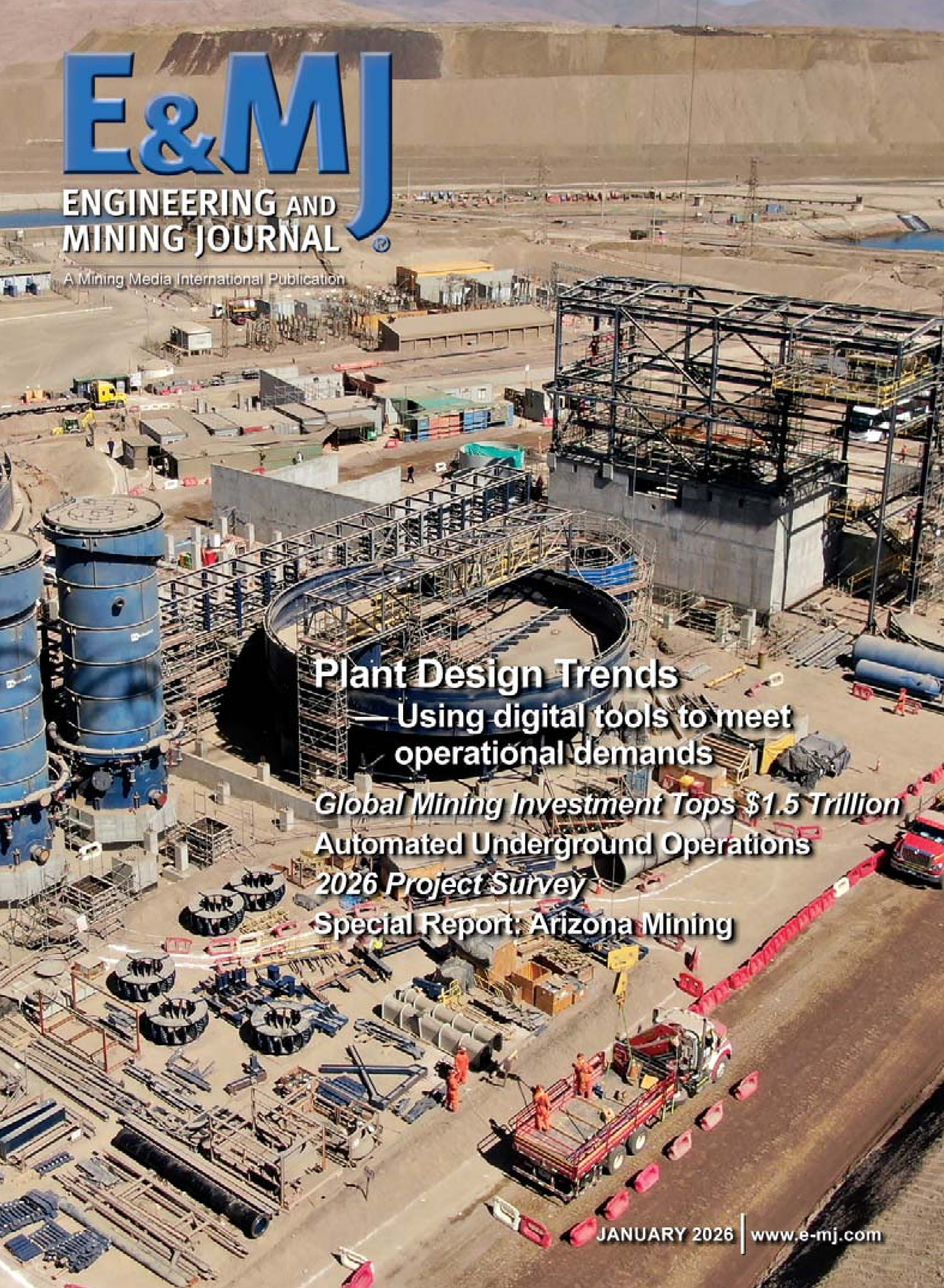

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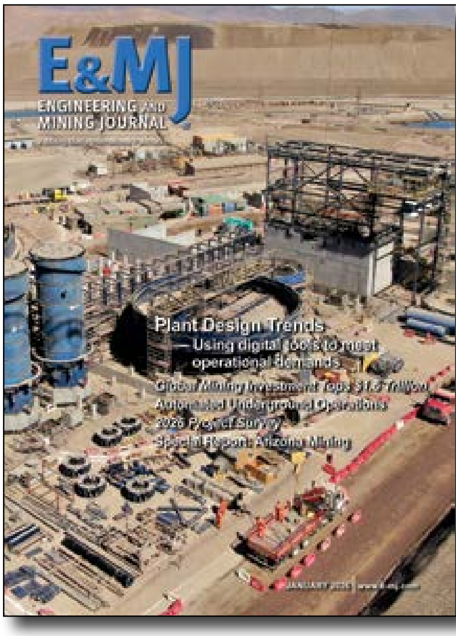
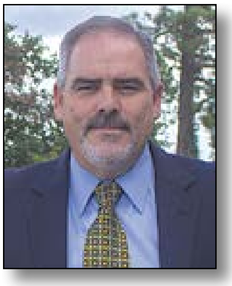
AROUND THE WORLD



In this edition, E&MJ *discusses mining investment and project development in depth. Another article explores plant engineering and design trends. On the cover, Capstone recently commissioned a concentrator at the Mantoverde mine in Chile. (Photo: Ausenco)*

DEPARTMENTS



Steve Fiscor
Publisher & Editor-in-Chief

It's Getting a Little Frothy

We have not seen the unbridled enthusiasm in the mining industry that we are seeing today in at least 20 years, maybe 50 years. As this edition of *E&MJ* was going to press, prices for most mined commodities were up month-to-month, and year-over-year. Gold had surpassed $4,600 per ounce (oz) and silver was setting its sights on $100/oz. Copper was knocking on the $6/lb door.

Every year, *E&MJ* publishes its annual Project Survey in the January edition and it tracks many of the mining projects being developed worldwide by commodity. Spoiler alert: The news is good. Many projects have moved from construction into commercial production and mining companies are adding more projects.

In years past, we have tried to merge the Project Survey with the work that Industrial Info Resources (IIR) is doing, but we maintain two different data sets. This year, we published IIR's report as a standalone article, Global Mining Investment. It details how mining investment worldwide has climbed to more than $1.5 trillion for the first time.

During October, I had the good fortune to attend the Idaho Mining Conference. It was packed with mining professionals, developers and suppliers, and the vibe was very positive. During that conference, a group of notable mining influencers were assembled for a panel discussion on project development. There was a healthy discussion as to what price should be used for feasibility studies. At the time, they could not have conceived that the higher prices they were discussing would be considered conservative a few months later.

The attendance levels at the American Exploration & Mining Association meeting in Reno during December exceeded 2,100. That's a 30% or 40% increase from four years ago. During his keynote address, Pat Risner, president for South32's Hermosa project, talked about the company's plans to launch a modern underground mine. He flipped the script when it came to staffing and a mine's social license to operate. Jobs are something communities expect from mining operations. Instead of importing skilled operators, South32 will hire people locally to operate the equipment from a remote operations center. Risner explained that they can quickly train people who have never seen a mine to operate the equipment remotely and hire from the surrounding communities. He also explained how South32 will invest in training for skilled trades locally as a community uplift.

The pace of development among the mines is accelerating and they are finding new ways to overcome obstacles. Let's hope that we can sustain this positive momentum. Happy New Year! Enjoy this edition of *E&MJ*.

Stephen J. Fiscor

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Equinox Sells Brazilian Operations

Canadian gold miner Equinox Gold Corp. has agreed to sell the Aurizona mine, the RDM mine and the Bahia Complex, all of which are located in Brazil, to a subsidiary of China's CMOC Group for $1.015 billion. Equinox will receive an upfront cash consideration of $900 million at closing, subject to customary adjustments, and a production-linked contingent cash payment of up to $115 million one year after closing. The transaction is expected to close during Q1 2026.

"The sale of our Brazil Operations is a pivotal step to position Equinox Gold as a North American-focused gold producer underpinned by robust cash flow and a tier-one growth profile," said Darren Hall, CEO, Equinox Gold. "The proceeds will transform our balance sheet." It will also simplify the portfolio and enable the company to deploy capital toward higher-return, lower-risk, organic-growth opportunities in Canada and the USA, he explained.

Following the close of the transaction, the Equinox gold production platform will consist of the Valentine and Greenstone mines in Canada, the Mesquite mine in California and the El Limón and Libertad mines in Nicaragua. As Valentine and Greenstone reach nameplate capacity, and assuming stable performance across the portfolio, the company anticipates annual 2026 production of between 700,000 and 800,000 oz of gold.

CMOC produces copper, cobalt, molybdenum, tungsten, and niobium and it's also a leading producer of phosphate in Brazil

China's CMOC will acquire three Brazilian gold operations including the Bahia Complex (above). (Photo: Equinox)

Oregon Issues Permits for Grassy Mountain

Paramount Gold Nevada Corp. announced that the Oregon Department of Geology and Mineral Industries (DOGAMI) has published the draft consolidated permit package for the Grassy Mountain gold project on behalf of all state permitting and cooperating agencies. This represents the first time in Oregon's history that a mining project has advanced through the state's consolidated mining permitting framework.

Paramount holds 100% interest in Grassy Mountain, which consists of approximately 8,200 acres located on private and BLM land in Malheur County, Oregon. Grassy contains a gold-silver deposit (100% located on private land) for which the results of a positive feasibility study have been released and key permitting milestones accomplished.

"This is a landmark achievement for both Grassy Mountain and the State of Oregon," said Rachel Goldman, CEO of Paramount. "The release of the draft consolidated permit package reflects years of detailed technical and environmental analysis, coordinated agency review and extensive community input. It demonstrates that well-designed, environmentally responsible mining projects can advance in Oregon."

With the release of the draft permit package, DOGAMI scheduled a public hearing for January 29, 2026, in Vale, Ore. The hearing will feature project presentations and allow for public comments on the draft permits through February 6, 2026. Following the closure of the public comment period, DOGAMI will make any necessary revisions before issuing the final consolidated permit package.

The final permit package will provide the regulatory framework for construction, operation, closure and monitoring of the Grassy Mountain gold project. The project is designed as a small footprint underground gold mining operation, with the potential to create high-quality local jobs, support regional economic activity and contribute to local and state revenues over the life of the mine.

Codelco and Glencore to Expand Smelting Capacity

Codelco selected Glencore as its preferred partner to develop a new smelter in Chile's northern region. The companies signed a Memorandum of Understanding (MoU) to advance the construction of the smelter, even though the final location is yet to be determined. The companies are considering the Antofagasta and Tocopilla Provinces. The MoU includes a long-term copper concentrate supply agreement. It also sets the framework for Glencore to conduct a prefeasibility study and negotiate other agreements.

Máximo Pacheco, chairman of Codelco's board, emphasized that the MoU represents "a major step forward for Chile's mining industry, enabling the development of new smelting capacities in line with our sustainability and global leadership goals." Pacheco also noted that the smelter's proximity to other copper producers will provide logistical advantages, operational flexibility, and opportunities to capture greater value by refining concentrates close to their source.

The MoU covers the design, financing, construction, operation, and maintenance of the plant, which is expected to process 1.5 million dry metric tons per year (mt/y), adhering to stringent operational and environmental standards. Under the agreement, Codelco will negotiate a supply contract for up to 800,000 dry mt/y of copper concentrate annually for a minimum of 10 years, with an option to extend for an additional 10 years.

"Being selected as Codelco's strategic partner demonstrates our long-term confidence in Chile, where we have been a significant investor in the mining sector for many years," said Glencore CEO Gary Nagle. "We look forward to building a successful, long-term commercial partnership with Codelco and bringing this ambitious project to life."

Korea Zinc to Build $7.4B Smelter in USA

Seoul-based Korea Zinc, one of the world's largest processors of the metal, recently announced plans to build a $7.4 billion smelter in Clarksville, Tenn., in partnership with the U.S. Department of War, the Department of Commerce and other private investors. As the first large-scale zinc smelter of its kind since the 1970s, the facility will process approximately 1.1 million tons of raw materials annually and produce a total of 540,000 tons of finished products, including 300,000 tons of zinc, 35,000 tons of copper, 200,000 tons of lead and 5,100 tons of rare earths.

Korea Zinc plans to begin site preparation and foundational work in 2026, while full-scale construction will start in 2027. Completion is planned for 2029, followed by phased operations beginning with zinc, lead and copper operations the same year.

The new smelter will be based on the model Korea Zinc used for its Onsan Smelter in Ulsan, the world's largest single-site smelter by production capacity. The company said it will use the same world-leading smelting technology, optimal processes, and state-of-the-art control systems.

Korea Zinc is proposing to build the new smelter as replacement for Nystar's current smelter in Clarksville, which is the only zinc smelter in the USA. To make effective use of this existing infrastructure, Korea Zinc has reached an agreement to acquire Nyrstar's U.S. operations subject to certain conditions. It said it is hoping to transfer several hundred highly skilled zinc smelter workers to the new facility.

The Capex costs for the new smelter are estimated to be $6.6 billion. Approximately $2.15 billion, arranged by the U.S. Department of War together with investors, will be invested in the

Kast Election Might Make Mining Investment in Chile More Attractive

By Oscar Martinez

The election of José Antonio Kast to the Chilean presidency will bring change to the mining sector, an industry that has historically underpinned the national economy and now faces structural challenges related to productivity, investment, sustainability and governance. Mining currently represents between 10% and 14% of Chile's GDP, accounts for approximately 55% of the country's total exports and contributes between $35 billion and $45 billion annually in foreign shipments, depending on the price cycle.

Kast will take the reins from current Chilean President Gabriel Boric in March. The president-elect is considering the appointment of a single "tri-minister," overseeing the Ministries of Economy, Mining and Energy, thereby centralizing leadership over portfolios that currently manage policies linked to sectors which, taken together, account for more than 60% of annual private investment.

The president-elect's vision is structured around three overarching objectives: restoring competitiveness, reestablishing regulatory certainty and accelerating the execution of investments, particularly in copper and lithium. Chile accounts for nearly 24% of global copper production and holds approximately 30% of known lithium reserves.

The incoming administration believes that Chilean mining has lost relative attractiveness compared to other mining jurisdictions due to regulatory complexity, the length of environmental assessment processes and an overlapping permitting process. Currently, the development of a large-scale mining project can take between seven and 10 years from the advanced exploration stage to construction, with environmental evaluation processes that, on average, exceed three to five years.

The incoming administration hopes to reduce regulatory uncertainty by providing clear and stable rules for long-term projects, a condition it views as essential for an industry that often invests $1 billion or more per project and operational horizons extending beyond two or three decades.

Chilean President-Elect José Antonio Kast and his wife, María Pía Adriasola, celebrate an election victory. (Photo: X: @CHILEPORJAK2026) smelter construction. The U.S. Department of Commerce will provide $210 million in award funding under the CHIPS Act for U.S. equipment procurement and other purposes.

The U.S. Department of War will reportedly hold a 40% stake in the venture. Additionally, the USA will have preferred access to a portion of Korea Zinc's expanded production in South Korea in the future.

Korea Zinc Chairman Yun B Choi said: "With its project in the USA, Korea Zinc will solidify its position as a strategic partner supplying essential minerals for aerospace and defense. This will become a model case of strengthened U.S.-Korean economic security cooperation."

Vale and Glencore Evaluate Sudbury Copper Deposits

Vale subsidiary Vale Base Metals (VBM) signed an agreement with Glencore Canada to jointly evaluate a potential brownfield copper development project at their adjacent properties in the Sudbury Basin. Per the agreement, the two plan to explore the significant synergies of mining both companies' underground deposits via the existing shaft and infrastructure at Glencore's Nickel Rim South mine.

Upon completion of this early work, the intention is that VBM and Glencore will transition to a joint venture as equal partners in the project. The project proposes deepening Glencore's existing mine shaft and developing new drifts to access nearby copper deposits. It is estimated to produce 880 metric tons of copper over 21 years with a capital cost of about $ 1.6 billion to $ 2 billion.

"Opportunities to partner and unlock synergistic value between neighboring miners in the Sudbury Basin have been pursued for decades, without meaningful success," said Shaun Usmar, CEO of Vale Base Metals. "The contemplated partnership paves the way to extract valuable copper-rich orebodies for our respective operations that would otherwise be lost to both companies. The proposed 50-50 joint venture aims to leverage Glencore's unused infrastructure to access orebodies on both our properties. This will benefit our respective companies, our local communities in and around Sudbury, and it has the potential to produce nearer-term critical minerals from this prolific brownfield project for the Canadian economy."

The polymetallic geology of the Sudbury Basin means that in addition to copper, the companies will also produce nickel, cobalt, gold, PGMs and other critical minerals. Detailed engineering, permitting and consultation work will occur in 2026, and a final investment decision is expected in the first half of 2027.


An aerial view of Glencore's Nickel Rim South mine in the Sudbury Basin, Ontario, Canada. (Photo: Glencore)

Fortescue to Acquire Alta Copper

Fortescue Ltd. plans to acquire the remaining 64% of Alta Copper Corp.'s shares, which are not already owned by Fortescue. Alta Copper shareholders will receive cash consideration of $1.02 per share, representing a significant and attractive premium of 50% to Alta Copper's 30-day volume weighted average price and implies a total equity value for Alta Copper of $101 million. The directors of Alta Copper, who are entitled to vote, have unanimously recommended to all shareholders that they vote in favor of the transaction.

Alta Copper owns the Cañariaco copper project located in northern Peru within an emerging porphyry corridor that hosts several large exploration and development opportunities. The project comprises 91 km^2 of highly prospective land, which includes the Cañariaco Norte deposit, the Cañariaco Sur deposit and the Quebrada Verde prospect.

The Cañariaco project has a reported mineral resource of 1.1 billion metric tons (mt) at 0.42% copper equivalent grade (measured and indicated) and 900 million mt at 0.29% copper equivalent grade (inferred resources). Alta Copper completed a preliminary economic assessment in June 2024 that outlined the potential for a long-life copper operation. Cañariaco is one of the largest copper deposits in the Americas not held by a major.

Anglo Asian Expands Gedabek Flotation Plant

Anglo Asian Mining, a copper and silver producer based in Azerbaijan, announced that it has started production from two new, larger filter presses and an associated thickener at its Gedabek flotation plant.

As announced in October 2025, the company installed a second new filter press at its Gedabek flotation plant. This was part of an upgrade to replace its previous filter presses with two new, larger filter presses, which have the capacity to process the higher-grade ore from the new Gilar mine. A new thickener to feed the filter presses has also been installed. The two filter presses and thickener were sourced from Yon Proses & Filtrasyon Teknoloji in Türkiye and are now fully operational. The installation of the two new filter presses and thickener will reportedly increase future copper production.

Construction work on the project to increase efficiency and productivity of the flotation plant will commence soon wit the addition of rougher and cleaner flotation cells.

Stephen Westhead, VP of Anglo Asian, commented: "Since we brought the new Gilar mine into production in May 2025, there has been a bottleneck at the filter presses due to the ore grades being higher than the forecast average. These upgrades to our flotation plant enable us to efficiently process this ore variability, which is particularly valuable to Anglo Asian, considering global copper demand. This upgrade was completed on time and on budget, and as a result, has enabled us to deliver our highest-ever monthly copper production."

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Lundin Mining Sells Eagle Mine and Humboldt Mill to Talon Metals

Lundin Mining Corp. signed a definitive agreement to sell its subsidiary, Lundin Mining US Ltd., which indirectly holds the Eagle mine and Humboldt Mill, to Talon Metals Corp. in return for 275.2 million Talon shares, or approximately $83.7 million. Talon will continue to be publicly listed on the Toronto Stock Exchange (TSX) under the symbol TLO following the closing of the transaction. Following the completion of the transaction, Lundin Mining will have increased its total holding in Talon to 19.99%.

Jack Lundin, Lundin president and CEO, commented: "The combination of Talon and Eagle will create a pure-play U.S. nickel company anchored by the Eagle mine, the only primary nickel mine currently operating in the USA. This transaction unlocks meaningful synergies, including the opportunity to leverage the Humboldt Mill as a shared, centralized processing facility."

Post-transaction, Talon will have the potential to process critical minerals from multiple facilities, operating both the Humboldt Mill in Michigan and the future proposed Beulah minerals processing facility in North Dakota. Talon has received U.S. federal grant funding to support the expansion of domestic critical mineral resources. Following the closing of the transaction, the team expects to continue to progress these projects to benefit domestic supply demands.

Lundin Mining and Lundin Mining US will also enter into a Production Payment Agreement for ore that is processed through the Humboldt Mill that was not mined or produced from the Eagle mine. Lundin Mining US will make ore delivery payments of $1.00/mt of non-Eagle ore processed through the Humboldt Mill to Lundin Mining until the aggregate ore delivery payments equal the capped amount of $20 million.

The company said that the share exchange and certain other transactions contemplated by the share purchase agreement are not required to be approved by the shareholders of Talon. The transaction is expected to close in early January 2026, subject to the receipt of the approval of the TSX and the satisfaction of other customary closing conditions. At closing, the board of directors of Talon will be reconstituted to comprise 10 directors, with two nominees from Lundin Mining being Jack Lundin and Juan Andrés Morel. Additionally, Darby Stacey, the current managing director of the Eagle mine and Humboldt Mill, will be appointed as CEO and director of Talon.

The Eagle mine (above) produces more than 9,000 mt/y of nickel. (Photo: Lundin)

Contango, Dolly Varden Propose Merger

Contango ORE, Inc. and Dolly Varden Silver Corp. have proposed a merger-of-equals. The combination of Contango and Dolly Varden, to be known for now as MergeCo, would create a North American asset portfolio consisting of the Manh Choh gold mine in Alaska, as well as several high-grade silver and gold projects located in British Columbia and Alaska, including the Kitsault Valley and Johnson Tract projects.

Upon completion of the transaction, existing Contango and Dolly Varden shareholders will each own approximately 50% of the outstanding shares of MergeCo, which is expected to be renamed Contango Silver & Gold Inc. and will be led by Rick Van Nieuwenhuyse as CEO, Shawn Khunkhun as president and Mike Clark as executive VP and CFO. The board of directors of MergeCo will include Clynt Nauman as Chairman, Brad Juneau, Darren Devine, Mike Cinnamond, Tim Clark, Rick Van Nieuwenhuyse and Shawn Khunkhun.

Rick Van Nieuwenhuyse, president, CEO and director of Contango, commented: "With the Manh Choh gold mine providing significant cash flows in a strong gold and silver price environment, the combined company will have a source of non-dilutive funding to advance development of its high-grade Lucky Shot and Johnson Tract projects in Alaska and the Kitsault Valley project in British Columbia. Kitsault Valley and Johnson Tract are particularly synergistic as both are high-grade, have similar metallurgy, are located near tidewater and fit the Direct Shipping Ore model. In addition, both have tremendous exploration upside."

Shawn Khunkhun, president, CEO and director of Dolly Varden, further commented: "The merger represents a step-change for the company, adding production and combining an exceptional portfolio of projects with the potential for high-grade precious-metal development. The combined company is poised to become a unique, multi-asset platform for silver and gold production, focused exclusively on the USA and Canada."

Kinterra Buys Highland's Interest in White Pine North

Highland Copper Co. Inc. signed a binding offer from its joint venture partner, Kinterra Copper USA LLC, for the sale of the company's 34% interest in the White Pine North project in Michigan's upper peninsula for approximately $30 million. The total consideration consists of $18.3

million in cash, net of the outstanding principal and accrued interest on the loan made by Kinterra to the company's wholly owned subsidiary, Upper Peninsula Copper Holdings Inc., which is expected to total approximately $11.7 million at closing. In addition, the parties have agreed to suspend cash calls under the White Pine joint operating agreement.

The proceeds will fund Highland Copper's corporate and Copperwood projects, including necessary detailed engineering and project financing activities, and allow the company to eliminate its existing debt, improving financial flexibility and reducing future interest obligations. Highland Copper says that the sale streamlines its asset portfolio, enabling management to focus entirely on advancing Copperwood.

"This is a truly pivotal moment for Highland Copper," said Barry O'Shea, CEO of Highland Copper. "The sale of our non-controlling stake in White Pine North delivers immediate, non-dilutive funding that achieves several key strategic objectives at once. This move sharpens our focus, de-risks our near-term timeline and significantly enhances our ability to become the next domestic U.S. copper producer."

The parties have agreed to work towards completion of the purchase and sale transaction by year end. Moelis & Company LLC acted as exclusive financial advisor and McMillan LLP acted as legal advisor to the company in connection with the transaction.

Vizsla Acquires Palmer VMS Project

Vizsla Copper Corp. completed the acquisition of Constantine Metal Resources Ltd. and is now the 100% owner of the Palmer VMS project, located in southeast Alaska. The company also announced the completion of its non-brokered concurrent financing for gross proceeds of $44,240,605.

Chairman and CEO Craig Parry said, "Palmer is a rare high-grade copper asset in a strategic location, with strong expansion and exploration potential, backed by existing resources. We welcome the opportunity to work constructively in collaboration and consultation with traditional landowners and communities and look forward to engaging positively with people and groups in the region."

The Palmer project is a 33,000-hectare, advanced-stage critical minerals exploration project in Southeast Alaska, with 60 kilometers of road access to tidewater. It contains high-grade VMS-related copper, zinc, silver, gold and barite mineralization with strong resource growth potential. Over $116 million has been invested in the Palmer project to date, establishing a strong foundation for the 2025 mineral resource estimates, with road access and all necessary state and federal permits in place for rapid advancement.

The company says it will begin 2026 with a major winter drill campaign at Poplar, focusing on expanding the Thira discovery and testing compelling nearby large porphyry targets. This will be followed by a large summer drill program at Palmer, focusing in and around the 2023 high-grade hits at Zone 1, testing extensions of the known high-grade deposit and multiple compelling VMS targets in the district.

Hemlo Mining Pours First Gold

Hemlo Mining Corp., a new mid-tier Canadian gold producer, announced the successful completion of its first gold pour at the Hemlo gold mine since acquiring the operation from Barrick Mining Corp. on November 26, 2025. The inaugural pour produced approximately 6,704 ounces of gold, representing one of Hemlo's largest single pours this year.

Jason Kosec, president and CEO of Hemlo Mining Corp., stated: "The first gold pour under Hemlo Mining Corp. marks a defining milestone for our company. Against a record gold-price environment, our team executed a seamless operational transition while maintaining an uncompromising focus on health, safety and the environment. This pour reflects the strength of our mine, the quality of our people and the disciplined plan we are now putting into action to stabilize operations, drive performance and unlock meaningful long-term value."

Orla Discovers High-grade Oxide Ore at South Carlin

Orla Mining Ltd. announced results from its 2025 exploration program at the South Carlin Complex in Nevada. The 18,000-meter drilling campaign delivered significant oxide intercepts outside current pit designs and advanced multiple satellite targets, reinforcing resource growth potential across the company's extensive land package along the prolific Carlin Trend ahead of planned 2028 production.

Orla is also advancing the South Railroad Project, located within the South Carlin Complex. South Railroad is in final permitting, with an optimized feasibility study due early in the first quarter of 2026, construction is expected to begin mid-2026, and first production in 2028.

"The South Carlin Complex is advancing rapidly and remains early in its exploration life. These results provide a strong foundation for resource growth that we expect to capture in future studies, and position South Railroad as a cornerstone asset on the Carlin Trend," said Sylvain Guerard, senior VP, exploration.

The South Carlin Complex hosts reserves and resources of 1.604 Moz and

(Continued on p. 18)

Bars of gold dore at the Hemlo mine in Marathon, Ontario.

Clayton Walker

Jim Coates

Clayton Walker is retiring as the COO for *Rio Tinto*'s copper product group after a 25-year tenure. Walker was responsible for overseeing operations and projects across the Americas, including Rio Tinto Kennecott and Resolution Copper. He has dedicated his career to driving safety, operational excellence, innovation and sustainability in the mining and metals industry, with over 25 years of experience in a variety of operational, commercial, business development and senior leadership roles across commodities and businesses in the Americas, Australia, Europe and Asia.

Yukon Metals Corp.'s board of directors has appointed **Jim Coates** (current executive vice president and a director of the company) as interim CEO, effective immediately. Coates replaces **Rory Quinn,** who resigned as president, CEO and a director of the company. The board will initiate a search for a successor CEO.

Loreto Silva

Barrick Mining Corp. announced that **Ben van Beurden** has stepped down as a director of the board and lead independent director. **Loreto Silva,** a current non-executive director, will succeed as lead independent director.

Jim Norine

Tim Kahl

Dustin Rissmiller

Joe Fazzini

Perpetua Resources Corp. announced key additions to the company's leadership team, welcoming **Jim Norine** as senior vice president projects, **Tim Kahl** as senior vice president technical services, **Dustin Rissmiller** as vice president human resources and **Joe Fazzini** as vice president investor relations. Norine has more than 25 years of experience in project construction and engineering between leadership roles at Hatch Engineering, Ltd., Ausenco Engineering USA, Sundt Construction and M3 Engineering. Kahl joins with more than 30 years of experience in design, construction, commissioning and operating complex mining and process operations, previously serving the general manager of operations for the Peñasquito mine in Mexico and the process manager for the Pueblo Viejo mine in the Dominican Republic. Rissmiller brings vast experience in building and managing teams across mining and energy projects in domestic and international settings. Fazzini, CA, CPA, CFA joins after 15 years working in both corporate and capital markets roles. Concurrently, **Michael Wright,** vice president of projects, submitted his resignation.

Carl DeLuca

Lindsay Newton

Mike Tsafaras

Hemlo Mining Corp. announced several additions to its corporate leadership team, including **Carl DeLuca** as the general counsel and corporate secretary, **Lindsay Newton** as the vice president of finance and **Mike Tsafaras** as the vice president of engineering and projects. DeLuca brings more than 25 years of legal and public company experience, serving as general counsel and corporate secretary of Li-Cycle Holdings Corp., the same role at Detour Gold Corp., various senior legal positions at Vale S.A.'s global base metals business and as a director of Magna Mining Corp. Newton brings nearly 20 years of financial leadership experience in the mining and natural resources sector, with previous senior finance roles at Li-Cycle Holdings Corp., Sherritt International Corp., Harte Gold Corp., Detour Gold Corp. and Kinross Gold Corp. Tsafaras is a mining engineer with nearly two decades of experience in both underground and open-pit operations, with previously held senior engineering and leadership roles at Hudbay Minerals, Barrick and Eldorado Gold.

David Stewart

David Stewart, P.Eng., will serve as the new vice president, capital markets and strategy, at *Minera Alamos*. Stewart is a mining engineer with 15 years of progressive leadership in the mining sector, most recently holding the position of vice president corporate development and investor relations at Omai Gold Mines Corp.

Iván Arriagada

ICMM announced the re-election of **Iván Arriagada,** CEO of Antofagasta PLC, as chair, effective immediately for a two-year term. Arriagada will succeed **Tom Palmer,** CEO of Newmont, who became chair in October 2024, and will retire from Newmont at the end of 2025. Arriagada previously served as Chair from 2022 to 2024.

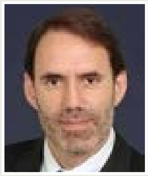
Cove Kaz Capital Group LLC appointed **Dominic Heaton** as CEO. Heaton previously led the team that built the Nui Phao integrated tungsten mine and refinery in Vietnam – the largest tungsten operation currently in production outside China. Going forward, he will lead Cove Kaz's development program for the Severniy Katpar tungsten project in partnership with Kazakhstan's national mining company, JSC Tau-Ken Samruk.

Greg Field

The board of *Deep Yellow Ltd*. announced that **Greg Field** will take on the role of CEO and managing director, commencing no later than May 1, 2026, succeeding former managing director and CEO, **John Borshoff.** Over a 29-year career in the resources sector, Field has gained extensive experience across operations and project studies, including experience as the managing director – project development at Rio Tinto.

Patrick McGrath

Patrick McGrath will serve as the new CFO of *Fortune Bay Corp*., succeeding **Sarah Oliver.** McGrath is a seasoned finance executive with over 25 years of experience in the resource industry. He has held senior leadership roles in multiple public companies, most recently as CEO of Blue Moon Metals Inc., and previously as CFO and later CEO of Hemlo Mining Corp., then known as Carcetti Capital Corp.



Robert Boisjoli

Lomiko Metals Inc. appointed **Robert Boisjoli** as the new CFO, effective immediately, replacing outgoing CFO **Jacqueline Michael.** Boisjoli is the managing director of Atwater Financial Group and an advisor to various public exploration companies.

Brian Imrie

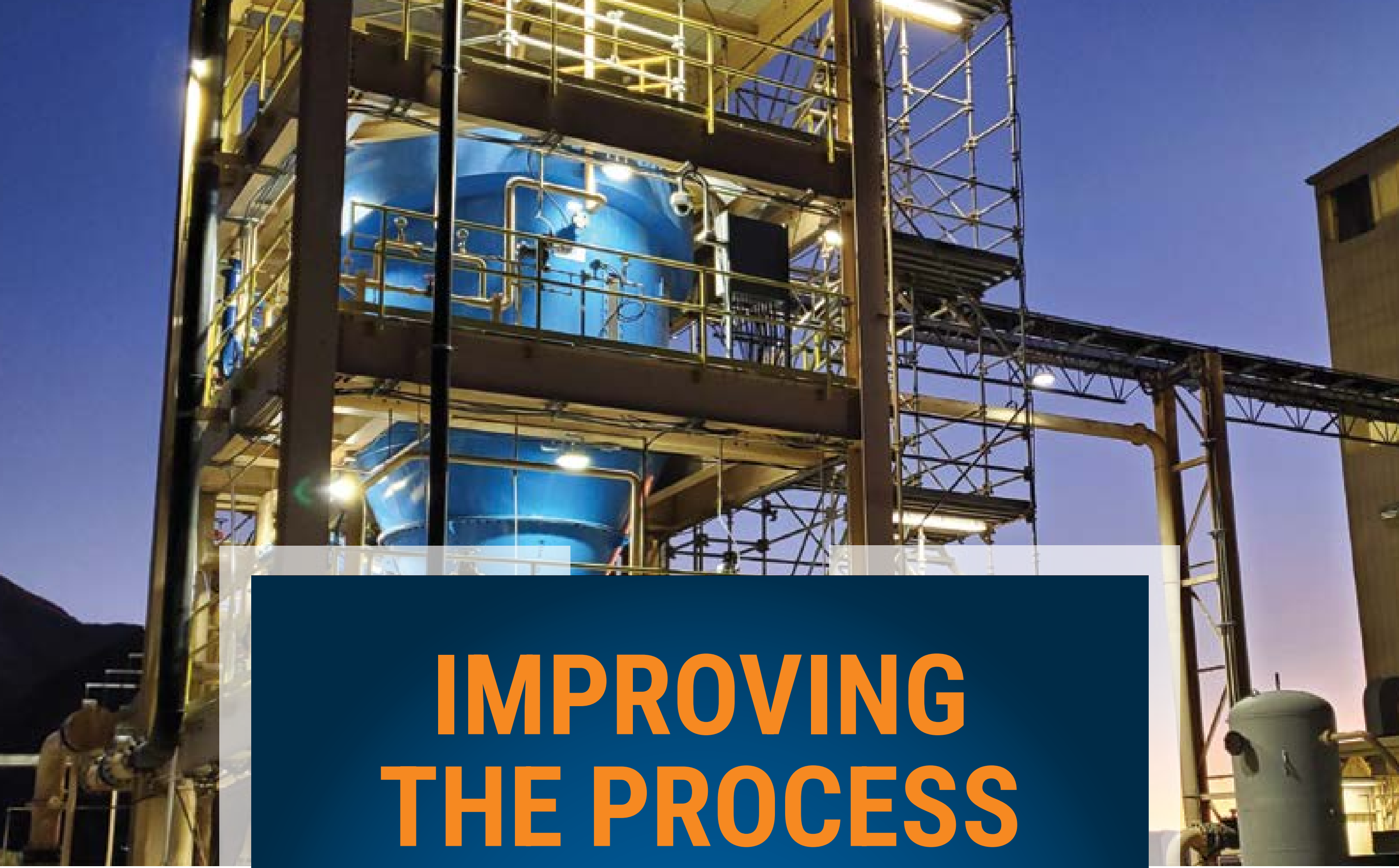
Sherritt International Corp. announced **Brian Imrie** has been appointed chair of the board, effective immediately. Imrie brings extensive leadership, capital markets and mining-sector experience, currently serving as executive chair at PPX Mining Corp. and as a director of Snow Lake Resources Ltd. Concurrently with Imrie's appointment, **Leon Binedell** is stepping down as executive chair, and **Shelley Brown** is stepping down as lead director, while both remaining on the board as directors.

Wendi Cooksey

FLSmidth appointed **Wendi Cooksey** as its new global lab manager. Cooksey began with the company in 2016 and brings 20 years of management and engineering experience in the minerals industry. Her background includes engineering, construction, start-ups, testing and operations with extensive international assignments in Mali, Brazil, French Guiana, the Dominican Republic and Canada.

Brian Gilbertson

Brian Gilbertson, the dealmaker who helped marshal the 2001 merger of *Billiton* with mining giant *BHP*, died in mid-December at the age of 82. He served as CEO before his departure in 2003. Gilbertson passed away at his home in South Africa after a long illness, his family said in a statement. He's survived by his wife Rensche, sons Quinton and Sean, and five grandchildren.



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Codelco, SQM Launch NovaAndino Litio

Chile takes decisive action on future lithium production. The country's state-owned copper company, Codelco, and SQM have formed a joint venture, NovaAndino Litio (NewAndean Lithium), to further develop lithium production from Chile's Salar de Atacama (Atacama salt flats).

The JV recently inaugurated its corporate governance and formed its first board, after completing all legal and regulatory reviews in Chile and abroad. The NovaAndino Litio board members include Maximo Pacheco, chairman (also Codelco Chairman); Ricardo Rames, vice chairman (also SQM CEO); Josefina Montenegro, director (Codelco); Afredo Moreno, director (Codelco); Manuel Ovalle, director (SQM); and Hernan Uribe, director (SQM). Carlos Díaz, the current general manager of SQM, was appointed general manager of NovaAndino Litio, and Eduardo Foix was appointed its CFO.

"As of today, Codelco is a company that produces copper and lithium, and with this, we are positioning Chile as a leader in the energy transition and decarbonization of the economy," Pacheco said.

The JV establishment culminates a process that began in May 2023, when negotiations between Codelco and SQM formally began within the framework for Chile's National Lithium Strategy, Pacheco explained. The two companies signed a partnership agreement in May 2024, which established a roadmap that would ensure legal certainty, as far as obtaining regulatory and sustainability approvals, as well as creating value for the Chilean government.

Between 2025 and 2030, Chile will receive up to 70% of the operating margin associated with new production, and from 2031 onwards, this return will reach up to 85% through payments to Corfo, taxes and profits for Codelco.

NovaAndino Litio inaugurated its board on January 6, 2026. (Photo: Codelco)

Buenaventura Produces Its First Dore Bar at San Gabriel

Compañia de Minas Buenaventura S.A.A., Peru's largest publicly-traded precious metals mining company, announced that San Gabriel has produced its first dore bar as part of the commissioning tests. This milestone was achieved in line with the planned timeline, and the company is progressing toward concluding the necessary arrangements with the Ministry of Energy and Mines to initiate full-scale production and commercialization.

San Gabriel is an underground gold and silver mining project located in the district of Ichuña, Sánchez Cerro province, Moquegua region. The start-up of operations at San Gabriel, Buenaventura's new flagship, will enable the company to replace production from depleting mines.

As previously announced, San Gabriel is on track to reach a processing rate of 2,000 tons per day (t/d) in 2026, within a nameplate capacity of 3,000 t/d. Production guidance for 2026 is estimated at 70,000 to 80,000 ounces of gold.

First Quantum Sells Cobre Las Cruces Mine

First Quantum Minerals Ltd. announced that its wholly-owned subsidiary, Cobre Las Cruces S.A.U., has entered into a binding agreement to sell the Las Cruces mine in Spain for consideration of up to $190 million plus a profitability-linked earn-out provision to Global Panduro, S.L.U., a company controlled by funds managed by Resource Capital Funds. The transaction paves the way for Global Panduro to develop the Las Cruces polymetallic primary sulphide project.

Cobre Las Cruces operates a high-grade open-pit copper mine and a hydrometallurgical plant, producing London Metal Exchange-Grade A copper cathodes as its final product. In 2020, the mining of the secondary sulphide ore deposit was completed, and production continued through the processing of tailings. In July 2023, the operation transitioned to a care and maintenance phase, marking a shift toward future underground mining projects and the development of the polymetallic refinery to produce copper, zinc, lead and silver.

Under the terms of the transaction, Global Panduro will acquire Las Cruces for a consideration comprising $45 million in cash at closing, issue of an approximately $65 million loan note to the seller, up to $80 million in deferred payments tied to certain project development milestones and a further contingent deferred earn-out payment or payments tied to exit and liquidity events of 10% of the proceeds over and above an agreed internal rate of return threshold.

The transaction is subject to certain customary conditions and regulatory approvals and is expected to close during the first half of 2026.

Glencore Buys Quechua Project

Glencore Peru Holding, a Peruvian entity controlled by Glencore, has announced the acquisition of 100% of the shares of Compañía Minera Quechua S.A., including full ownership of the Quechua copper project located in Espinar, Cusco.

"The addition of the Quechua project to our portfolio further expands our investment in Espinar. More importantly, the project has the potential to support our Antapaccay mine, given its close proximity to the operation and its Coroccohuayco project," said Luis Rivera, COO of South America at Glencore.

