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Machine Learning for Lithologic and Ground Type Modeling at the Stillwater Mine

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Orebody knowledge and characterization are the foundation of economic decision-making from exploration to mine development. Timely and robust modeling of narrow vein-style deposits can be problematic in the fast-paced underground production environment. This presentation will highlight new methods to model the lithology and ground types in and near the narrow vein platinum and palladium deposit of the Stillwater Complex that is being mined in Nye, Montana, USA. The geology and geotechnical staff at the Stillwater Mine was challenged with modeling thin problematic poor ground areas that are prone to unraveling, and could be areas that are the root cause of falls of ground when encountered unexpectedly. In the case study, presenters will showcase how machine learning techniques coupled with conventional estimation methodologies were used to model the lithology and Q data. Utilizing a processing partnership between Maptek and Sibanye Stillwater to test and implement DomainMCF, a machine learning technique was leveraged to generate geologic domain boundaries for lithology and Q data. This approach to dynamic modeling has allowed the Stillwater Mine teams to rapidly evaluate new diamond drilling information. The lithologic model data is now used by the grade control geologists prior to mining new floors, guiding where they should be mining. This predictive method helps the geology-driven mining operation empower the forty-plus geologists and five plus rock mechanics engineers to guide the mining operation. Future uses of this modeling methodology are applications to digital face mapping for both teams. Additionally, testing of the DomainMCF™ modeling methodology as applied to the development of a structural model. Recent innovations and enhancements in machine learning for domain modeling allow for geologists to spend more time boots-on-the-ground with their geologic data to help more efficiently predict and use the geology and geotechnical information for efficient and economic mine development.