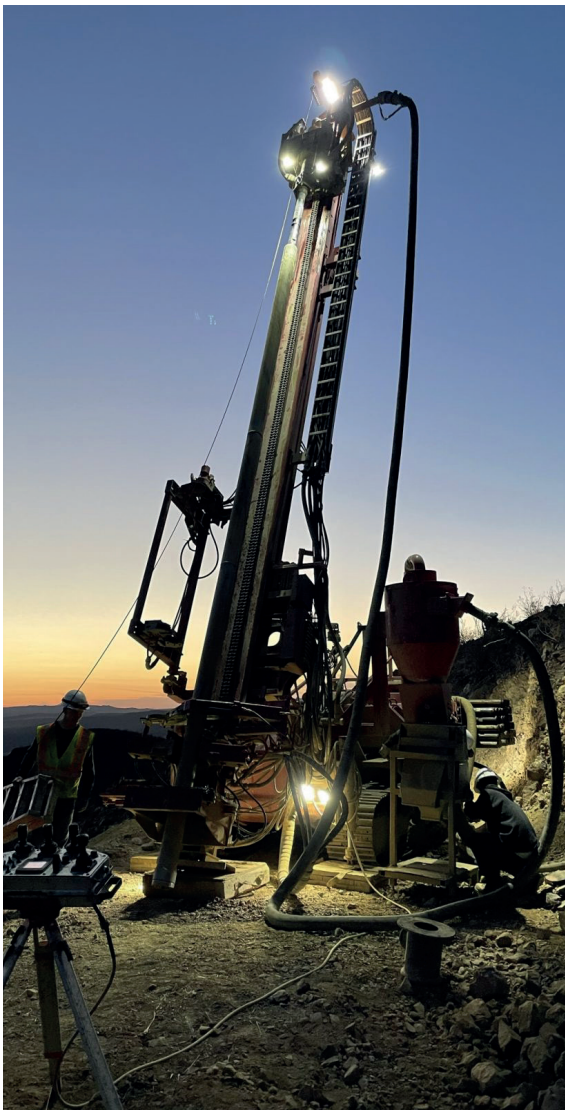
From drillhole to decision, faster

An in-depth look at how the intelligent use of geoscience data using software from Seequent can be a highly effective mechanism in instilling confidence in investors and reducing risk for mine developers



Apollo Silver's Calico Project: drilling at its Waterloo site

Explorers have to dig deeper to uncover new discoveries and face challenges along the way. Using geoscience data at every stage of the mining lifecycle can be a highly effective mechanism in instilling confidence in investors and reducing risk. But how do you harness that insight? What solutions are available to help you be more agile, accurate and productive?

Seequent's director of Exploration and Resource Management, Rob Ferguson, said: "Mining is a hugely complex industry, and it's becoming increasingly difficult to find and extract new resources. Subsurface understanding is key, and our technology is pivotal in building that ore body knowledge by connecting teams to the data and solutions they need to solve complex, real-world problems."

Seequent, The Bentley Subsurface Company, is a world leader in geoscience software that helps organisations to understand the underground. Its solutions empower exploration teams worldwide to improve their chances of winning investment and enhance exploration by enabling them to discover faster, drill smarter and make more confident decisions.

Ferguson noted that technology empowers quick, accurate decision-making in mineral exploration and mining. "The industry is under more pressure than ever to increase productivity and efficiency, particularly as demand grows for critical minerals driving the energy transition. To get to project decisions faster, timely decisions must be made based on the most accurate data and insights. This concept holds true from drillhole to core imagery to data management and models.

"Solutions such as ours, which are cloud-based, centralise the data, making it available in real-time to all stakeholders worldwide for faster and more transparent decisions. This breaks down silos that have slowed mining and exploration for decades."

FROM DATA TO MODELS

To enable faster, more confident decisions while drilling, Seequent combines the power of MX Deposit, Imago, and Leapfrog to manage drilling data and core imagery in the cloud securely and bring it into Leapfrog geological models.

- MX Deposit for drillhole and point sample data management simplifies how drillhole and point sample data is collected, managed and shared within the cloud.
- Imago enables easy access, collaboration, and validation of drillhole and sample data using high-quality geoscientific images.
- Leapfrog 3D geological modelling software allows trends in data to be discovered.
- Seequent Central allows the entire process to be shared and collaborated across teams.

DATA MANAGEMENT

MX Deposit is a software-as-a-service (SaaS) solution that simplifies and controls how drill hole, point sample, and other field data is collected, managed, and shared throughout the lifecycle of a deposit, allowing geologists to make better decisions faster no matter where in the world they are.