"The area is highly mineralized, offering volume upside and longevity," said Jon Evans, Industrial Lead Copper at Glencore.

Harmony Approves Eva Copper Project

Harmony Gold completed the updated feasibility study and the company's board has approved the final investment decision for the Eva copper project in Queensland, Australia.

Since acquiring the project in October 2022, Harmony Gold has increased mineral resources and mineral reserves with 166,000 m of resource definition drilling. The proposed low strip ratio open pit development is expected to produce approximately 65,000 metric tons per year (mt/y) of copper in concentrate during the first five years, with an expected life-of-mine average production profile of around 60,000 mt/y of copper and 19,000 oz/y of gold. This will be achieved by processing on average 18 million mt/y of ore over its currently estimated 15-year mine life, with an all-in sustaining cost of approximately $2.50/lb for copper, including by product credits.

"Over the past three years, we have received strong support from the Queensland Government and key stakeholders as we systematically de-risked this project, driving resource and reserve expansion at exceptionally low discovery costs and unlocking further upside potential. In addition to our significant gold production, our two Australian copper assets are expected to deliver a combined total of approximately 100,000 mt of copper annually once fully commissioned," said Beyers Nel, CEO, Harmony Gold.

Project capital is estimated at $1.55 billion to $1.75 billion. The company says the capital profile remains highly manageable, with expenditure phased over a three-year construction period. First production is estimated to commence in H2 2028.

Harmony Gold's Eva copper project, an iron oxide-copper gold resource, is set to become the largest copper mine in northwest Queensland, Australia.

MinRes's Lamb Creek Iron Ore Project is Underway

Mineral Resources (MinRes) broke ground at its Lamb Creek iron ore project, part of the company's Pilbara Hub in the Pilbara region, Western Australia. Lamb Creek will be an open-pit mine with a capacity of 7.5 million metric tons per year and is expected to extend Pilbara Hub's current production profile by over five years, with an improved cost profile.

MinRes' in-house engineering and construction teams have commenced construction of the mine and supporting infrastructure, including a 16 km haul road and crushing plant. The company says that this unique internal capability will help fast-track speed to market, with first ore from Lamb Creek targeted in Q4 FY26.

The operation is located 50 km from the business's Iron Valley operation, with product from both sites to be blended and hauled to Utah Point for export through the Port of Port Hedland.

MinRes Chief Executive Iron Ore Chris Soccio said: "Developing Lamb Creek supports our five-year outlook for the Pilbara Hub, which plays an important role in our iron ore portfolio. I extend my thanks to the countless MinRes staff who have played a role in bringing Lamb Creek to life — for many, this project has taken years of hard work, approvals and planning. It's also important to acknowledge the Traditional Owners of the lands where Lamb Creek sits — the Banjima People — with whom we have a strong relationship thanks to early and ongoing consultation."

The development of Lamb Creek also involves the winding down of the current Wonmunna iron ore operation. According to MinRes, all Wonmunna-based staff will transfer to Lamb Creek once it is operational, with no anticipated impact on jobs.

OceanaGold Receives Permit Approval for the Waihi North Project

OceanaGold Corp. announced that the Expert Panel appointed by the New Zealand government to consider permitting of the Waihi North Project (WNP) is now officially permitted to develop and operate WNP, which includes the high-grade Wharekirauponga Underground mine (WUG), located about 10 kilometers (km) North of the company's Waihi operation in New Zealand.

This permit approval includes the development of WUG and the associated surface infrastructure, expansion of the current processing plant and water treatment plant and construction of a new tailings storage facility. The OceanaGold board has approved the selection of the mining contractor for the tunnelling of the underground mine, plus the awarding of contracts for bulk earthworks at the Willows portal site and a power upgrade project. The mining contractor is expected to mobilize and begin tunnelling in the first half of 2026.

The permit also allows an increase in the number of exploration drill pads and a doubling of the allowable drill rigs to six, which will allow the company to further accelerate both definition and conversion drilling at Wharekiraupongain 2026 and beyond.

Gerard Bond, president and CEO of OceanaGold, said: "We are delighted to have received approval for our Waihi North Project, which allows access to one of the best undeveloped, high-grade orebodies in our industry. The development of WNP will provide meaningful gold production for years to come while bringing substantial investment, job creation and economic and biodiversity benefits for the surrounding communities and New Zealand."

Russian Mining Industry Navigates Turbulent Geopolitical Waters

By Vladislav Vorotnikov

Caught between the hammer of Western sanctions and the anvil of the worsening macroeconomic situation at home, the Russian mining industry shows mixed dynamics. The Russian gold mining industry has remained stagnant over the last two years, according to calculations by Zolteh, a Moscow-based think tank focused on gold mining. In 2024, Russia produced 345 metric tons (mt) of gold, almost as much as the previous year. Over the last three years, the Russian mining industry has become less transparent.

The Russian Finance Ministry, the state statistical service Rosstat and the Union of Gold Miners suspended publication of gold mining data to safeguard the industry from sanctions. In 2021, the last time the official figures were released, the Russian government estimated the figure at 346.2 mt.

In 2023, the Russian state geological service, Rosnedra, forecasted that Russian gold production could rise to 600 mt per year in 2030 under a base case and to 700 mt per year under an optimistic scenario. However, there are currently no new gold mining projects on the horizon with capacities sufficient to facilitate such growth. Additionally, six of the 10 largest gold mining companies in Russia saw output decline in 2024, according to Zolteh.

The Russian gold mining industry is plagued by a persistent labor shortage and substantial technical challenges, Mikhail Leskov, Zolteh director, admitted. A lack of access to Western mining technologies results in a surge in operating costs, though an import-replacement campaign in the industry is bearing certain fruits, Leskov added.

The Russian coal industry appears to be the main loser in the sanctions war with the West. According to Rosstat, combined coal industry losses tripled in 2025 compared with the previous year, reaching a stunning $13 million per day.

Despite the headwinds, the Russian coal industry is holding up. During the first 10 months of 2025, Russian coal production rose by 0.1% year on year to 351 million mt. Following years of turbulence, Russian coal exports are also bouncing back in 2025. During the first nine months of the year, sales to foreign customers grew by 5.5% to 157 million mt.

Despite this, the Russian coal industry's revenue is projected to decline by 12% to $20.1 billion in 2025 compared with the previous year, according to Neft Research, a Moscow-based energy industry think tank. Neft Research analysts also forecast a 3% drop in exports to 189 million mt, as most miners in Kuzbass, the key coal basin, sell coal at a loss – a practice that cannot be maintained for long.

Not every segment of the Russian mining industry is doing poorly. For example, Rusal, the Russian aluminum giant, saw its net profit skyrocket to $2.1 billion during the first nine months of 2025, compared with only $39 million during the same period of the previous year.

Rusal had a hard time the last several years, losing its Nikolaev alumina plant in Ukraine and seeing its logistics disrupted by sweeping sanctions imposed by the USA and EU against the Russian economy. However, the company is back on its feet, pursuing business diversification with a $259 million investment in Bitcoin mining capacity in Siberia, among other things. Despite this, the prospects for the launch of the Ust-Luga alumina plant, with a nameplate capacity of 4.8 million mt/y scheduled for 2028, remain vague. Recently, there has been little information about this project, which is estimated to cost around $4 billion.

A lack of Western technologies is also taking a toll on the Russian metal production. During the first nine months of 2025, Russian metal giant Norilsk Nickel saw a 4% decline in nickel production to 140,000 mt. Copper production went down by 4% to 313,000 mt, palladium production dropped by 6% to 2 million ounces (oz) and platinum declined 7% to 484,000 oz.

"This adjustment was driven by a temporary decrease in ore production volumes due to the gradual transition to new mining equipment in the Norilsk division as part of the ongoing import substitution strategy, a change in the composition of mined ore — an increase in the share of disseminated ore," Norilsk Nickel's vice president told local press.

In 2024, Norilsk Nickel also downsized its investment program by 20% to $2.4 billion due to a mix of macroeconomic factors. This is a common strategy in the Russian mining industry, as most companies remain cautious with their investment plans, mainly due to uncertainty about the looming Russian economic recession and the signing of a Ukrainian peace deal.

Russia's mining industry navigates sanctions and economic strain with uneven results across gold, coal and metals. (Photo: Polymetal)

Polyhalite Conveyor Tunnel Over 80% Complete

By Nia Kajastie, European Editor

Anglo American and tunneling contractor Strabag have made progress on the

Miners celebrate progress on the Mineral Transport System (MTS) tunnel at the Polyhalite mine in the U.K. (Photo: Anglo)

Mineral Transport System (MTS) tunnel for the $9 billion Woodsmith polyhalite project in North Yorkshire, UK. At full production, Anglo is targeting an output of 13 million metric tons (mt) per year.

Earlier this month, a Herrenknecht single-shield tunnel boring machine (TBM), named *Stella Rose*, passed the 30 km (18.6 miles) milestone, leaving less than 20% of the 37 km (23 miles) MTS tunnel to be completed. Since reaching 25.8 km (16 miles) in December 2023, the tunnel has held the record for the world's longest single-drive tunnel excavated by a single TBM. Tunneling originally began in April 2019, when the project was still owned by Sirius Minerals.

The tunnel has a maximum depth of approximately 400 m (1,312 ft) below ground level and is being driven through the Redcar Mudstone Formation. It will house a conveyor belt designed to transport polyhalite from the project site near Whitby to a processing facility at Wilton, near Teesside. The polyhalite deposit — a natural mineral fertilizer product containing potassium, sulphur, magnesium and calcium — lies under the North York Moors National Park. With a mineral resource exceeding 2 billion mt, it is the largest known high-grade polyhalite deposit in the world.

In May 2024, the project's development was rephased as part of Anglo's new strategy to deliver better value for investors. As a result, TBM advance rates were reduced, and shaft sinking on the project's 1.6 km (1 mile) deep production shaft was paused. Redpath Deilmann is in charge of sinking the project's production and service shafts, both to the same depth, using two Herrenknecht Shaft Boring Roadheaders (SBRs).

In its Half Year Results 2025 presentation, Anglo said that the "three key conditions for a potential project restart" include completion of studies to embed optimization opportunities and learnings from the SBRs progress in the hard Sherwood Sandstone strata, positive engagement with potential syndication partners and continued balance sheet deleveraging, to be strengthened by transaction proceeds.

Redpath Deilmann's SBR entered the Sherwood Sandstone formation after passing the halfway point on the service shaft toward the end of 2024. Progress through the formation was expected to be slow, and any delays could significantly extend the timeline to first production. Among other things, Redpath Deilmann and Herrenknecht tested synthetic diamond cutting tools as a potential solution.

In July, during the Half Year Results 2025 Q&A, Duncan Wanblad, CEO and executive director of Anglo, commented on the lessons learned up to that point: "We had a base case plan that said that we could navigate this at around about a meter a day. And if you could only do half a meter a day, you could add a year to the first production date of the project. If you were able to progress at two meters a day, of course, you make massive capital savings."

He added: "When we started off on this thing, we had a really difficult time with the picks on the head — so just like a head on a continuous miner. The rock was so hard, it was beating the picks up, but then we did a lot of work with De Beers and ended up with lab-grown diamonds as one of the abrasives in the pick. I just can't think of a better use of lab-grown diamonds, and the penetration rates improved phenomenally.

The 14th Nordic Exploration Award 2025

RMG Consulting presented the14th Nordic Exploration Award 2025 to Stefan Bernstein for his relentless work to expand the mineral resources in Greenland. The award was presented to Bernstein during the Autumn Summit organized by Svemin (The Swedish Association for Mines, Mineral and Metal Producers) held in Stockholm on November 25th.

Bernstein has worked with Greenland geology since 1987. As an employee of GEUS (The Geological Survey of Denmark and Greenland), he has been involved in the discovery and description of several famous deposits in Greenland, such as the Skaergaard Intrusion's Platinova Reef (1988-1990); stratabound PGE mineralization at the Kap Edvard Holm Complex (1989-1991), the Citronen Fjord Pb-Zn deposit (1993) and the Disko Bay Diamond Province (2007-2009). He was the initiator of Avannaa Resources. Since 2022, he has been CEO of GreenRoc Mining, where he is the prime mover of the Amitsoq graphite project in South Greenland.

Magnus Ericsson (left) presents Stefan Bernstein with the 2025 Nordic Exploration Award. (Photo: RMG)

Komoa Smelts First Copper Anode

Ivanhoe Mines announced that the first copper anodes were produced by Kamoa-Kakula's on-site, state-of-the-art 500,000 metric-ton-per-year (mt/y), direct-to-blister copper smelter on December 29, 2025, approximately five weeks after the commencement of the smelter's heat-up and one week after the first feed of concentrate. Located in the Democratic Republic of Congo (DRC), the smelter also produced its first batch of by-product sulphuric acid. The smelter is expected to produce up to 700,000 mt/y of high-strength sulphuric acid at steady-state operations, which will be sold locally.

"This achievement is the culmination of a $1.1 billion investment, 18 million man-hours of disciplined execution and an outstanding health and safety record that reflects the professionalism and commitment of everyone involved," said Robert Friedland, founder and executive co-chairman, Ivanhoe Mines.

The ramp-up of the smelter will continue throughout 2026, with completion expected toward year-end. Kamoa-Kakula's copper production is estimated at between 380,000 and 420,000 mt of copper in 2026, with the mid-point of 400,000 mt of copper representing approximately 80% of the smelter's total capacity. Its margins are expected to expand as the smelter ramps up, as concentrates produced by Phase 1, 2 and 3 concentrators are smelted on-site, rather than being exported unbeneficiated.

The company says that Stage Two dewatering activities are complete, with the first pair of high-capacity submersible dewatering pumps (Pumps 3 and 4) running dry. Stage Three dewatering activities will take over from Stage Two dewatering and consist of re-commissioning the existing, water-damaged underground horizontal pump stations. Stage Three dewatering activities are expected to continue into Q2 2026 and will not be on the critical path for Kakula's mining operations.

In addition, the western side of the Kakula mine has been dewatered, enabling the mining of higher-grade areas. Head grades from mining areas on the western side of Kakula are expected to increase from 3.5% copper in January to approximately 4.0% copper by the end of Q1 2026. Selective mining on the eastern side of the Kakula mine began ahead of schedule at the end of December.

Ivanhoe commemorated the start-up of the smelter with a ceremony known as a lwanzo lwa mikuba. Chief Musokantanda Sabuni Kafweku provided a blessing, and passed a traditional flame to Friedland, who lit the smelter furnace.

"From a site where we first discovered high-grade copper in 2008, we now harness a fire blessed by tradition to power a facility that will set a new global standard for copper smelting," Friedland said.

Speaking of power, the facility will draw power from the DRC grid, which has had availability issues. While the company has made a significant investment in a nearby hydroelectric facility, it also maintains a backup set of diesel generators for the smelter and the Kamoa-Kakula copper complex.

Ivanhoe previously announced that the first 50 megawatts (MW) of hydroelectric power from the newly refurbished 178-MW Turbine No. 5 at the Inga II dam is now being received at the Kamoa-Kakula complex. The feed is expected to increase to 100 MW in Q1 2026 and then rise to 150 MW as grid improvements are completed.

The smelter heat-up commenced as the installation of the uninterruptible power supply (UPS) facility nears completion. The 60-MW UPS is designed to provide up to two hours of instantaneous back-up power to the smelter, protecting the operation from voltage fluctuations in the domestic DRC grid. In addition to the UPS, Kamoa-Kakula has, in total, approximately 180 MW of on-site diesel-powered back-up generator capacity.

A view over the casting wheels during the first batch of anodes produced by the Kamoa-Kakula Copper Smelter on December 29, 2025. (Photo: Ivanhoe Mines)

West Wits Begins Mining at Qala Shallows

West Wits Mining Ltd. announced that first ore from Qala Shallows was successfully delivered to the surface in mid-October 2025, marking the beginning of stockpiling ahead of planned processing at Sibanye-Stillwater's Ezulwini Plant. West Wits says it remains on track to deliver 30,000 metric tons (mt) of ore by March 2026, coinciding with the commencement of toll treatment and first gold pour.

The company also achieved a key technical milestone with the first blast on the main decline, which will become primary access to future production areas.

Core Natural Resources Resumes Longwall Mining at Leer South

The Core team recovered, repositioned and restarted the longwall, and sealed the affected area of the Leer South mine.

Core Natural Resources announced that it resumed longwall operations at its Leer South metallurgical mine in Barbour County, W.Va. The longwall system had been idle since January 13, 2025, when combustion-related activity was detected in a previously mined area.

In addition, Core announced that its West Elk longwall mine in Colorado is now executing at consistent productivity levels following a period of transition associated with its move to the B-Seam, and Core expects that improved performance to continue in future periods.

"Leer South is a highly strategic asset, and we fully expect this world-class operation to execute at a high level in 2026 and beyond. While the issues at Leer South and West Elk adversely affected Core's performance in 2025, we are looking forward to strong cost improvement and profitability at both these operations going forward," said Jimmy Brock, Core's chairman and CEO.

The Core team successfully recovered the major mining equipment at Leer South, including the 209 hydraulic shields, face conveyor, shearer, stage loader, crusher and power system. The company said that the equipment was generally in good condition, with limited damage despite the prolonged period of inactivity. Following the repositioning of the longwall system, the operations team permanently sealed the affected area of the Leer South mine, effectively eliminating any potential future issues associated with this combustion event.

"The Core operations team has displayed tremendous professionalism, dedication, and — most importantly — the highest commitment to safety throughout this process at Leer South," said George Schuller Jr., Core's senior VP and COO. "We expect Leer South to enter 2026 fully ramped and operating efficiently, with an exceptionally strong outlook for operational excellence going forward."

In aggregate, Core expects a significant step-up in its financial performance in 2026 due to the restart at Leer South, the much-improved geological conditions at West Elk, the substantial insurance recoveries stemming principally from the combustion event at Leer South, the cessation of the fire-suppression and idling costs at Leer South and the full-year benefit of substantial and ongoing merger-related synergies.

EIA Sends Mixed Messages With Short-term Energy Outlook

The U.S. Energy Information Administration (EIA) released its Short-Term Energy Outlook (STEO) on December 9, 2025. The EIA said it expects coal consumption to increase by 9% in 2025, driven by an 11% increase in coal consumption in the electric power sector this year as both natural gas costs and electricity demand increased. Despite reports that power generation from intermittent sources has reached a plateau, the agency is predicting that "coal consumption will fall in 2026 as electric power generation from renewable sources increases. However, coal production falls by less than consumption next year, supporting a small increase in coal exports and rising coal inventories."

The general rule of thumb is that coal is competitive with natural gas when gas prices are greater than $2 per million BTU (MMBtu). The Henry Hub natural gas spot price in the EIA forecast rises to an average of almost $4.30/MMBtu this winter (November– March), more than $0.40/MMBtu higher than it forecast in its November STEO. The revision is driven primarily by colder- than-expected weather in December.

However, the agency believes that "milder- than-normal weather" in early 2026 and rising production will help moderate natural gas prices, and the Henry Hub price will average $4/MMBtu next year. The STEO forecasts that U.S. electricity generation by the power sector will grow by 2.4% in 2025 and by 1.7% in 2026.

This growth, according to EIA, contrasts with relatively flat generation from 2010 to 2020 and is primarily driven by increasing demand from large customers, including data centers, concentrated in regions managed by the Electric Reliability Council of Texas and the PJM Interconnection. Those two regions burn a considerable amount of coal. The EIA STEO hedges toward conservative growth in power demand and a belief that power from intermittent sources will continue to grow.

(Regional News-U.S. & Canada - from p. 9)

1.753 Moz, respectively, with a projected eight-year mine life based on the 2022 Feasibility Study. Since the acquisition, Orla has completed 57,800 meters of drilling in 266 holes, systematically building geological understanding and confirming district-scale potential.

Headwater Gold and Centerra Gold to Explore Crane Creek

Headwater Gold Inc. entered into a definitive earn-in agreement with a subsidiary of Centerra Gold Inc. for Centerra to earn 60% interest in Headwater's Crane Creek project in Idaho through staged exploration expenditures totaling up to $25 million during the first three years of the agreement, granting Headwater a royalty on the project. Centerra may earn an additional 10% interest (up to 70%) in the project by completing a preliminary economic assessment (PEA) report.

Caleb Stroup, Headwater's president and CEO, stated: "Centerra's commitment to a substantial multi-stage earn-in underscores the scale of the opportunity at this project and allows us to properly test what we believe is a large, underexplored epithermal system with high-grade potential at depth as well as near-surface bulk-tonnage potential."

The Crane Creek project is located in western Idaho, encompassing an array of mineralized epithermal quartz veins within a broad gold and trace element geochemical anomaly and characteristics of a well-preserved low-sulfidation system, including historical mercury workings, widespread opaline silica and chalcedonic vein fill. The project comprises approximately 1,240 hectares, consisting of 123 unpatented federal mining claims on BLM land, a 640-acre State of Idaho minerals lease and a private lease.

Under the earn-in agreement, Headwater and Centerra will work to finalize an integrated exploration plan that incorporates the recently completed geophysical datasets, historical results and updated geological interpretation. The partners intend to prioritize and refine specific drill targets across the main vein corridor and newly generated structural and alteration targets, to initiate Phase 1 drilling as early as the spring of 2026. The project is fully permitted for drilling under a Notice of Intent with the BLM and a Plan of Operation with the Idaho Department of Lands.

Touquoy Restart to Proceed to Permitting

St Barbara Ltd. recently completed a study for the proposed restart of Touquoy. The study demonstrates an investment case for a near-term, low capital restart with excellent project economics at a proven, low-cost operation.

The Touquoy Restart Project is designed to produce gold from the processing of existing medium- and low-grade stockpiles through the existing Touquoy processing plant, utilizing the open pit for in-pit tailings deposition.

Touquoy operations ceased in 2023 with approximately 3.1 million metric tons of ore in stockpile, because permits could not be obtained in time for continued production. The processing plant has been maintained in a state of 'hot' care and maintenance in preparation for future use as part of the 15-Mile Project and can be readily returned to production.

Managing Director and CEO of St Barbara, Andrew Strelein, stated: "The improved permitting environment in Nova Scotia, combined with a clear and constructive regulatory process, has created the opportunity for Touquoy to return to production in a responsible and timely manner. The renewed support for natural resource development in Nova Scotia, with the improved permitting environment, gives St Barbara a clear pathway back into operations in the Province."

Leveraging existing infrastructure requires low capital investment and compresses construction timelines, enabling an anticipated six-month construction period. The planned 13-month operating period is expected to generate positive cash flow ahead of the proposed timing for demobilizing the processing facilities for relocation and construction of the 15-Mile Processing Hub project.

The company says that reclamation activities at Touquoy will continue as planned, with a focus on completing the Tailings Management Facility cover system. Processing of the stockpiles removes this above-ground material for processing and storage of the resulting tailings deep below the water line within the Touquoy open pit. The potential for a future closed-loop pumped hydro renewable energy project at Touquoy also remains unchanged, with pit lake volumes and water quality still more than sufficient to allow for that development possibility.

NEWS - CALENDAR OF EVENTS

FEBRUARY 9-12, 2026: **Mining Indaba, CTICC, Cape Town, South Africa.** Contact: Web: www.miningindaba.com.

FEBRUARY 22-25, 2026: **MINEXCHANGE The annual conference of the Society for Mining, Metallurgy and Exploration (SME), Salt Palace Convention Center, Salt Lake City, Utah, USA.** Contact: Web: https://smeannualconference.org/.

MARCH 1-4, 2026: **The annual meeting of the Prospectors & Developers Association of Canada (PDAC), Toronto Metro Convention Center, Toronto, Canada.** Contact: Web: https://pdac.ca/convention-2026.

MAY 3-6, 2026: **CIM CONNECT Annual meeting of the Canadian Institute for Mining, Vancouver Convention Centre, Vancouver, Canada.** Contact: Web: https://cim.org.

MAY 5-7, 2026: **2026 GRX26 (Global Resources Innovation Expo), Perth, Australia.** Contact: Web: grx.au.

MAY 26-28, 2026: **Euro Mine Expo, Kraft Center, Skellefteå, Sweden.** Contact: Web: www.euromineexpo.com.

JUNE 3-6, 2026: **Elko Mining, Elko Convention Center, Elko, Nevada, USA.** Contact: Web: https://exploreelko.com/top-events/elko-mining-expo/.

JUNE 24-26, 2026: **World Mining Congress, Lima Peru.** Contact: Web: https://wmc2026.org/.

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Automation Helps Operations Achieve KPIs

Remote-, autonomous- and semi-autonomous-control technologies may offer a competitive advantage to mines willing to innovate

Jesse Morton, Technical Writer

Global consulting firm McKinsey reported that over the last two decades, while some other sectors saw productivity increase by 150% due to innovation and technology, "mining saw its productivity decrease by half." Declining grades, deeper mines and logistics challenges "have pushed many mines below historic performance curves." Meanwhile, demand for metals and minerals rose.

Currently, however, the industry is benefiting "from emerging innovation tailwinds," the firm said. Adoption of AI, automation and robotics has "resulted in high-impact mining subsectors showing high potential for innovation specifically within typically bottlenecked steps in the mining value chain, including loading and hauling, comminution and processing."

The firm advises that miners take a targeted approach. First, determine the core priorities, and then focus on the topmost critical one, perhaps even at the expense of others. "Leaders have to identify the right critical business problem to solve, dedicate the right leadership and set an ambitious 'North Star' grounded in the physics of the process."

For a minority of mines, their geology almost guarantees success, with or without meaningful innovation, the firm said. "For everyone else, winning in innovation will be critical to moving down the cost curve and creating competitive advantage."

Translating that fact from abstraction into action will likely require more than just tough leadership choices and effective process change management. It will require partnering with the right equipment and technology suppliers. A few headlines from the space reveal some of the top prospective partners.

RCT Automates Loaders for NSW Gold Miner

RCT Powered by Epiroc said it automated four new Sandvik LH621i loaders with AutoNav at a gold mine in New South Wales. The loaders doubled the size of the existing Sandvik loader fleet, which was equipped with AutoNav years ago.

Inside an AutoNav Centre, where a Cat dozer is controlled. (Photo: RCT Powered by Epiroc)

RCT said the fleet delivered "years of strong results," prompting the recent adoption. "When the site purchased four more machines to add to their fleet, the decision to again choose RCT's proven agnostic automation technology was an easy one."

The fleet is managed from three AutoNav Centres at the mine. Two are on the surface and one is underground.

The miner sought to realize the benefits of standardized automation across the fleet, said RCT Brisbane Branch Manager Owen Perrott. "This includes an increase in productivity across the board, as everyone is familiar with the technology and how it works," he said. "It also streamlines the operator training process."

An expert with RCT described the deployment as seamless. "It really shows the strength of RCT's brand-agnostic and highly scalable automation," said Hari Prakash, product manager, automation and control.

Prakash said the development jibes with a couple trends in the industry. "Mines are increasingly looking for solutions that work across mixed fleets, integrate with existing systems and minimize downtime during rollout," he said. We're also seeing faster adoption in operations facing labor shortages, high production targets, or strict safety demands."

Mines want scalable solutions that produce quick but significant results and that support further automation down the road, Prakash said. "Another major trend is the push toward better data visibility," he said. "Operations want real-time insights into machine behavior, health and productivity to maximize the value of automation."

AutoNav aligns with these trends. Beyond being OEM-agnostic and able to automate repetitive machine tasks, it is scalable. "Most sites don't jump straight to fully autonomous operations, and RCT enables a phased approach," Prakash said. "Many operations begin with tele-remote control for operator safety and efficiency," he said. "From there, sites can add features like autonomous tramming, multi-machine control, or traffic management as they feel ready."

Mines can expand automation "at their own pace," equipping a single machine or a fleet, he said. "This step-by-step path helps mines build confidence, train their workforce and adapt their site processes before moving into higher levels of autonomy."

Some sites will have to make significant changes to accommodate higher levels of autonomy. "Automation works best when supported by good site practices, reliable communications and clear operational workflows," Prakash said. "Highly variable, unstructured environments or tasks requiring complex human judgment can be challenging to fully automate," he said. "Certain site-specific conditions, such as inconsistent draw point shapes, unpredictable rock movement, or limited data infrastructure may require semi-autonomous or operator-assisted modes rather than full automation."

After adopting AutoNav, "miners often see a notable shift in operator roles and overall site efficiency," Prakash said. "Operators move away from hazardous frontline tasks and into safe control-room environments," he said. "Machine utilization improves because automation reduces waiting time and keeps cycles more consistent."

Above, an unmanned Aramine loader navigates a gallery. (Photo: Aramine)

Aramine Co-develops Automated Loaders

Aramine reported three loaders have recently been equipped for autonomous or near-autonomous operation. Two of them are in trials. The company said the loaders represent steps on Aramine's long-term automation journey.

"Nearly a decade ago, the company introduced a partially autonomous version of the L140B, capable of navigating underground galleries independently, while loading and dumping still relied on human intervention," said Marc Melkonian, co-president of the Equipment Division. "Today, the fully autonomous L140B builds on this foundation by enabling operators to supervise operations remotely, safely away from the active mining face, significantly enhancing both safety and working conditions."

Each of the three loaders was equipped for autonomous operability by a third-party partner. The partnerships, among other things, help ensure the loaders meet regulations and expectations.

"Automation remains an evolving field, and applicable standards, particularly in underground mining, are still not fully harmonized," he said. "In this complex landscape, Aramine's ambition is clear: to deliver safe, cost-effective and sustainable solutions that meet both local regulatory requirements and real-world operational needs."

Each partner is an automation leader in the local market "and has a strong understanding of regional customer expectations and regulatory frameworks," he said. "This approach ensures that Aramine's automation solutions are adapted to local standards and operating conditions."

Berlin-based Sensmore was selected by Aramine to retrofit an L140B "with advanced hardware and software, transforming it into a fully intelligent and autonomous machine," Melkonian said. "The upgrade includes a comprehensive sensor suite, which includes cameras, LiDAR and radar." Those sensors integrate with "AI-driven automation software," he said. "This enables the L140B to autonomously perform load, haul and dump cycles without human intervention, operating directly in production environments at customer sites."

Operators remotely assign missions and monitor the progress. "The machine is currently completing its testing phase and is scheduled for deployment in early 2026 at a European mine, following CE certification," he said.

Separately, Aramine partnered with RCT in Australia to equip an L350D with autonomous operability. "This transformation is made possible by Aramine's native software architecture, which already allows machines to be controlled from a remote operator station via radio control," Melkonian said. "Aramine provided a dedicated software update to ensure compatibility with RCT's specifications, which integrate all requirements specific to the Australian market."

On the other side of the planet, Aramine partnered with Hexagon subsidiary HLS on autonomous LHD development. "A diesel mini-loader, the L130D, is currently operating at the Norcat Underground Centre near Sudbury, Canada, where it is being tested in real underground conditions," he said.

The strategic partnerships are "accelerating the company's transition from teleoperation to full automation across global markets," Melkonian said. "By combining robust machine platforms with the expertise of world-class automation partners, Aramine is shaping a new generation of intelligent mining equipment designed not only to meet today's operational challenges, but also to set the standards for tomorrow."

Hexagon Launches Development Optimiser Lite

Hexagon's Mining division introduced the Development Optimiser Lite. An un-

Development Optimiser Lite uses on-boom sensor technology and in-cab intuitive visual displays to guide drill operators so that holes are true to plan. (Photo: Hexagon)

derground mining expert with the supplier described the solution as a smaller, lighter, "more ergonomic" version of the proven OEM-agnostic, plug-and-play, production drilling automation solution.

"The system provides millimeter-precise drilling accuracy by delivering live guidance to drill operators through advanced on-boom sensor technology and in-cab intuitive visual displays, ensuring every blast hole follows exact design specifications," said Andrew Clark, product manager, underground pperations, Hexagon.

Development Optimiser Lite addresses several trending challenges.

It addresses the "persistent gap" between drilling plans and "actual underground execution," he said. "Current drilling practices consistently lack the accuracy needed to ensure drilling follows design specifications, leading to systematic operational problems that compound throughout the mining lifecycle and undermine project economics."

The lack of accuracy typically results from shortcomings in "manual drilling alignment, which results in significant deviations from planned trajectories," Clark said. "When drill operators rely on traditional manual alignment methods, the inherent imprecision creates a cascade of downstream problems."

Deviations from design specifications "lead to inconsistent blast outcomes, as poorly positioned blast holes fail to deliver the controlled fragmentation and profile that mine planners intend," he said. "The consequences manifest as substantial over-break and under-break, compromising tunnel profiles and structural integrity while generating extensive rework requirements."

Costly rework and remediation work "extends development timelines and delays access to ore bodies, directly affecting the project's financial performance," Clark said. "Development Optimiser Lite addresses these challenges through a comprehensive approach centered on precision drilling excellence."

The system's real-time drilling guidance "ensures every hole follows exact design specifications, fundamentally transforming the accuracy and consistency of drilling operations," he said. "Through instant deviation alerts, the technology prevents costly drilling errors before they occur, allowing operators to make immediate corrections rather than discovering problems only after blasting reveals the damage."

Knowing that drilling will be true to plan, "engineers can design with tighter tolerances and eliminate conservative safety margins previously needed to compensate for execution errors," Clark said.

The benefits offered include substantial cost savings. "Operations implementing the technology typically achieve between 20% and 30% reductions in development costs through the elimination of rework and improved operational efficiency," he said.

Because Development Optimiser Lite reduces rework and the wear that puts on rigs, it reduces maintenance costs. "Operations achieve lower total drilling meters by meeting specifications on the first attempt rather than requiring additional drilling to correct deficiencies, while simultaneously minimizing equipment downtime previously consumed by corrective drilling and profile remediation activities," he said.

Development Optimiser Lite can be rapidly deployed. "The system's OEM-agnostic architecture ensures compatibility with virtually any drilling equipment manufacturer," Clark said.

It is designed to operate within and support a "broader mining technology ecosystem, enhancing rather than replacing existing systems," he said. "The platform integrates seamlessly with mine-planning software, including industry-standard tools, enabling direct import of drill designs and export of as-built drilling data."

The system can serve as a bridge to autonomous drilling. "Autonomous drilling requires precise positioning data, standardized execution protocols and validated performance feedback, which is exactly what the system provides today with human operators in control," Clark said.

"Hexagon's RD Link solution currently enables remote operation of production drilling rigs, significantly increasing drilled meters per rig daily by maximizing machine utilization during shift changes and periods when staffed equipment operation isn't feasible," he said. "This gateway technology demonstrates the viability of remote drilling operations and provides the architectural foundation for extending autonomous capabilities to development drilling."

Among other things, the introduction of Development Optimiser Lite reveals the swift pace of research and development at Hexagon. The supplier acquired predecessor technology in early 2022. Later that year, after successful field trials at a gold mine in Western Australia, the supplier launched the Development Optimiser. The first deployment was to a "major contractor in APAC," Clark said. Shortly thereafter, trials began at a mine in North America that, subsequently, implemented the solution "across their entire underground development fleet."

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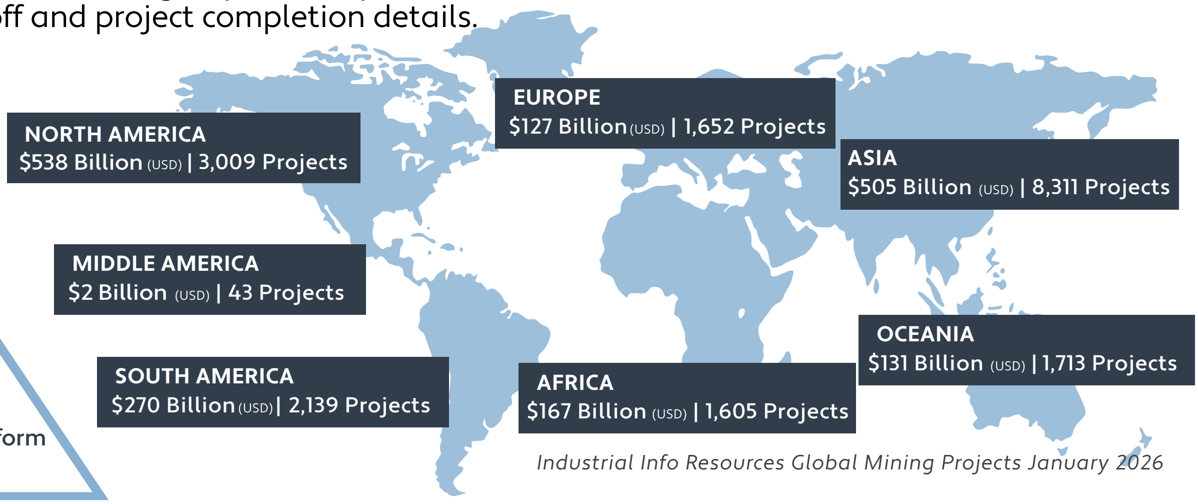

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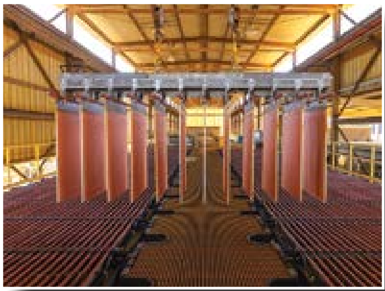

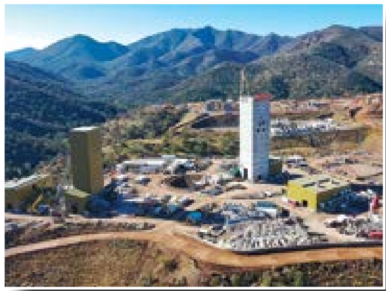

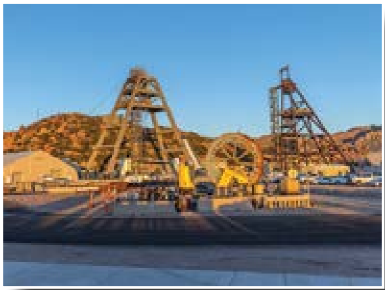

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A Message from Arizona Mining and Industry Get Our Support – AMIGOS

Alberto Bennett, Chairman

Sydney Hay, President

It is an exciting time to be part of the mining industry. As our nation moves toward an ever-greener economy, mining will be more important than ever. Green technological innovations require vast amounts of copper, silver, gold, lithium, rare-earth elements and more. The future of mining is bright, and it is an exciting industry to be part of. Reflecting that optimism, our membership ranks have grown dramatically, now topping **400 member companies**.

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"Our members continually develop state-of-the-art technologies that enable mines to do what they do best: create wealth and enhance quality of life."

Our members continually develop state-of-the-art technologies that enable mines to do what they do best: create wealth and enhance quality of life.

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AMIGOS stands for *Arizona Mining and Industry Get Our Support*, but it also means "friends." That title is earned every day by every AMIGOS member — not only by delivering best-in-class goods and services to mines locally and around the globe, but also by standing up and being counted whenever the mining industry needs support.

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We are equally committed to helping our member companies thrive. Our online meetings connect members face-to-face with mines near and far. Our Reverse Expos — offering "speed-dating" opportunities between suppliers and mine procurement personnel — are hugely popular and highly effective. Luncheons, golf tournaments, sporting clays events, conferences, receptions and mine tours all provide valuable opportunities for members to network with mine customers while having fun along the way.

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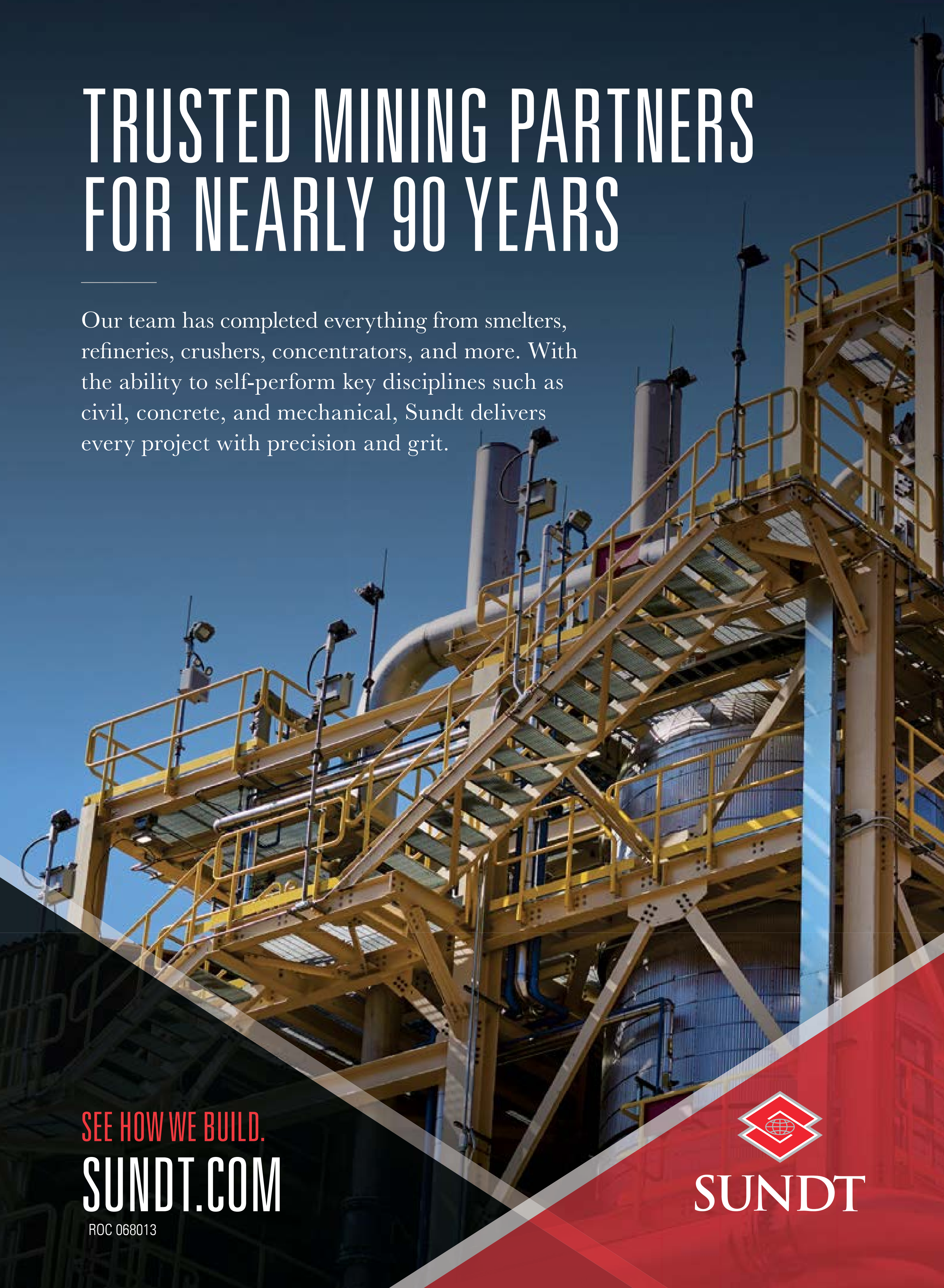
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Freeport Grows Copper Production in Arizona

Taking full advantage of leaching initiatives and autonomous haulage, America's leading copper miner positions itself for future success

Freeport-McMoRan operates seven copper mines in North America – Morenci, Bagdad, Safford (including Lone Star), Sierrita and Miami in Arizona, and Chino and Tyrone in New Mexico. The company also operates a copper smelter and rod mill in Miami, Arizona, and copper refinery and rod mill in El Paso, Texas.

