

### What is the Value of Ore Body Knowledge for the Mining Industry?

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Despite decades of technological progress and growing access to high-resolution geoscientific data, many mining operations continue to fall short of their forecasted production targets and fail to deliver on projected financial returns. A key contributor to this systemic underperformance is insufficient or poorly integrated ore body knowledge (OBK), rooted in technical shortcomings during feasibility studies (e.g., McCarthy, 2003). Recent analysis by Gillis et al. (2024) reinforces this concern, identifying inadequate OBK as a leading cause of financial impairment in the Canadian mining sector, with technical errors contributing to over USD \$1 billion in global annual losses. These issues also carry significant environmental consequences through inefficient resource extraction and increased waste.

Paradoxically, mining companies now have access to more subsurface data than ever before—thanks to advances in sensors, remote sensing, and AI-driven analytics—yet the conversion of this data into actionable, economically relevant knowledge remains a major bottleneck. We argue that the central challenge is no longer data scarcity, but rather the integration and contextualization of data into meaningful, decision-ready insights that can support technical, engineering, and financial assessments.

Addressing this challenge demands a fundamental shift in how ore body knowledge is generated, shared, and utilized across the mining value chain—from exploration through to mine planning, production, and processing. We propose an “exploration-to-mill” framework that promotes cross-disciplinary collaboration, enhanced data integration and visualization platforms, and the adoption of robust, transparent value-of-information (VOI) methodologies. By explicitly quantifying the financial impact of improved OBK, this approach offers a clear pathway to reduce risk, enhance predictability, and drive more sustainable and profitable mining outcomes.