Ferguson said: "Drill and sample data are the lifeblood for mining companies when exploring. MX Deposit unlocks value from drilling, one of the largest investments for any mining and exploration company, with enduring high-quality data. MX Deposit represents a new era of data management and understanding of the underground."

The cloud-based data management solution is easy to use, highly configurable and scalable, and works anywhere online and offline. Sample and drillhole data can be easily collected on a tablet or laptop. Mobile and web-based logging with built-in validation enables enhanced quality and reliability while logging multiple data sources anywhere. Real-time

collaboration is enabled with live project data. MX Deposit ensures users work from a single source of truth for faster, easier, and more accurate logging. Errors are reduced with built-in quality assurance and quality control, and assay data can be managed from any lab.

Traditionally, companies would capture and store information in multiple formats and locations, creating inefficiencies and a greater likelihood of error. MX Deposit addresses these challenges by enabling companies to improve their data management by simplifying and optimising how drillhole and point sample data is collected, managed and shared. As it is cloud-based, it is accessible by all members of an organisation, making project management and data sharing more efficient.

Mining exploration teams can configure the solution for various activities, including diamond and percussive drilling, grade control, underground face sampling, metallurgical sampling, stockpile sampling, and sampling mill circuits. MX Deposit closes gaps in a project's data collection, streamlines workflow, reduces errors, and provides an audit trail to improve data confidence and act as a single source of truth for project data.

Junior explorer Apollo Silver leverages MX Deposit to collect, manage, share and integrate that data to create dynamically updated models in Leapfrog Geo. For its Calico silver project in San Bernardino County in California, Apollo completed an 88-hole, 32,283ft ~~(9840 m)~~ RC drill programme on the Waterloo Property between April 6, 2022, and November 12, 2022. The programme's objective was to upgrade the confidence in and expand the 2022 silver mineral resource estimate at Waterloo by furthering the geologic understanding and controls on mineralisation of the deposit via infill and marginal drilling.

Detailed logging for all 88 drill holes collected information on lithology, alteration, and mineralisation (where observed). All observations were recorded digitally, directly into MX Deposit, which Apollo uses to host all drill data.

Cathy Fitzgerald, vice president of Exploration and Resource Development for Apollo Silver Corporation, said: "What my CEO and I always say is you want one source of the truth. By having all your data in MX Deposit, that's what you're getting. MX Deposit helped things run smoothly on our drilling programme to upgrade our resource for our Calico silver project, a very lively project.

"We want to ensure loggers have the tools they need to log properly. We also want to guide what minerals we want them to capture or what rock types you want them to highlight. You can do that very well with MX Deposit because you can define your libraries. You can say these are the rock types and minerals you can expect to see.

"It's a great visual tool to educate the teams; you can log your hole, and it's a huge benefit to press a button and see a visual picture of that hole. Seeing is different than just writing, and it elevates the data quality. I also like that it is cloud-based, and to check out a drill hole, you don't need to be connected to the internet to use the project. There are also varying controls in the software so that some team members can edit drill holes, but not others."

Fitzgerald said Apollo Silver uses MX Deposit for more than just logging. "We can use it for surface databases and bring our assay data directly from the lab. It has all its checks and balances for quality control and discharge, and we can take that information into Leapfrog. So, we are updating our model dynamically as we go. When the loggers are finished logging the hole, our geologist takes that information right away, puts it in the model, and can adjust contacts. Then, when we get our assay data, it validates their logging. The interoperability between Leapfrog Geo and MX Deposit works very well for us."

The company said there is a lot to like with MX Deposit. "It's an excellent logging platform and storage solution for a company like ours. I like the subscription model; it's very cost-effective. I feel I'm getting good value for my money, not just because of how the software works but also what I get from the team. Seequent is also very responsive and open to our suggestions for future software updates."

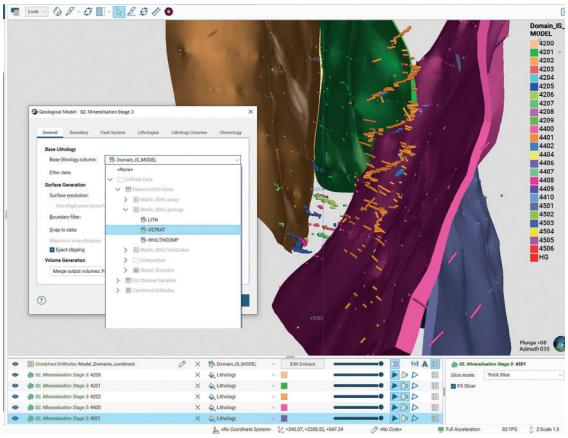
MX Deposit offers interoperability with workflows at every stage of the mining value chain, delivering valuable insights across all mining projects. The integration with Imago and Leapfrog enables users to go from drillhole to model in real time, but it also fits well with third-party applications.