Freeport knows it has substantial reserves, resources and future opportunities for organic growth. Several initiatives are already under way to fulfill anticipated significant future growth in U.S. copper demand. These initiatives include leaching and innovations in mining technology.

Recently the company launched a remote operations center (see sidebar) at its headquarters in Phoenix and during October 2025 the Bagdad mine in northwest Arizona completed its haul truck fleet conversion to autonomous haulage. Bagdad is now the first major mine in the USA to operate a fully autonomous haulage fleet.

The company is also considering a $3.5 billion expansion project at the Bagdad mine, which could more than double its concentrator capacity. Bagdad's reserve life currently exceeds 80 years and it would support an expanded operation.

Freeport said it also continues to advance pre-feasibility studies in the Safford/Lone Star district to define a potential significant expansion opportunity. Exploration drilling in recent years indicated a large, mineralized district with opportunities to pursue a further expansion project. The company said it expects to complete these studies in 2026.

The company continues to incorporate new applications, technologies and data analytics into its leaching processes. It is actively advancing testing of innovative technology to substantially increase production from these initiatives.

In addition to its innovative leaching initiatives, Freeport is pursuing opportunities to leverage new technologies and analytic tools in automation and operating practices with a goal of improving operating efficiency and reducing costs and capital intensity of its current operations and future development projects.

All 33 of Bagdad's autonomous haul trucks are in operation.

Managing Risk in a Modern Era

During December, Freeport promoted Cory Stevens to president and COO of Freeport Americas. He joined Freeport in 1997 and has held multiple leadership roles throughout his career.

When asked about $6/lb copper prices, he smiled and said, "I was around during the days of $0.60/lb copper, so yeah, it's amazing and something I never thought would happen."

Freeport's North American workforce has changed and roles continue to evolve. Since 2019, about 50% of the 14,000 people working for Freeport in North America are new to the company, Stevens explained.

After COVID, Freeport endured the great resignation with its turnover and challenges. "We have reached a point where things are stable now, and we have this new workforce that we are training, and that is exciting. On the flip side, average ore grades continue to decline, and a lot of the cost inputs continue to climb regardless of copper prices," he said. "So, when we think about how we secure our future in the southwest, we really need to leverage technology, innovation, and different ways of working to capitalize on our strengths.

"Internally, we are talking about more centralization, and more autonomous/automated type work like what we have accomplished at the Bagdad mine," Stevens said. "The work at Bagdad is really a phase one for us in terms of how that might actually unfold broadly into the Southwest to improve safety and efficiency and be able to harness the resource that much better."

The Integrated Remote Operations Center (IROC) represents a way to centralize expert resources, Stevens explained. "It will create a collaborative forum, where we will be able to hold ourselves accountable to a common standard, and apply other tools, like AI, to a common framework. And then, when we implement an improvement for one site, we can do it for six at the same time.

"It will allow us to be much more nimble on how we are applying technology solutions," he said. "We are doing it with fragmentation in blasting operations. We are doing that with a lot of our predictive maintenance diagnostics. We will soon centralize our geotechnical monitoring and dispatch capabilities."

These are exciting times, technology-wise, for Freeport. "It's also a lot of change and sometimes the technology seems to move so fast that the change management aspects cannot keep up," he said. "So, we are purposely tapping the brakes here and there to make sure that we're really focused in on the people side of the impacts because at the end of the day that's really our most precious resource."

The haul trucks at the Bagdad mine were converted to autonomous haulage, which is an engineering feat in itself, but it was also accomplished with zero job losses for the drivers. "That is super important to us as we apply new technology throughout the organization," Stevens said. "Deploying technology is not about replacing people, it's about becoming more efficient. That gain in efficiency allows us to grow and create more jobs. Those jobs might look a little bit different and require additional training programs. Some individuals would rather operate equipment and there is still plenty of equipment to operate. The point is that the use of technology will continue to grow and we really want the team of people that's been with us to stay with us moving forward as we make the transition."

Cory Stevens, president and COO, Freeport Americas.

The Bagdad expansion involves the construction of a new concentrator, which would be a 3- to 4-year construction project. "While I have never seen the company more optimistic about the outlook for demand for our product, we don't know what the price of copper will be in three to four years," Stevens said. "The success of the project hinges on securing the labor resourcing to ensure that we can build it. Arizona is a hotbed of activity right now. Companies are importing skilled expertise from out of state. We are competing with data centers and chip manufacturing, while we will be trying to build a new concentrator in a rather remote location. Enticing top notch talent to help build and operate that facility could be difficult."

Freeport is discussing the project with contractors to get a handle on the incentives. "We don't want to get halfway through the project and face a possible skilled labor shortage," he said. "It's a different sort of risk management strategy.

"It's a great time to be part of Arizona," Stevens said. "When times are great with high commodity demand and prices, it's usually the hardest time to execute on expansion projects, but it's the best price environment to justify it."

The current concentrator processes around 90,000 tons per day (t/d) and it was built in the early 1970s. It uses autogenous grinding mills and it's an efficient plant. "We have spent the past five years redesigning the flowsheet for the expansion," he said. "It would still use autogenous grinding, but we want to increase the capacity by 115,000 t/d. It will incorporate other processing technologies from our other state-of-the-art flowsheets like HPGR technology. Instead of five lines, it will have two. It will also be retrofitted with all the modern sensors and gadgets for remote monitoring and the use of digital twins. So it's going to be pretty cool."

In connection with the company's innovative leaching initiatives, Morenci is currently testing an internally developed additive. Continued success with these initiatives could lead to more recoverable copper in leach stockpiles at favorable average cash costs.

"Last year, we started using our leach additive on one of the stockpiles at Morenci," Stevens said. "It's performing quite well for us. It's a first of a kind for us and the industry. And so now we're building facilities to use the additive across the site at Morenci early this year. It gives us a bump in chalcopyrite recovery. And it's the first in the pipeline of several that we have in development and we will be adjusting additives incrementally as we move forward."

As far as longer term plans, Stevens said he is looking forward to providing development opportunities for people to step up and lead, and to harness Freeport's resources safely and responsibly to add life for the next generation.

Production is Up and Costs are Down

Freeport said it planned to produce at least 1.3 billion lb of copper from its U.S. operations in 2025. That would be an increase of at least 50 million lb over the company's 2024 production of 1,250 million lb. Through the first nine months of 2025, the copper production from U.S. operations stood at 967 million lb, 42 million lb ahead of the 925 million lb the mines produced during the same period in 2024.

Copper production from leaching operations in North America totaled

607 million lb for the first nine months of 2025 versus 633 million lb for the same period in 2024. The mines collectively place more than 600,000 metric tons per day of ore with an average grade of 0.21% on the leach pads to achieve this level of production.

Through the first nine months of 2025, the company's milling operations processed 330,100 mt/d compared to 304,2000 mt/d for the same period in 2024. The average grade was 0.31% (up from 0.30% in 2024) copper and the recovery rate was 84% (also up from 82.6%) in 2024. Milling operations produced 503 million lb of copper through the first nine months of 2025, compared to 440 million lb during the same period in 2024.

Unit net cash costs, which include by-product credits, for the U.S. copper mines averaged $3.11/lb of copper in Q3 2025, which were lower than Q3 2024 average unit net cash costs of $3.24/lb, primarily reflecting higher copper volumes and higher molybdenum by-product credits.

Freeport expects the net cash costs for its U.S. copper mines to continue to trend lower for 2026, reflecting the projected impact of efficiencies, improved volumes and cost reduction plans currently in progress.

Freeport's U.S. Copper Production

(millions of lb)	2023	2024	YTD 9/30/24	YTD 9/30/25
Morenci (72%)	575	505	381	368
Safford	245	249	182	210
Sierrita	185	165	120	137
Bagdad	146	146	109	117
Chino	141	133	97	106
Tyrone	51	43	33	24
Miami	12	9	7	7
Other	-5	-4	-4	-2
Total	**1,350**	**1,246**	**925**	**967**

Bagdad Completes Conversion

The Bagdad mine has fully implemented its fleet of autonomous haul trucks while meeting its commitment that no displaced drivers would lose their jobs with the company because of the conversion. The site's full fleet of 33 autonomous vehicles has been running since August.

The announcement that Bagdad would convert to autonomous haulage was made in July 2023. "Our team has done a phenomenal job," said Jeff Monteith, general manager for the Bagdad mine. "This has been a very long two-and-a-half-year rollout with respect to autonomy. We are going to continue to work on it. We are going to continue to improve."

Beyond retrofitting the haul trucks themselves with new technology, extensive site improvements were required to make the autonomous system function. A new command center was built to monitor and control the trucks, communications and data transmission networks were upgraded, roads were widened, and an isolated autonomous operating zone was created to minimize human interactions with the driverless vehicles.

The Bagdad mine is the first major mine in the USA to transition to fully autonomous haulage. (Photo: Freeport)

October 1 was the official close-out date for the implementation phase of the project, said Mark Elliott, project manager of the Bagdad Autonomous Haulage System. Now, the focus is on continuous improvement to maximize and sustain operational efficiency and deliver on production goals.

"We knew up front there would be a steep learning curve," Elliott said. "To effectively manage an autonomous fleet, we have to be almost perfect in every aspect to fully utilize its capability. So, we as a site have to elevate our skills and expertise to the degree that we didn't quite understand with a staffed operation."

Zero Job Losses

The zero job loss goal was communicated to drivers when the decision to convert to a driverless haulage fleet was announced. The company followed up with career fairs, one-on-one interviews and opportunities for job shadowing so displaced drivers could find out what other career opportunities matched their skills and interests. Extensive training was made available.

Ensuring none of the more than 200 haul truck drivers then working at Bagdad lost their jobs because of the conversion was a priority from the beginning, Monteith said. Kathleen

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Quirk, president and CEO, repeatedly stressed the company was committed to protecting the workforce. Quirk is the one who coined the phrase "Zero Job Loss."

"She was clear from the beginning that no one would lose their job, and those were our marching orders," Monteith said. "The commitment to our employees is something that makes Freeport stand out. These are not people who can be cast aside. They're not just employees, they're family."

As of mid-September, 217 haul truck drivers have found new roles with the company. About 80 drivers found new jobs in Bagdad mine operations running shovels and other equipment. Another 15 have been retrained for new careers in the autonomous system while the rest are scattered in other departments.

Former driver Isaac Romero, MIS Technician, said the company did an effective job communicating the career opportunities and training that were available to drivers.

Romero spent time shadowing co-workers in different departments and researching other jobs at Bagdad. Eventually, he retrained as an MIS technician, working on the equipment needed to support driverless haul trucks.

"It's the future of mining, here and at other mines around the world," Romero said. "It's really exciting to be a part of this. I look forward to the future to see where my career goes. There are a lot of different paths you can take with autonomous."

Freeport Establishes Remote Operations Center

Shifting certain roles from mine sites to a centralized Phoenix-based operation, Freeport recently launched its Integrated Remote Operations Center (IROC), which supports North American mining sites through remote monitoring, data analysis and coordinated decision-making. It brings together work that previously was performed independently at individual sites, allowing teams to operate from shared data, common dashboards and consistent communication protocols.

IROC supports mine sites by monitoring equipment health and operational performance in real time and working directly with site teams to address issues as they arise. Engineers, technicians and analysts collaborate in one location, improving coordination and reducing delays that can occur when expertise is spread across multiple remote locations. Initial focus areas include payload optimization, fragmentation improvement and remote asset management, with additional technical and engineering functions expected to transition over time as appropriate.

"IROC is a tangible expression of our commitment to operational excellence," said Cory Stevens, president and COO Freeport Americas. "It will connect people, technology and processes to make our operations safer, smarter and better aligned with the future of mining."

The Phoenix-based operating center is designed to handle certain functions common to North American sites from a single facility. (Image: Freeport)

The move to IROC reflects both technological readiness and operational need. Advances in remote monitoring and communications now allow critical decisions to be made effectively away from the mine site, while increasing operational complexity makes a site-by-site approach less efficient. Centralization enables earlier identification of risk, more consistent decision-making and better use of specialized expertise.

IROC is being implemented through a phased approach that is already underway, beginning with remote monitoring and core technical functions and expanding over time as additional roles are assessed and transitioned to the centralized model.

IROC changes where certain roles are based, not whether they exist. Employees whose positions move to Phoenix are offered relocation support, and those who choose not to relocate can work with the company to explore other opportunities. The approach is intended to strengthen long-term workforce stability while maintaining continuity of experience and knowledge.

For now, IROC is in a temporary space within the company's corporate hub in Phoenix and is scheduled to move into a larger, purpose-build space in an adjacent building in mid-2026. The new facility is designed as a modern, high-performance workspace that supports remote operations and fosters collaboration across the teams. It places operational decision-making closer to enterprise leadership, planning and support functions. This proximity improves alignment between day-to-day operations and broader business strategy, while also providing access to a larger and more sustainable talent pool than remote site locations.

Overall, IROC represents a shift in how Freeport's mining operations will be supported and managed. The company said it will move the organization toward a more connected, technology-enabled operating model that emphasizes faster decisions, reduced operational risk and long-term competitiveness.

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America's Newest Copper Producer: Gunnison Copper

Gunnison restarts the Johnson Camp mine and quickly proves the viability of the Nuton Technology

Last year was a year of firsts for Gunnison Copper. The company, which controls the Cochise Mining District in the Southern Arizona Copper Belt, brought the Johnson Camp mine back into production. The operation began mining and placing ore on leach pads. By September, it was producing and selling copper cathode, and generating revenue. Just before the end of 2025, the company announced first copper production from Rio Tinto's Nuton Technology.

Located 65 miles west of Tucson, Ariz., the Johnson Camp mine can trace its history to the 1880s, and today Gunnison is using the latest technology to recover copper cost effectively and explore for more metals. The use of Nuton Technology is a prime example. It's a process developed by Nuton LLC, a Rio Tinto Venture that uses microorganisms to extract copper from primary sulphide materials, adding a new twist to leaching techniques that boosts recovery. The Johnson Camp mine is now expected to produce 25 million lb/y of copper cathode.

Gunnison is also evaluating the use of new cutting-edge technology to explore for critical minerals regionally. The company is partnering with Lunasonde Inc., a defense and mineral exploration technology company that has developed Airborne Georadiotomography (aGRT) Technology. This next-generation, remote sensing technology may have the ability to see through the thick alluvial cover.

"This collaboration reflects Gunnison's disciplined approach to innovation and data-driven decision-making," said Stephen Twyerould, president and CEO of Gunnison Copper. "We are continuously evaluating advanced technologies that have the potential to enhance our geological understanding, improve targeting efficiency and support long-term value creation across the Cochise Mining District."

The Cochise Mining District contains 12 known deposits in the Southern Arizona Copper Belt. In addition to the Johnson Camp mine, the company's Gunnison copper project has a measured and indicated mineral resource containing more than 831.6 million tons with a total copper grade of 0.31%. The plan is to develop it as a conventional open-pit mine, using heap leach and solvent extraction/electrowinning (SX/EW) to produce copper cathode on-site.

Gunison Copper produces first copper cathode from the Johnson Camp mine. (Photo: Gunnison)

Johnson Camp Sells First Copper

On September 15, 2025, Gunnison reported copper sales of 225,371 lb at an average realized copper price of \$4.64/lb, which generated gross proceeds of nearly \$1.05 million, following successful commissioning of the SX/EW plant and refinery.

"We are especially proud that every pound sold is 100% Made-in-America copper, directly supporting our nation as we work together to strengthen our supply chains," said Craig Hallworth, senior vice president and CFO for Gunnison.

Copper cathode production at the Johnson Camp mine began during the last week of August 2025, ahead of schedule, and with an excellent health and safety record. "Not only did we start producing ahead of schedule, but we started producing with an excellent health and safety record," said Melissa Mackie, director, investor relations and communications for Gunnison. "We're extremely proud of our operational discipline and bringing American copper to the market."

The Johnson Camp mine uses hydraulic excavators, wheel loaders and a fleet of trucks to move rock and ore. Ore production began in January 2025 and was stockpiled as the leach pad was developed in phases. Phase 1 was developed for conventional oxide heap leach, while Phase 2 would host

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Nuton's processing equipment and a mix of sulphide and oxide ore.

The company also completely redesigned and constructed a modern laboratory for on-site material and process analysis. The lab started its work in April alongside development of the leach pads. The company's human resources group progressed its staffing plan, with a focus on hiring locally, and has added exceptional talent to the Gunnison team.

"In one year Johnson Camp has been able to deliver a brand new mine, a brand new leaching plant and start the SX/EW plant," said Robert Winton, senior vice president, operations for Gunnison. "We have transformed Gunnison Copper into a nimble open pit copper producer with a future as bright as the Arizona sky we enjoy daily."

Gunnison Proves Nuton Technology

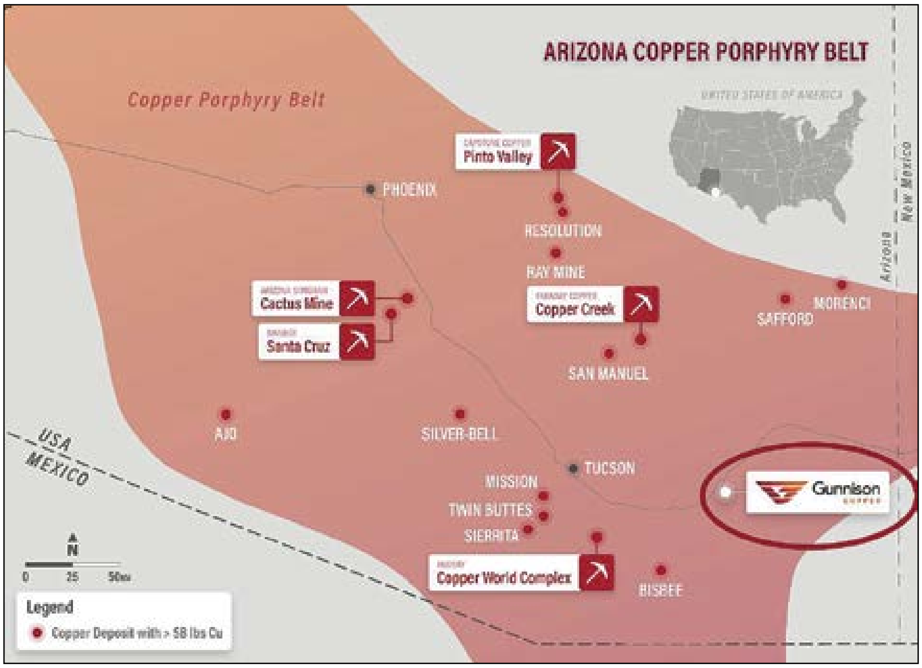
During December, Gunnison announced the first use of Nuton Technology to produce copper at the Johnson Camp mine, "marking a pivotal step forward in the development of this innovative copper processing technology," the company said.

A blasthole rig drills a bench at the Johnson Camp mine. (Photo: Gunnison Copper)

After more than 30 years of research and development, the first copper cathode using Rio Tinto's proprietary bioleaching technology, which relies on microorganisms grown on site, was produced at the Johnson Camp mine during November. The deployment involved the design and delivery of a technology package for a heap leach pad targeting production of 30,000 metric tons (mt) of refined copper (16,000 mt from run of mine leach pad and 14,000 mt from Nuton) over a four-year demonstration period.

"This is a breakthrough achievement for our Nuton technology, which is proving that cleaner, faster and more efficient copper production is possible at an industrial scale," said Katie Jackson, chief executive, Rio Tinto Copper. "In an industry where projects typically take about 18 years to move from concept to production, Nuton has now proven its ability to do this in just 18 months.

"The first production of Nuton copper at Johnson Camp is the culmination of exceptional teamwork between Gunnison Copper and Rio Tinto's Nuton team," Twyerould said. "Achieving this level of performance in such a short time frame shows what is possible when innovation, operational excellence and a shared vision come together. With Nuton copper now entering the U.S. supply chain, this milestone underscores the critical role we can play in strengthening domestic access to cleaner, low-carbon copper."



Gunnison's operations are located 65 miles east of Tucson. (Map: Gunnison)

Nuton relies on naturally occurring microorganisms to extract copper from primary sulphide materials, which are traditionally difficult to process. These microbes, grown at large scale in Nuton's proprietary bioreactors, accelerate the oxidation of minerals in the crushed material heap, generating heat and enabling copper to dissolve into a leach solution, which is then processed into 99.99% pure copper cathode.

Significantly, processing copper ore with Nuton eliminates the need for concentration, smelting and refining, shortening supply chains and delivering copper cathode at the mine gate. It achieves recovery rates of up to 85% from primary sulphides, the most abundant copper bearing materials in the world.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An aerial view shows the scale of the Johnson Camp leach pad. (Photo: Gunnison)

Nuton can also extend mine life and maximize resource use by extracting value from mineralized materials that would otherwise be classified as waste, increasing yield and revenue at both new and existing mines.

"Nuton has designed a modular system deployed as a technology package integrating biology, chemistry, engineering and digital tools, allowing it to be rapidly scaled and tailored to different ore bodies, unlocking resources that have historically been considered uneconomic or challenging," Jackson said.

At the Johnson Camp mine, Nuton aims to produce copper with the lowest carbon footprint in the USA. Through the purchase of 134,000 Green-e Energy certified renewable energy certificates, Nuton ensures 100% of the site's electricity is matched by renewable sources. The copper produced is anticipated to have a mine-to-metal carbon footprint of 0.82-kilogram CO_2-e per kilogram copper, the lowest in the USA and substantially lower than the projected 2026 global average of 3.4 kilograms CO_2-e per kilogram among operating copper mines. Additionally, water intensity is anticipated to be 71 liters per kilogram copper, compared to the global average industry estimate of ~130 liters per kilogram of copper production.

While this milestone confirms Nuton's engineering and operational viability, the next phase will focus on validating long-term technical performance. This includes multi-year testing, independent third-party verification and internal review by Rio Tinto to ensure consistent recovery rates and environmental performance.

Using Technology to Target Critical Minerals

Lunasonde will deploy its proprietary aGRT remote sensing technology to conduct an initial high-resolution subsurface survey over a defined portion of Gunnison's property. The work program is expected to include test and calibration flights, followed by data processing and analysis to generate three-dimensional subsurface imaging of identified anomalies with the potential to host critical minerals.

The collaboration is intended to evaluate the potential application of Lunasonde's technology as a complementary exploration and targeting tool across Gunnison's land position, which hosts multiple known copper deposits within close proximity to existing infrastructure and operations.

"Our partnership with Gunnison is a pivotal first step toward deploying aGRT for mineral exploration across the globe and securing our nation's critical mineral supply" said Jeremiah Pate, founder and CTO of Lunasonde.

Lunasonde's technology is designed to identify subsurface features from aerial and space-based platforms, offering a non-invasive method of data acquisition that may complement traditional geophysical and geological datasets. Results from the initial survey will be assessed alongside Gunnison's existing technical information to determine potential future applications.

"The Cochise Mining District has been known to host at least 12 of the critical minerals so important to the U.S. supply chain, yet most of this geology lies, un-explored, beneath thick alluvial cover," Twyerould said.

A Positive Impact for Arizona and the USA

Restarting of operations at Johnson Camp mine has already benefited the local community and economy by bringing jobs and economic growth to the area, not only through direct employment, but also by supporting local suppliers, contractors and service providers.

During October 2025, the University of Arizona's Eller College of Management completed an economic impact study, which underscores the transformative economic potential of the Gunnison copper project. It calculated a total present value output of \$14.6 billion for the project, which would support more than 53,000 job-years of employment and generate \$2.07 billion in labor income across the U.S. economy over its life.

Beyond the jobs and the economic impact, the new leaching technology that Gunnison and Nuton have proven will hopefully benefit the entire copper industry.

"The importance of Johnson Camp being the next American producer is significant for America and its supply chain," Winton said. "We have a significant lack of copper in America. Being able to produce a finished copper product domestically is incredible and such a proud moment for the entire organization and all of our partners in this process."

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South32 Prepares for Future Production at Hermosa

South32 embarks on a program to home-grow a workforce to support a greenfield operation

The Hermosa project differs from other mining projects. The deposit contains abundant amounts of critical minerals and for that reason it benefited from the federal government's FAST-41 permitting program providing greater transparency and an enforceable timetable through the Permitting Council. The owner, South32, made a $2.16 billion final investment decision in 2024 to develop its zinc deposit. It has also received two grants from the federal government for its manganese deposit. More importantly, however, Hermosa is a greenfield project, which means that it is starting with a clean slate and a fresh approach to operations that will create a meaningful economic uplift for southern Arizona.

Located in the Patagonia mountains just north of the Mexican border about 60 miles southeast of Tucson, the Hermosa project is currently focused on two large critical mineral deposits, one zinc and the other manganese. Processing these metals will create byproduct streams of other metals and a copper deposit has potential for development.

Hermosa is a true greenfield project that provides a unique opportunity to develop a next-generation mine, explained Pat Risner, Hermosa president, South32. "We have the good fortune of being able to do things differently, and our company is committed to funding that effort."

The Hermosa project has about 45,000 acres of unpatented mining claims. In the middle of that land package, it has about 600 acres of patented mining claims on private land.

Hermosa has one of the largest undeveloped zinc deposits in the world and another deposit could yield battery grade manganese. "The high purity manganese that we are targeting is for the lithium-ion battery supply chain and it has the scale and grade to serve domestic demand," he said. "The project also has 15 areas with potential satellite deposits where we are conducting exploration. As for the capital program we're deploying now, more than a quarter of it is in shared infrastructure that we can use to develop several deposits. It's kind of an emerging district play for critical minerals development."

The supply and demand issues associated with rare earth elements and other critical minerals is well known. Today, the USA produces only 6% of the world's zinc supply. Over the next eight or nine years, however, South32 sees a significant supply-demand gap developing. "By about 2034, we believe there will be a global supply-demand gap of

The Hermosa mine will have a footprint a fraction of the size of other mines in the area. (Photo: South32) at least 4 million tons," Risner said. "To close that gap, you would have to develop three Hermosa's or more every year between now and then."

The supply chain for manganese is even more challenging, much like some of the other battery metals. "It's one of the critical minerals where the USA has no domestic production," he said. "We have not mined manganese in North America in about 50 years. We believe that demand will grow about 15-fold over the next 10 years."

Nearly all battery grade manganese (99%) comes from China. "If you operate a battery-electric vehicle (BEV), the battery most certainly has Chinese manganese in it," Risner said.

Hermosa is currently progressing through construction of its zinc deposit. South32 received the final state permits, allowing construction to commence 18 months ago. The company's board made the financial $2.16 billion investment decision to move forward, and it is funding the project through operating cash flow. "We received our permits quickly and we didn't have to go to the market to finance construction on the zinc deposit," Risner said. "We do have two grants regarding the manganese deposit that are helping us accelerate the production of battery metals.

"We received a $166 million grant from DOE to accelerate manganese processing which will be fully integrated," he said. "We will mine it and process it in southern Arizona into a final product for sale into that supply chain. That equates to a one-third cost share of the first phase of the manganese processing facility, which was part of the bipartisan infrastructure act. We have just finished construction of a decline to access the manganese deposit, which was funded in part by a.... Defense Production Act Title III grant."

South32 had a very deliberate strategy around permitting. "We started on private land to get into the construction as soon as possible," Risner said. "We began with a state permitting regime. We kept the project confined to private land and then as we started to think about the ancillary infrastructure and the federal lands that surround us, we started to engage the federal government on FAST-41," which refers to Title 41 of the Fixing America's Surface Transportation (FAST) Act.

An LHD arrives at the shaft's first level to begin lateral development. (Photo: Hermosa)

In May 2023, under the Biden administration, Hermosa became the first mining project to be covered under the FAST-41 permitting program. "We are really happy to see this program being used more broadly by the current administration," Risner said. "As a project developer who is almost through the full process, we believe it works, particularly the covered projects where you get the full force and support of the Federal Permitting Council as well as better resourcing. It's better coordinated and it has been a very successful program for us. We will get through that process in about two years."

When South32 started the prefeasibility for the Hermosa project, it made a decision, based on purpose, values, and objectives, to present something different to its stakeholders. Hermosa will combine the best practices used in many places by various mine operators in one place for a different outcome. The project will leverage technology and innovation to not only be safer and more responsible, but also to achieve its goals as far as its social license to operate.

Next Gen Mining

Like most mines, Hermosa needs to meet the expectations of its stakeholders. "We are working really hard with this project to challenge a lot of the paradigms as far as past mining practices," Risner said. "We knew we had to produce something fundamentally different to engage our stakeholders."

One of the goals was to minimize the surface footprint of the Hermosa project to the fullest extent possible. "We will mine both deposits with a potential 70-year mine life, yet only disturb a total of 750 acres," he said. "That includes roads, tailings, support infrastructure, everything. Our primary mine access and infrastructure is contained to a block of land that is less than 200 acres."

Hermosa has a footprint a fraction of the size of other mines in the area. The mine will be a long-hole, openstope mine that will produce 11,800 tons per day (t/d). "For a mine of that scale, 750 acres is a very small footprint," Risner said. "We built a new lined, dry stack tailings facility."

Another commitment is to reach net-zero as soon as possible which includes using battery-electric equipment. In April 2025, South32 placed the largest order for battery-electric underground mining equipment in the history of the industry. "By the time we hit full nameplate capacity, our primary and support equipment underground will all be BEVs," Risner said.

South32 is also working with the local utility to power the mine with renewable energy sources. "If you eliminate fossil fuel-powered electricity and diesel use underground, Hermosa moves closer toward a net-zero mining operation," he said.

Water is obviously a hot-button topic in the Sonoran Desert of southern Arizona. "Beyond permitting requirements, this is a particularly sensitive issue for the area, and our stakeholders value the emphasis we have placed on this issue," Risner said. "It's really important to them and it's an area where we felt like we really had to push hard."

At nameplate production, Hermosa will consume about 0.5 gallons of water for every pound of metal produced. "To put that into context, the average mine consumes about six to 20 gallons for each pound of metal produced," Risner said. "A lot of the open pit mines use 10 to 20 gallons per pound of metal produced. With filtered tailings, we will recover about 90% of the process water and reuse it. We also designed the underground mine to be a low water consumer as well.

"We didn't make these decisions to accelerate permitting," he said. "We wanted to meet stakeholder expectations as far as our social license to operate. We have the luxury of starting from a blank sheet, and we decided to do things differently."

Automation and the Social License to Operate

Another area where South32 is pushing the boundaries is the use of automation and remote operations. "All of our primary production processes underground will either be tele-remote, fully automated or semi-autonomous from a remote operating center. Why? There is the obvious safety and productivity benefit with far fewer people underground. However, the reason that's probably not as evident is that we can use technology to enable our social license to operate.

"If all of the equipment was manned, we would need to import a large, experienced workforce to do the work," he said. "We still will have to do some of that, however, once the mine is operating at nameplate capacity, and we have the automated and tele-remote fleets in place, many of the jobs as far as operating primary production equipment will be located at our remote operating center, Centro."

Centro is currently under construction in Nogales, 20 miles from the mine site. "Typically, the mining industry builds these remote operating centers in large metropolitan cities to access larger pools of workers," Risner said. "Our aim is to have a local workforce."

A social license to operate means shared value for stakeholders. "Mines create lots of jobs and one of the big selling points is the socioeconomic community uplift created by operations like this, and it's more impactful when the local community benefits the most," he said. "Our intent is to home-grow the workforce and technology now enables that."

At peak operations, South32 plans to have 80% of its workforce come from current residents from the community, not people that move to the community. "We can train people that have no mining experience in about 18 months to do a lot of the jobs in this facility with modern technology," Risner said. "That gives us a much better chance to accelerate the local content in our workforce compared to a traditional operation. It gives us a chance to truly have a workforce that reflects our community really early in the life of the mine.

"We believe there will be a lot of people that would have never considered a career in mining to be attracted to Hermosa," he said. "That's why we decided not to put Centro in Tucson, but to build it in Nogales, a community of about 20,000 people on the border, which has not had mining in a long time."

A person that would not want to drive 60 miles roundtrip to work a shift in an underground mine might choose to work at Centro instead. It would be close to schools, their support network, childcare, etc. A remote operating center removes those barriers that might prevent a career in mining.

"For many years, we have been talking about the impact of retirement on the industry and the impending workforce crisis," Risner said. "If we do not make the jobs more accessible to everyone, we are going to have a challenge operating these businesses. That is what we will need to do to be successful with these new projects and Centro could introduce a lot of new people to mining."

Hermosa will have about 200 roles based at Centro, meaning that a little more than one-third of the workforce will not work at the mine. "They will be monitoring autonomous, semi-autonomous, and tele-remote operating equipment at this facility," he said.

Hermosa will have 200 people based at Centro in Nogales. (Image: South32)

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An illustration depicts the zinc processing plant, which is under construction. (Image: South32)

"It will also house short interval control planning and engineering. We will have a lot of predictive analytics roles planned for Centro. It will be the nerve center for the operation."

Construction Update

With its final investment decision, the South32 board committed $2.16 billion in February 2024 to build the infrastructure for its zinc deposit. At that point, the company had already invested about $500 million in early expenditures. When Hermosa reaches first zinc production in mid-2027, the company will have invested about $2.7 billion to get the project from inception to first production.

"We're about 45% through the full construction program now," he said. "We have one shaft that's developing the first mining level, which is a little more than 50% complete. We're starting to do some lateral development. Later this year, we will be developing a second level, and one shaft will be complete."

"For the manganese development, we finished the decline at the beginning of December," he said. "We are developing some more sampling levels to start underground exploration drilling."

Hermosa has been producing battery grade manganese from a pilot plant for about two years now. "We are in the process of scaling that up into a much larger test plant so that we can produce greater volumes," Risner said. "We have about 15 entities in the lithium-ion battery supply chain testing that material. They need larger volumes to test and to qualify that material. So, we will take a bulk sample from the decline and run it through that test plant. We have MOUs with two potential customers for manganese offtake."

Currently about 1,000 people are working on construction including building a paste plant, a tailings filtration plant and a zinc processing facility. "We are about a third of the way through the first of four packages, and obviously the shaft sinking is well developed," Risner said.

The pace of the manganese development will follow the development of the U.S. battery market. "That is a market that does not exist today, but it's coming," Risner said.

The Workforce Challenge

When Risner arrived at the Hermosa project in early 2019, he said South32 had about 25 to 30 people in a little office thinking about what a prefeasibility study might look like. "We now have 250 full time staff and another 700 or 800 contractors, and in the next 18 months, we have to hire 300 to 350 more people," he said. "With the longer-term development of both deposits, the total workforce will grow to 800 to 900 people."

While Arizona is a mining state, Santa Cruz County has not seen mining activity in a long time. It's one of the more impoverished parts of the state where unemployment is double the state average. The per capita income is 40% below the state average. Each Hermosa job generates twice the average household income in the county, and this will be transformational. Risner admits that home-growing the workforce is not the easiest way to go about this and acknowledges it will take more effort and time.

"Santa Cruz County has never had a skilled trade training program," he said. "If you wanted to be a welder or an electrician, you could not get the training in Santa Cruz County. They do not have a community college. That's the environment we are working with."

South32 is now partnering with Pima Community College in Tucson to offer skilled trade training programs through the Santa Cruz County Provisional College in Nogales. "We have just kicked off the first program in the history of the county," Risner said. "We're training electricians in Nogales. We are training double what we need to provide a broad skills uplift for the community. We are going to roll out one program after another over the next five to 10 years.

"This is a really important legacy that we can leave," he said. "If we are going to grow and build new projects, we need to think about how we start to home-grow workforces, how we start to invite more people into the business and how to establish the next generation of workforce for these mines."

This article was adapted from the keynote speech Hermosa President Pat Risner delivered at the American Exploration & Mining Association's annual convention, which was held during December 2025 in Reno, Nevada.

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Florence Copper Starts Wellfield Operations

First copper production is expected by early 2026

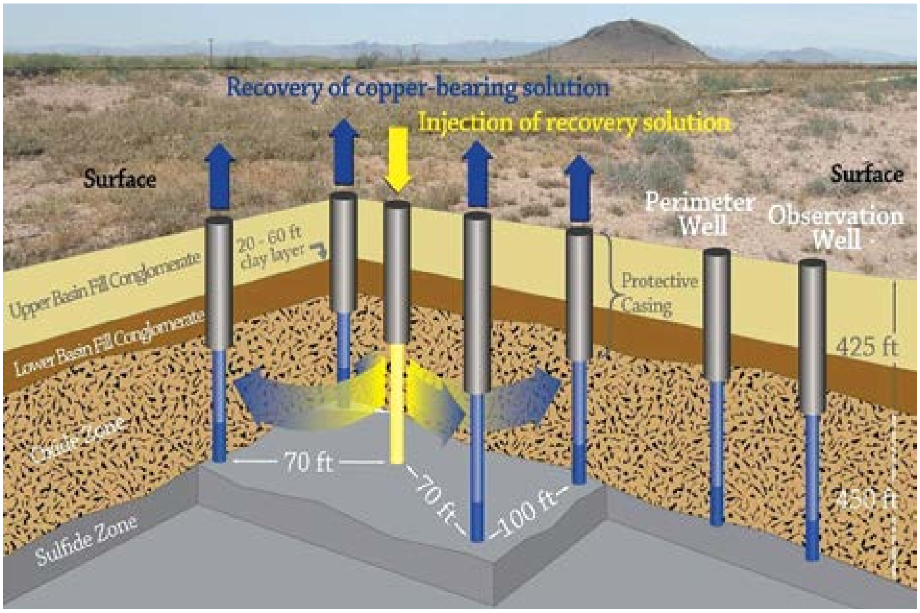
Construction activity at Florence Copper is now complete and the focus has shifted to wellfield operations and commissioning of the SX/EW plant. Located south of Phoenix in the community of Florence, Ariz., it will produce LME Grade A copper metal onsite with operating costs projected to be in the lowest quartile among global copper producers. The operation will soon become a significant employer in the region and the state, supporting more than 800 Arizona jobs.

With in-situ copper recovery, a low-pH solution is injected into a naturally fractured copper orebody via a series of injection wells, causing copper minerals to dissolve into solution prior to being pumped to the surface through recovery wells. Hydraulic control of the solution is maintained through carefully managed pumping rates and verified with monitoring and compliance wells.

Operations at Florence Copper do not require blasting, loading, hauling, crushing or conveying of mineralized material, resulting in 75% fewer greenhouse gas (GHG) emissions, 65% less energy use and 78% less water consumed per pound of copper produced, compared to conventional open-pit copper mines in Arizona.

Construction of Florence Copper's commercial production facility began in January 2024, and first copper is expected to be produced in early 2026. When fully operational, it's expected to produce 85 million lb/y of copper for 22 years. The first copper cathode from the new production facility is expected soon.

The copper-bearing solution is processed through a solvent extraction/electrowinning (SX/EW) plant to produce copper metal as cathodes. The general contractor assigned to the SX/EW plant area completed construction on September 19 and began to demobilize its construction crews at that time. Florence Copper is supervising the remaining contractors as they wrap up the final construction activities and systematically hand over sections of the plant area to the operating team for commissioning. The commissioning phase for the SX/EW plant is scheduled to run in parallel with the start of wellfield operations.



In early December, solution began circulating in the commercial wellfield. (Image: Taseko)

"The transition from construction to early-stage operations at Florence has gone smoothly, and we are very pleased with the initial copper recoveries and performance of the commercial wellfield," said Stuart McDonald, president and CEO of Taseko. "Our project team is focused on the successful start-up of the SX/EW plant, followed by first copper cathode production."

With copper prices approaching record levels, and a growing focus on security of critical mineral supply, the timing is ideal to bring on a major new source of refined copper inside the USA, McDonald explained.

