Bellekeno Project, Canada:** Trade off study for paste fill versus dry cemented fill and backfill plant system design. Manage paste fill material testing, testing results review and interpretation.
- **Silver Standard Resources Inc, Pitarrilla Project, Mexico:** Feasibility study for 5,000 t/d paste backfill plant and the design of underground distribution system. Managed pastefill material testing, cement screening, testing results review and interpretation.
- **Redfern Resources Ltd., Tulsequah Chief Project, Canada:** Engineering design for 3,200 t/d paste backfill plant underground distribution. Managed paste fill material testing, cement screening and oxygen consumption in high pyrite tailings, testing results review and interpretation.
- **Eldorado Gold Corp, Efemçukuru Project, Turkey:** Feasibility study for 1,280 t/d paste backfill plant design and the underground distribution system for the gold project.
- **Glamis Gold, Cerro Blanco Project, Guatemala:** Scoping study for 1,150 t/d paste backfill plant design and underground distribution system for the gold project. Provided trade-off study on trucking versus pumping paste backfill.
- **Cia. Minera Minsur S.A., Mina San Rafael, Peru:** Involved in site preparation for three pilot plants testing tin tailings to evaluate the possibility of thickening the tailings for the purpose of paste production. Results of the pilot plant testing was followed by feasibility studies and detailed engineering for the paste plant.

GEOTECHNICAL AND HYDROGEOLOGICAL INVESTIGATIONS AND DESIGNS

- **Diavik Diamond Mines Inc., Canada:** Performed underground geotechnical mapping for the Main (A154) and A21 Decline. Data analysis for surface discontinuity mapping, including carrying out probabilistic and deterministic analyses.
- **De Beers Canada, Snap Lake Diamond Project, Canada:** Performed test pits investigation at the North Pile to investigate the subsurface conditions.

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- **Compania Minera Antamina S.A., Peru:** A geotechnical and hydrogeology investigation was carried out for the proposed diversion tailings impoundment tunnel at Antamina mine. Supervised approximately 1,660 m of drilling to determine the geotechnical properties of the rockmass. Involved in the geotechnical mapping and rockmass classification, hydraulic conductivity testing, and installation of vibrating wire piezometers and inclinometers.
- **Inco Limited, Canada:** Carried out analyses of reservoir dam slope stability utilizing SLIDE. The evaluation and optimization of slope angle, safety factor, and pseudo-static state were analyzed for the stability of the dam during construction and for the long-term stability of the tailings impoundment. An optimum slope with the required safety factor was calculated and recommendation was made for the dam.

PROFESSIONAL DEVELOPMENT

- 7 Safety Habits, Wardrop Internal Training by Global Training Edge, January 2009.
- Surpac – Underground mine design module training, February 2008.
- Surpac – Introduction module and block modeling training, November 2007.
- Conflict Resolution – Graduate Student Professional Development, Faculty of Graduate Studies, University of British Columbia, Vancouver, BC, February 2007.
- Mine Safety and Health Administration – U.S. Department of Labour. Completed 16 hours of MSHA surface safety orientation. February 2005.
- Transportation Endorsement – Trauma Tech., Burnaby, BC, October 2004.
- Occupational First Aid Level 1 – Trauma Tech, Burnaby, BC, October 2004.
- Geotechnical Field Camp – Golder U Course, Kelowna, BC, May 2004.
- Troxler Nuclear Gauge Training – Safety of transportation, handling, and operation of Troxler Surface Moisture-Density Gauge, Sudbury, Ontario, October 2001.
- Norcat WHMIS Training and Surface and Underground Mine Safety Orientation, Sudbury, June 2001.
- Destress Blasting, Sudbury, Ontario, Canada, seminar conducted by ITASCA Consulting Canada, February 2002.
- Blast Monitoring, Sudbury, Ontario, Canada, seminar conducted by ITASCA Consulting Canada, February 2002.

EDUCATION

Laurentian University, B.Eng., Mining Engineering	1998
University of British Columbia, M.Eng., Rock Mechanics	2007
University of Northern British Columbia, Executive MBA	2010

PROFESSIONAL AFFILIATIONS

Professional Engineer, Province of Ontario

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LANGUAGES

Fluent: English, Portuguese, Spanish, Bahasa Melayu and Indonesian, Cantonese, Hokkien

Basic: Mandarin

PUBLICATIONS

Foo, B., Iavkovlev, I., “Mining at Depth under Weak Rockmass, São Bento Mineração S/A Santa Bárbara, MG, Brazil”. CIM Maintenance, Engineering and Mine Operators Conference, Val d’or, Quebec, Canada, February 2008.

Foo, B., Pakalnis, R., “Numerical Modeling Analysis for São Bento Mineração SA, Santa Bárbara, MG, Brazil”, 1st Canada-U.S Rock Mechanics Symposium, Vancouver, Canada, 2007.

Foo, B., Silva, M.V.T., Lopes, G.F., “Mineração em Maciços Rochosos Fracos em Profundidade e Sistemática Adotada para Reforços de Rocha, Mineração São Bento, Santa Bárbara, Minas Gerais, Brasil”, IV Congresso do Mina Ceu Aberto e Subterrâneo 2006, Belo Horizonte, Brazil.

Foo, B., Bourguignon, L., Huard, B., and Lavoie, D., “Instrumentation des sautages aux mines Agnico-Eagle, division Laronde”, Recueil des conférences données lors du 11e colloque en contrôle terrain, Val d’Or, March 1996.