VALIDATING DATA

Imago streamlines the core logging process and saves time by enabling users to capture consistent, high-quality chip samples and drillhole core images. Imago controls the camera, captures the images, and automatically transfers them to the user's laptop or PC with a fast, intuitive, and easy-to-use interface.

Imago processes core imagery efficiently and automatically labels, inspects, auto-crops, and stores images, removing the need for manual handling and delivering a cloud-based virtual core shed that can be shared or ►

Imago being used in the field for validating data insights with core imagery for better decision-making in drilling and mining



Leapfrog Geo geological model with an Imago link

viewed anywhere at any time. Meaningful insights can be extracted from images and validate decisions long after drilling is complete.

Imago supports interpretation and modelling, and geological models can be validated in seconds with high-quality core imagery. Imago is fully agnostic and can be integrated with the geological tool of choice, including Leapfrog, MX Deposit, Oasis montaj, Target, and more. This seamless integration with geological data and modelling tools provides instant access to images that offer rich information to support and validate geology information while building geological models.

LEAPFROG

Leapfrog Geo, the leading 3D geological modelling software for the mining and exploration industries, allows users to discover trends in data. Leapfrog allows rapid integration, communication and interpretation of geological data. Drilling, sample, and core image data can be directly viewed in a 3D geological model as MX Deposit and Imago data can be synced with Leapfrog.

Ferguson said: "Leapfrog's intuitive workflows, rapid data processing, and visualisation tools bring teams together – and enable the discussions that drive decisions. Leapfrog is designed to ensure time is spent on geology and interpretation, not data."

Users can build and refine geological models with user-friendly tools, inputting large data sets and rapidly generating models directly from the data, bypassing time-consuming wireframing. The result is that geological data can quickly be visualised in 3D, and visual insights can be gained to guide interpretations. As new data is added to a model, the rules and parameters set are automatically applied. When a change is made to one model, any dependent models are instantly updated – ensuring models are always up to date.

Analysing data is quick and intuitive with Leapfrog Geo's features, such as exploratory data analysis, distance function, structural modelling, vein modelling, and indicator interpolation tools.

Risk and uncertainty can be minimised as new ideas can be tested and models refined quickly. Models can be duplicated, and streamlined workflows can be applied to iterate interpretations the moment new insights become available. Users can rapidly copy, modify, test, and share alternative interpretations. This allows users to keep track of how decisions were made for auditing with a record of all input data and parameters used to construct a surface.

Leapfrog enables teams and non-technical stakeholders to get on the same page as 3D models or 2D slices can be shared with annotations. Movies of geological models can also be created to illustrate ideas clearly, and high-quality images can be exported for reports and presentations.

Leapfrog allows users to bring in data directly from Seequent solutions, such as MX Deposit and Imago, or from industry-leading partner solutions, such as acQuire, Maptek, ioGAS Link, IMDEXHUB-IQ, ALS Coreviewer and Coreshed. Users can import and work with many different data types, like GIS, maps and images, drillhole, points, geophysical, structural, meshes, polylines, and geochemical data.

SEEQUENT EVO

Ferguson said operational decisions within the mining industry heavily rely on a good subsurface model encompassing geological features and/or mineral grades. "The future iteration of geological models must prioritise ease of creation, repeatability, time and responsiveness to the demands of the operational decision-making process.

"However, subsurface modelling encounters inherent uncertainty and subjectivity uncommon in other engineering domains. A significant challenge in mining is making critical strategic and tactical decisions based on uncertain information. While constructing multiple scenarios aids in capturing this uncertainty, adapting workflows to process and analyse this plethora of information becomes imperative. To bridge the gap between geological modelling and operational strategies, Seequent is spearheading the development of a flexible, cloud-based ecosystem of interconnected solutions."

The next evolution in the company's capabilities – Seequent Evo – will unite teams through a unified data platform and open ecosystem, with collaborative workspaces and secure, efficient data storage and hosting. Evo provides the foundation for connected workflows between Seequent and third-party applications, including a customer's solutions.

Ferguson said mining companies can seamlessly amalgamate real-time data, services, and applications within this inclusive platform. "By accessing the most recent geological data and block models, operational units gain the requisite information for informed decision-making. This encompasses models that mirror the current state of drilling information while encapsulating the geologist's confidence in the model. The enhanced utilisation of geological and block models translates into elevated operational efficiency and performance."