Moving Forward With Wellfield Operations

Wellfield acidification commenced in early November, and in early December mining solutions were circulating in all the new production wells within the commercial wellfield. Injection flowrates in the wellfield have met or exceeded expectations, resulting in faster initial acidification of the wellfield.

The grade of copper recovered in solution from the recovery wells has continued to increase, and the average solution grade has now reached the level required for SX/EW plant operations.

Commissioning of the SX/EW plant area has been advancing without any significant issues, and plant operations are expected to commence shortly.

Wellfield drilling has also re-commenced with three drill rigs currently operating on site. Continued expansion of the commercial wellfield will support higher solution flows and increased copper production for the ramp-up this year.

"The transition from construction to early-stage operations at Florence

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Florence Copper is now focused on the start-up of the SX/EW plant. (Photo: Taseko)

has gone smoothly, and we are very pleased with the initial copper recoveries and performance of the commercial wellfield," McDonald said. "Our project team is focused on the successful start-up of the SX/EW plant, followed by first copper cathode production."

Prior to the launch of the production facility, Taseko built a production test facility (PTF), which consisted of a wellfield (four injection wells, nine recovery wells and 11 ground-monitoring wells), and a small SX/EW plant. Operation of the PTF proved Taseko had the ability to establish and maintain hydraulic control of the fluid within the oxidized zone of the orebody. The PTF also allowed the company to collect valuable information in initial leach periods, sweep efficiencies and recoveries, which was used in the design of the commercial scale facility.

During the 2026 ramp up, Florence Copper will commence operations with approximately 90 wells. Wellfield drilling began during Q4 2025 with new wells to begin phasing into operation throughout 2026. The company expects to drill 100 wells per year. The target is to produce 85 million mt/y (the design capacity) in 2027.

Since acquiring Florence Copper in 2014, Taseko has invested $266.6 million to bring the project online. That includes $50 million in construction financing from Mitsui. In exchange, Mitsui received a 2.67% copper stream plus an offtake contract for 81% of the copper cathode during the initial years of operation. Mitsui has the option to invest an additional $50 million (for a total of $100 million) to convert the stream to a 10% joint venture interest.

Mitsui and Florence Copper will develop sales channels for green (low-carbon) copper in the USA.

Florence Copper, United Way Raises Funds for Early Literacy

Florence Copper recently announced the results of its 2025 United Way of Pinal County campaign. Thanks to the generosity of employee donations and a $15,000 corporate contribution, over $25,600 was raised to support early childhood literacy in the community.

Florence Copper employees helped raise $25,600 for the United Way of Pinal County. (Photo: Taseko)

Employee donations totaled more than $10,600, reflecting a strong commitment to giving back and investing in the next generation. These combined contributions helped provide approximately 9,848 books to local children through the Better Beginnings Initiative.

Better Beginnings is a partnership between Florence Copper, United Way of Pinal County and the Florence Unified School District (FUSD). In Pinal County, only 31% of students are considered proficient readers by third grade. Working with Dolly Parton's Imagination Library, the Better Beginnings program aims to help address this issue and promote early childhood literacy by providing free books to children ages 0-5 living in FUSD zip codes. This effort is part of United Way's broader Reading by 3rd Grade initiative, which works to help foster a lifelong love of reading and set young learners up for future academic success.

"Florence Copper is deeply committed to strengthening the community we call home," said John Mays, general manager of Florence Copper. "Supporting early literacy is one of the most important investments we can make, and we are proud to stand alongside our employees and partners to help create a brighter future for local children."

Families interested in registering for the program can learn more at: https://unitedwayofpc.org/programs/.

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Ivanhoe Electric Publishes Feasibility Study for Its Santa Cruz Project

The study further defines a deep copper mining operation with strong economics

Ivanhoe Electric (IE) is developing the Santa Cruz project, a major underground copper mine and mill, located 60 miles south of Phoenix. During June 2025, the IE published a prefeasibility study for the project detailing its mining and processing plans for the first time.

The Santa Cruz project sits on private land, which will allow for an accelerated permitting process. Most of the reserves are held in a large oxide formation that will allow heap leach recovery. IE is projecting 1.4 million metric tons (mt) of copper cathode over a 23-year mine life. The capital costs for the project are estimated at $1.24 billion and the cash costs to mine and process the copper will be $1.32/lb, according to the study.

More recently, IE's subsidiary, Mesa Cobre Holding Corp., closed on a $200 million bank credit facility to support project development. The multi-draw bridge facility is secured by a banking syndicate composed of the National Bank of Canada, BMO Capital Markets and Societe Generale. The bridge facility is a significant milestone in Ivanhoe Electric's long-term financing strategy for the Santa Cruz project. The company said it will complement ongoing discussions related to the broader project financing plan.

"As we advance toward breaking ground in 2026, Santa Cruz is steadily marching on the path to becoming one of the first new copper mines built in the U.S. in almost two decades," said IE Executive Chairman Robert Friedland. "Our mining process is designed to produce 99.99% pure copper metal on site, thanks to the very high grade nature of our oxide copper reserves. Santa Cruz is the first step in our vision to grow a new American-based and American-focused critical metals company. Today's credit approvals, coming from this group of top-tier mining financiers, are a clear vote of confidence in the project, our people and this vision."

Along those lines, during April 2025, IE received a Letter of Interest from the U.S. Export-Import Bank (EXIM) for $825 million of project debt under the Make More in America initiative. The full application for funding from EXIM is in process. The company expects to complete the project financing process for the Santa Cruz project in mid-2026. IE is poised to become the newest producer of copper metal in the USA.

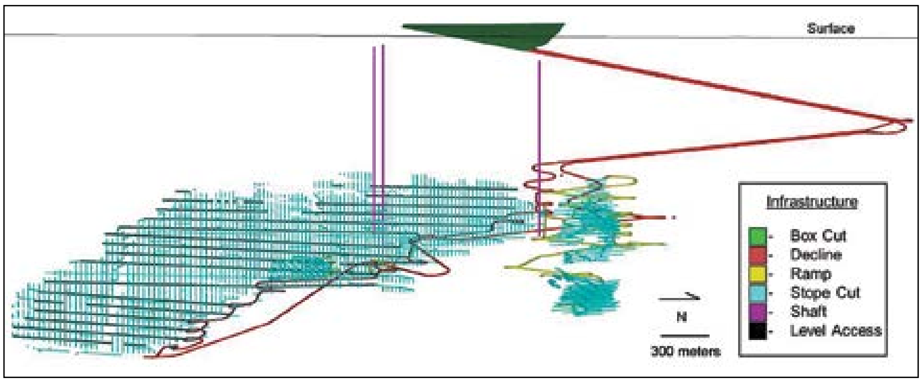
Producing Copper in America for America

"Given the global conflicts that concern us all, the USA is now awake to the urgent national security imperative to restore domestic American mineral production to the scale of the American economy," Friedland said. "Our government, industry and defense establishment clearly recognize the paramount importance of having a secure, domestic supply of all critical minerals in the 21st century, including copper."

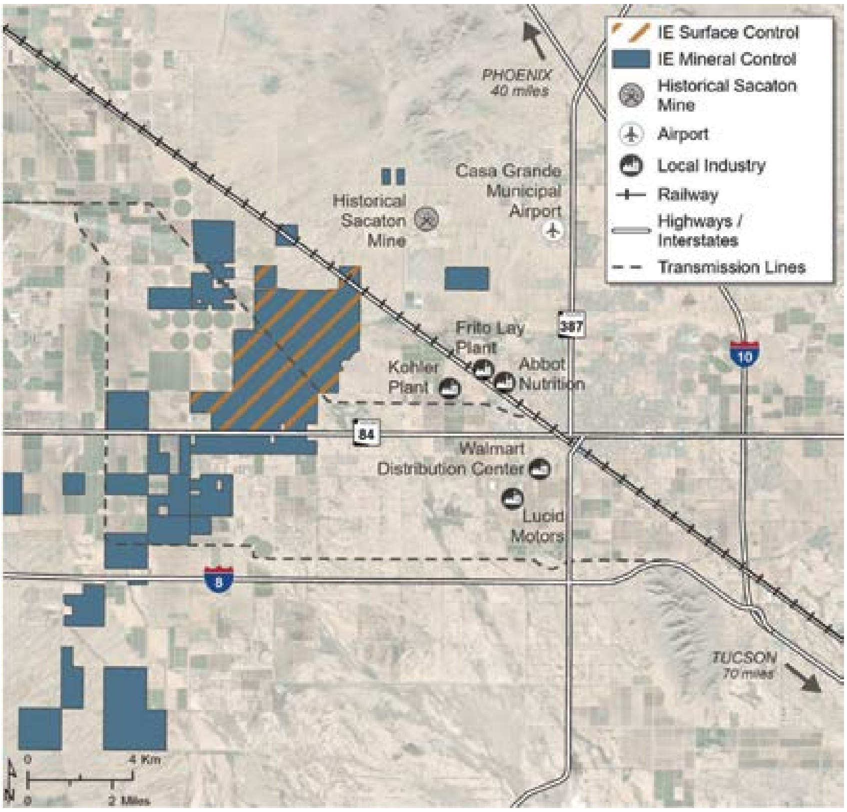
Santa Cruz will mine the largest high-grade copper oxide orebody in America, which will be processed onsite by a new generation of skilled and highly paid American workers. "Santa Cruz will produce an LME Grade A copper cathode that will be ready for immediate sale to American industry from our mine gate. Our project will not process concentrate in antiquated, expensive and polluting smelters or ship copper concentrate back and forth across international borders for downstream processing.

"We will produce pure American copper mined and processed in America, and directly shipped from Arizona for use in American homes, factories and our national defense industry," he said. "Santa Cruz is the right project, in the right place, at the right time.

"Our progress to date could not have been achieved without the support of our long-term supportive investors, such as Saudi Arabia's Maaden and BHP, the world's largest mining company, and several of the world's top institutional investors who understand the urgent need for domestic copper production," Friedland said. "This is what the American mineral industry and resurgence must look like – clean, secure, strategic and ready to support American national security."



Santa Cruz copper project underground mine design, long-section. (Source: IE)



Santa Cruz copper project location.

A World Class Operation Supported by Modern Technology

Since its initial assessment study in 2023, IE has invested more than $100 million in new drilling, advanced test work and extensive engineering studies to produce the preliminary feasibility study. It incorporates data gathered from an additional 149 drill holes totaling nearly 120,000 m, more than 250 trade-off studies, and hundreds of hydrogeological and metallurgical tests. Since commencement of exploration at the Santa Cruz project in 2021, IE has completed 329 drill holes totaling 279,000 m.

Fluor Canada Ltd. served as project lead for the study and was also responsible for surface infrastructure and heap leach pads, working in close collaboration with IE's project team of more than 40 engineers, geologists and technicians. Other industry-leading consultants involved in major workstreams of the study include BBA USA Inc. for resources, reserves, underground mine planning and economic analysis, KCB Consultants Ltd. for heap leaching, Paterson & Cooke USA, Ltd. for paste backfill, Met Engineering, LLC for metallurgical testing, and INTERA Inc. for hydrogeology.

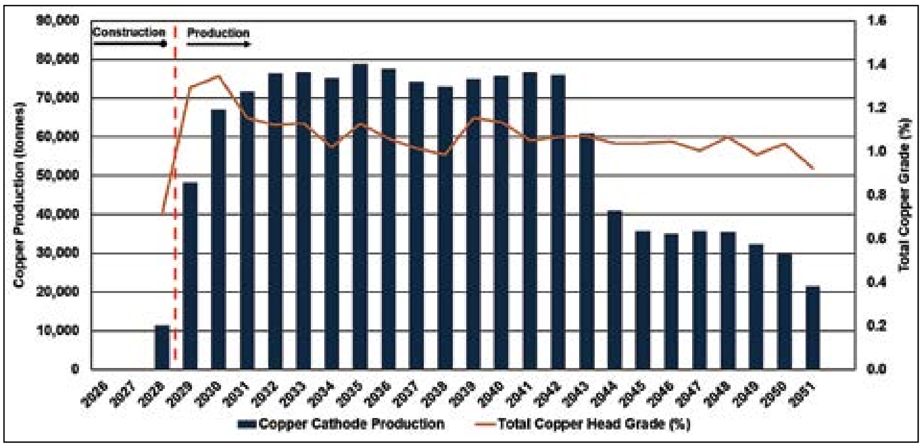
"Working together with our expert industry consultants, our team's tireless efforts have resulted in a highly engineered underground mine plan and a simplified heap-leach process design with low initial capital, low unit operating costs and high copper recoveries," IE President and CEO Taylor Melvin said.

The study determined that the economics of the Santa Cruz project compare favorably on a global scale in terms of C1 cash costs, and in terms of capital intensity when compared to other greenfield copper projects in North and South America.

Located near Casa Grande, Ariz., the Santa Cruz land package consists of 6,000 acres of private land, including surface, mineral and associated water rights necessary for the mining operation. Casa Grande is at the heart of a rapidly growing industrial corridor with readily available power and transportation infrastructure and a skilled local industrial workforce. The planned site layout provides for a compact surface footprint of less than 2,600 acres.

The probable reserves for the project amount to 136 million mt at a 1.08% total copper grade, totaling 1.5 million mt of contained copper. The study only considered the high-grade copper mineralization from the oxide and chalcocite domains of the Santa Cruz and East Ridge Deposits.

The deposit will be accessed by conventional twin decline drifts. Roadheaders will be used to mine the declines, measuring approximately 8 km in combined length. Main intake and exhaust raises will be developed using blindbore shaft sinking to supply ventilation to the mine workings.



Copper production at Santa Cruz will average 72,000 mt/y for the first 15 years. (Source: IE)

Permit	Status	Submittal Timeline
The following permits have been obtained for exploration activities and are in the process of being amended for project construction activities:		
Arizona State Mine Inspector Mined Land Reclamation Plan	Active/amendment in progress	Q3 2025
Pinal County Dust Control permit	Active/annual renewal	Ongoing
The following permits for construction activities are in preparation or have been submitted:		
City of Casa Grande Major Site Plan and Development permit	In progress	Q3 2025
Pinal County Air Quality Control District Class II Air permit	Submitted	Q1 2025
Arizona Department of Environmental Quality General Aquifer Protection permits for construction	In progress	Q3 2025
Arizona Department of Water Resources 45-513 Groundwater Withdrawal permit	In progress	Q4 2025
The following permits for construction and operation will be prepared and submitted as design and engineering details become available:		
Arizona Department of Transportation Encroachment permit for access off Highway 84	Road improvements engineering in progress	Q4 2025
US Environmental Protection Agency Class V Underground Injection Control permit	Engineering to inform application in progress	Q4 2025
Arizona Department of Environmental Quality Individual Aquifer Protection permit	Engineering to inform application in progress	Q3 2026
Arizona Department of Environmental Quality Recycled Water Discharge permit	Detailed engineering required for application, if necessary	Q1 2027

Current Santa Cruz copper project permitting status and timeline. (Source: IE)

The underground mine will utilize the latest mining equipment, including a tele-remote-operated electric fleet, mine telemetry and grade control technologies. Underground mining will primarily use longhole stoping and local drift-and-fill, totaling approximately 201 km of stope cuts completed across 16 main levels. Mining will occur in blocks, extracting ore from the bottom upwards, with paste backfill providing ground support. Ore will be transported underground using the Railveyor system.

Hydrogeological mitigation strategies during decline development and mining include grouting, hydrostatic lining and silica gel injection. Groundwater modelling and mitigation result in residual passive inflow rates ranging from approximately 6,000 to 8,000 gallons per minute (gpm) during peak mining periods.

Throughput will steadily increase from the start of production onward to achieve an average of 20,000 mt/d, producing an annual average of 72,000 mt of copper cathode over the first 15 years of the mine life.

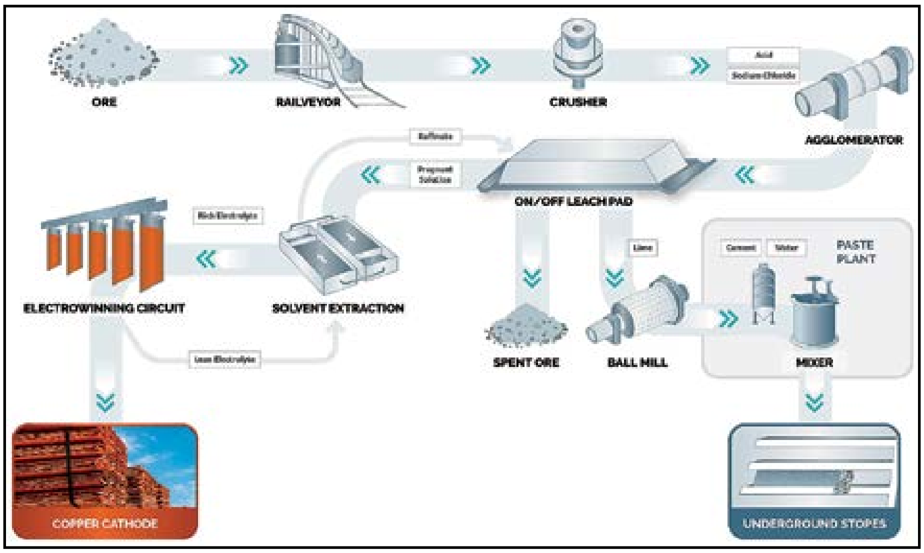
Mined ore will be brought to the surface and processed through a conventional chloride-assisted on/off-heap leach process to produce copper cathode through solvent extraction/electrowinning (SX/EW). The high-grade nature of the Santa Cruz and East Ridge orebodies enables high copper recoveries averaging 92.2% over the life of mine, with low sulphuric acid consumption of 6 kg/mt of treated ore. Up to 50% of the spent ore will be converted into paste and used as backfill underground.

The Santa Cruz project requires permits primarily from the City of Casa Grande, Pinal County and the State of Arizona, with only one Federal permit required. Land use authorizations from the City of Casa Grande, including a General Plan Amendment and Major Amendment to a Planned Area Development Zone, have already been obtained and allow mining activities and infrastructure within the project site.

The current Santa Cruz development plan targets initial construction in the first half of 2026 and first copper cathode produced in 2028.

The indicated resources at Santa Cruz and East Ridge, exclusive of previously discussed mineral reserves, comprise a total of 1.5 million mt of contained copper. The indicated resources amenable to heap leaching at Santa Cruz total 800,000 mt and 41,000 mt at East Ridge. These indicated resources at Santa Cruz and East Ridge are not included in the current mine plan, and if converted to mineral reserves, represent near-mine expansion potential.

"Santa Cruz will provide high-paying jobs in Arizona and be a significant long-term U.S. producer of copper cathode," Melvin said. "We are fortunate to have such a high-quality copper asset on private land with excellent infrastructure."



A simplified flowsheet shows the copper production process for Santa Cruz. (Image: IE)

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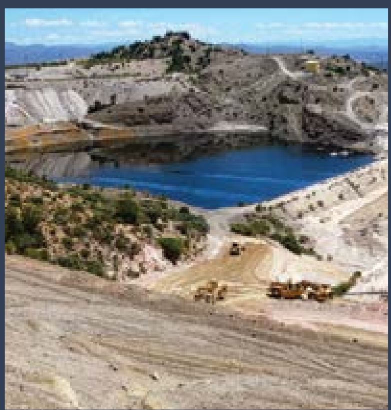

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Arizona Sonoran Outlines Plans for a Long-life, Low-cost Copper Producer

Hudbay and others provide initial funding for the project

The Arizona Sonoran Copper Co. (ASCU), a U.S.-based copper exploration and development company, published a prefeasibility study (PFS) for its Cactus project during October 2025. The study considers a simple open-pit, heap-leach operation using solvent extraction/electrowinning (SX/EW) to produce approximately 103,000 metric tons per year (mt/y) of copper cathodes during the first 10 years, which would make Cactus the third largest cathode producer in the USA.

During 2025, ASCU raised a considerable amount of cash before and after the PFS announcement. During June, the company closed on a C$51.75 million ($37.2 million) bought deal with a syndicate of underwriters led by Scotia Capital. That same group returned in December with another C$86.3 million ($62 million). Hudbay Minerals exercised its pre-emptive rights as an investor and brought an additional C$10.4 million ($7.5 million) to the table.

"The recent financings have provided ASCU with the incremental capital to expand our key 2026 deliverables to include early development activities," said ASCU President and CEO George Ogilvie. "Logistically, we will begin advancing the most productive and/or time sensitive activities outlined in the recent PFS." He thanked Hudbay for its ongoing support. As a result, ASCU ended 2025 with a little more than $100 million.

The Cactus mine will soon become a world class copper producer. (Photo: ASCU)

An Optimized Plan Brings High-grade Ore Forward

The PFS that ASCU published for its Cactus project in Pinal County, Arizona, foresees a long-life and economically viable copper mining operation. It will use conventional open pit mining methods and heap leach-SX/EW processing to produce LME Grade A copper cathode onsite.

"The work product of this recent study validates the investment of optimizing the Parks/Salyer mine plan both in terms of production cadence and ore quality," said Bernie Loyer, senior vice president-projects for ASCU. "That optimization has resulted in higher grade material being placed sooner in the execution plan, and produces a much more consistent copper production profile, generating superior cash flows as compared to the 2024 PEA.

"Building on the benefits first highlighted by the 2024 PEA, including the impact of the MainSpring land acquisition and the comprehensive available infrastructure, a solid foundation with a defined and compelling plan of operations emerges in sharp focus," he said. "That plan, in combination with a supportive local community, a proven project team on deck and the Cactus project being fully positioned on private land, sets an impressive stage for the next step in this incredible journey to deliver a future long-term source of copper cathode produced in the USA."

Ogilvie explained that the PFS is a major milestone in the advancement of the project toward a final investment decision, which could be as early as Q4 2026. "We believe we are developing a world-class copper cathode project, within Casa Grande's copper district," Ogilvie said. "Looking forward, Cactus is a project capable of plating an average of 103,000 mt/y of copper cathodes annually in the first 10 years.

Ogilvie also noted that, to date since the company's IPO in 2021, the land position for the Cactus project has increased by 320% and mineral resources have grown by over 580% in the measured and indicated category, with the after-tax NPV8 reaching a substantial $2.3 billion.

"We have the opportunity to become a significant player in the American copper industry, filling a clear gap in the domestic copper supply," Ogilvie said. "Cactus is among the highest quality copper development projects globally in terms of risk, size, scale and capital intensity." He said the

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company is anticipating production of first copper cathodes in H2 2029.

ASCU will now embark on three key workstreams toward a final investment decision, including a definitive feasibility study, obtaining permit amendments and project financing. "Each workstream has begun and is being led by experienced team leaders," Ogilvie said.

The Cactus PFS contemplates a streamlined mine plan that leaches oxides and enriched ore from Parks/Salyer and Cactus West open pits, reducing the life of mine (LoM), but improving estimated overall ore grade reporting to the processing circuit and simplifying the execution of the project. The Primary Sulphides and Cactus East underground will be placed on the back burner as future expansion opportunities.

The new mine plan optimizes crushing and haulage to maximize copper recovery. Metallurgical performance improves to 75% total copper recovery from 65% total copper, over a defined leach cycle spanning three 180-day cycles.

Economically, the focus on efficient copper operations results in consistent estimated annual revenues, free cash flows and annual production rates. An initial capital estimate of $2.3 billion supports a higher production profile in years three through five. The Cactus operation becomes positive in terms of cash-flow between years two and three, based on $4.25/lb. It generates $3.8 billion in cash flow over the first 10 years. Mining costs are reduced through economies of scale. The processing side will benefit from decreased net acid consumption (7 lb/ton).

Conventional Mining and Processing Operations

The PFS moves the mining phases north to access higher grade ore tons earlier at Parks/Salyer. The crusher capacity was increased to 28 million mt/y and the SX flow rate was increased to 21,500 gallons per minute (gpm). Full SX/EW nameplate capacity increases to 140,000 mt/y copper between years three and four, facilitating a higher production profile in the early years.

The mine plan establishes on-site copper cathode production from conventional heap leach and SX/EW processing of the oxide and enriched sulphide ore. Mine operations are expected to use conventional truck and shovel and two-stage crushing. The mine will use trucks to load the leach pads in the first three years and then pivot to conventional stacking.

The Parks/Salyer and Cactus West open pits will provide ore feed to the leach pad from year one through year 20 at variable rates not less than an estimated 18 million mt/y and not more than 28 million mt/y. The Parks/Salyer open pit will be mined in seven phases (0-6), while the Cactus West open pit will be mined in two phases (1-2).

A total of 1.84 billion mt of material is projected to be mined from the Parks/Salyer pit, including 373.8 million mt of proven and probable mineral reserve leach ore at a 0.59% total copper grade and a strip ratio of 3.9:1. A total of 368.9 million mt of material is projected to be mined from the Cactus West pit, including 139.1 million mt of proven and probable mineral reserve leach ore at a 0.33% total copper grade and a strip ratio of 1.7:1. The LoM strip ratio is 3.3:1 combined.

The material handling system has been designed so that 28 million dry mt/yof ore can placed on the heap leach pad. Crushing rates are variable to accommodate constraints in the electrowinning circuit and avoid building large inventories on the leach pad. The mining sequence has been designed to balance stripping requirements under this constraint for efficient plant operations.

There are also various future opportunities to improve material handling solutions. Trolley assist for haul trucks, battery-powered trucks and waste sizing/stacking systems, etc., could lower overall operating costs per ton. These are expected to be further detailed in the definitive feasibility study. The use of in-pit or near-pit crush and convey solutions for waste could reduce operating costs. Once the rail line is operating, it could be used to deliver supplies in bulk, such as reagents, which would also reduce costs.

The Cactus processing plant will consist of a two-stage crushing and screening plant ahead of heap leach. All material will be crushed to a minus ¾-in. P80 size, stacked on a single pad and leached for 180 days. The pregnant leach solution (PLS) will be processed in a SX/EW plant. The SX/EW plant process design will include three extraction settlers, one strip settler and a tank house. The tank house will start as a 70,000 mt/y facility and then ASCU will add a second facility of same size, ready for use between years three and four.

Production from the heap will reach 140,000 mt/y from year five. Copper cathodes will be produced directly on-

The Cactus team plans to revive a brownfield copper operation. (Photo: ASCU)

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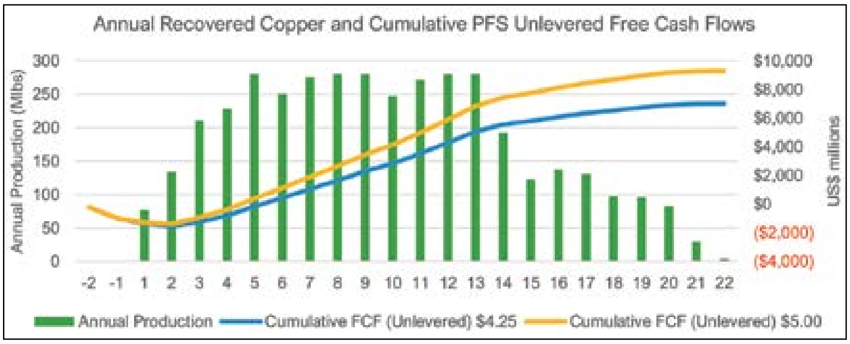


Production from the Cactus mine is expected to average 113,000 mt/y for the first 10 years. (Graph: ASCU)

site via heap leach and SX/EW, including a three-year ramp up period. Average annual cathode production for the first 10 years is expected to be 113,000 mt. A total of 2,210 million mt is expected to be mined (waste + ore), including a total of 513 million tons processed, resulting in the recovery of 3,988 million lb of copper cathodes over the LoM.

Average annual water consumption is planned at approximately 2,050 gpm, the equivalent of 3,300 acre-feet/year, well within ASCU's permitted 3,736 acre-feet/year industrial use allocation, using in-place onsite wells. The PFS includes a high demand for dust suppression. ASCU acknowledged that it would be possible to reduce the use of water by adding surfactants, gravel, or pavement to reduce dust from the roadways. It will be evaluated as a way to minimize the environmental impact and preserve water resources.

Infrastructure, Permitting and Financing

The Cactus project is a brownfield project located approximately six miles northwest of Casa Grande and 40 miles south-southwest of Phoenix.

During historic ASARCO operations (1974-1984), a rail spur was connected directly with the Union Pacific Railroad to ship concentrates to its El Paso refinery in Texas. While the spur has been removed, the onsite rail line still exists. Current onsite infrastructure also includes power lines and a substation, water wells and a water pond, geological buildings, core sheds and administrative offices. All of which contribute to a lower capital intensity.

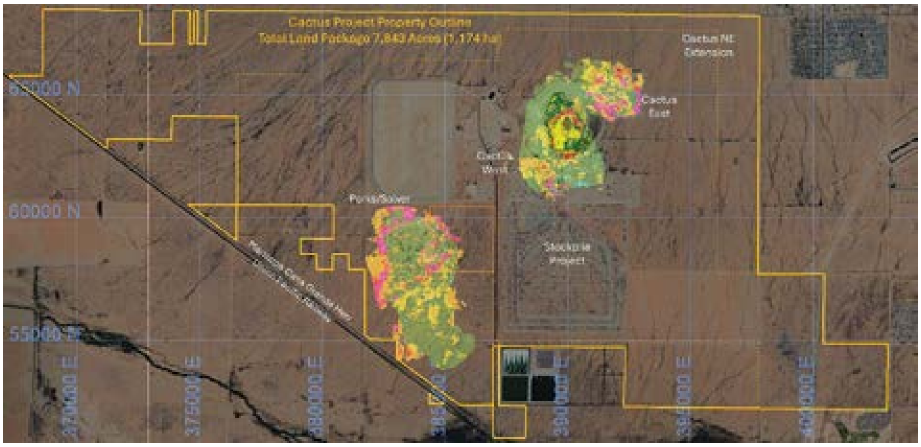
Because it will be developed on private lands, the Cactus project has no federal nexus for permitting. All permitting is limited to state and local required permits, including the aquifer protection permit, industrial air permits and the mined land reclamation permit, each of which ASCU has already received from regulators pertaining to the 2021 PEA. Permitting amendments will be submitted to address changes in the mine plan pre-

sented by the PFS, with an expected completion date in H2 2026.

In keeping with its community engagement and partnership standards, ASCU said the Cactus project will be developed with a plan to establish and maintain the support of its host communities. The company initiated community outreach at the earliest stages of the project and is currently evaluating and building partnerships within the community. ASCU understands the importance of outreach during its development and throughout the LoM.

ASCU said it is encouraged by the positive response to the project from the community. Reviving a brownfields project is potentially more appealing than a new mine.

Discussions with Tier 1 lenders for the mining space are well underway. ASCU is targeting a financing completion date as early as H2 2026. "Our financing strategy will focus on minimizing dilution and optimizing the Cactus project's strong cash generation potential," said Nick Nikolakakis, CFO, ASCU. "With the PFS confirming the financial strength of the project, we have begun the process of engaging with a range of banks, private lenders and export-credit agencies to support a disciplined and capital efficient path to construction."



The Parks/Salyer and Cactus West open pits will provide ore feed for the Cactus leach pad. (Map: ASCU)

ASCU is reviewing several standalone opportunities for further optimization of the operation. There are possibilities for an expansion. Exploration has identified opportunities at Cactus West, Cactus East, Northeast Extension and Gap Zone North, Southwest and beneath the Cactus West pit between Cactus East and Cactus West. Cactus East development could add to the production profile, as could options for late-stage processing of LoM primary sulphide ores (including leaching and flotation technologies).

Resolution Copper to Strengthen Arizona Economy

Miners celebrate shaft sinking success. (Photo: Resolution Copper)

Resolution Copper's project in Superior, Ariz., is expected to become the largest copper mine in North America, with a goal of producing as much as 40 billion pounds of copper over 40 years. The proposed underground mine is a large brownfield redevelopment of the historic Magma mine, an underground copper mine located in a region where mining has been ongoing for over 100 years. The Resolution Copper project has the potential to add up to $1 billion per year to the state's economy and create thousands of local jobs both directly and indirectly, while also positioning Arizona as a key supplier of essential minerals.

The project, which is jointly owned by Rio Tinto (55%) and BHP (45%), saw its first Final Environmental Impact Statement (FEIS) from the U.S. Forest Service (USFS) in 2021, but the FEIS was ultimately revoked a short time later to allow for further review and tribal consultation. In April 2025, the USFS issued a legally required 60-day notice of the agency's intent to republish a FEIS for the project.

"A decade of feedback from local communities and Native American Tribes has shaped this project every step of the way," said Vicky Peacey, general manager at Resolution Copper. "Working together, we have created a plan that preserves the area's cultural heritage and natural resources and enhances recreational opportunities while creating new economic opportunities that will put Arizona resources and workers at the center of the nation's energy security and infrastructure needs, with a domestic supply of copper and other critical minerals."

The land exchange, wherein Resolution Copper would transfer more than 5,400 acres of land across Arizona to the USFS and the Bureau of Land Management (BLM) in return for over 2,400 acres of Tonto National Forest land, was scheduled to occur on August 19, 2025, but was halted the day before the exchange by a panel of judges with the 9th U.S. District Court of Appeals in response to late appeals by a Native American tribe and environmentalists. Four months later, the "Save Oak Flat from Foreign Mining Act" was introduced to Congress, further delaying the project.

"We believe Arizonans deserve clear, accurate information about this project. It will help protect America's energy future, support American jobs and reduce reliance on foreign copper," the company said in a statement regarding the bill. "Resolution Copper has agreed to forego half-a-billion tons of ore and completely relocate major surface facilities to minimize impacts, preserve access to Oak Flat and physically avoid areas of cultural significance identified by Tribes."

While the project's development status is currently paused, the company did reach a major milestone with the completion of a $200 million project to rehabilitate and deepen the historic No. 9 Shaft.

Originally constructed in 1971 by the Magma Copper Co. and operated

No. 9 and No. 10 headframes on a sunny day. (Photo: Resolution Copper)

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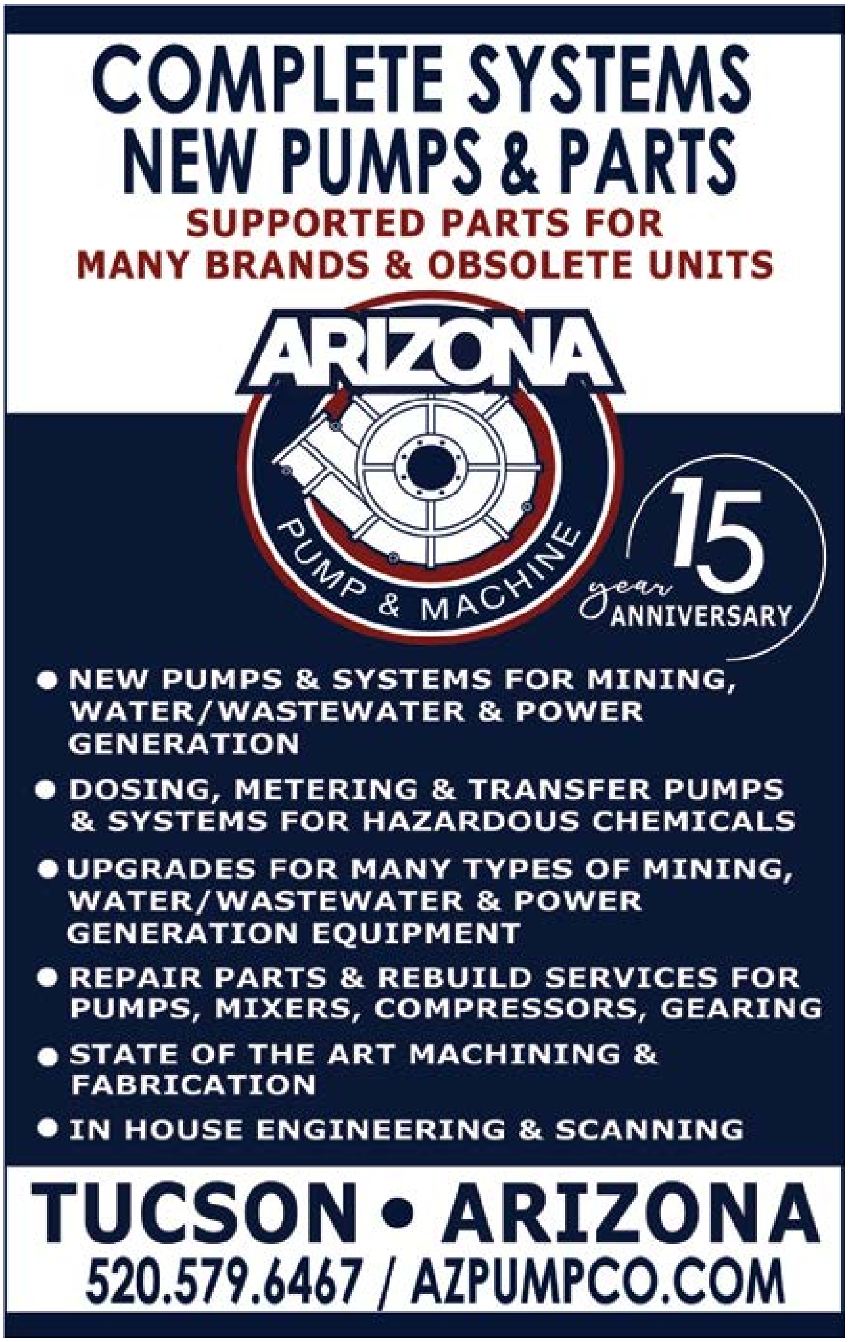
as a production shaft until the mid-1990s, the refurbished and deepened shaft now extends to a final depth of 6,898 ft and measures 22 ft in diameter. The completed No. 9 Shaft is now the second deepest single lift mine shaft in the USA. Resolution's No. 10 Shaft is the deepest at 6,943 ft.

Rehabilitated and deepened from 4,800 ft to over 6,800 ft, the No. 9 Shaft now connects to the No. 10 Shaft, serving as ventilation and access for future underground development. Over the course of the work, crews drilled nearly 14,500 ft, poured more than 560 yd^3 of concrete and installed nearly 140 yards of shotcrete.

Together, the network of underground mine workings forms the backbone of the project's next phase of underground development, creating the foundation for future copper production that will strengthen the U.S. supply of this critical mineral.



"This achievement underscores what's possible when American miners, homegrown talent from local communities including the Superior, Miami, Globe, San Carlos Apache Tribe, Hayden, Kearny and Winkleman, come together to do the job safely," Peacey said. "While ongoing litigation continues to stall development, we are ready to advance this important copper project, enabling thousands of high-paying jobs, billions in economic development for rural Arizona and access to a domestic supply of copper essential to American security and modern infrastructure."

"This accomplishment reflects years of planning, discipline and teamwork between our people and partners," said Rob Tobin, operations and maintenance manager at Resolution Copper. "Achieving this safely for more than two years without a recordable injury shows the professionalism and dedication of everyone who worked underground to bring No. 9 back to life in a modern way."

Redpath USA, the project's lead contractor, managed sinking and construction, supported by Globe-based Oddonetto Construction underground concrete and surface batch plant operations and logistics.

"We are proud of the innovative solutions developed in partnership with Resolution Copper, Oddonetto Construction and the flawless safety performance achieved along the way," said Eric Stoll, project manager at Redpath USA.

"Completion of the No. 9 Shaft shows what can be achieved when local companies and national partners work side by side with a shared commitment to safety and excellence," said Kim Oddonetto, president, Oddonetto Construction. "This project demonstrates that with the right training and opportunities, we can build a skilled underground workforce right here in our communities, one that will help power Arizona's future for generations to come."

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Mako Takes Control of the Moss Mine

After slipping into bankruptcy, a new owner buys the mine, restarts operations and begins developing a long-term strategy

At the beginning of 2025, Mako Mining purchased the Moss mine in Mohave County, Ariz., from Wexford Capital, the controlling shareholder in Golden Vertex, which filed for bankruptcy protection. Mako immediately began working toward restoring operations, and in June 2025, the company announced that it had recovered the entire $6.4 million acquisition cost through the cash flow it derived from residual leaching of previously stacked ore, and the return of $1.5 million of the $3.1 million held as collateral for various environmental bonds.

"It's extraordinary to fully recover the acquisition cost of a mine in less than three months, and prior to the restart of mining operations," said Akiba Leisman, CEO of Mako. "This is a testament to how the Moss acquisition was structured, with help from higher gold prices.

"After taking control of the mine, we began to refurbish a lot of the mess that was left by the previous operator," Leisman told the *Korelin Economics Report* during a December 2025 podcast. "Toward the end of April 2025, we were ready to restart mining operations." The company initiated the bidding process and hired a contractor by the end of June.

The contractor began delivering equipment to the site, and by October, the Moss mine was producing 9,000 tons per day (t/d). Leisman said he expects the Moss mine to achieve steady state production around March 2026. "We are still in ramp up mode at this point," he said. "The Moss mine is a heap leach operation, and it takes time to recharge the leach pads."

The Moss mine is mining relatively low-grade gold ore, and Leisman acknowledged some hiccups with startup. "But even with that, it was a profitable mine," he said. "We have never had to take a cash draw from corporate other than an advanced payment for the contractor, which we're going to get back over the course of

A wheel loader transfers ore to the processing plant at the Moss mine. (Photo: Mako)

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the next seven or eight months on an amortized basis. Other than that, all operations have been funded through the cash flows that are coming from the residual heap leach and now from steady state production at the mine."

Unencumbering the Mine

After the sale, disputes arose relating to the royalty agreements that Golden Vertex had entered related to the Moss mine. "Originally, there was a large stream on silver production and five other royalties on the property," Leisman said. "So, the stream is gone. That was eliminated during the bankruptcy process. One of the royalties was settled during bankruptcy. One of the royalties is on a part of the mine we view as depleted. Technically, it's still there, but it has no value.

"Another one of the royalties is associated with a fairly important option agreement," Leisman said. "Over the course of the next six or seven years, a minor property payment needs to be made. And, if we exercise that option for a few million bucks, the royalty holders would be entitled to a 2% royalty. It only comes into play once that option is exercised, and there is a high probability that it will be exercised."

The other two royalties were in dispute during bankruptcy. One was held by Patriot Gold, and the other was held by Sandstorm, which is now owned by Royal Gold. "Litigation began during the bankruptcy in July 2024," Leisman said. "We took full control of the bankruptcy negotiations with them in litigation shortly afterwards."

A few things needed to be decided in bankruptcy that started with the fundamental declaration about whether these royalties were real property interests or personal property interests, Leisman explained. "We thought that the structure of the royalties themselves was pretty clear and that these were personal," Leisman said. "The judge made a somewhat bifurcated ruling on this. He disagreed with us on the real property-interest side for the Patriot royalty. On the Royal Gold royalty, the judge has decided to send that to trial to determine what makes them real or personal. It comes down to what exactly the intent of the parties was during the original construction of the royalties."

There will be fallout from the decision as far as the payments that were due to the royalty holders prior to the bankruptcy that have been tied up, Leisman explained. "That needs to be decided to exit the Canadian bankruptcy process," he said. "The U.S. bankruptcy process was exited.

"A substantial amount of cash collateral is being held in Canada that

The Moss mine is a low-grade heap leach operation and the operation is currently recharging the leach pads. (Photo: Mako) would be owed to Mako's account pending the conclusion of this trial," he said. "I thought litigation would end this calendar year, but it is likely going to continue into next year. Fortunately, much of the expense is being funded out of the collateral account in Canada."

Restoring the Moss Mine

Mako is resolving a few short-term issues that should improve production at the Moss mine. When Northern Vertex designed the processing side, the feed for the crusher was constrained, Leisman explained. "There was not enough room for a truck dump," he said. "A wheel loader must carry ore from a run-of-mine stockpile to the crusher. It's not the most efficient process, and it requires a functional wheel loader. The mine's Cat 988 wheel loader has maybe 50% or 60% availability. The new contractor delivered another wheel loader just to make sure that the Moss mine can maintain 95% plus availability, which will resolve a short-term bottleneck that should increase capacity to 9,000 t/d consistently."

The mine also has availability issues with its blasthole rigs, which Leisman said would be addressed.

Longer term, he believes the Moss mine needs to run at about 11,000 t/d. "That will require some ingenuity with the current plant configuration," he said. "We're anticipating that this will be resolved by the end of September."

Mako was planning to publish an updated resource in January. An updated reserve and project economics would be published six to eight weeks after that. By early March, Leisman thought the operation could produce an extensive long-term mine plan.

"This is the type of ore body where grades improve at depth," Leisman said. "The higher-grade part of the mine happens to be to the east of one of the controlling faults, which we are not currently permitted to mine. We expect the Bureau of Land Management will issue a permit amendment during Q1 2026. It was delayed due to the government shutdown." With that permit, the Moss mine can access some higher-grade parts of the ore body.

For most of 2026, the operation will be mining lower grade ore. Longer term, Leisman believes the Moss mine will be pushing close to 0.4 grams per ton. "And, if it can mine and process 11,000 t/d, production could be more than 40,000 oz of gold equivalent," he said.

Since the mine restarted, as sporadically as it has been, production has averaged in the mid- to high-4,000-t/d range at low grades, and it's still been profitable, Leisman explained. "It's easy to imagine how great the numbers will be with higher grades, running at maximum efficiency," he said. "People will be surprised at how profitable a mine like Moss can be when it's basically unencumbered by its royalties and running at full efficiencies. This may go down as one of the most accretive transactions the mining industry has ever seen, at least on a percentage basis."

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A Turnaround for Pinto Valley

A mature operation leverages know-how to improve operational discipline

By Steve Fiscor, Editor-in-Chief

A comprehensive turnaround effort is underway at the Pinto Valley mine to improve key performance metrics. The mine's owner, Capstone Copper, recently brought a new general manager and a well-recognized consultant on board to help implement a new management operating system. The company is currently working to overcome production limitations caused by water shortages, which primarily affected the concentrator.

After commissioning two new shovels and bringing in expertise from a sister operation in Chile, Pinto Valley's mining operation increased material handling by more than 50%, but copper production was limited by the operation's processing capacity. Last year, Pinto Valley produced 42,382 metric tons (mt) of copper, compared to 57,272 mt in 2024. They are working to reverse that trend.

Pinto Valley has plenty of reserves and a long mine-life. Like most mines in the region, they are looking at various ways to limit turnover and bring new people into the organization, and they also benefit from the broad experience of Capstone Copper.

The Adjustment Begins

During October, the company named Mark Scott as the new general manager for Pinto Valley Mining Corp. He previously managed Vale's Manitoba operations, which included the prolific Thompson mine. "We have launched a fairly wide-ranging turnaround effort here that involves just about every aspect of our business," he said. "All of the technological improvements that E&MJ has covered previously are still paying dividends for us. Now, it's time for the next round of improvement to instill operational excellence. The hope is that more informed decision making will take root here so that we can take full advantage of the resource and the processes we have available to us."

A shovel loads copper ore into haul trucks at the Pinto Valley mine. (Photo: Capstone)

Capstone also hired a well-known consulting house to help with management operating system implementation. "We are calling it the Pinto Valley Way," Scott said. "It's the mine's new management operating system, which will improve the discipline with which we execute our management routines, the daily cadence of operations and execution, and continuous improvement."

Getting the team of consultants involved with our design and implementation teams is about organizing and resourcing this change management effort to ensure rigorous discipline for the operation with daily, weekly, monthly and quarterly routines, Scott explained. "It's difficult for a management team to implement that internally when they have full-time jobs, keeping them fully occupied day-to-day," he said. "It's helpful to have outside advice on structure from a group of experienced people who have been through this any number of times in similar environments, including Capstone's other operations in Mexico and Chile. They lend their expertise and help resource our internal effort to gain the discipline that's required for us to achieve the level of operational excellence that we're looking for.

Part of that refresh includes implementing Capstone's Asset Management Framework. "It touches on 14 different elements of the business from structure and leadership through, probably most importantly for us, operational and maintenance integrated frontline planning and scheduling," he said.

"We will use our enterprise resource planning systems and the other operational management tools that are at the disposal of the team here on site to make sure we are reliably meeting the commitments we make to the corporation and to the investment community every year, which has been a challenge here over the last couple of years," Scott said.

During 2025, production at Pinto Valley was limited by water availability. "We're in a multi-year drought here in this part of the country, so we're doing a lot of work on water availability and conservation to make sure we do not have those same limitations in 2026 and beyond," Scott said. “Part and parcel of that is the maintenance, planning and scheduling work, and operational excellence that goes along with making sure our pumps and pipes are running at full capacity, enabling the mill to do the same.”

The lack of water primarily impacted the plant. “For a good part of 2025, Pinto Valley was only running four of the plant’s six ball mills,” Scott said. “We have been running all six since late October. We’ve had some rain, but unfortunately it was disastrous in our community. The October downpour caused floods and landslides, which led to a loss of life and property in Globe-Miami.”

The rain partially replenished the Pinto Valley mine’s reservoirs, and they have been working to rehabilitate pumping systems to make full use of the water that is now available.

Pit Production Grows

Total material movement in the pit has grown from 90,000 tons per day in 2024 to an average of about 145,000 tons a day in 2025. Scott credits the new mine manager, Jaime Espinoza and his team. “Jaime and the mine department have realized a dramatic improvement in mine material movements over the course of 2025,” Scott said.

Part of the increase in total material movement can be attributed to two relatively new Hitachi 5600 hydraulic shovels. The mine’s second shovel arrived on site at the beginning of 2025. For years, the Pinto Valley mine relied on wheel loaders as the primary production tools. “One of the shovels is in a front-facing configuration and the other is oriented as an excavator,” Scott said. “They have been very productive for us. We are still using the fleet of four Cat 994 wheel loaders, but they are used more as supplementary loading units.”

The mine is currently using the single-side loading method with the shovels, but it may experiment with two-sided loading methods in 2026, which works well for some mines and frustrates others. “It’s a more challenging loading method for sure,” Scott said. “We don’t have the world’s highest benches, so you’re dealing with limited volumes of material in any one setup location for the shovel. We will give it a go and see how much of an improvement we get in our loading, queuing and overall cycle times.”

Pinto Valley also refreshed a good chunk of the truck fleet. “We had some quite high-hour Cat 789s that have been replaced with a combination of 793Fs and NewGen 793 haul trucks. The new trucks are running along with the remaining 12 Cat 789 haul trucks. We have retired six 789 haul trucks so far, and we will retire a few more units as we move through 2026.”

The shovels have improved Pinto Valley’s static loading times, and cycle times for the trucks have also improved. “That is a major development as far as material handling,” Scott said. “We made some improvements with mine plan-

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All six of Pinto Valley's ball mills are running again. (Photo: Capstone)

ning and pit sequencing. We are also paying closer attention to the condition of the roadways and the tie down areas, and we have been shortening the shift change timelines. Those are just a few examples of the initiatives underway in the mining department for the last year, which is basically the effort that we are exporting to the concentrator plant, maintenance and tails and water areas in 2026."

Maintaining a Quality Workforce

Like most mines, Pinto Valley must actively maintain a well-trained workforce. Turnover is a concern. "We have 738 employees on site right now, augmented by a couple hundred contractor employees on any given day," Scott said. "We would like to replace about half of those contractors with full-time employees. To do that, we're putting a fair bit of effort into our recruiting process and our training and development processes.

"We have beefed up our progression charts for the formal way in which we develop operators from entry level to haul truck operators, to shovel and loader operators and to multi-equipment qualified operators," Scott said. "The mining department has focused a lot of attention on that over the last year."

To supplement those efforts, Pinto Valley is looking at military outplacement recruiting programs to find operating and maintenance technicians. The company is also implementing a co-op program to recruit professionals, like engineers, geologists, metallurgists, etc.

At the same time, the mine plans to implement a formal apprenticeship program for skilled trade development. "We are going to take some lessons learned elsewhere and formalize the process by which we develop highly skilled maintenance technicians," Scott said.

The mining industry in Arizona tends to have a high turnover. "We are competitive as far as wages and benefits, but there are opportunities with other local employers in the same industry doing very similar work pretty close at hand."

Companies are flocking to Phoenix. There are defense contractors, semiconductor manufacturing operations, and data and fulfillment centers where people can find work relatively close to a major population center.

"In a way, Pinto Valley must compete with those factories starting up in the Phoenix area," he said. "So, we're going to trial some things this year like commuting support programs with buses to see what that does for us in terms of improving our employees' commuting safety, expense and overall quality of life.

"As we achieve operating excellence, we will lower the daily level of workplace stress experienced by our people and make ourselves an even more attractive place to work," he said. "We know we offer competitive compensation, very good healthcare and contributory pension benefits.

"As an industry, we could do a better job of marketing ourselves as an employer of choice, especially when you consider the importance of copper to just about everything that society needs these days, like electrification, data centers and AI. None of that is possible without the copper produced in Arizona," Scott said. "We are an important industry with a lot of opportunities. While *E&MJ* readers certainly get it, we need to do a better job of telling that story more widely."

Located near Miami-Globe, Ariz., Pinto Valley sits near Freeport's Miami copper smelter and KGHM's Carlotta mine, so it has some regional competition. The mine is about 50 miles east of the eastern suburbs of Phoenix, not far from Tucson, which has a big mining presence. "Most of our workforce lives in either Miami-Globe or in the East Valley suburbs of Queen Creek, Gilbert, Gold Canyon, Mesa, etc., just this side of Phoenix," Scott said.

The district has a fairly consistent grade of about 0.3% copper, so concentrator throughput volume is critical. "We have no magic jewel box stope to go to at the end of every month to make our numbers. So, consistent, reliable throughput is absolutely critical," Scott said.

"That improvement in total material movement at the mine last year and the work we're doing on safe, reliable, stable production in the tailings and water and the concentrator this year are big opportunities," he said. "We are permitted through 2039, with a good long life ahead of us.

"There may be some regional consolidation opportunities with the presence of our existing milling and SX/EW infrastructure," he said. "As we stabilize the operation here at 55,000 metric tons per day through the mill, that may serve as a great platform for growth in the Miami-Globe camp down the road.

"This year will be all about reliable, credible, safe operations for us and really achieving operational excellence here, which we've done a great job with in the mine department over the last year and a half," Scott said.

Emergency Response Drill Gives Mining Undergrads a 'Leg Up'

By Pricilia Mugwa

Students in the School of Mining Engineering and Mineral Resources acted quickly to save lives and prevent a catastrophe recently during a simulated roof collapse at the University of Arizona San Xavier Mining Laboratory.

"Students had to engineer their way through technical problems then coordinate with operations to find, triage and evacuate trapped miners," said Kray Luxbacher, the Gregory H. and Lisa S. Boyce Leadership Chair of mining and geological engineering.

The Mine Emergency Response Drill (MERD) was part of the school's safety and health curriculum.

"MERD showed me how interconnected every role is during an emergency," said Jessica Davis, a mining engineering student who served as a procurement specialist. "My job was to help identify and secure the equipment needed for the response, and it taught me how quickly decisions must be made under pressure."

Advisers from Resolution Copper and UofA EMS as well as the state mine inspector were on hand to help guide students through the high-pressure scenario.

"All of these students will graduate with a leg up on any other college of mines because of programs like this," said Arizona Mine Inspector Lesley "Les" Presmyk, who helped guide students during the simulation, including quick development of an emergency plan to evacuate "trapped" miners.

Luxbacher, also the executive director and head of SMEMR, assigned roles such as press relations, mine manager and engineering team.

"Exercises like this allow students to apply curriculum under stress, using skills from geotechnical engineering to communication, all while safeguarding their peers," she said.

Presmyk, a 1975 mining engineering alum with more than 30 years of industry experience, worked with students acting as mine managers to ensure scenario documentation, maps and safety plans followed Mine Safety and Health Administration standards.

He said the simulation covered "all aspects of what would happen and what the mine manager and team would do in case of a collapse or major accident."

Arizona Mine Inspector Les Presmyk guides students through an emergency response to a simulated roof collapse at the San Xavier mine. (Photo: UofA)

Mitsubishi to Invest $600M in Copper World

Hudbay Minerals announced the closing of the strategic investment from Mitsubishi Corp. for a 30% joint venture (JV) interest in Copper World LLC, which owns the fully-permitted Copper World project in Arizona. On closing, Mitsubishi contributed approximately $420 million in cash to Copper World LLC and will contribute an additional $180 million in cash to complete its initial investment within 18 months in accordance with the terms of the definitive subscription agreement. Mitsubishi will also fund its pro-rata 30% share of future equity capital contributions required to construct Copper World.

Peter Kukielski, Hudbay's president and CEO, said: "This strategic partnership will leverage our organizations' complementary strengths to deliver this world-class project that will increase Hudbay's consolidated copper production by more than 50% and create significant value for all of our stakeholders. We are ideally positioned to build one of the next major copper mines in the U.S. and produce 'Made in America' copper for the U.S. critical minerals supply chain."

The company says that the $420 million proceeds from Mitsubishi will be used to directly fund the remaining definitive feasibility study (DFS) costs and pre-sanction costs, in addition to the initial project de-

The funds from Mitsubishi will be used to complete a feasibility study and the initial project development costs. (Photo: Hudbay)

velopment costs for Copper World. Feasibility activities for Copper World are underway, with expected completion of the DFS in mid-2026. Hudbay says it has continued to execute detailed engineering work and other de-risking activities in preparation for a Copper World sanction decision expected in 2026.

Arizona Metals Sugarloaf Peak Shows Expansion Potential

Arizona Metals Corp.'s second round of results from its 2025 reverse-circulation drill program on the company's Sugarloaf Peak gold project continue to expand the deposit laterally to the southwest, along strike both northwest and southeast, and at depth. The company said that the second round of results confirms excellent continuity within the deposit, along with similar results from the first round of the reverse-circulation drill program in December 2025, which also confirmed continuity of mineralization.

Duncan Middlemiss, president and CEO of Arizona Metals, commented: "The results from this drill program have delivered a meaningful increase in the scale of the deposit, with strong continuity demonstrated along a

The Sugarloaf Peak gold project, located in La Paz County, Arizona. (Photo: Arizona Metals)

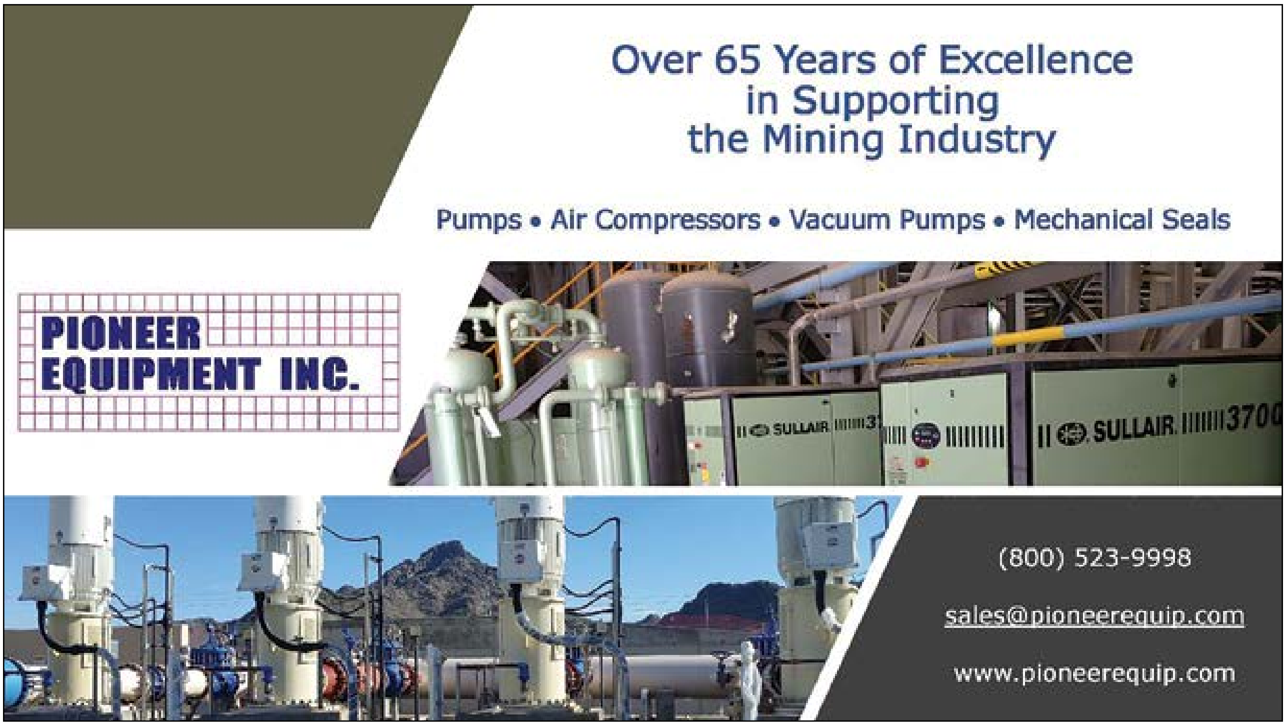
broad southwest corridor where mineralization remains open and highly prospective. With six additional drill holes pending at the lab and active exploration underway to refine and prioritize further step-out targets, we believe Sugarloaf is well positioned for continued growth through additional drilling later this year."

The Sugarloaf Peak project, located in La Paz County, Arizona, on 4,400 acres of BLM claims, is a heap-leach, open-pit target and has a historic estimate of 100 million tons containing 1.5 million ounces of gold. Metallurgical test work on the project by Arizona Metals indicates favorable gold recoveries in both oxide and sulfide mineralization. As a result of these initial results, the company engaged SRK Consulting (Canada) Inc. to oversee metallurgical test work to develop low-cost flow sheets to recover gold from the sulphide zone. This test work on sulfide mineralization indicated gold recoveries of up to 85%. Mineralogy and diagnostic leach tests on the samples indicated that the majority of gold is present as free gold within sulfides, primarily pyrite.

After encouraging current drilling results at the Sugarloaf Peak project, Arizona Metals is conducting a comprehensive, detailed program to evaluate current data and gather additional modern exploration data, including geophysics (IP-resistivity, magnetics, radiometrics), geochemistry (surface rock-sample grid, hyperspectral airborne survey) and AI studies. The planned exploration program intends to integrate all past data with new, consistent, deposit-wide data in order to optimize drill spending later in 2026.

Copper Fox Makes Progress on Mineral Mountain

Copper Fox, a Canadian resource company focused on copper exploration and development in Cana-



da and the USA, made significant headway with exploration of its 100% owned Mineral Mountain porphyry copper project in 2025. The company submitted a Plan of Operations (PoO) to the Bureau of Land Management (BLM) back in 2024 to conduct a drilling program at four locations, and exploration was officially underway by October 2025, when drilling operations commenced at the site.

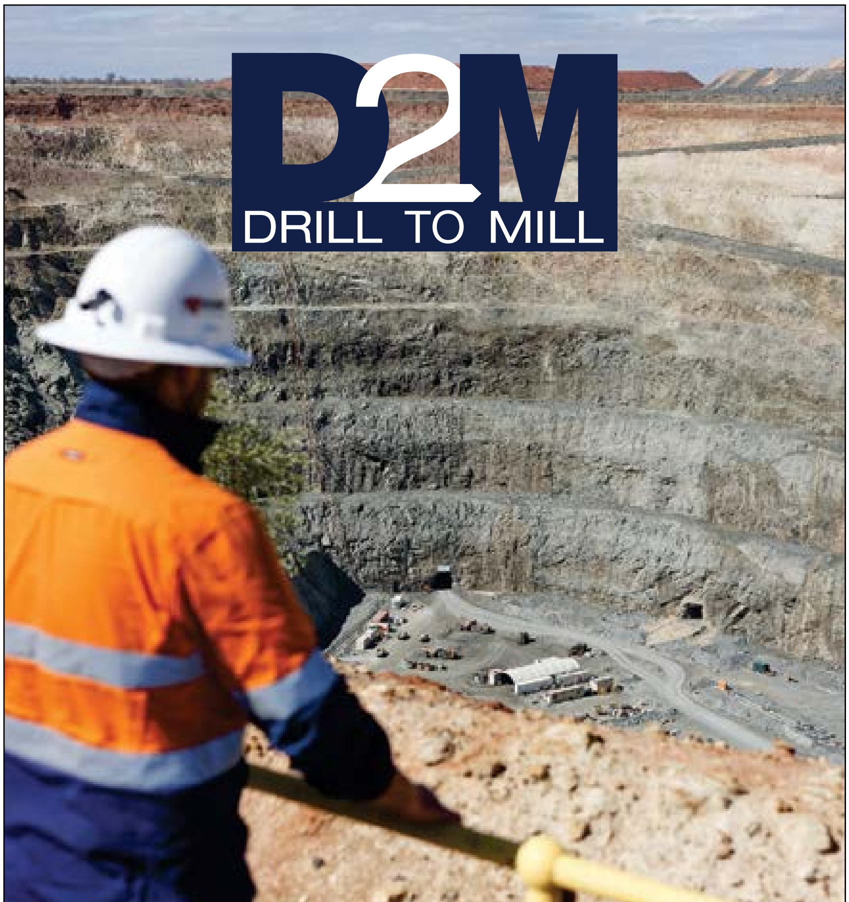
Mineral Mountain is a drill-ready project hosting three porphyry copper targets covering 2,692.4 hectares in the Mineral Mountain Mining District, Arizona, on a northeast-trending porphyry copper belt. The company proposed a drilling program of the area to drill test the depth extent of the porphyry style copper-molybdenum mineralization and alteration exposed on surface, and determine the cause of the underlying, equally large open-ended chargeability anomaly. The drilling program called for up to 2,000 meters of drilling in four locations as specified in the drilling permit.

The 30-day public review period of the drilling on Mineral Mountain concluded on May 7, 2025, where the BLM advised that there were no substantive public comments made. On May 15, 2025, the proposed PoO was approved by the BLM field manager, and by July of 2025, the BLM accepted the company's Surety Bond for the Mineral Mountain PoO to conduct an exploratory drill program.

Preliminary exploration in September 2025 on the Mineral Exploration Permit located on the southeast corner of Mineral Mountain identified a large, broadly defined area exhibiting the host rocks and proximal style of alteration and mineralization expected in a Laramide age porphyry copper-molybdenum system. The identification of this target, combined with the large, open-ended porphyry target found approximately 1.5 km to the north, significantly expanded the size of the district and enhanced its porphyry potential before drilling occurred. Sixteen rock samples were submitted to Vancouver Petrographics Ltd. for petrographic analyses to describe mineral percentages, grain size, textures, vein alteration halos, alteration patterns, copper mineralization and other minerals present.

The maiden drilling on October 28, 2025, was the next step in testing the large porphyry copper footprint that Copper Fox identified at Mineral Mountain in 2024.

Elmer B. Stewart, president and CEO of Copper Fox, stated: "Cop-



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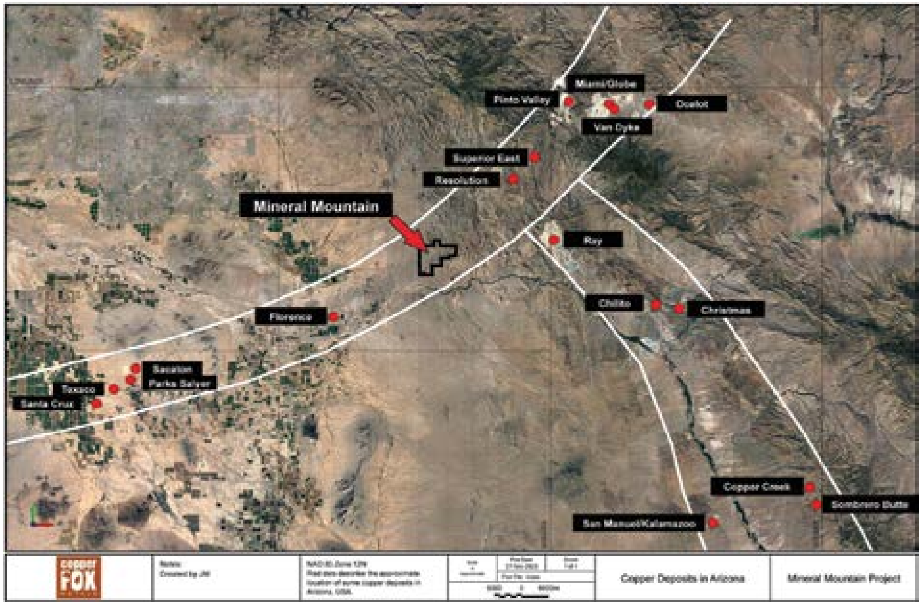

A map of Copper Fox's Mineral Mountain porphyry copper project. (Photo: Copper Fox)

per Fox is excited to test this large, high-quality porphyry copper target that exhibits the mineralization, alteration, host rocks and geophysical signatures typically observed at other porphyry copper deposits in Arizona. The size of the porphyry footprint and its location on a northeast-trending porphyry copper belt that hosts some of the largest porphyry copper deposits in Arizona is an indication of the porphyry potential of the Mineral Mountain project."

Edge Copper Acquires Zonia Copper Project

Edge Copper is a U.S.-focused copper exploration and development company advancing the next generation of domestic supply to power the clean-energy transition sustainably, transparently and profitably. Formerly known as Plata Latina Minerals Corp., the company changed its name to Edge Copper in October 2025 after the successful acquisition of the Zonia copper project from World Copper Ltd. in exchange for $10.5 million in cash and an aggregate of 37,820,374 Edge Copper shares, resulting in World Copper and its shareholders owning approximately 31.3% of Edge Copper.

The Zonia copper project is a past-producing oxide copper deposit and conventional open-pit mine that is planned to produce pure copper cathode on-site, located in Arizona's historic Walnut Grove district. As a brownfield site on private and patented land, Zonia benefits from an existing water

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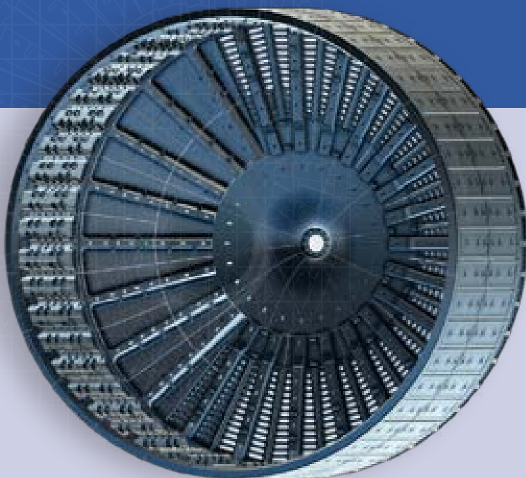

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supply, nearby grid power and a faster state-level permitting process. Edge Copper's 2024 mineral resource confirms a strong foundation with room to grow, including an indicated 668 million pounds of copper contained in 112.2 million short tons, and an inferred 320 million pounds of copper contained in 62.9 million short tons.

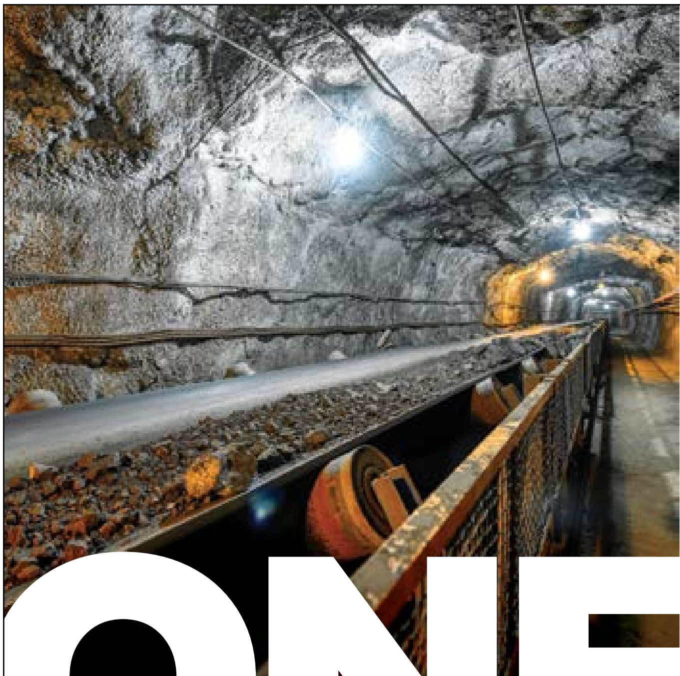
Edge Copper's president, Letitia Wong, commented: "The acquisition of the Zonia copper project marks a transformative step in establishing the new Edge Copper as the next leading U.S. copper developer. As global demand for copper continues to grow and the USA focuses on domestic demand for critical minerals, Edge Copper is focused on advancing projects that can deliver both economic and environmental value."

The company is planning a 60,000-foot drill program for 2026, commencing in Q4 2025, to expand resources and advance the conversion of Zonia's extensive oxide copper indicated and inferred resources. In November 2025, Edge Copper announced an equity investment by and technical collaboration with GeologicAI, the global leader in High-Resolution Decision Engineering for the critical minerals sector. The collaboration is expected to shorten the exploration and development timeline at Zonia.

The Zonia project is a past-producing oxide copper deposit in Arizona's historic Walnut Grove district. (Photo: Edge Copper)

Faraday Copper Initiates Largest Ever Drill Program at Copper Creek

Faraday Copper is a Canadian exploration company focused on advancing



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Phase IV of Faraday Copper's drilling program began at the Copper Creek project. (Photo: Faraday Copper)

its 100% owned flagship project, the Copper Creek project, located in Pinal County, Arizona. The company acquired Copper Creek in 2018 and quickly identified the site as the next major source of U.S. copper production.

In June of 2025, the company announced the results of the final nine drill holes from its Phase III drill program at the Copper Creek project, which began in October 2023. Five holes were drilled in the American Eagle area, one at Old Reliable, two at the Sunrise Trend and one at Horsecamp, which resulted in the discovery of multiple mineralized breccias, including the high-grade Banjo breccia.

The approval of Faraday's Exploration Plan of Operations from the Bureau of Land Management (BLM) in July 2025 provided access to 67 drill pads on federal land, 48 of which were in the American Eagle area. The access will allow the company to fully delineate multiple mineralized breccias and porphyry occurrences, as well as near-surface oxide mineralization. The additional approved pads will allow testing for further near-surface porphyry and breccia-hosted mineralization near American Eagle, and as a result, the company has decided to focus on exploration upside to fully evaluate the American Eagle area and test other high-priority targets across the property. Some drilling will be aimed at the collection of geotechnical and hydrological data.

Faraday commenced Phase IV of its planned 40,000 m drill program in September 2025. Phase IV is the largest drill program ever planned on the project to date, according to the company. The program will focus on the American Eagle area, as well as new targets, infill, geotechnical, infrastructure and hydrological drilling.

"I am excited to announce the start of our Phase IV drill program, the largest drill program ever planned on the project to date," said Paul Harbidge, president and CEO. "Growing the resource and maximizing the economic potential is our priority – and, therefore, we have deferred the updated resource and technical study until after this drill program is completed."

Exploration upside remains in the Copper Creek district with numerous breccias and porphyry targets yet to be drilled. Geological mapping, geophysical and geochemical data, as well as reconnaissance drilling, have highlighted various targets outside the resource area, including the Sunrise Trend, Bunker Hill and Sycamore. Mapping and geological data collection will continue throughout the district and are expected to highlight further exploration targets.

The American Eagle underground resource contains high-grade cores that may correspond to magmatic cupola zones or high-grade breccias. The underground resource at both Keel and American Eagle is open laterally, and additional drilling has the potential to expand the mineralization and further define high-grade mineralization. Some drilling will be aimed at reconnaissance drilling for potential new porphyry centers.

G50 Sets its Sights on Gallium

G5O Corp. Ltd., an emerging precious metals exploration company progressing high-potential projects in the Southwest U.S., is focusing on the continued support of its fully owned Golconda project in Arizona to produce potential commercialization of gallium.

"Gallium's strong price momentum from 2025 has carried into 2026," Mark Wallace, CEO of G50, said in a statement. "Although headlines focus on rare earths, broader strategic metals — including gallium — are likely to be affected [by export restrictions]. With China accounting for roughly 98% of global gallium supply and now restricting exports to both the first- and second-largest consumers (the USA and Japan), the supply outlook has tightened meaningfully."

G50 completed the Golconda project's purchase in October of 2025 for $1 million, under the terms originally agreed upon in August 2020 and disclosed in the prospectus dated August 4, 2021. The transaction follows the company's recent divestment of non-core assets, allowing G50 to streamline its project portfolio and focus resources on delivering value at the Golconda project and the White Caps project in Nevada.

A preliminary mineralogical study conducted in June 2025, after a large gallium discovery and a district-scale precious metals discovery at the company's Golconda gold-silver-zinc project, led to a substantial increase in activity at Golconda in 2025. SGS's two phases of mineralogical test work showed that 90% of Golconda's gallium is concentrated within 10% of the rock (sericite).

Core drilling commenced at Golconda in November 2025, wherein the drilling program has been designed to achieve multiple outcomes, including following up on the shallow high-grade gold and silver discovery made by G50 in 2025, increasing the company's knowledge of the depth extent of known mineralization and exploring new targets along the Tub Vein and Tub Footwall zones. Additional test work in 2026 is expected to define those potential commercialization pathways.

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The Antler project is a high-grade, development-stage underground copper project in Arizona with the potential to become a leading U.S. copper supplier. (Photo: Kinterra)

Kinterra Acquires Antler Copper Project

Kinterra Capital Corp. expanded its U.S. copper platform by completing the acquisition of New World Resources Ltd. and its flagship Antler copper project. With the acquisition, Kinterra gained not only the Antler copper project, a past-producing, high-grade underground copper asset in western Arizona, but also two copper exploration projects in Arizona and New Mexico.

Antler is underpinned by a polymetallic resource with over 555 million lb of contained copper, approximately 1.2 billion lb of copper equivalent, supporting robust economics and a projected 12-year mine life. The project is well advanced technically, with a clear federal and state permitting pathway. All metals produced by Antler are classified by either the USGS or by Executive Order as critical or strategic minerals. The project has received all state-level permits, and Kinterra is executing a focused development plan.

"With an average grade of 3.8% copper equivalent, Antler ranks among the highest-grade underground copper development projects globally, nearly six times the global development average," said Kamal Toor, co-managing partner at Kinterra. "Its combination of exceptional grade, capital efficiency and strategic location makes it capable of materially contributing to near-term U.S. copper supply."

"Including Antler, Kinterra now controls approximately 175,000 metric tons of annual copper production capacity across its U.S. portfolio — from Antler in Arizona, White Pine in Michigan and Pumpkin Hollow and the adjacent Southwest Open Pit in Nevada," said Cheryl Brandon, co-managing partner at Kinterra.

Kinterra also initiated the evaluation and development of sulphide leach processing technologies aimed at enabling domestic copper cathode production across its U.S. portfolio. The initiative will evaluate the application of established methods capable of converting sulphide ores directly into refined copper. Early engagement with leading technology developers is underway, with initial testing and pilot plans expected in early 2026.

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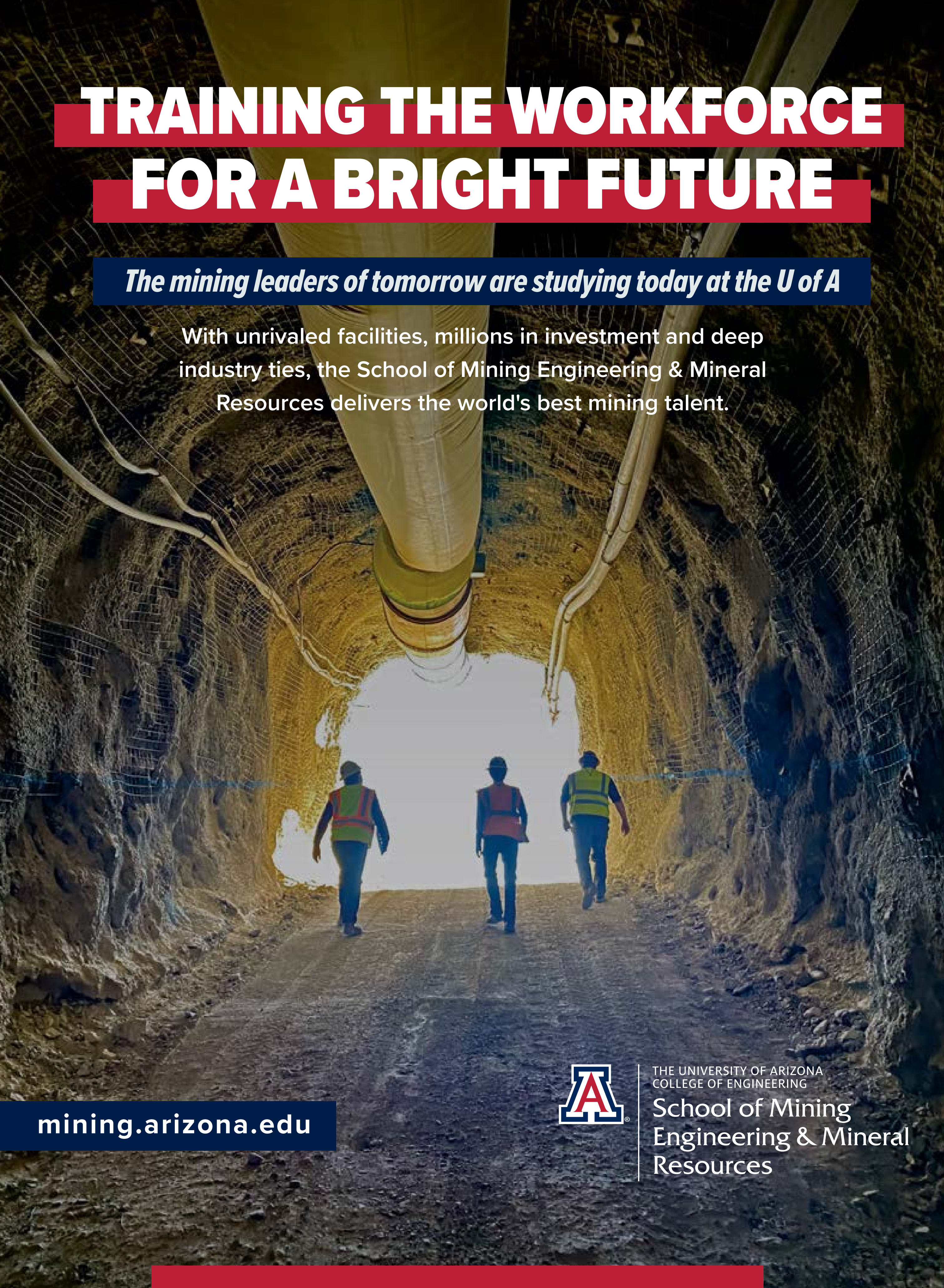
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Mining Investment Worldwide Tops $1.5 Trillion

Critical minerals and supply chain security dominate as mining project drivers in 2026

By Joseph Govreau

Coming off a tumultuous but busy year for project activity, 2026 is shaping up to be an equally active year for the mining industry, as mining companies navigate a complex maze of geopolitical changes, regulatory/permitting hurdles, environment, social and governance (ESG) responsibilities, supply/demand considerations and the need to optimize/automate existing assets. Demand for metals and minerals remains robust with electrification and supply security as the leading drivers in 2026. Governments are prioritizing projects based on national security concerns, influencing mining company decisions on where and when to commit to projects.

Metals needed for traditional infrastructure buildout such as aluminum, copper and steel continue to be supported by electrification of transportation and industry. The boom in AI/data center construction has intensified the growth in electricity consumption, and the subsequent need to build out power generation, battery storage and transmission capacity. Electricity consumption is increasing globally by around 4% per year, according to the International Energy Agency (IEA), with record consumption forecast for 2026 in the U.S., according to the U.S. Energy Information Administration (EIA). Data center construction is an immense market, with 8,279 projects totaling $3.4 trillion involving new or expanding data centers worldwide, according to Industrial Info's Global Market Intelligence (GMI).

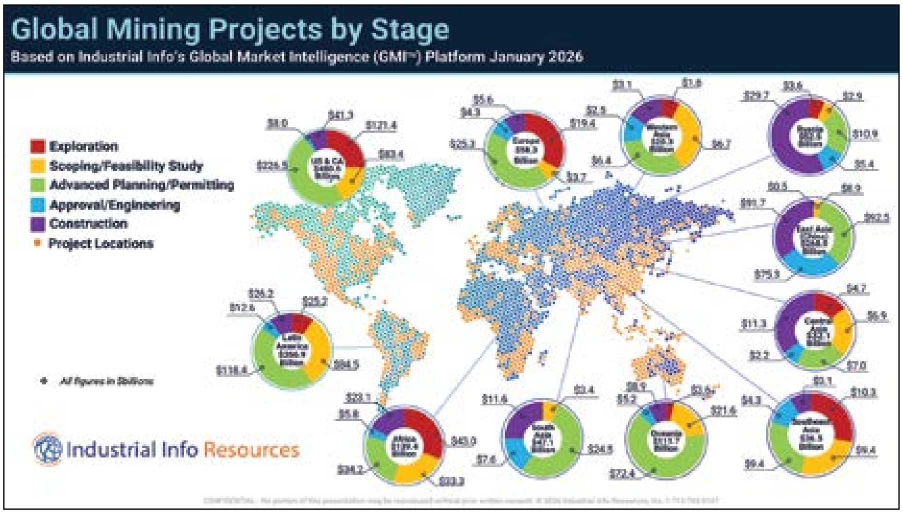
Let's not forget that we are in the infancy of an energy transition that started 15 years ago and continues today. Energy transition technologies, such as wind and solar power and electric vehicles, are much more metals intensive than traditional energy technologies, and while the growth rate has slowed in some western markets, globally the energy transition continues. In China, new electric vehicle sales now account for about 50% of the market, with several countries in Europe exceeding that mark.

Geopolitical events and concerns over secure supply of critical minerals have ratcheted up reshoring, near-shoring and friend-shoring projects, and that will play heavily to influence project activity in places like the U.S., where the current administration is shifting away from green energy programs and embracing a more mining- and fossil-fuel-friendly approach to supply chains. Emphasis is being placed on resource security and building up domestic supply chains to provide alternatives to Chinese supply domination. The value of projects involving critical mineral mining, refining and downstream processing has increased 24% over the past year, according to Industrial Info's Global Market Intelligence (GMI), increasing up to $1.24 trillion across more than 8,600 projects, based on U.S. classification of 60 critical minerals as listed by the U.S. Geological Survey (USGS).

Global Mining Majors Continue High Levels of Capital Spending

Capital expenditures for the top eight mining majors, including Anglo American, Barrick, BHP, Freeport-McMoRan, Glencore, Newmont, Rio Tinto and Vale, is forecast to rise 1.9% in 2026 based on guidance from these companies, rising from $48.6 billion to $49.5 billion, which would make it the largest capital outlay since 2014. This comes after a 1% growth in spending in 2025, indicating a plateauing of growth, but still at a relatively high level of spend when compared to the bottom of the market in 2017. Capital spending has more than doubled since that time. Both BHP and Rio Tinto are each planning to spend $11 billion in 2026.

Not all companies are increasing capex. After receiving board approval in December, Anglo American and Teck are navigating the regulatory approval process for a merger of equals creating Anglo Teck. The combined company, to be headquartered in Vancouver, British Columbia, will be a leading copper producer, as well as a producer of iron ore and zinc, and would have 89 mines and other processing plants with a strong presence in the Americas, Africa and Europe. Teck has previously announced plans to delay new copper projects in Peru and Mexico in order to focus on getting the Quebrada Blanca asset up to speed in Chile. Prior to the merger announcement, Anglo American was reducing its capital expenditures from $4.5 billion in 2025 to $3.6 billion in 2026. Teck Resources spent about $2.1 billion in 2025.



For many mining companies, the focus has been on optimizing assets. Expansions of existing mines, mine restarts and brownfields are proving easier to permit than grassroot mines. Still, grassroot mine development accounts for the majority of what we are tracking, about 56% when you look at it by value. There are more than 5,000 grassroot mines in the planning, engineering and construction stages globally. Of that total, 562 are currently under construction with two thirds of those mines under construction in China, for mainly coal, stone quarries, iron ore and phosphate rock. Costs for new grassroot mines are skyrocketing. Barrick is spending $5.6 billion on Phase I of Riko Diq copper-gold project in Pakistan. Rising project costs are one of the reasons we are seeing increased merger and acquisition activity; the recently announced talks between Rio Tinto and Glencore to create the world's largest mining company is a good example of this trend. It's cheaper for companies to acquire than to grow organically, in some cases.

Government Policy Shifts to Pro-mining in the West

The U.S. government is actively supporting mining and downstream refining of critical minerals through partnerships, equity buy-ins, funding/grants and permitting programs. For example, in an effort to reduce the lengthy and costly permitting and regulatory process for permitting new mines, the Trump administration has added 48 mining projects to the Fast 41 permitting program, having just just one project on the list a year ago. The Fast 41 permitting program was created several years ago to support large infrastructure projects from the Infrastructure Bill. It has been expanded to include mining projects, such as Anfield Energy Incorporated's $15.3 million Velvet-Wood uranium-vanadium project in San Juan County, Utah. The U.S. government is also directly investing in mining projects, having taken 15% ownership of MP Materials and 10% interest in Canadian miner Trilogy Metals.

Canada is also fast-tracking the permitting process for major infrastructure projects and has created what it calls the Major Projects office, which now has 13 projects on the list, including several mining projects, such as Newmont's Red Chris mine expansion in British Columbia and Furan Mining's McIlvenna Bay copper mine project in Saskatchewan.

In the EU, the European Commission has selected 60 strategic projects representing $15 billion supporting the Critical Raw Material Act. This includes 47 mining, refining and recycling projects in Europe and 13 outside of Europe. Projects are mainly targeting the following critical minerals: alumina, bauxite, cobalt, copper, graphite, gallium, germanium, lithium, manganese, nickel, PGMs, rare earths and tungsten.

Global Project Activity Reaches $1.5 Trillion

Globally, Industrial Info is tracking more than 13,700 active mining projects totaling $1.5 trillion, according to GMI. (See Map pg. 25). The top four regions are the U.S. & Canada with $480.6 billion, Lat-

Table 1 — Top 20 Countries for Planned Mining Projects in 2026

Country	$ Billion	Projects
China	$137.1	1,425
Canada	$42.2	203
U.S.A.	$40	331
Australia	$28.1	573
India	$17.7	593
Chile	$16.4	102
Brazil	$14.8	161
Argentina	$10.7	28
Russia	$8.9	83
Peru	$7.7	216
South Africa	$7	75
Iran	$6.2	85
Saudi Arabia	$5.4	44
Egypt	$4.7	41
Indonesia	$4.5	362
Tanzania	$3.9	46
Mongolia	$3.8	12
Zambia	$3.7	38
Jordan	$3.3	19
Botswana	$3.3	27

Table 2 — Planned Mining Projects by Commodity

Commodity	$ Billion	Projects
Coal	$98.1	1,630
Copper Ore	$72	490
Gold & Silver Ore	$56.3	934
Iron Ore	$55.2	567
Lithium	$27.1	172
Other Metal Ore	$20.5	241
Ferroalloy Ore	$18.6	231
Potash, Soda & Borate Minerals	$18.2	71
Crushed & Broken Limestone	$12.1	369
Uranium	$10.2	84
Phosphate Rock	$8.2	85
Other Nonmetallic Minerals	$7.6	124
Lead & Zinc Ore	$6.9	142
Crushed & Broken Stone	$4.8	116
Oil Sands	$4.5	12
Industrial Sand	$4.4	69
Crusher & Broken Granite	$4	80
Clay, Ceramic & Refractory Minerals	$2.3	57
Construction Sand & Gravel	$1.8	60
Dimension Stone	$1.2	16
Total	**$434**	**5,550**

in America with $266.9 billion, East Asia with $268.9 billion and Africa with $139.4 billion. Overall construction activity has declined slightly since last year, dropping from $260.6 billion to $255.6 billion, further supporting a plateauing of spend in 2026, but still at a high level.

Currently, there are about 5,500 active mining projects totaling $434 billion scheduled to begin construction in 2026. China remains the number one market for mining projects, heavily dominated by coal projects (see Top 20 Countries for 2026 Planned Mining Project Construction Starts Table 1). China is followed by Canada, the U.S., Australia and India. This is followed by four countries in Latin America (Chile, Brazil, Argentina and Peru) and Russia, which make up the top 10 countries.

The Middle East will be a growing market for mining projects in 2026 with Iran, Saudi Arabia, Egypt and Jordan joining the top 20 countries list. Saudi Arabia, seeking to diversify from oil, is actively ramping up gold and critical mineral project activity. Saudi mining company Maaden has partnered with the U.S. government and U.S. rare earth producer MP Materials to build a rare earths refinery in Saudi Arabia.

Latin America

In Latin America, copper and lithium projects will continue to dominate investment trends in the region. A reactivation of copper projects is anticipated in both Peru and Chile, supported by improving price conditions and renewed investor confidence. Meanwhile, Argentina is experiencing a remarkable surge in lithium-related investments, positioning the country to surpass Chile in production within the next five years. This surge is being fueled by a combination of new projects and the gradual maturation of existing developments in the lithium triangle region.

Brazil will continue to consolidate its position as one of the world's leading iron ore producers, benefiting from stable operations and a solid export base. However, the domestic steel sector is expected to experience a slowdown due to increased competition from low-cost Chinese imports. There is also growing activity for critical minerals including copper, lithium and rare earths.

Geopolitical tensions, including ongoing trade disputes between the United States and China and the imposition of new tariffs, remain a key factor influencing investment decisions in 2026. Geopolitical events and the growing emphasis on resource security are having a major impact in Latin America. Resource nationalism continues to shape regulatory and investment changes in several countries. Mexico is a clear example: the previous government declared lithium a "national strategic resource," which created uncertainty and delayed private investment. In Chile, the recent agreement between Codelco (the state-owned copper company) and SQM marked a turning point, as the state is now directly entering lithium production through a public-private partnership.

Argentina Rising

By contrast, Argentina is not following this strong nationalist trend. While companies continue to monitor policy signals, the country has been more open to commercial opportunities, which is drawing international interest in its national resources, including lithium and copper. This relative openness stands out in the region and is encouraging firms to expand their participation in Argentine projects. In Argentina, one of the most relevant new policies is the Large Investment Incentive Regime, or RIGI. This program provides tax and customs benefits, long-term stability, and even international arbitration rights for large-scale mining and mineral projects, especially those that can export and bring in foreign currency. Rio Tinto's Rincón lithium project in Salta was approved under RIGI for an investment of about $2.5 billion to $2.7 billion. Another example is Galan Lithium's project in Catamarca, approved for around $217 million, with plans to produce more than 20,000 metric tons of lithium carbonate equivalent per year by 2027.

A different picture is displayed in Chile. The new Codelco–SQM partnership signals a stronger state role in lithium. This shift in policy has cooled private investment and created a more cautious outlook for new projects.

What Commodities Will Lead the Way in 2026?

Coal continues to be the number one market for projects in 2026 with $98.1 billion, but with the caveat that most of that spend is in China (See Table 2). China accounts for 76% of that spend with India, Australia, Indonesia, U.S. and Vietnam making up the majority of the rest.

Copper is the number two market for 2026 with $72 billion planned, as an important critical mineral for the energy transition and infrastructure buildout. Supply concerns including declining reserves of copper ore and unexpected closures of major mining operations, such as First Quantum's Cobre Panama mine, which was closed in 2023 by the Panamanian government, are causing supply issues at a time when demand is increasing. Cobre Panama is going through a government audit process and should restart some time in 2026.

Gold and silver prices exceeded historic highs at the end of 2025. As a result, projects for gold and silver ore will be strong in 2026. There are currently 934 gold ore and silver ore projects totaling $56.3 billion planned worldwide.

Iron ore project activity is slowing, having fallen to fourth place in 2026 with $55.2 billion being surpassed by gold and silver projects. The iron ore market is changing. It is dominated by exports to China's large steel industry, which is in over capacity, and demand has waned. The startup of the Simandou project in Guinea, the largest mining project ever constructed, will move Guinea up to third-largest exporter of iron ore after Australia and Brazil. India's iron ore demand will increase as it expands steelmaking capacity significantly over the next five years.

Other critical minerals getting attention include lithium, rare earths, antimony and zinc. Extraction and downstream refining and smelting of critical minerals is also garnering government support, as the emphasis on securing nonchains sources rises in the current trade war atmosphere.

Demand for mined commodities remains robust on continued energy transition, infrastructure build-out and changes in supply chains due to geopolitical issues. In spite of the strong long-term demand outlook, mining project activity will be challenged by constraints to project development, including slowing economic growth, project cost inflation, permitting, financing and market challenges. This appears to point the way for modest growth or plateauing of project spending activity in 2026, but at a relatively high level when considering recent history. Coal, copper, gold, iron ore and critical minerals such as lithium and rare earths will receive the largest investments in 2026.

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Annual Project Survey Reflects Expectations for Continued Growth

Several projects move from construction to production, as operators rush to take advantage of high commodity prices

By Steve Fiscor, Editor-in-Chief

From concept to reality, it takes 15 years or more and billions of dollars to develop an orebody into a producing mine. Over the course of the project timeline, developers will refined plans multiple times with studies that include a preliminary economic assessment (PEA), a preliminary feasibility study (PFS), and a bankable feasibility study (FS). If the FS provides a suitable return, the developers begin the permitting process and they look for funding. Once an investment decision is made, the project moves into construction.

The three studies demonstrate various levels of confidence as developers design and engineer the project. The studies try to assess the variables associated with the project, like the geology of deposit, mining and processing methods, and economic estimates, such as capital expenses (Capex) and operating expense (Opex), required to extract ore from the deposit and metal from the ore.

The PEA serves as a scoping study to quickly determine if the project is economically viable. The PFS is more advanced and relies on reserves and resources. It also uses detailed engineering to tighten Capex/Opex estimates. As the name implies, the bankable FS is something the developer and a mine financier can discuss intelligently.

Each year, *E&MJ* compiles all of this to the best of its ability in its Project Survey. These days with commodity prices on the rise along with costs, mining companies and developers are making a lot of announcements and revising those figures in a direction that indicates future growth for the mining business.

Copper Mining Projects

Trianon Ltd., a company controlled by Kazakhstani billionaires Vladimir Kim and Oleg Novachuk, sold the Baimskaya copper and gold project in Russia to Northern Aurora, a Russian closed mutual investment fund. In early May 2024, the U.S. added the Baimskaya mining company to its list of sanctioned companies. Information on the proposed $8 billion open-pit copper project, which sat at the top of the survey's copper projects, is no longer available, and it has been removed from the Project Survey.

Construction of the $2 billion Super Pit Expansion project is well underway at the Lumwana mine in Zambia. (Photo: Barrick Mining)

Glencore is now estimating the initial Capex for its El Pachon Phase 1 copper-molybdenum project in Argentina to be somewhere between $8,500 million and $10,500 million. It now sits atop the list at $9,500 million. It's followed by Barrick's Reko Diq 1 & 2 ($7,000 million) in Pakistan, Northern Dynasty's suspended Pebble project ($6,770 million) in Alaska, Vicuña Corp.'s Vicuña project ($6,500 million) in Argentina/Chile and Rio Tinto's Resolution Copper project ($6,000 million) in Arizona.

Vicuña is a new name added to the survey this year. Incorporated in Canada, Vicuña is a joint venture between BHP and Lundin Mining that merged the Josemaría copper project with the Filo del Sol project (copper, gold and silver). Both projects are located in Argentina's San Juan Province, with part of Filo del Sol crossing the border with Chile. BHP and Lundin Mining each own a 50% stake in Vicuña Corp. Vicuña will be the operator of the combined projects, acting independently of BHP and Lundin Mining, and will be responsible for the development, operation and management of the projects.

Glencore's ($4,000 million) MARA project combines the Agua Rica project, a large-scale copper, gold, silver and molybdenum deposit located Argentina with the Alumbrera processing facilities, located 35 km from the Agua Rica pit.

Glencore submitted applications for both the El Pachón Phase 1 and MARA projects for the Incentive Regime for Large Investments (RIGI) implemented by Argentinian President Javier Milei. If approved, the projects will have access to an attractive and long-term economic and investment framework as well as enhanced investor protections. "President Milei and his administration must be credited for introducing the RIGI," said Gary Nagle, CEO, Glencore. "This framework has changed the investment landscape in Argentina, providing a key catalyst to attract major foreign investment to the country."

Major Mining Projects, Year-end 2025*

Project Name	Location	Status	Type	Products	Owner	Project Cost (US$M)**
BASE METALS						
Copper						
El Pachon Phase 1	Argentina	FS	OP	Cu, Mo	Glencore	9,500
Reko Diq 1 & 2	Pakistan	Construction	OP	Cu, Au	Barrick, Balochistan Govt	7,000
Pebble	USA	PEA, Delayed	OP	Cu, Au, Mo	Northern Dynasty	6,770
Vicuña	Argentina	FS	OP	Cu	Vicuña Corp. (Lundin, BHP)	6,500
Resolution	USA	PFS	UG	Cu, Mo	Rio Tinto, BHP	6,000
Tampakan	Philippines	FS	OP	Cu, Au	Sagittarius	5,900
Galore Creek	Canada	PFS	OP	Au, Ag	Newmont, Teck	5,208
Centinela Phase 1	Chile	Construction	OP, conc	Cu	Antofagasta Minerals	4,400
MARA	Argentina	PFS	OP	Cu	Glencore	4,000
Casino	Canada	FS	OP, HL	Cu, Au, Ag, Mo	Western Copper	3,620
Frieda River	PNG	FS	OP	Cu, Au	PanAust, Highlands Pacific	3,600
Taca Taca	Argentina	PEA	OP	Cu, Au	First Qantum Metals	3,600
NuevaUnion	Chile	FS	OP	Cu, Au	Newmont, Teck	3,500
Los Bronces UG	Chile	Permitting	OP, UG	Cu	Anglo American	3,000
El Arco	Mexico	PFS	OP, conc, SX-EW	Cu	Southern Copper	2,900
Los Azules	Argentina	PEA	OP	Cu, Au	McEwen Copper	2,700
Schaft Creek	Canada	PEA	OP	Cu, Au	Teck, Copper Fox	2,650
Los Chancas	Chile	FS	Conc, SX-EW	Cu	Southern Copper	2,600
Michiquillay	Peru	FS	OP	Cu, Mo	Southern Copper	2,500
Vizcachitas	Chile	PFS	OP	Cu, Mo	Los Andes Copper	2,440
La Granja	Peru	PFS	OP	Cu	First Quantum, Rio Tinto	2,400
Santa Domingo	Chile	FS	Complex	Cu, Co, Fe, Au	Capstone	2,315
Cactus/Parks Salyer	USA	PEA	OP	Cu	Arizona Sonoran	2,300
Mason	USA	PEA	OP	Cu	Hudbay Minerals	2,100
Berg	Canada	PEA	OP	Cu, Mo, Ag, Au	Surge Copper	2,000
Lumwana Super Pit Exp	Zambia	Construction	OP	Cu	Barrick	2,000
Haquira	Peru	PEA	OP	Cu	First Qantum Metals	1,860
Coroccohuayco	Peru	PFS	OP	Cu	Glencore	1,800
Tia Maria	Peru	Construction, delayed	OP	Cu	Southern Copper	1,800
Twin Metals	USA	PEA	UG	Cu, Ni, PGMs	Antofagasta Minerals	1,700
Copper World	USA	PFS	OP	Cu, Mo, Ag	Hudbay Minerals	1,690
Cascabel	Ecuador	PFS	UG	Cu, Au, Ag	SolGold	1,554
Eva	Australia	Construction	OP	Cu	Harmony	1,550
Kamoa-Kakula Phase 4	DRC	Construction	OP, conc	Cu	Zijin Mining, Ivanhoe, DRC Govt	1,550
Yellowhead	Canada	PEA	OP	Cu	Taseko Mines Ltd.	1,446
Winu	Australia	PFS	OP	Cu, Au	Rio Tinto, Sumitomo	1,300
Diamante-Andesita	Chile	Construction	UG	Cu	Codelco	1,240
Santa Cruz	USA	PEA	UG	Cu	Ivanhoe Electric	1,240
Zafranal	Peru	FS	OP	Cu, Au	Teck	1,230
Zaldivar	Chile	Permitting, expansion	OP	Cu	Antofagasta	1,200
Arctic	USA	FS	OP	Cu, Zn, Pb	Ambler Metals	1,177
Santo Tomas	Mexico	PEA	OP	Cu	Oroco Resource	1,104
West Musgrave	Australia	Suspended	OP	Cu, Ni	BHP	1,100
San Nicolas	Mexico	Permitting	OP	Cu, Zn	Teck, Agnico Eagle	1,100
Costa Fuego	Chile	PEA	OP, UG	Cu, Au	Hot Chili Ltd	1,050
Cañariaco	Peru	PEA	OP	Cu	Fortescue	1,040
CuMo	USA	PFS	OP	Cu, Mo	Idaho Copper	1,000
McIlvenna Bay	Canada	FS	UG	Cu, Zn Au, Ag	Foran Mining	800
Copper Creek	USA	PEA	OP, UG	Cu, Mo, Ag	Faraday Copper	798
NewRange	USA	Permitting	Complex	Cu, Ni, PGM, Co	Teck, Glencore	690
White Pine North	USA	PEA	UG	Cu, Ag	Highland Copper, Kinterra	615
Los Pelambres 2	Chile	Expansion	OP	Cu	Antofagasta Minerals	500
Escalones	Chile	PEA	OP, HL	Cu	World Copper	438
Alacran	Colombia	PFS	OP	Cu, Au, Ag	Cordoba Mining, JCHXX	420
Kwanika-Stardust	Canada	PEA	OP, UG	Cu, Au	NorthWest Copper	408
Copperwood	USA	FS	UG	Cu	Highland Copper	391
Kutcho	Canada	FS	OP, UG	Cu, Zn	Kutcho Copper	388
El Pilar	Mexico	Construction	OP	Cu	Southern Copper	310
Van Dyke	USA	PEA	ISR	Cu	Copper Fox	290
Zonia	USA	PEA	OP	Cu	Edge Copper	250
El Domo-Curipamba	Ecuador	Construction	OP, UG	Cu, Au	Silvercorp, Salazar	236
Florence	USA	Construction	ISR	Cu	Taseko Mines, Mitsui	230
Carmacks	Canada	PEA	OP	Cu, Au	Cascadia Minerals	158
Chibougamau	Canada	PEA	UG	Cu, Au	Cygnus Metals	130
Parys Mountain	UK	PEA	UG	Cu, Zn	Anglesey Mining	99
Nickel, Cobalt & Molybdenum						
Crawford Phase 1 and 2	Canada	FS	OP	Ni, Co, Pd	Canada Nickel	3,500
KNP	Australia	PFS	OP	Ni, Co	Ardea Resources, Japanese consortium	2,229
Baptiste	Canada	PFS	OP	Ni, Co, Fe	FPX Nickel	2,182
Wingellina	Australia	PFS	OP	Ni, Co	NiCo Resources	2,085
Sorowako	Indonesia	FS	Smelter	Ni	Vale Indonesia, Huayou	1,900
Turnagain	Canada	PEA	OP	Ni, Co	Giga Metals, Mitsubishi	1,893
Sunrise	Australia	IA	OP, conc	Ni, Co	Sunrise Energy Metals	1,830

Construction of the $2 billion Super Pit Expansion project at Barrick Mining's Lumwana mine in Zambia is well underway, accelerating its transformation into a Tier One copper mine. Barrick has positioned the Lumwana expansion as a turnaround from a struggling asset into a key pillar of both its global copper portfolio and Zambia's long-term development agenda.

Site construction is underway, long-lead equipment orders have been placed, and infrastructure upgrades — including a new power transmission framework developed in partnership with ZESCO — are progressing to support both the mine and the wider region.

The project involves key infrastructure developments, including the expansion of existing mining operations at Chimiwungo and Malundwe, the opening of two new open pits at Kamisengo and Kababisa, and a substantial increase in mining capacity to 200 million mt/y in 2026 and 300 million mt/y in 2030. By 2039, the mine is projected to reach a maximum peak mining capacity of 350 million mt/y, positioning Lumwana as the largest mine in Africa by total tons moved.

Technological advancements are central to the expansion, with plans to introduce high-level automation and modern process control systems. A parallel process circuit will enable substantial productivity improvements and reduced operating costs. A new pit-rim crusher and conveyor system will optimize hauling efficiency, cutting current ultra-class trucking haul cycles by at least 15%. The tailings storage facility will see a capacity increase from 360 million mt to 2 billion mt.

The expansion will substantially increase the mine's production capacity, extending its operational life by 17 years to 2057, and doubling the capacity of the processing plant from 27 million mt/y to a peak design of 54 million mt/y — achieving an average copper output of 240,000 mt/y over the life of the mine, from a planned 52 million mt/y process feed.

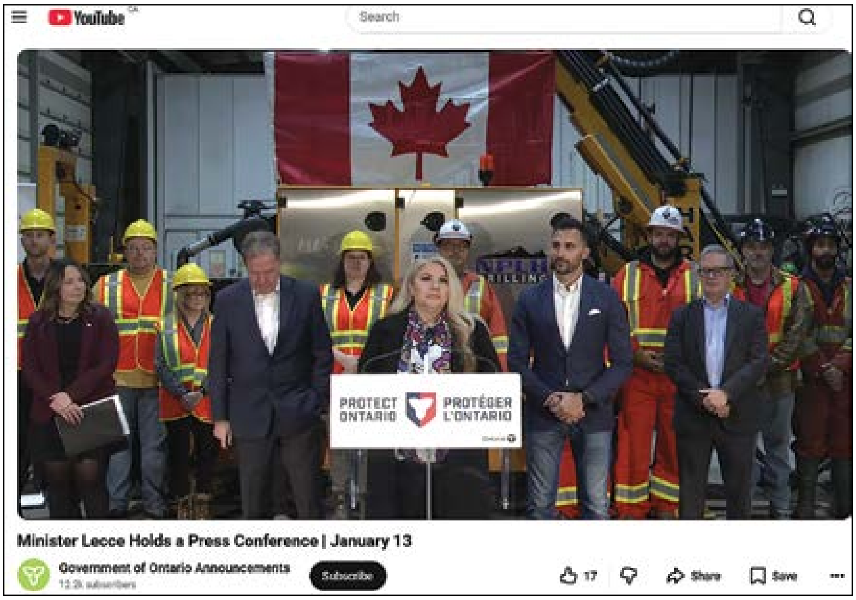
Last year, Taseko Mines Ltd. completed a technical report for its Yellowhead copper project ($1,446 million) in British Columbia, Canada. "With strengthening copper prices, the project economics have improved significantly since the 2020 technical report," said Stuart McDonald, president and CEO, Taseko Mines. "The project now has a $2 billion NPV and the potential to become one of the largest copper mines in North America. It's been just six years since we acquired Yellowhead for $16 million, and we've added an incredible amount of value to the project since then." Over the next few years, in parallel with the permitting process, Taseko said it will also be advancing engineering, community engagement, copper offtake discussions, and project financing initiatives.

Mining operations will be conducted from a single open pit using conventional truck and shovel mining techniques. The Yellowhead process flowsheet consists of a conventional SAG and ball milling circuit, followed by rougher flotation, regrinding of rougher concentrate, and a three-stage cleaner flotation circuit. Chalcopyrite is the dominant copper bearing mineral across the deposit, comprising more than 98% of the copper contained in the mineral reserves. Copper production would average 206 million lb/y during the first five years of operation.

First Quantum's $1.25 billion Kansanshi S3 expansion in Zambia was commissioned and produced first concentrate in August 2025. It was removed from the Project Survey.

During December, Fortescue acquired the rest of Alta Copper that it did not already own. Alta owned the Cañariaco copper project located in northern Peru within an emerging porphyry corridor that hosts several large exploration and development opportunities. The project comprises 91 km^2 of highly prospective land, which includes the Cañariaco Norte deposit, the Cañariaco Sur deposit and the Quebrada Verde prospect.

Several other copper projects tracked by the Project Survey moved into production during 2025, including Minsur's Mina Justa; Gunnison Copper's Johnson Camp; Taseko's Florence Copper; Ero Copper's Tucuma; Philex's Silangan, MMG's Las Bambas Expansion and Newmont's Cadia PC1-2. They were removed from the survey. Hudbay Minerals acquired Rockcliff's Tower & Rail copper project and merged it with its Snowflake operation in Manitoba.



Ontario fast tracks the Crawford nickel project. (Photo: Ontario Govt)

Iron Ore Developments

Rhodes Ridge now tops the list of iron projects with an initial capex estimate of $20 billion. The Rhodes Ridge joint venture (Rio Tinto 50%, Mitsui 40% and AMB Holdings 10%) recently approved a $191 million feasibility study to progress development of the first phase of the Rhodes Ridge project, one of the world's best undeveloped iron ore deposits, in Western Australia's Pilbara. The feasibility study will assess the development of an operation with an initial production capacity of 40 to 50 million mt/y of iron ore and is expected to conclude in 2029.

Rhodes Ridge will be a staged development. The investment and feasibility study is focused on phase one, with an initial hub likely in the northern part of the project. The JV partners intend to invest a further $146 million exploration between

Project Name	Location	Status	Type	Products	Owner	Project Cost (US$M)**
Nickel Shäw	Canada	PFS	OP	Ni, Cu	Nickel Creek Platinum	1,700
Rönnbacken	Sweden	PEA	OP	Ni, Co	Bluelake Mineral Group	1,400
Dumont	Canada	FS	OP	Ni, Co	Waterton	1,018
Araguaia 2	Brazil	Suspended	OP	Ni	Horizonte Minerals (Admin)	1,000
Kabanga	Tanzania	IA	UG	Ni, Cu, Co	Lifezone Metals	859
Malmbjerg	Greenland	IA, pending	OP	Mo	Greenland Resources	820
Vermelho	Brazil	Suspended	OP	Ni	Horizonte Minerals (Admin)	652
Eagles Nest	Canada	FS	UG	Ni, Cu, PGE	Wyloo	609
Thompson Creek	USA	Restart	OP	Mo	Centerra	400
Broken Hill	Australia	PFS	OP	Co	Cobalt Blue	384
Samapleu	Côte d'Ivoire	PEA	Complex	Ni, Cu	Sama Resources	338
Mt. Thirsty	Australia	PFS	OP	Ni, Co	Horizon Minerals	330
Crean Hill	Canada	PEA	OP, UG	Ni, Cu, Co	Magna Mining	330
Ulsan	South Korea	Construction	Refinery	Ni	Korea Zinc, Trafigura	140
Zinc/Lead						
Hermosa-Taylor	USA	Construction	UG	Zn, Pb, Ag	South32	2,700
Citronen	Greenland	FS	UG	Zn, Pb	Skylark Minerals	654
Hilarion	Peru	PFS	UG	Zn, Pb	Nexa Resources	585
Pine Point	Canada	PEA	OP, UG	Zn, Pb	Osisko Metalsm, Appian	470
Gamsberg 2	South Africa	Expansion, construction	OP	Zn	Vendanta Zinc	405
Prairie Creek	Canada	Permitting	UG	Zn, Pb, Ag	NorZinc	368
Macmillan Pass	Canada	PEA	OP	Zn, Pb	Fireweed Metals	296
Prieska	South Africa	Construction	OP, UG	Zn, Cu	Orion	267
Ayawilca	Peru	PEA	UG	Zn, Pb, Ag	Tinka Resources	264
Lagoa Salgada	Portugal	FS	UG	Zn	Cerrado Gold	164
Gorno	Italy	Scoping	UG	Zn	Altamin	114
Rosh Pinah RP-2	Namibia	FS, expansion	UG	Zn, Pb	Appian	111
Santander Pipe	Peru	PEA	UG	Zn	FIC	52
IRON ORE						
Rhodes Ridge	Australia	FS	OP	Fe	Rio Tinto, Mitsui	20,000
Simandou 1 & 2	Guinea	Construction	OP	Fe	Rio Tinto, WCS	16,000
Simandou 3 & 4	Guinea	FS	OP	Fe	Rio Tinto, Simfer	11,600
Zanaga 1 & 2	Republic of Congo	FS	OP	Fe	Zanaga Iron	4,700
Hawsons	Australia	PFS	OP	Fe	Hawsons Iron, Pure Metals	3,324
Serra Sul 120	Brazil	Expansion, construction	OP, plant	Fe	Vale	2,700
Hope Downs 2	Australia	PEA	OP	Fe	Rio Tinto, Hancock	1600
Southdown	Australia	PFS	OP	Fe	Grange Resources	932
Shymanivske 1 & 2	Ukraine	PEA	OP	Fe	Black Iron	771
K. Hill	Botswana	PEA	OP	Mg	Giyani Metals Corp.	579
Mont Sorcier	Canada	PEA	OP	Fe, V	Voyager Metals	574
Lake Giles	Australia	FS	OP	Fe	Macarthur Minerals	569
Razorback	Australia	PFS	OP	Fe	Magnetite Mines	506
Nimba 1	Guinea	PFS	Complex	Fe	SMFG	108
PRECIOUS METALS & DIAMONDS						
Gold						
Donlin	USA	Permitting	OP	Au	NOVAGOLD, Paulson Advisors	7,402
KSM	Canada	PFS	OP, UG	Au, Cu, Ag, Mo	Seabridge Gold	6,400
Norte Abierto	Chile	FS	OP	Au, Ag	Barrick, Newmont	6,000
Sukhoi Log	Russia	FS	OP	Au	Polyus	3,300
Walfi-Gopu	Papua New Guinea	Permitting	UG	Au, Cu, Ag	Newmont, Harmony	2,800
Stibnite	USA	Construction	OP	Au, Sb	Perpetua Resources	2,215
Pueblo Viejo Expansion	Domnican Republic	Expansion	OP	Au	Barrick, Newmont	2,100
Yanacocha Sulphides	Peru	Delayed	OP	Au	Newmont, Buenaventura, Sumitomo	2,100
Livengood	USA	PFS	OP	Au	International Tower Hill	1,930
Fourmile	USA	PEA	UG	Au	Barrick	1,700
Cangrejos	Ecuador	PFS	OP	Au	CMOC Group	1,454
Windfall	Canada	FS	UG	Au	Osisko, Gold Fields	1,100
KCGM Mill Optimization	Australia	Expansion	Mill	Au	Northern Star Resources	959
Gramalote	Colombia	FS	OP	Au	B2Gold	925
Volcan	Chile	PEA	OP, HL	Au	Hochschild	900
Mount Todd	Australia	FS	OP	Au	Vista Gold	892
Skouries	Greece	Construction	OP, UG	Au, Cu	Eldorado Gold	845
Horne 5	Canada	FS	UG	Au	Falco Resources	844
Tulu Kapi	Ethiopia	FS	OP, UG	Au	Kefi Gold & Copper	785
Island 3	Canada	Construction, expansion	UG	Au	Alamos Gold	756
Cerro Blanco	Guatemala	FS	UG	Au, Ag	Bluestone Resources	750
Courageous Lake	Canada	PFS	OP	Au	Valor Gold	747
Springpole	Canada	PFS	OP	Au, Ag	First Mining Gold	718
Lynn Lake	Canada	FS	OP	Au	Alamos Gold	632
Cariboo Phase 1 & 2	Canada	FS	UG	Au	Osisko Mining	588
Fenelon	Canada	PEA	UG	Au	Wallbridge	579
Waihi District	New Zealand	PEA	OP, UG	Au	OceanaGold	556
Koné	Côte d'Ivoire	FS	OP	Au	Montage Gold	544
Adumbi	DRC	PEA	OP	Au	Loncor	530
Eskay Creek	Canada	FS	OP	Au, Ag	Skeena Gold & Silver	525

2026 and 2028 as part of ongoing study phases. Subject to relevant regulatory approvals, first ore from the initial Rhodes Ridge development, located 40 km northwest of Newman, is expected by 2030.

Rio Tinto also completed some of the infrastructure associated with Africa's largest mining project, the Simandou iron ore mine, which is located in the Republic of Guinea. Simandou is divided into 4 blocks. Rio Tinto hold rights to blocks 3 and 4 through Rio Tinto SimFer — a joint venture with the Government of Guinea and Chalco Iron Ore Holdings (CIOH). These blocks contain ore reserves estimated at around 1.5 billion mt. Rio Tinto is the majority shareholder and managing partner of Rio Tinto SimFer.

Rio Tinto is also working with the Government of Guinea and Winning Consortium Simandou (WCS), developers of Simandou blocks 1 and 2, to codevelop the infrastructure needed to export mined iron ore from the far southeast of the country to Guinea's maritime borders and beyond.

Gold Projects

Barrick Gold sold its 50% interest in the top gold mining project, the Donlin gold project in Alaska, to affiliates of Paulson Advisers LLC and NOVAGOLD Resources for $1.1 billion in cash.

Kinross Gold announced that it is proceeding with the construction of three organic growth projects: the Round Mountain Phase X and Bald Mountain Redbird 2 projects in Nevada, and the Kettle River-Curlew project in Washington. These projects are expected to meaningfully extend mine life, benefit long-term costs within Kinross' U.S. portfolio and contribute significantly to Kinross' U.S. production profile to maintain 2 million gold equivalent ounces (Au eq oz) per year, with an expected production of 400,000 Au eq oz per year between 2029 and 2031, based on the initial mine plan inventories. Kinross intends to fund the three projects from operating cash flows.

"These three new growth projects are expected to contribute 3 million ounces of life-of-mine production to our portfolio, extend mine lives at our Nevada assets well into the 2030s and benefit our long-term costs in the U.S.," said CEO J. Paul Rollinson. "Together they deliver attractive economics with an expected quick payback, an IRR of 55% and a cumulative NPV exceeding $4.1 billion at a $4,300 gold price."

The Phase X project is a bulk tonnage underground mining opportunity below the current Phase W open pit at Round Mountain, targeting higher-grade, lower-cost mining of the same orebody at depth. The primary mining method is transverse long-hole open stoping with paste backfill following a bottom-up mining sequence. The transition to underground mining at Round Mountain is anticipated to initially extend mine life to 2038 and deliver incremental annual production of approximately 140,000 Au eq oz per year from 2029 to 2037. The transition is also expected to increase the operation's grade profile, reduce and increase long-term optionality for mine-life extensions.

The Kettle River mill with be refurbished for the Curlew mine in Washington. (Photo: Kinross)

The Curlew project is a high-grade, underground gold mine restart opportunity in Washington, leveraging existing Kettle River mill infrastructure. It has an initial 11-year mine life at an average mining grade of 5.8 g/t. The mining methods will include both longitudinal and transverse long hole open stoping with cemented and uncemented rockfill following a bottom-up mining sequence. Curlew is expected to produce 100,000 oz/y of gold for the first five years with first production expected in 2028. Ore will be processed through the existing 1,800 t/d Kettle River mill, which will be refurbished as part of the restart project.

The Redbird 2 project consists of Phase 2 of the Redbird pit and is expected to deliver high-productivity, low-cost production as the next anchor pit alongside five satellite pits. Combined, the project is expected to incrementally produce a total of approximately 640,000 oz of gold, with first production in 2028 and an average production of approximately 155,000 oz/y gold, extending production at Bald Mountain until early 2032. The project leverages the existing infrastructure, equipment and workforce at Bald Mountain, continuing the history of open-pit heap leach operations on the extensive land package.

Buenaventura, Peru's largest publicly-traded precious metals mining company, brought its San Gabriel gold mine, located in Moquegua, into production during 2025. It is on track to produce 70,000 to 80,000 ounces of gold in 2026 and has been removed from the Project Survey.

During November 2025, Equinox Gold announced commercial production at the Valentine gold mine in Newfoundland & Labrador, Canada, which it acquired from Calibre Mining. The company said it was expecting Valentine to produce 150,000 to 200,000 oz of gold produced in 2026. Equinox said it is advancing Phase 2 studies that could increase mill throughput to 5 million mt/y, doubling the current nameplate capacity.

Orla Mining's initial Capex for the South Railroad project is now estimated to be $395 million, updated from a previous $190 million estimate, reflecting inflation, flow sheet upgrades (like a two-stage crusher), and enhanced water systems, with the company allocating $215 million for construction readiness in 2026.

Seabridge Gold announced its intention to spin-out its subsidiary, Seabridge

Project Name	Location	Status	Type	Products	Owner	Project Cost (US$M)**
Duparquet	Canada	PEA	OP, UG	Au	First Mining Gold	521
Chulbatkan	Russia	PFS	OP, HL	Au	Polyus	500
Kurmuk Phase 1 and 2	Ethiopia	Construction	OP	Au	Allied Gold	500
Nyansanga	Tanzania	FS	OP, UG	Au	OreCorp	474
Redbird 2	USA	Construction	OP	Au	Kinross Gold	490
South Railroad	USA	FS	OP, HL	Au	Orla Mining	395
Kettle River-Curlew	USA	Construction	UG	Au, Ag	Kinross Gold	485
Valentine Phase 2	Canada	PFS	OP	Au	Equinox Gold	472
Veduga	Russia	PFS	OP, UG	Au	Polymetal	447
La Mina	Colombia	PEA	OP	Au	GoldMining	425
La Cumbre 1 & 2	Colombia	PEA	OP, HL	Au, Ag	Batero Gold	418
Wasamac	Canada	FS	UG	Au	Agnico Eagle Mines	416
Ikkari	Finland	PEA	OP, UG	Au	Rupert Resources	405
Phase X	USA	Construction	UG	Au	Kinross Gold	400
Castle Mountain 2	USA	FS	HL, plant	Au	Equinox Gold	389
DeLamar	USA	FS	OP, HL	Au, Ag	Integra Resources	389
Twin Hills	Namibia	FS	OP	Au	Osino Resources	365
Lawyers	Canada	PEA	OP	Au, Ag	Thesis Gold	364
Metates	Mexico	PEA	OP, HL	Au, Ag	Chesapeake Gold	359
Fox Complex	Canada	PEA, expansion	UG, plant	Au	McEwen Mining	358
Goliath	Canada	PFS	OP	Au	Treasury Metals	335
Black Pine Oxide	USA	PFS	OP	Au	Liberty Gold	327
Marban	Canada	PFS	OP	Au	O3 Mining	326
Meyas Sand	Sudan	FS	OP	Au	Perseus Gold, Sudan Govt	321
Los Filos	Mexico	FS, expansion	UG, plant	Au	Equinox Gold	318
Coffee	Canada	PFS	OP, HL	Au	Newmont	317
Loma Larga	Ecuador	Permitting	UG	Au, Cu, Ag	Dundee	316
Hod Maden	Turkey	FS	UG	Au, Cu	SSR, Horizon Copper	309
Volta Grande	Brazil	FS, delayed	OP	Au	Belo Sun	298
Lihir Phase 14A	Papua New Guinea	FS	OP	Au	Newmont	296
Twin Hills	Namibia	PFS	OP	Au	Osino Resources	283
Gabbs	Nevada	PEA	HL	Au, Ag, Cu	P2 Gold	278
CK Gold	USA	PFS	OP	Au, Cu	US Gold	277
Spanish Mountain	Canada	PFS	OP	Au, Ag	Spanish Mountain Gold	273
Boto	Senegal	FS	OP	Au	Managem, Senegal Govt	271
Goldboro	Canada	FS	OP	Au	Signal Gold	271
Chimo	Canada	PEA	UG	Au	Cartier Resources	252
Klaza	Canada	PEA	OP, UG	Au	Rockhaven Resources	244
Fremont	USA	PEA	UG	Au	Stratabound Minerals	203
Lemhi	USA	PEA	OP	Au	Freeman Gold	190
Borborema	Brazil	FS	OP	Au	Aura Minerals	188
Cabaçal	Brazil	PEA	OP	Au	Meridian Mining	180
Ixtaca	Mexico	FS	OP	Au, Ag	Almaden	174
Goldfields	Canada	PEA	OP	Au	Fortune Bay	173
Bomboré Phase II	Burkina Faso	FS, expansion	OP, plant	Au	Orezone Gold	167
West Kenya	Kenya	Scoping	OP, UG	Au	Shanta Gold	161
Porvenir	Nicaragua	PFS	UG	Au, Ag, Zn	Mineros	161
Kiniero	Guinea	Construction	OP	Au	Robex Resources	160
La India	Nicaragua	FS	OP	Au	Condor Gold	160
Diamba Sud	Senegal	Scoping	OP	Au	Chesser Resources	159
Aurizona	Brazil	PFS	UG, OP	Au	Equinox Gold	154
Mogale TSF	South Africa	Construction	Hydro	Au	Pan African	145
Burnstone	South Africa	Construction	UG	Au	Sibanye-Stillwater	130
ATO 2	Mongolia	FS	OP	Au	Steppe Gold	128
Tres Cruces	Peru	PEA	OP, HL	Au	Steppe Gold	125
Fenix	Chile	FS	HL	Au	Rio2	117
Beartrack-Arnett	USA	PFS	OP HL	Au	Revival Gold	109
Havieron	Australia	Construction	UG	Au	Greatland Gold	106
Tulkubash	Kyrgyzstan	FS	OP	Au	Chaarat Gold	104
Silver						
Pitarrilla	Mexico	PFS	OP, UG	Ag	Endeavour	741
Cordero	Mexico	PFS	OP	Ag, Pb, Zn	Discovery Silver	606
Diablillos	Argentina	PFS	OP	Ag, Au	AbraSilver	544
Algarrobo	Peru	PEA	UG	Ag, Zn, Cu	Buenaventura	480
Cerro Las Minitas	Mexico	PEA	UG	Ag	Southern Silver	388
Silver Sand	Bolivia	PEA	OP	Ag	New Pacific Metals	308
Los Ricos	Mexico	PEA	OP, UG	Ag, Au	GoGold Resources	148
El Tigre	Mexico	PEA	OP	Ag, Au	Silver Tiger Metals	87
Tangana	Peru	PEA	UG	Ag, Au	Silver X	61
PGMs						
Ngezi	Zimbabwe	Construction, expansion	UG/smelter/refinery	Pt	Implats	1,800
Mogalakwena	South Africa	Construction	UG, conc	PGM	Anglo American	1,500
Marathon	Canada	FS	OP	Pd, Cu	Generation Mining	739
Platreef Phase 2	South Africa	FS	UG	PGM	Ivanhoe Mines	700
Garatau	South Africa	Construction	UG	Pt, Pd	Zijin Mining, Genorah	700

The Thacker Pass team celebrates the exciting milestone of first steel installation. (Photo: Lithium Americas)

Gold (NWT) Inc. (to be renamed Valor Gold) which owns 100% of the Courageous Lake gold project, located in Canada's Northwest Territories. Following the spin-out, Valor Gold will be focused on advancing the project through exploration, engineering and permitting. Seabridge said it would continue focusing primarily on its KSM gold-copper project and its other exploration assets.

Courageous Lake is one of Canada's largest undeveloped gold projects with total contained gold inventory, comprising measured and indicated resources, of 11 million oz of gold (145.2 million mt at an average grade of 2.36 g/mt), plus an additional 3.3 million oz of gold in the inferred category (40.6 million mt at 2.52 g/mt). The reported measured and indicated resources incorporate 2.8 million oz of proven and probable reserves (33.9 million mt at 2.6 g/mt) which would make it one of the highest-grade open pit gold projects in Canada.

Nickel Development Projects

The Province of Ontario is fast-tracking the Crawford nickel project with its new One Project, One Process (1P1P) framework. The 1P1P framework is designed to better coordinate Ontario's permitting and review processes for major mining developments by aligning timelines, responsibilities, and information sharing across provincial ministries. For Canada Nickel, this designation reflects the advanced state, scale, and strategic importance of the Crawford nickel project within Ontario's Critical Minerals Strategy.

"Ontario is moving at lightning speed to open this 100% Canadian owned mine to create 4,000 jobs for Canadian workers," said Stephen Lecce, Minister of Energy and Mines. "In 2026, our government is going full-tilt to unlock one of the world's largest nickel deposits that will supercharge our economy and help end China's critical mineral dominance. 'Made-in-Canada' from start to finish, as we build a domestic supply chain that includes the Western world's largest nickel sulphide mine, a new nickel processing plant and downstream alloy production facility."

"This announcement underscores the strategic significance of the Crawford nickel project for Ontario and the province's ambition to establish a world-leading, Made-in-Ontario critical minerals supply chain," said Mark Selby, CEO of Canada Nickel. "Crawford is purpose-built to anchor a new low-carbon mining and clean metals manufacturing corridor in Northeastern Ontario — driving long-term economic growth, creating high-quality jobs, and ensuring that value generation remains within the province. As the only mining project in Canada to secure this type of endorsement from both federal and provincial governments, today's announcement strengthens our commitment to commencing construction by year-end. We look forward to working with the province through its newly announced Critical Minerals Processing Fund to help realize these ambitions."

Crawford is already advancing at the forefront of Canada's modernized regulatory framework, having become the first mining project in the country to submit an Impact Statement under the amended Impact Assessment Act, 2019, in November 2024. Together with its designation under the 1P1P framework and its referral to the federal Major Projects Office in November 2025, these milestones establish a clear path to responsibly accelerate development.

Lifezone Metals CEO Chris Showalter, recently announced significant progress for the Kabanga nickel project in Tanzania, which remains on track for a final investment decision in 2026. Following the July 2025 FS, which demonstrated Kabanga to be one of the world's largest and highest-grade development-ready nickel sulphide deposits, and the successful completion of $75 million in capital raises in H2 2025, Lifezone said it has commenced readiness activities to advance and de-risk the project and prepare for full-scale execution.

Lithium Development Projects

The initial Capex for Lithium America's Thacker Pass project in Nevada increased to $2,930 million from $1,060 million positioning it just behind Rio Tinto's ($2,950 million) delayed Jadar project in Serbia. The initial Capex for Ioneer's Rhyolite Ridge increased to $1,668 million, placing it among the top lithium development projects.

Sibanye-Stillwater withdrew from its joint venture with Ioneer Ltd. for the Rhyolite Ridge lithium-boron project in Nevada, USA. The company said the project did not meet its investment hurdle rates based on prudent pricing assumptions.

Ioneer said it was pleased to have the matter resolved, which will now enable them to progress the fully permitted project to a final investment decision. Rhyolite Ridge could quadruple U.S. lithium production. Ioneer secured its federal permit and closed on a $996 million loan from the U.S. Department of Energy.

Piedmont Lithium completed a major merger with Sayona Mining in August 2025, creating a new entity called Elevra Lithium, and one of North America's largest hard-rock lithium platforms. The deal resulted in an approximate 50/50 ownership split between former Sayona shareholders and Piedmont stockholders, with Sayona as the ultimate parent entity and operations now under the Elevra Lithium banner.

Project Name	Location	Status	Type	Products	Owner	Project Cost (US$M)**
Waterberg	South Africa	FS	UG	PGM (4E)	Platinum Group Metals	617
Darwendale	Zimbabwe	Suspended	UG	Pl (4E)	Great Dyke Investments	500
Two Rivers Merensky	South Africa	Construction	UG	PGM (6E)	African Rainbow, Implats	330
Marula	South Africa	Expansion	UG	Pt	Implats	295
River Valley	Canada	PEA	UG	Pd	New Age Metals	268
K4	South Africa	Construction	UG	PGM	Sibanye-Stillwater	228
Diamonds						
Star-Orion	Canada	PEA	OP	Dia	Star Diamond	1,410
Karowe UGP	Botswana	Construction	UG	Dia	Lucara	683
Chidliak	Canada	PEA	OP	Dia	De Beers	435
Diavik A21 Phase One	Canada	Construction	UG	Dia	Rio Tinto	40
ENERGY & BATTERY METALS						
Uranium						
Arrow (Rook 1)	Canada	FS	UG	U	NexGen	1,300
PLS	Canada	FS	UG	U	Fission Uranium	1,155
Gryphon	Canada	PFS	UG	U	Denison Mines	545
Norasa	Namibia	FS	OP	U	Forsys Metals	433
Tumas	Namibia	FS	OP	U	Deep Yellow	372
Madaouela	Niger	FS	OP	U	GoviEx Uranium	343
Wheeler River	Canada	FS	ISR	U	Denison, JCU	322
Etango-8	Namibia	FS	OP	U	Bannerman	317
Mulga Rock	Australia	FS	OP	U	Deep Yellow	255
Wiluna	Australia	Scoping	OP	U	Toro Energy	220
Tthe Heldeth Túé	Canada	PEA	ISR	U	Denison Mines	112
Salamanca	Spain	FS	OP	U	Berkeley Energia	96
Kayelekera	Malawi	FS	OP	U	Lotus Resources	88
Tafoya-Marquez	USA	PEA	UG	U	Anfield Energy	79
Lithium & Rare Earth Elements						
Jadar	Serbia	FS, delayed	UG	Li	Rio Tinto	2,950
Thacker Pass	USA	Construction	OP	Li	Lithium Americas	2,930
Rincon Expansion	Argentina	Construction	Brine extraction	Li	Rio Tinto	2,500
Boardwalk	Canada	PEA	Brine extraction	Li	LithiumBank	2,092
Beauvoir	France	Construction	UG	Li	Imerys	2,076
Rhyolite Ridge	USA	FS	OP	Li	Ioneer	1,668
Zero Carbon	Germany	FS	Brine extraction	Li	Vulcan Energy	1,687
Rainbow Lake	Canada	PEA	Brine extraction	Li	Volt Lithium	1,549
Clayton Valley Phase 1	USA	PFS	OP, plant	Li	Century Lithium	1,537
South West Arkansas	USA	PFS	Brine extraction	Li	Standard Lithium	1,450
San Jose	Spain	Scoping	UG	Li	Infinity Lithium	1,287
Kemerton	Australia	Construction, expansion	Plant	Li	Albemarle	1,000
Carolina	USA	FS	OP, conc	Li	Elevra Lithium	988
Mt. Holland	Australia	PFS	OP, refinery	Li	Covalent Lithium	950
Keliber	Finland	Construction	OP/UG	Li	Sibanye-Stillwater	880
Wolfsberg	Austria	FS	Complex	Li	Critical Metals	873
Arizaro	Argentina	PEA	Brine extraction	Li	Lithium Chile	823
Tonopah	USA	PEA	OP	Li	American Lithium	819
Tennessee	USA	FS	Plant	Li	Elevra Lithium	809
Sonora 1 & 2	Mexico	FS	OP, plant	Li	Bacanora	800
Tolillar	Argentina	PEA	Brine extraction	Li	Alpha Lithium	777
Crater Lake	Canada	PEA	OP	Sc	Imperial Mining	712
Cinovec	Czech Republic	PFS	UG	Li	CEZ, EMH	644
Clearwater	Canada	PEA	Brine extraction	Li	E3 Metals	600
Sal de Vida 2	Argentina	PFS, expansion	Brine extraction	Li	Rio Tinto	524
Kvanefjeld	Greenland	FS, delayed	OP	RE	Energy Transition Minerals	505
Rose	Canada	FS	OP	Li	Critical Elements Lithium	471
PAK	Canada	PFS	OP	Li	Frontier Lithium	468
Longonjo/Saltend	Angola, UK	Scoping	OP, plant	RE	Pensana	450
Pastos Grandes	Argentina	FS	Brine extraction	Li	Lithium Americas	448
Wicheeda	Canada	PEA	OP	RE	Defense Metals	440
Deep Fox-Foxtrot	Canada	PEA	OP, UG	RE	Search Minerals	422
Galaxy	Canada	Permitting	OP	Li	Rio Tinto	286
Zinnwald	Germany	PEA	UG, plant	Li	Zinnwald Lithium	336
Kindersley	Canada	PEA	ISR	Li	Grounded Lithium	335
Goulamina	Mali	FS	OP	Li	Leo Lithium, Ganfeng	325
Songwe Hill	Malawi	FS	OP	RE	Mkango Resources	311
Phalaborwa	So. Africa	PEA	Hydro	RE	Rainbow Rare Earths	295
Bandeira	Brazil	PEA	UG	Li	Lithium Ionic	233
Ewoyaa	Ghana	PFS	OP	Li	Atlantic Lithium	185
Grota do Cirilo	Brazil	FS	OP	Li	Sigma Lithium	123
Raleigh Lake	Canada	PEA	OP	Li	International Lithium	112

** Information listed above has been compiled from available public sources, including corporate reports and presentations, press releases and regulatory filings.*
E&MJ and its publisher, Mining Media International, assume no responsibility for errors, omissions or suitability for purpose.
*** Original capital cost estimate is shown in most cases; mature projects may show updated late-stage capital estimate.*
FS - Feasibility Stage; PFS - Preliminary Feasibility Stage; PEA - Preliminary Economic Assessment; IA - Investment Approval; OP - Open pit; UG - Underground; HP - Heap Leach; Conc - Concentrator

Mineral Processing Plants Engineered for Adaptability

Designing modern mineral processing plants requires a flexible approach and the use of advanced digital tools to meet rising operational demands

By Nia Kajastie, European Editor

Mineral processing plant design for today's mining operations is a complex task. Miners need their facilities to deliver more with less due to increased ore variability and declining grades. At the same time, environmental pressures and rising capital and operational expenditures (capex and opex) add to the complexity.

Commodity prices rose in 2025, with silver, gold and copper hitting record highs, placing upward pressure on throughput and recoveries for existing operations to maximize revenues. Despite the soaring prices, greenfield projects are facing growing construction costs. Matt Pyle, chief technical officer at Ausenco, told *E&MJ* that these are "ongoing drivers to minimize project capital cost while maximizing performance and return on investment through good design and robust project delivery."

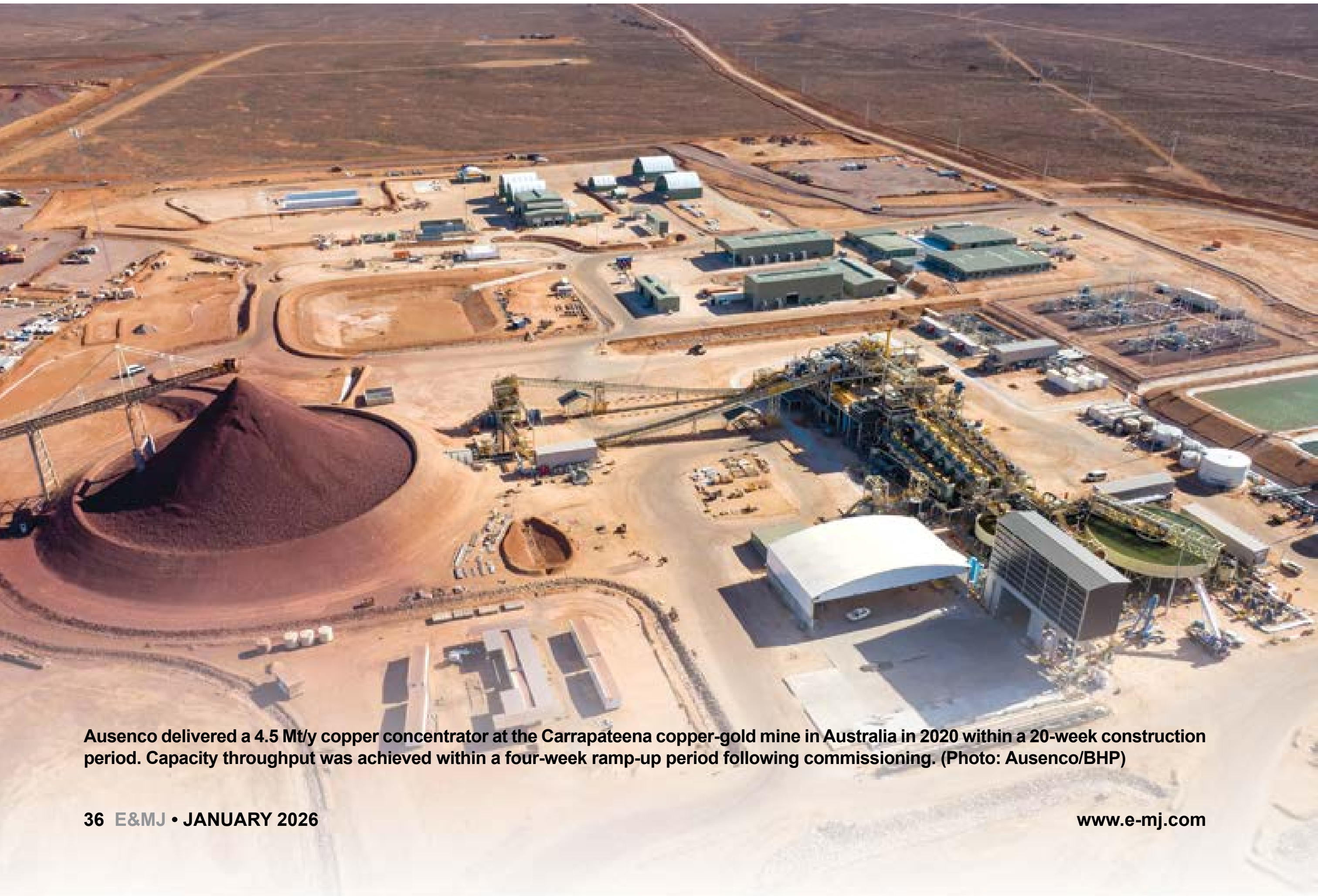
Declining feed grades and greater orebody complexity are well-known industry challenges that can raise the difficulty and cost of designing mineral processing plants. Both capex and opex are affected, as today's plants must often handle finer grinding and more complicated separation cycles.

"Multi-metal (low-grade) operations tend to create challenges of splitting separation streams to different concentrates," said Janne Tikka, segment head for metals and mining at AFRY.

The plant design is further complicated by ore feed unpredictability during the feasibility stage. Mines relying on overly optimistic feasibility studies can run into difficulties during the implementation phase, particularly when it comes to meeting cost and schedule constraints.

"Frequent changes in ore characteristics (grade, mineralogy, moisture and particle size) make it hard to maintain stable processing recovery rates – and design optimized for one ore zone may perform poorly when ore changes once mining proceeds to different ore zones," Tikka explained.

Plant designs thus need to be flexible so they can adapt to changing feed



Ausenco delivered a 4.5 Mt/y copper concentrator at the Carrapateena copper-gold mine in Australia in 2020 within a 20-week construction period. Capacity throughput was achieved within a four-week ramp-up period following commissioning. (Photo: Ausenco/BHP)

conditions without sacrificing recovery, noted Steven Cohen, global growth lead at Mipac.

Modular construction — although nothing new — has once again become a buzzword across construction and engineering sectors due to a renewed interest in the versatility the method affords. In mineral processing plant design, prefabricated modules are also seen as an option for adding flexibility to the plant layout, depending, of course, on operational requirements.

Tikka believes that modular plant architecture and flexible processing units are becoming more popular because they allow for easier upgrades, scaling and adaptation to the changing plant feed and market conditions. Modular layouts can also shorten construction schedules.

As mine operators evaluate the capex, opex and footprint of their plants, they are also looking at ways to minimize unit count, which translates to sizing fewer and larger units.

Todd Burchett, head of mining and minerals at Eriez, said that the company's StackCell flotation technology can offer "compact, staged fine-particle recovery delivering column-like metallurgical performance with lower residence time and in a smaller footprint."

He added: "Another trend is with brownfield projects as operators favor more compact, modular solutions. Eriez technologies, like HydroFloat, can be inserted as a tailings scavenger circuit, while StackCell augments rougher residence time or cleaner capacity where floorspace is limited."

Tikka highlighted electric in-pit crushing and conveying (IPCC) systems as a further trend in the wider materials handling and processing ecosystem.

IPCC systems can replace traditional diesel-powered haul trucks, reducing both opex and CO_2 emissions.

"IPCC system solutions will change the plant designs at the ore run-of-mine stockpiling area and remove the need of stationary primary crushing at plant," he explained.

Mipac — which works at the intersection of control systems, advanced automation, advanced process control (APC) and data analytics — has witnessed that many of the challenges miners face with plant design are due to decisions made late in the process.

Control systems, instrumentation and data architecture are critical to plant flexibility and performance. (Photo: Mipac)

"Control systems, instrumentation and data architecture are often overlooked, yet they are critical for plant flexibility and performance," Cohen said.

Thus, he believes it is important to embed control philosophy, APC requirements and data-readiness into front-end engineering design (FEED), so that plants are engineered for integrated control and digital readiness from day one.

Given the complexity of modern plants and need for adaptability, optimization of design and operation has become more challenging. Many decisions, starting with early design stages, can have a substantial impact on a facility's safety, productivity, recovery and sustainability. The adoption of advanced technological tools, however, is transforming how processing facilities are planned, engineered and operated.

Modern Tools for Design and Operation

The widespread use of computer-aided design and digital tools in processing plant projects dates back to the early 1990s. But, naturally, the industry has has not stood still, with modern digitalization solutions now firmly part of the engineer's toolbox.

Digital access to previous designs and project documents, for example, allows engineering teams to reuse proven solutions where applicable. This enables projects to be developed to high levels of definition in a short timeframe, Pyle said.

For projects requiring new designs or optimizations, the digital environment enables faster iterations, which can lead to a more optimal plant design. Pyle, however, stressed that "in design environments where changes can be made quickly, engineering teams need to be particularly focused on making good decisions early to minimize late changes, rework and project 'churn.'"

It is, nevertheless, clear that more sophisticated engineering tools and increased digitalization of design processes are making a difference in the speed at which changes are made as well as the level of collaboration across engineering disciplines. Tikka believes that the use of digital twins is central to this evolution.

Cohen added that digitalization and automation have now gone from "optional to essential in plant design," with digital twins and integrated design platforms becoming standard tools for validating operability before construction begins.

"Today's plants are built around integrated control systems, historian platforms and connectivity that enable real-time monitoring and remote operations," Cohen said.

He believes the benefits are clear, from faster ramp up to improved stability and enhanced safety.

There is an integration of tools across multiple engineering disciplines, from process to mechanical, electrical, instrumentation and automation.

"By basing this integration on shared databases, information flows seamlessly from PI-diagrams to detailed mechanical engineering models, reducing inconsistencies and eliminating redundant data entry," Tikka said.

By operating on a single, unified platform, various stakeholders are able to use

HydroFloat CPF technology can increase mill throughput and net metal production while unlocking innovative tailings disposal techniques. (Photo: Eriez)

the same validated, up-to-date information. This, in turn, can improve communication and traceability, reduce errors and speed up design cycles. According to Tikka, this can then enhance "the overall quality of engineering outcomes."

Improved digitalization and automation have also become critical tools for the operation of mineral processing plants. The use of APC systems, in particular, can help deliver better plant performance.

Cohen noted that APC strategies can improve throughput and recovery while also reducing energy and reagent consumption.

Pyle has witnessed these same benefits but is cautious about over-reliance on technology. It could lead to the loss of essential operational knowledge, a problem exacerbated by the retirement of experienced processing personnel. It can also lead to operating teams and technical managers taking a less "hands-on" approach.

"This can create confusion about which setpoints should be managed by plant operators and which by the APC," he said.

"In this context, a sub-optimally configured and unoptimized APC layer can 'fight' with competing control logic, leading to poorer operating performance than that of well-trained and capable operators."

While this technology cannot replace hands-on expertise gained over time, Burchett noted that it does assist process engineers as they process more challenging ores.

In addition, less manual intervention can lead to better adherence to standard operating procedures.

Through digitalization and automation, "safety considerations are integrated across all process functions to ensure compliance and risk mitigation," Tikka said.

Simulating and Modelling the Plant

Advanced simulation and modelling have emerged as powerful tools for de-risking mineral processing plant design. They are used to help mimic and predict process behavior and optimize overall plant performance.

"They allow engineers to validate flowsheets, test equipment sizing and model ore variability before construction begins," said Cohen. Potential bottlenecks can also be identified at an early stage.

"Various scenarios and layout configurations can be evaluated to determine the most cost-effective solution prior to implementation," Tikka explained.

Dynamic simulations can go further than this, as they allow engineers to "test how circuits respond to changing feed grades, hardness, moisture or throughput without risking production losses," he added.

Models can also reveal constraints in crushing, grinding, pumping and classification systems, which, in turn, can help reduce over- or under-design.

When used on new projects and operating sites, more advanced simulation and modelling tools can improve geometallurgical approaches, meaning the way different types of ore behave going through a processing plant.

"[The tools] enable optimization of treatment strategies, operating configurations and plant designs to deliver the highest returns on investment," Pyle confirmed.

This is increasingly important for more complex orebodies. However, access to advanced simulation and modelling tools alone is not enough. There is still a need for fundamental knowledge and basic skills in geology, mining, metallurgy, processing, engineering and project delivery, which are essential for identifying and resolving problems.

Growing Influence of Artificial Intelligence

More recently, the industry has seen significant improvements in AI capabilities, with systems showcasing improved logic and reasoning.

"AI agents (or agentic systems) are also improving in their development, capability and deployment. These tools will continue to grow in applicability and ability to optimize and operate mining businesses and manage plant assets," Pyle said.

However, he cautioned that many AI models are still trained on incomplete or misleading data, requiring careful investment in accurate model training and context setting.

According to Tikka, "advanced simulation and data analytics provide enhanced capabilities for processing large datasets, enabling identification of accurate and optimized engineering solutions."

Machine learning-based control can adjust flotation, grinding and gravity circuits using real-time sensor data, maintaining consistent recovery even when feed quality fluctuates.

"Simulation models that integrate into mine-to-mill data (geology, production drilling, blasthole assays, sensor readings etc.) will improve forecasts of rock hardness, feed grade and mineralogy — enabling proactive flowsheet or set-point adjustments," Tikka said.

Cohen agrees that while AI and machine learning can be used to enhance resource recovery and asset reliability, their success depends on fundamentals around data quality and integration.

He added: "Near-term applications include predictive maintenance, anomaly detection and smarter reagent dosing strategies, all of which can improve recovery and reduce downtime. AI can also support decision making by identifying patterns in historical data and recommending optimal setpoints."

It is also important to design plants that are ready for AI integration in the future.

Addressing Sustainability Challenges

In response to increased environmental scrutiny and higher capex and opex, miners are seeking to reduce energy, water and reagent consumption at their plants while maintaining throughput. There is also a push for new plants designed to support tailings reprocessing.

"As mineral resource grades decline and social/environmental pressure grows, designs now need to consider water recycling, waste residue reuse and more efficient use of all mined material including waste rocks," Tikka said.

Mine operators are seeking solutions that minimize freshwater intake and enhance dewatering, while reducing tailings risk.

According to Burchett, Eriez's HydroFloat coarse particle flotation (CPF) produces coarser, fines-free barren sands that can "improve permeability and enable hydraulic/dewatered stacking concepts to lower tailings risk."

Tikka sees stricter controls around energy consumption as one of the key trends that will affect design processes going forward. As part of this approach, he noted that waste heat could be recovered and utilized in auxiliary processes to reduce opex across the plant.

Burchett highlighted the energy intensity of comminution as an ongoing challenge, with grinding dominating concentrator energy costs.

"By floating at sizes two to three times coarser than conventional tanks, HydroFloat shifts the economic optimum grind size and reduces specific energy. Industrial deployments target 2%-6% global recovery uplift and 10%-20% energy reductions when CPF is integrated into the circuit," he said.

The overall aim is to design energy-efficient plants with a low environmental footprint that produce safe, easily dewatered tailings. Naturally, mining operations seek to achieve all of this while maximizing revenue from their products and minimizing capital and operating costs, as Pyle concluded.

Case Study: Campo Morado, Mexico

Luca Mining's Campo Morado is a complex polymetallic operation that produces copper, lead, zinc, gold and silver.

Ausenco said it has helped transform its process plant operating principles and enhance the asset's performance.

"Work to date has transformed Campo Morado's economic performance by driving fundamental metallurgical principles to optimize the processing strategy, reconfigure the circuit, increase throughput, improve recoveries and tailor the product specification to maximize economic return for each ore type," Pyle explained.

"Areas of focus included the orebody understanding, mine plan and blending, comminution and regrind circuit performance for liberation and throughput, flotation circuit configuration, reagent selection and dosage, control system optimization and operator training."

The work has iterated between orebody understanding, plant performance, diagnostic laboratory testwork, future ore testwork, strategy development, economic modelling, plant modifications and execution.

Copper recoveries have increased from around 35% to 70%, while zinc recoveries have risen from 75% to 82%, with zinc grades improving from 45% to 51% Zn. According to Ausenco, further work is underway to increase revenues from gold production.

"The asset is now a key success story within the Luca Mining portfolio and a great example of the step change that can be achieved for mining businesses by applying fundamental metallurgical and engineering principles to minerals processing plants," Pyle said.

In 2023, Ausenco supported the Campo Morado mine in Mexico to improve its recovery rates of zinc and copper. (Photo: Luca Mining)

Evolving Tools for Managing Surface Fleets

Recent developments in surface fleet management systems show a push towards real-time decision support and more connected open-pit operations

By Nia Kajastie, European Editor

Suppliers of mine fleet management systems (FMSs) have continued to refine their products to help optimize surface operations. Developments in this space have been driven by a need for faster decision-making and greater interoperability.

Among other things, updated systems come with new user interfaces and hardware options for improved performance. The vendors have also launched enhanced optimization models and cloud-ready architectures aimed at improving day-to-day control in open-pit environments.

These improvements have been introduced to allow for clearer visibility of production, reduce delays, enable quicker adjustments and offer more reliable automation support. Strengthened cyber security and more streamlined data-sharing capabilities are also important developments.

Alongside these technical upgrades, companies continue to prioritize practical implementation, through structured change management and training.

Key Launches and Developments

Over the past year, Komatsu has expanded the capabilities of its DISPATCH FMS through the introduction of the Modular Ecosystem. This is an interconnected suite of platforms designed to simplify workflows.

As part of this ecosystem, Komatsu has introduced three new DISPATCH applications — Roadways, Replenish and Adaptive Config — with a fourth, Look Ahead, being prepared for launch.

"These apps help mines keep their road networks current with minimal intervention, optimize fueling and charging strategies, automate system configurations and execute adaptable shift plans in real-time," said Aluizio Marcelino, senior product specialist for mining technology solutions at Komatsu. "DISPATCH apps enable customers to achieve higher productivity, reduce idle time and operate more predictably and efficiently."

Haultrax recently redesigned a key part of its FMS, creating FleetOps 2.0.

The FleetOps module uses GPS tracking and intelligent algorithms to compile real-time operational data to enable miners to measure, report and improve on key metrics for optimized productivity and improved performance.

The new version, designed with production supervisors in mind, comes with more intuitive and user-friendly visuals that are optimized for tablets and phones.

Lorenzo Scalabrini, operational lead for HX Digital at Haultrax, said: "With this launch, we're giving supervisors the tool they need to confidently meet production and safety goals, lead their teams to success every shift, and make their work easier and faster."

On the hardware side, Haultrax has launched HXTag. It is a compact, ultra-modern edge computing device designed to capture precise machine data through a Global Navigation Satellite System (GNSS), digital inputs, Controller Area Network (CAN) bus, and serial communication over WLAN, LAN and GSM networks.

HXTag is a plug-and-play unit designed for harsh mining environments that automatically collects and transmits operational data. It can be mounted externally and is rated to IP66K to withstand high-pressure water cannon blasts during machine washdowns. The unit is designed to link seamlessly with FleetOps to provide visibility into production performance.

Haultrax has also introduced FMSaaS, a software-as-a-service model for its FMS solution. Miners can get access to a bundle of hardware, software, updates and support for one monthly fee per asset without a minimum term.

"Many mining operations face challenges adopting new technology due to high upfront costs and complex implementation requirements," said Gordon Crane, commercial director at Haultrax. "FMSaaS solves this by delivering the fleet management system as a simple monthly subscription."

For Hexagon's Mining division, the biggest milestone from the past year was the release of an improved version of Hexagon OP Pro.

It is designed to provide stronger fleet efficiency, smarter dispatching algorithms, accelerated analytics, broader equipment integration and increased system stability.

Haultrax fleet management system. (Photo: Haultrax)

"Enhancements such as improved understanding of shovel status, more proactive truck assignment and refined feed-rate calculations help mines improve utilization and reduce operational delays, even in edge-case scenarios," explained Jarym Kowalchuk, head of product for operations in Hexagon's mining division. "Key performance indicators now refresh in a few seconds, giving users immediate insight and supporting fast, data-driven decisions."

Hexagon also added to the system's equipment compatibility, with support for more truck, drill and plant systems. These include Volvo trucks, Epiroc drills and multi crusher bay systems.

Kowalchuk said that this makes "OP Pro easier to deploy in mixed fleets and more complex crusher interfaces."

He continued: "Architecture updates ensure performance reliability under high-load conditions or extremely large fleets ensuring consistent performance during peak operational periods."

Model Mining director Marcelo Romero said that 2025 had been an exciting year for the mining technology consultancy as well.

"We introduced the SimpleFMS Display for customers who wanted more operator feedback," he said. "While the black-box system works perfectly without a screen, the new mobile app adds powerful tools like real-time equipment status, production reports, heat maps, overspeed alerts and checklists – and it works with minimal wireless infrastructure.

"We also redesigned our web interface to make it intuitive and fast, so teams can stay aligned and reduce training time."

Additionally, Model Mining launched a new version of SimpleBLENDING, focused on ore control at the primary crusher. "It reduces process variance, improves recovery and makes hitting blend targets easier and more reliable for dispatchers," Romero added.

Outliers Mining Solutions, a consulting firm with FMS expertise, offers a software solution that leverages real-time FMS data to drive Short Interval Control and deliver actionable productivity insights.

"Over the past year, our key FMS developments have focused on moving beyond passive information delivery to real-time action enablement," said Brad Jewson, director for mining at Outliers Mining Solutions.

"The most significant launch has been our automated critical event notification system, which pre-emptively identifies emerging production losses as they happen, enabling supervisors and dispatchers to intervene in a short interval.

"We also introduced the ability to track the impact of these actions and gain insights into how to address them in the future, closing the loop between detection, response and measured value. These enhancements materially improve how truck-and-shovel fleets are managed in real time and elevate the effectiveness of Short Interval Control."

Role of Automation and AI

Automation, artificial intelligence (AI) and machine learning are now at the core of FMS evolution for many solution providers.

Marcelino said that these advanced technologies continue to shape Komatsu's approach to fleet management, "enabling faster decision-making and more precise optimization across the haulage cycle."

"Through advanced algorithms and the application of AI our FMS platform can now identify bottlenecks, forecast disruptions and automatically recommend or execute corrective actions," he continued.

"These technologies also support a broader vision of interoperability and autonomous readiness, allowing mines to progress along the automation spectrum, from assisted operations to more advanced autonomous functions, at the pace that best meets their needs."

The evolution of Hexagon's OP Pro is also "increasingly shaped by the industry's shift toward advanced real-time analytics, AI and scalable cloud technologies," Kowalchuk noted.

"This influence is visible today in our intelligent dispatching logic, which uses improved algorithms to refine shovel assignment priorities, optimize routing and reduce downtime in dynamic operating conditions."

Hexagon sees AI playing an even bigger role in the future.

"Our roadmap includes deeper optimization models capable of learning from historical and real-time operational data, enabling smarter predictions and more adaptive decision-making. These technologies will unlock richer production insights and support more natural, intuitive interactions, such as enabling users to access insights through natural language queries," Kowalchuk explained.

So, as automation and AI mature, OP Pro could deliver more proactive

An improved version of Hexagon OP Pro was released in 2025. (Photo: Hexagon)

recommendations and exceptions-based workflows.

Model Mining's SimpleFMS uses smart algorithms to automate the production cycle, so operators can focus on driving while the system handles repetitive tasks.

"It automatically captures production data for any truck, make or model and logs delays like shift changes or breaks — cutting down on human error and eliminating manual dispatching," Romero noted. "I like to say the SimpleFMS black box knows what the truck is doing, just like a smartwatch knows if you're walking, running or sitting."

In 2025, Model Mining ran internal AI and machine learning projects. In 2026, the development of AI agents will begin for its SimpleFMS, SimpleBLENDING and SimpleSIC solutions.

Outliers Mining Solutions is also making use of advanced technologies for its FMS data-driven solutions.

"We are combining our operational expertise with client-specific learnings from our software solution, enabling us to automate Short Interval Control analyses, identify the highest-value actions and optimize decisions that drive productivity in real time," said Jewson.

Data Integration and Sharing

Improving integration and data sharing has become a priority for mining technology providers, including FMS suppliers. By breaking down data silos, operations can get closer to establishing a single, trusted source of operational information.

Komatsu's Modular Ecosystem has an open-architecture design that enables data from Komatsu products, third-party vendors and mixed-fleet equipment to coexist within a single platform.

"We are also helping to lead the development of interoperability standards through ISO working groups, ensuring

SimpleFMS mine traffic management window. (Photo: Model Mining)

that automated systems can communicate reliably and that customers benefit from a more connected and collaborative technology environment," Marcelino said.

Model Mining's SimpleFMS supports cloud-based architecture and interoperability, so mines have the capability to share data in real time across planning, maintenance and reporting systems. Users can access dashboards and reports from their phone, ensuring everyone sees the same information.

"We're also expanding our portfolio to enhance operational safety," Romero said.

Model Mining now offers advanced safety solutions, including an Anti-Collision System (Level 9) and a Fatigue Detection System through a trusted safety partner.

"Looking ahead to 2026, expect deeper integration between safety and FMS solutions, providing richer operational and safety context for a more productive and secure work environment," he added.

Haultrax aims to enhance data integration by providing API access that allows connection with external systems such as data warehouses, payload management systems, high-precision positioning systems and other operational tools. Additionally, it offers Power BI reporting solutions to ensure business users can access, visualize and interpret key operational insights.

Hexagon wants to expand interoperability on multiple fronts with OP Pro.

"Support for more makes and models helps mines operate mixed fleets without compatibility barriers," Kowalchuk pointed out. "This aligns with industry trends toward operational flexibility and the rise of electric and hybrid fleets."

OP Pro's ability to share real-time data with planning, plant and maintenance workflows is also meant to strengthen cross-functional coordination.

"For example, enhanced onboard monitoring tools give plant personnel clearer visibility into targets and fleet progress, enabling better synchronization with upstream activities," Kowalchuk continued. "Engineers can use real-time positioning and misrouting alerts to optimize production flows, while maintenance relies on accurate utilization data to plan interventions."

In the future, Hexagon will focus on deeper integration across its ecosystem, including planning tools, collision avoidance and fatigue management technologies.

"This will reduce hardware requirements, standardize data sharing and strengthen the foundation for a more connected life-of-mine environment," Kowalchuk said.

Outliers Mining Solutions' focus lies on integrating FMS, production data, planning systems and workflows, with the aim of making Short Interval Control fully data driven.

"By streamlining data sharing between platforms, we remove manual work, improve KPI accuracy, create opportunities to discover new learnings and insights, and ensure that real-time decisions in the field and the control room are aligned with the mine plan," Jewson said.

Cyber Security Concerns

As mines continue to become more digitalized and systems more interconnected, cyber security is front of mind for technology providers. This is made all the more urgent due to recent cyberattacks in the mining industry.

Cyber security is also a foundational element of Komatsu's technology strategy.

"Our FMS platforms are built on a secure architecture that incorporates modern authentication protocols, data encryption, rigorous access controls and continuous monitoring to detect anomalies before they impact operations," Marcelino explained.

"We work closely with customers' teams to ensure solutions align with site-specific cyber security policies. Our open-architecture approach maintains strict controls around data ownership, allowing customers to decide when and how their information is shared."

Model Mining said it works closely with leading technology partners and customers to implement best practices.

These include cloud infrastructure protection to prevent and respond to attacks; data encryption at rest and in transit; role-based access control to prevent unauthorized changes; and regular vulnerability assessments and hardware patching.

To enhance security across its FMS ecosystem, Haultrax leverages Microsoft Entra ID for robust authentication and enforces multi-factor authentication (MFA) for all users. Its servers are protected with CrowdStrike Falcon sensors, enabling real-time threat detection and response. In addition, its environment is monitored 24/7 by two dedicated security specialists.

Haultrax is working towards compliance with ISO 27001 cyber security requirements, with certification targeted for 2026. The standard provides verification that an organization is using an internationally recognized Information Security Management System (ISMS) to keep its information assets safe and secure.

Hexagon is also on track to get ISO 27001 certification in 2026.

Moreover, many of the upgrades in the newest version of Hexagon's OP Pro indirectly reinforce cyber security.

"The transition toward greater cloud scalability, broader integration and improved system stability is supported by secure-by-design principles within our development process," Kowalchuk said.

Change Management and Training

When introducing more advanced systems on a mine site, users will always need appropriate training and support to manage the transition. The technologies alone cannot improve the operation; it ultimately depends on how effectively they are applied by the people on site — or those supporting the operation remotely.

Marcelino believes that successful technology adoption requires strong change management.

"Our teams provide structured onboarding programs, scenario-based training and continuous support to ensure dispatchers, supervisors and operators can quickly build confidence in the system. With intuitive interfaces, remote assistance tools and data-driven insights, we help customers integrate new workflows seamlessly, sustain long-term performance and maximize the value of their technology investments," he said.

For Outliers Mining Solution, change management and capability building are some of the core outcomes of its professional services work.

"Our focus is to close skills gaps, build a true understanding of production drivers and ensure teams can sustain performance long after our engagement ends. We integrate training, coaching and role-specific upskilling from the outset so that system adoption is strong, behaviors are embedded and the solution's value endures," Jewson explained.

The team behind Haultrax's FMS has a mining operational background, meaning it has direct experience of how sites work and the pressures that teams can face.

In addition to deploying software, Haultrax offers role-based training, in-pit coaching, process alignment and continuous improvement support.

"We look at how digital solutions and mining technology can be integrated into a business and implemented with the people at the frontline and apply it in a way that brings most value to them. I commonly say that we have the ability to communicate the same message in different languages, from C-suite level to middle management and operators — in the meeting room, pre-start meeting, or in an operator's cab," explained Haultrax managing director Shyamal Sharma.

One of the strengths of Hexagon's OP Pro is that it offers benefits across various roles within the mining organization, thus reducing the friction of change.

For operators, simplified dialogue boxes, faster status-change shortcuts and clearer plant monitoring can help reduce workload and errors. For engineers and controllers, more precise feed-rate calculations, real-time truck positioning and timely misrouting alerts support adherence to plans and help refine processes. Maintenance teams benefit from higher-frequency analytics refreshes and more accurate availability tracking, enabling proactive scheduling. Management, in turn, can gain heightened visibility through real-time analytics and intelligent dispatching.

"Our implementation approach builds on these features with structured onboarding, scenario-based training and continuous post-deployment optimization," Kowalchuk said.

Romero explained that Model Mining's FMS platform is first and foremost built for simplicity.

"Operators don't need to enter data manually — the system captures and streams production metrics automatically, so supervisors don't have to spend time training operators. This makes adoption smooth and reduces resistance to change," he said.

A Look Underground

Over the last 12 months, Micromine has focused on improving real-time visibility for underground operations through its underground FMS, Pitram.

It recently introduced comprehensive Shotcrete Tracking, enabling full traceability from the batch plant to the sprayed locations. The system records key quality and process data, including batch numbers, slump tests, additives and transfers between mixers and sprayers. It also supports complex scenarios, such as partial discharges across multiple locations or the disposal of unused material. All shotcrete-related events are processed during the shift and stored in the reporting database.

Erich Guevara, head of business unit for Micromine Pitram Americas, said: "One of the core improvements was Pitram Connect, our mobile-first experience designed to give supervisors and engineers immediate access to shift data without being tied to the control room.

"This includes new capabilities such as recording measures directly in the app, real-time task progress and instant updates from operators underground."

Micromine also released Real-Time Deviation Tracking, which highlights plan-versus-actual discrepancies as they occur, not at the end of the shift.

"Another major focus has been strengthening our material management capabilities, from stope to ROM. Mines are now leveraging richer load-haul-dump tracking, improved ore routing intelligence, and tighter reconciliation workflows to reduce losses and bottlenecks," Guevara said.

Micromine sees automation and AI reshaping expectations for what an FMS should deliver in the underground space.

Guevara explained that, in Pitram, it is applying these technologies in the following ways:

- Automation of routine data capture to reduce operator burden and improve reporting consistency.
- Pitram Vision, the world's first machine-vision-based capability for automated LHD cycle detection.
- Expanding its onboard integration framework, with the latest release supporting a broader range of equipment for direct data acquisition and fully automated data flows.
- Anomaly detection and deviation insights, helping teams identify trends and operational risks that would be difficult to see manually in large volumes of shift data.

As underground mines also push toward more connected, continuous operational workflows, more integration between systems has been a focus for Pitram as well.

"Over the past year, we've strengthened interoperability across planning, maintenance, ERP and analytics environments, as well as with OEM equipment integration," Guevara noted.

"We expanded an already established set of onboard integrations by adding Caterpillar VIMS, Komatsu Komtrax and Volvo articulated haulers, alongside existing support for Loadrite onboard scales and other OEM systems."

Critical data on machine health, payload, fuel burn, cycle counts and engine hours then flows into Pitram, and it is automatically converted into structured production events.

Activities such as cycle changes, dumping, refueling and servicing can be captured without manual entry. This helps reduce operator load and improve data quality, and mines can respond faster to emerging bottlenecks or equipment issues.

Micromine has also strengthened APIs for third-party tools, enabling better interoperability with OEM dashboards, fleet maintenance systems and corporate data lakes.

Micromine sees cyber security as non-negotiable for operational technology systems. It has thus invested in:

- Hardened authentication and role-based access controls across all Pitram interfaces, including Connect.
- Enhanced encrypted data transfer between all clients, including underground mobile units and servers.
- Regular third-party penetration testing and security audits to benchmark against global best practice.
- Separation of operational and corporate data layers.
- Alignment with Weir Group's enterprise-grade cyber security governance.

Real-time Data Reveals High-grade Ore

A positive turn marked the progress of Northisle Copper and Gold Inc. on Vancouver Island, Canada, after a drill hole that was close to being considered completed ended up delivering one of the strongest intersections of the 2025 program. The episode reflects a broader shift: the emergence of immediate, in-field data in decisions that traditionally depend on assay results with long turnaround times.

Within this context, Northisle highlighted the strategic impact of on-site technology. "Integrating real-time data into an active drilling program is changing the way decisions are made on the ground. When geological judgment is paired with continuous-reading tools, uncertainty is reduced immediately rather than weeks later. At West Goodspeed, one of the key target areas within the broader Northisle project, we are already seeing how this approach sharpens targeting and speeds up positive results on our North Island Project," the company noted.

The turning point came with drill hole RD25-07. After more than 250 meters (m) with few indications of important mineralization, shutting down the hole was being considered. As that call was evaluated, Veracio's Scan platform was returning real-time geochemical results from nearby RD25-05, indicating the potential for a mineralized horizon at greater depth. With that information, and despite the lack of visual indicators at the current depth of RD25-07, Vice President Exploration Pablo Meji-Herrera and his team decided to continue drilling.

The decision led to the interception of 39 m grading 1.16% copper equivalent (Cu Eq.) within a broader interval of 93 m at 0.77% Cu Eq., one of the best results obtained to date at West Goodspeed. The results not only confirmed deeper high-grade mineralization, but also redefined the interpretation of the model for the area. Veracio summarized the case with a phrase already circulating in the industry: "Visual geology suggested stopping, but the real-time data told another story. This discovery shows how technology can change the course of an exploration campaign within hours."

The situation is consistent with other recent results that strengthen the geological interpretation of the target. Highlights include RD25-04, which returned 38 m of 0.72% Cu Eq., including 18 m of 1.13% Cu Eq., and RD25-05, which delivered two mineralized intervals at shallow depth and farther downhole. Near surface, GS25-28 and GS25-29 confirmed grade continuity and support the interpretation of a stacked mineralization now traced for more than 1.2 km along strike and 280 m vertically.

The 2025 program continues at pace. Northisle has already completed 14,130 m of drilling, 9,000 m of which are exploration-focused, and is advancing a plan that will add up to an additional 10,000 m across infill, condemnation and geotechnical drilling. With the updated geological model provided by these results, the company has begun formally integrating West Goodspeed into its resource inventory and will be a key component for the upcoming prefeasibility study.

What a decade ago may have seemed experimental, using continuous, in-field data, has now become a strategic input in programs where decisions are made shift by shift. Real-time scanning not only eliminates the wait for assays, but can fundamentally alter the trajectory of an entire drilling program.

A mobile lab provides real-time data from core scans on site. (Photo Veracio)

Sirens Warn Locals of Dam Breach

Brazilian mining company Mineração Morro do Ipê (MMI) uses sirens to warn the population in the danger zone of its tailings dam. The 19 sirens are connected to sensors and are automatically triggered in the event of a dam breach. The use of sirens to warn the population is mandatory by law in Brazil.

All Brazilian mining projects with tailings dams must conduct a geotechnical dam failure study to predict the potential flood risk in the event of a dam failure. A geotechnical reassessment revealed that the flood zone at the dam owned by the mining company MMI had increased significantly. This necessitated the installation of 12 additional sirens.

MMI decided to replace the seven existing sirens from another manufacturer with new sirens from Hörmann Warning Systems. All 19 ECN-D sirens were

MMI installed 19 sirens to warn people of a possible tailings dam breach. (Photo: Hörmann)

installed by Hörmann's partner EKM do Brasil in Brazil. The high operational reliability of the German manufacturer's sirens was a decisive factor in the decision to choose Hörmann.

The specific requirements for the warning system were:

- Reliable warning of the population in the event of an impending dam breach;
- The first 10 kilometers of the flood zone must be completely covered by electronic sirens with a sound level of at least 70 dB/30 m;
- Connection of the sirens to the geotechnical monitoring system at the dam;
- Operation of the sirens at locations without a power grid;
- Reliability and low maintenance requirements; and
- Two independent communication channels for triggering.

The ECN-D sirens can communicate with and be triggered by the control center via both digital radio (DMR) and Wi-Fi. This redundant communication path ensures reliable triggering even if one communication medium fails. Each siren is also monitored by video. The MCE gateway, the communication center of a siren warning system consisting of several sirens, is equipped with two relays and, in the event of a dam breach, automatically triggers the Brumadinho area with nine sirens and the Igarapé area with 10 sirens, either individually or together. For this purpose, the siren control center was connected to MMI's geotechnical monitoring systems at the dam.

The project was completed in less than six months, from concept development to installation, in collaboration with Hörmann's local partner and siren expert EKM do Brasil. All sirens are working perfectly and are always ready for operation. Maintenance costs are virtually zero. The automatic triggering of the alarm in the event of a dam breach prevents any loss of time in warning the population.

The Future of Repair: Cross-Linking

By Don Meyers

For more than 50 years, the world has attempted to repair critical infrastructure using the same 1970s technologies — glues, epoxies, urethanes, acrylics, contact cements and composite wraps. All of these methods rely on adhesion, a surface-level grip that weakens and ultimately fails under moisture, vibration, thermal cycling, pressure and load. These systems were never designed for 21st-century materials, high stress operating environments, or industrial expectations. Today, the limitations of these technologies are accelerating the rate of pipe and tank failures around the world.

With Cross-Linking, Tech-Bond Global has introduced the first true materials-science breakthrough in structural repair in over half a century. Instead of adhesion, the patented technology achieves molecular integration, forming continuous chemical bridges at and through the interface. The Tech-Bond System creates a unified molecular network that eliminates the weaknesses that cause all traditional repairs to fail.

The Tech Patch Repair System (TPRS) uses PTFE-coated E-glass fabric as the patch material. With Tech-Bond's patented Polymer Bonding Process, almost any two surfaces can become cross- linked. The result of this cross linking is a permanent solution—moisture-proof, fuel-proof, vapor-proof, unaffected by thermal cycling, capable of restoring full structural integrity and guaranteed for the life of the pipe.

The development of cross-linking, the Polymer Bonding Process and the TPRS was entirely empirical — driven by systematic trial, observation and refinement rather than theoretical prediction. Each breakthrough emerged only after repeated experimentation produced consistent, verifiable performance outcomes. In other words, the technology was not invented on paper; it was proven in practice, one controlled test at a time, until the underlying mechanisms of molecular integration became undeniable.

After nine years of validation by IIT–ISM, Borouge, MEI Laboratories and ISO 1167/13479 testing, TPRS has proven permanent across HDPE, steel, PVC, poly tanks, concrete and more.

In difficult environments, mechanical fasteners and adhesives (glues and epoxies) create costs and downtime due to repeat failures. Pipe replacement requires cutting, drilling, clamping and creates structural disturbance. Adhesives require precise conditions, long cure times and controlled environments that rarely exist in the field. Moisture, vibration and pressure destabilize adhesive bonds, creating an ongoing cycle of temporary fixes and production losses.

With the Tech-Bond System, cross-linking creates permanent molecular connections between the Bonding Agent and the conditioned surface, forming a continuous network that eliminates creep, delamination, moisture intrusion and failure initiation. It expands and contracts with temperature changes, forming a structural repair permanent for the life of the pipe or tank.

Don Meyers is the founder of Tech-Bond Global LLC. www.techbondglobal.com

Cat Sends BEV Trucks to Pilbara, Autonomous Trucks to Brazil

Caterpillar deployed two 793 XE Early Learner battery electric trucks to BHP's Jimblebar iron ore mine in the Pilbara for commissioning and testing.

The trials seek to prove the viability of battery-electric technology as an alternative to diesel usage in large-scale iron ore mining operations. They will help inform the development of technology, processes, infrastructure and people required to lower greenhouse gas emissions by machines and mine sites of the future, BHP said.

"Replacing diesel isn't just about changing energy sources, it's about reimagining how we operate and creating the technologies, infrastructure and supply chains to transform mining operations," said Tim Day, president of BHP's Western Australia Iron Ore. "These trials will help us understand how all the pieces of the puzzle fit together: the battery technologies, generation and charging infrastructure, power management, as well as the supply chains to potentially deliver this at scale."

Above, an autonomous Cat truck hauls a load at the Brucutu mine in Minas Gerais, Brazil. (Photo: Vale)

The deployment is described as an industry-first collaboration between BHP, Rio Tinto and Cat. Following the trials, BHP and Rio Tinto will independently determine progress towards scaled trials within their respective operational environments.

A Cat 793XE arrives at Jimblebar iron ore mine in Western Australia. (Photo: Caterpillar)

Separately, Vale tapped Caterpillar and its Brazilian distributor, Sotreq, to expand the fleet of autonomous haul trucks in iron ore operations in the Northern System, in the Carajás region, in Pará, Brazil. Currently, the Northern System has 14 autonomous haul trucks. The agreement expands the fleet to 90 autonomous trucks equipped with Cat MineStar Command for hauling in the region by 2028.

In Serra Sul, the trucks will work alongside a truckless system, which uses a network of long-distance belt conveyors. Vale's autonomous program began in 2018 with Cat autonomous trucks at the Brucutu mine in Minas Gerais. Currently, the company uses more than 70 autonomous pieces of equipment, including trucks, drills and yard machines.

Eldorado Gold Buys 10 BEVs for Lamaque

Eldorado Gold bought 10 battery-electric vehicles and 10 charging stations from Sandvik for the Lamaque Complex in Val-d'Or, Québec (Canada). The five TH550B trucks and five Toro LH518iB loaders will help the miner attain sustainability and productivity goals, the supplier said.

Previously, Lamaque adopted two Sandvik electric trucks in 2023 and 2024. The performance of the trucks prompted the new purchase, leadership at the miner said.

Above, a Toro LH518iB loader similar to those adopted for Lamaque. (Photo: Sandvik)

"The first Sandvik BEVs at Lamaque have proven their capability underground, and expanding the fleet lets us move more tons with less energy and heat," said Sylvain Lehoux, vice president, Canada, Eldorado Gold Québec. "We see electrification as a long-term enabler of safer, more efficient and more productive mining."

The order will be completed in 2027.

Separately, Sandvik broke ground for its new 12,500-m^2 facility in Sudbury. The supplier is investing $61 million in the project. The new facility, which is scheduled to open in Q3 2027, will support 400 employees from a nearby facility that has been operating for 40 years.

Sandvik said the new facility will offer a modern, collaborative, future-ready work environment. "With expanded capabilities, enhanced infrastructure and a strong focus on our core products, which align with Canada's priorities around electrification and sustainability, this investment strengthens our ability to remain a trusted partner for our customers for many years to come," said Peter Corcoran, vice president, sales, Canada.

Also in December, Sandvik said it will invest $37 million in a new purpose-built mechanical cutting and parts-and-services facility in Saskatoon, Saskatchewan. The 4,700-m^2 building will feature "optimized workshop bays equipped with dedicated space for equipment maintenance and component repairs, wash bay and staging areas, and robust cranage and clearance," Sandvik said.

Corcoran said the "facility will strengthen our local presence in a key mining region and ensure we have the capacity, infrastructure and expertise to support our customers well into the future."

Valmet to Acquire Severn Group

Valmet agreed to acquire Severn Group, maker of valves, from a UK-based private equity firm for $480 million. Valmet said Severn's technologies, subsidiaries, and book of business support Valmet's growth strategy.

"This acquisition marks a significant step in the execution of Valmet's Lead the Way strategy, strengthening our Process Performance Solutions segment and expanding our Flow Control business," said CEO Thomas Hinnerskov. It also "strengthens our commitment to deliver lasting customer value over the life cycle."

Severn said the acquisition will present global opportunities. "Joining Valmet positions us to accelerate our growth, expand into new markets and deliver even greater value to customers worldwide," said CEO Perttu Louhiluoto.

The acquisition is expected to finalize during Q2 2026.

Weir to Acquire ESEL

Weir agreed to acquire the remaining 50% share of its Chile-based joint venture ESCO Elecmetal Fundición Limitada, maker of ground-engaging tools, for $75 million. Weir said the acquisition will strengthen its manufacturing capabilities in South America.

The development will enable Weir to "transition to a direct-to-customer model" in the region, leadership at the supplier said. "With full operational control, we will enhance our Weir network to grow market share and capitalize on Chile's long-term structural tailwinds in mining, particularly in copper," said Weir CEO Jon Stanton.

The acquisition is expected to finalize in Q1 2026.

FMS Group Acquires Cru Services

FMS Group, a maintenance services company, acquired Western Australia's Cru Services and subsidiary The Pilbara Clean Machines, a maintenance and labor services supplier, from Schlam Cru. Schlam Cru said the two companies have common values.

"Their people-first approach, operational capability and commitment to safety and culture align perfectly with the foundations we've built," said Ryan Schlam, founder. "Joining forces ensures that our teams and clients continue to thrive under a like-minded national organization."

Silver Storm Buys, Rebuilds Equipment Before Restart

Silver Storm Mining placed orders for equipment to support underground mining at the La Parrilla Silver mine, located in Mexico's Durango State. The equipment will support the restart of underground operations, scheduled for Q2 2026.

The order includes scooptrams, trucks and drills from Jiangxi Siton Machinery Mfg. Co. Siton machines are "in use at other similar-sized Mexican-based underground

Sandvik broke ground on a new Sudbury facility, above. (Image: Sandvik)

Sandvik will invest in a new 4,700-m^2 facility for parts and services in Saskatchewan. (Image: Sandvik)

Above, an XTUT-20 similar to those adopted by Silver Storm Mining. (Photo: Siton)

mines and have excellent performance and utilization ratings," the miner said. Existing Sandvik machines have been sent for maintenance and rehabilitation.

Silver Storm Mining also bought two ventilation fans from Howden. "A 600-hp unit will act as the principal Rosarios mine exhaust ventilation fan, while a 250-hp unit will enhance the ventilation in the west mining areas of La Parrilla," the miner said.

Silver Storm Mining said the order illustrates its commitment to safety and efficiency. "These investments are essential steps as we advance toward unlocking the full potential of La Parrilla," said CEO Greg McKenzie.

Codelco to Trial, Adopt Hexagon Tech

Codelco and Hexagon partnered to test and deploy technologies throughout the former's operations. The five-year contract "provides the framework for conducting pilots and trials of products under development or not yet commercialized, as well as adapting Hexagon's technologies to Codelco's operational challenges," Hexagon said.

Technologies expected to be trialed for adoption include proximity detection and other safety solutions, machine- and remote-monitoring solutions, fleet management solutions, drill optimization solutions and artificial intelligence. Codelco said the technologies will deliver needed safety, sustainability and productivity benefits.

"We are paving the way for the mining of the future through collaboration, to fulfil our purpose of being a pillar of sustainable development for Chile and the world," said Felipe Lagno, corporate manager of innovation and technology at Codelco.

Hexagon said the development formalizes an already strong partnership. "Together, we can demonstrate how collaboration and digital innovation can transform the mining industry for the better," said Hexagon's mining president, Dave Goddard.

From left: Codelco's José Ramón Abatte and Felipe Lagno; Sofía Karlberg, Swedish ambassador to Chile; and Hexagon's Dave Goddard, Norma Vargas, and Rodrigo Couto. (Photo: Hexagon)

BEUMER Turns 90

BEUMER Group celebrated its 90th anniversary after what it called a record-breaking year. "With an order intake of $1.62 billion and 5,700 employees worldwide, the intralogistics specialist achieved its best ever results in 2024."

BEUMER attributed the milestone and the banner year to a policy of innovation and boldness. "As a family business, we think in generations, not quarters," said Dr. Christoph Beumer, chairman of the advisory board. "This mindset shapes our actions and our ambition to remain an industry leader in the future."

RF Valves Opens Maryland Facility

RF Valves held a grand-opening ribbon-cutting ceremony and hosted tours of its new facility in Hanover, Md. (USA). The facility includes workspace, warehouse and logistics operations.

The company has experienced double-digit growth over the last four years, resulting in job creation and culminating in the opening of the new facility, the company said. "For more than 30 years, our engineers have been solving complex challenges across many industries and municipal applications, with our valves playing a vital role in critical infrastructure around the globe," said Danilo Garcia, company president.

RF Valves President Danilo Garcia showcases a 40-in., electrically actuated knife gate valve. (Photo: RF Valves)

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Transition Metal Solutions to Reinvent Bio-based Copper Recovery

Transition Metal Solutions, a startup boosting copper production from existing mining operations and waste, announced an oversubscribed $6 million seed round. The company's proprietary platform analyzes the microbes living in an orebody and predicts, tests and formulates chemical additives to optimize the specific wild biology and deliver more copper.

The concept emerged following work at a major copper mine where some heaps were producing significantly more copper than expected. Analysis revealed the overperformance was driven by the diverse microbes found in the ore — over 90% of which had never been isolated or sequenced.

That discovery convinced Dr. Sasha Milshteyn, founder and CEO of Transition Metal Solutions, that all the necessary biology is already present. "We just need to identify what's limiting the microbial communities from doing what they naturally evolved to do," said Milshteyn, who has more than 20 years of experience in biophysics, metagenomics and synthetic biology.

When tested on a low-grade primary sulphide ore, lab results showed an increase in copper recovery from 60% to 90%. Experiments on ores with challenging mineralogy, such as refractory, high-carbonate ore, achieved in situ acid generation and metal leaching three times faster than industry standard.

"We listened to dozens of miners and industry experts who have been disappointed by the performance of past biomining efforts," said Alexandra Shiluk, co-founder and COO of Transition Metal Solutions. "Our solution does not require lab-grown microbes or additional capital investments, making it cheaper, faster and easier to adopt and scale."

The company, formerly Transition Biomining, was founded in 2023 and rebranded to better reflect its unique chemical approach to enhancing biological systems. It is headquartered at UC Berkeley's Bakar Labs for Energy & Materials. Dr. Suzan Yilmaz leads R&D, alongside scientists Dr. Diana Bojanova and Jeremy Wei. Yilmaz brings 15 years of experience in metagenomics and engineering across energy, environment and human health applications. Vania Grandi leads the go-to-market efforts as chief commercial officer, with 20 years of experience in mining, metals and sustainability. Dr. Peter Kondos is an independent board director who brings over three decades of mining and metallurgical expertise from leadership roles at Barrick Gold, Inco (Vale) and Noranda (Glencore.)

The seed round was led by Transition Ventures and backed by all prior investors — SOSV, Dolby Family Ventures, Astor Management AG, Juniper VC and Climate Capital — alongside new investors Possible Ventures, Understorey Ventures, New Climate Ventures, Essential Capital and Kayak Ventures.

Dr. Sasha Milshteyn (right) and Alexandra Shiluk discovered diverse microbes that could optimize the copper leaching process. (Photo: Transition Metals)

"Transition Metal Solutions has developed a scalable, low-emission alternative to smelting," said Clara Ricard, partner at Transition Ventures. "This drop-in solution to leaching low-grade ores is transforming the industry and addressing a critical gap in the energy transition worth billions."

The seed funding will be used to scale the technology from lab to industrial pilot conditions, with 3-meter column trials targeted to start the first half of 2026. Transition's long-term vision is to extend the platform to other critical metals, including nickel, cobalt, gold and zinc.

"We evaluated dozens of new mining start-ups," said Pae Wu, general partner at SOSV, "and urged Sasha to start the company because his unique scientific insight draws a straight line to scaled cash flows for his customers by tapping into what mining companies are already doing — without any overhead."

Ontario Launches $500 Million Critical Minerals Processing Fund

As part of its plan to protect the province, the Ontario government has officially launched the $500 million Critical Minerals Processing Fund (CMPF), which will provide strategic financial support to projects that accelerate its critical minerals processing capacity and strengthen domestic supply chains. First announced in the 2025 Budget, the CMPF will strengthen the province's position as a global leader by ensuring critical minerals mined in Ontario are processed and refined in Ontario, by Ontario workers.

"As global demand for critical minerals rises across leading industries, our government is meeting the moment by increasing Ontario's domestic processing capacity," said Vic Fedeli, minister of economic development, job creation and trade. "Through the Critical Minerals

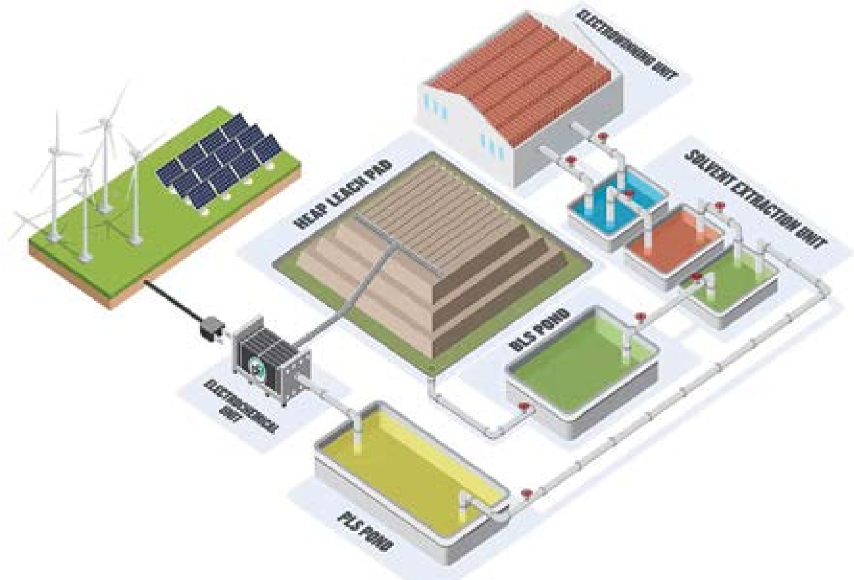
Processing Fund, we are building a complete, made-in-Ontario critical minerals supply chain that will create good-paying jobs for workers, strengthen the economy and reinforce our province's position as a global leader in this critical sector."

The CMPF complements the government's ongoing efforts to unlock the economic potential of Ontario's mineral resources sector in the Ring of Fire and across northern Ontario. By ensuring existing mineral processing facilities can maximize their production and supporting the construction of new operations, the government is boosting Ontario's manufacturing competitiveness and building a more resilient and self-reliant economy equipped with the tools needed to meet growing domestic and international demand for critical mineral resources. The CMPF will be delivered through Invest Ontario, the province's investment attraction agency.

"We are finally ending the ripping and shipping of Canada's vast resources by stepping up with a plan to build mines faster and expand domestic processing," said Stephen Lecce, minister of energy and mines. "This is about protecting Ontario workers by ensuring 'Made in Canada' is stamped on the minerals we process, creating thousands of good-paying jobs right here at home. We will continue to lead the clean energy economy by unapologetically opening new markets for the most ethically sourced resources on Earth."

Ontario's critical minerals advantage will play a key role in growing the province's strategic sectors, including defense, electric vehicle (EV) and battery manufacturing, technology, aerospace and advanced manufacturing. By expanding production capacity through the CMPF, Ontario will be positioned to provide these industries with secure, reliable access to responsibly sourced materials, ensuring local manufacturers have the resources they need to adapt and expand in the face of U.S. tariffs and create new, good-paying jobs for Ontario workers.

The CMPF builds on the government's plan to protect Ontario by increasing the competitiveness and resiliency of its manufacturing sector. By lowering taxes, cutting red tape, making strategic investments, speeding up approvals and championing local procurement, the government is positioning the province as the most attractive and competitive economy for growth and investment in the G7.



An electrochemical module produces an in-situ oxidizer. (Image: pH7)

pH7 Technologies to Scale Metals Extraction Technology

pH7 Technologies Inc., a Canadian company developing next-generation critical-mineral extraction technologies for both primary and secondary resources, raised $25.6 million to advance the scaling and commercialization of its extraction technology for the mining sector, beginning with copper. The pH7 process enables mine operators to economically recover metals from lower-grade ores, and other feedstocks that have historically been uneconomic to process, which could unlock new sources of copper, nickel and platinum group metals (PGMs).

The proceeds from this round of funding will support commercial deployments and on-site demonstrations at mining operations globally.

"We are accelerating the transition from pilot to commercial deployments, enabling operators to produce copper and other critical minerals directly on-site," said Mohammad Doostmohammadi, CEO of pH7 Technologies. "Our technology provides a new pathway for nations to secure resilient, domestic sources of the metals that underpin modern infrastructure and the energy transition."

Through its proprietary closed-loop organo-electrochemical process, pH7 enables mining and recycling operators to economically recover metals from low-grade ores, tailings and complex feedstocks that have historically been uneconomic or technically challenging to process.

A proprietary electrochemical module is added to the heap leach process without any changes in the flow sheet. This unit produces an in-situ oxidizer strong enough to break the metal-sulphur bonds, eliminate passivation layer and oxidizes the target metal. The lixiviant's organic ligands bond with oxidized metal, carrying it to the solvent extraction or ion exchange unit, followed by electrowinning to extract the metal. The barren solution then passes through the electrochemical unit again, regenerating the oxidant prior to irrigating the heap.

This heap leach mining process allows operators to extract copper and gold from oxide, transition and sulfide ores, producing copper cathode or gold doré on-site while eliminating the need for mills, concentrators, concentrate shipments and smelters.

"The electrochemical process developed by pH7 unlocks a significant opportunity through extraction of critical minerals from low-grade ores and tailings," said Laurel Buckner, VP of ventures at BHP. "This kind of leap in extraction technology could transform how critical minerals are sourced and help provide more of the critical mineral the world urgently needs."

The company has already commercialized its technology at the Vancouver facility for extraction of PGMs from spent catalysts. pH7 has also advanced its mining-sector technology to pilot scale, positioning the company for its next phase of commercial growth.

World's First Autonomous Rock-breaking Solution

Normet launched the Xrock Autobreaker, which it describes as the world's first autonomous rock-breaking solution. It automatically identifies and breaks oversized rock, eliminating the need for humans in the grizzly area, the supplier said. "It also allows operators to supervise several breaker systems safely and remotely from a protected control room."

The Xrock Autobreaker uses cameras and sensors to create a dynamic point-cloud of the ore mass. "The system automatically identifies oversized boulders, plans strike positions and executes breakage sequences autonomously, while dynamically adjusting its model to reflect the changes in the ore mass," Normet said. "The system plans and controls its own boom movements, recognizes the current phase of the breaking process in real time, and communicates seamlessly with the mine's control infrastructure, allowing full supervision and intervention from an office location far from the hazard zone."

A breaker expert at Normet said the solution, because it can be remotely managed, could create new roles in underground mining. "By enabling rock breaking to be supervised safely from an office environment, we not only multiply the output of every operator, but also open opportunities to a wider group of people who may not previously have been able to access operator or operational roles in the underground mining industry," said Vesa Marttila, breaker booms product line director. "Moving operators away from direct exposure at the crusher or grizzly sites fundamentally improves both safety and productivity."
Normet.com

Surge Protector Cleans Dirty Power

Mechanical Ingenuity said the Wavecrest surge protector cleans dirty power and also protects equipment against sags, swells, transients, overvoltage, undervoltage, EMI noise and more. Using an array of MOVs, capacitors, chokes and transformers, it will allow through only 10% of a surge.

Wavecrest is "easy to install" and has a diagnostic display giving information on power status, the supplier said. "In a compact space-saving design," it is available for 120-volt (V), 208-V, 240-V, 277-V, and other circuits. "Innovative in function and cost, the Wavecrest is economical enough to install on effected circuits that might not require overhauling the power conditions for an entire building."
MechanicalIngenuity.com

Wireless Level Transmitter

Emerson launched the Rosemount 3408 Wireless Level Transmitter for automated measurement applications. Described as "non-contacting radar," it cuts installation time and costs compared to cabled predecessor models. It also "eliminates measurement blind spots and the need for manual readings," the supplier said.

Using 80 gigahertz frequency modulated continuous wave technology, the solution can measure the level of liquids and solids. Data is transmitted via the WirelessHART communication protocol. "The 3408 can also be easily integrated into any host monitoring and control system compliant with the HART protocol and the Field Device Integration standard," Emerson said. "This makes it easy for operations and maintenance teams to obtain clear visibility of data that may previously have been siloed, resulting in improved operational performance and inventory management."

The 3408 features a modular electronics cassette that can be quickly replaced. "The availability of different seals and antenna types increases the range of applications for which the transmitter is suitable," Emerson said. "With two power modules, organizations can adjust the update rate to suit their needs and obtain extended battery life with a slower update rate."
Emerson.com

Drill String Improves ROP

Epiroc introduced the COPROD 89 drill string for surface applications. Compared to previous designs, the system delivers increased rate of penetration and reduced fuel consumption due to increased flushing capabilities, the supplier said.

The drill string combines the speed of tophammer drilling with the precision of down-the-hole drilling, and "offers improved wear resistance and simplified maintenance," Epiroc said. "It's a powerful step forward in our mission to drive productivity and sustainability in the industry."

A drilling tools expert with the company said the launch highlights the company's commitment to innovation. "The new Epiroc COPROD 89 drill string is built to perform in the toughest conditions, helping our customers achieve more with less," said Fredrik Gransell, marketing head, tophammer rock drilling tools.

Epiroc.com

Hammer-less Screen Changeouts

Multotec reported its hammer-less attachment systems for screen media simplify changeouts, making them faster and safer. The panels clip or snap into place, minimizing the required force and reducing the number of moving parts.

The supplier also offers the systems for use on modular runner-type screens that accommodate interlocking, standardized screen panels. "These systems can also be retrofitted to any existing screen decks or applications currently in operation," Multotec said.

The ERX system secures polyurethane or rubber panels with clamping strips. The Y-LOK system for Multotec trommel screens uses a snap-on mechanism and a groove rail system. The CCX and HALO systems "provide versatile clip-in and snap-on solutions for applications ranging from sizing and dewatering to media recovery."

The supplier said the systems demonstrate a focus on safety and efficiency. "By reducing hammering and simplifying installation, they lower the risk of hand injuries and pinch points, cut down on repetitive strain, and decrease operator fatigue, improving alertness and morale," Multotec said. "The result is a safer working environment, faster maintenance, greater plant availability and improved productivity, fully aligned with the mining industry's growing emphasis on both safety and operational efficiency."

Multotec.com

Radar Sensors for Tough Environments

Baumer said its R600V off-highway radar sensor for mobile machinery delivers quick and precise distance measurements. It features "robust housing, optimum lens protection, effective sealing that meets IP69K immersion and a CAN SAE J1939 interface," all of which "make these radar sensors especially suited to challenging applications," the supplier said.

With a 122-GHz design, the R600V is "designed to operate in tough environments" with "extreme wind, temperature and humidity conditions," Baumer said.

Baumer.com

Cat's Artificial Intelligent Assistant

Caterpillar unveiled Cat AI Assistant, an artificial intelligence-based solution that helps customers gain knowledge on the supplier's offerings and solutions. The assistant is designed to help customers buy, maintain, manage and operate their equipment, Cat said.

The assistant is conversational and draws on information from across the entire Caterpillar enterprise when advising. It can help manage the data on a customer's equipment and give "insights and recommendations" for maintenance, the supplier said. It can inform technicians on maintenance and repair tasks. For operators, it can serve as a coach, "providing operators with information to work smarter and safer without switching screens, returning to the yard, or losing focus."

The Cat AI Assistant is scheduled for release in Q1.

Cat.com

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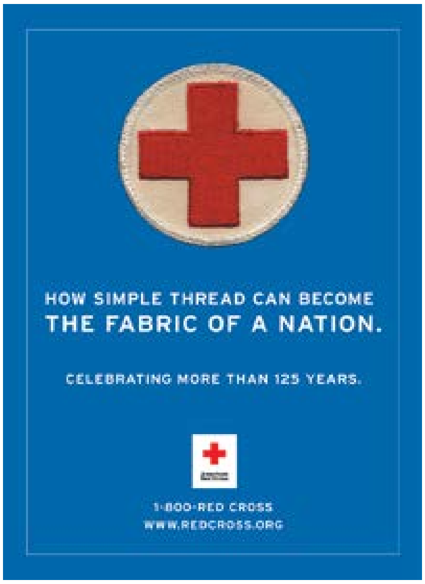

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Most Metal Prices Moved Higher in 2025

By Steve Fiscor, Editor-in-Chief

As this edition of *E&MJ* was going to press, gold and silver price increases could only be described as parabolic. The price of gold had surpassed $4,800 per ounce (oz) and will likely reach $5,000/oz before readers receive this edition. Similarly, silver was approaching $100/oz and copper futures were approaching $6/lb.

The *E&MJ* Price Index records prices at or near the first of the month and all of the metals that it tracks increased during December. So, the mining business is starting the year on a high note. Ruthenium posted a 40% increase, climbing $365/oz to $1,275/oz; the prices for lithium hydroxide (LiOH) grew nearly 29%, increasing $2,980/mt to $13,400/mt; and silver had already experienced a month-to-month increase of $13.62/oz (23.5%) to $71.54/oz prior to its January moves.

Looking back a year or five years adds a little more perspective. Gold prices have increased to $4,317/oz from $2,639/oz this time last year. Five years ago, gold was selling for $1,50.50/oz. It climbed nearly $700/oz in four years and then it increased nearly $1,700/oz in the last year, hence the parabolic reference. The numbers are more exaggerated for silver, which was essentially range-bound at less than $30/oz for four years, before climbing 142% in the last year.

Other metals tell a different story. The price of palladium increased 72% to $1,608/oz from $933/oz during 2025, but it's down 34% from five years ago. Similarly, iron ore is up year-on-year, but down 35% from five years ago.

Only time will tell what the future holds. Last year, Eric Sprott said gold could reach $7,000/oz at the annual PDAC conference. That prediction doesn't seem so farfetched now.

Table 1 — Metal prices compared to last year and five years ago.

	Jan-26	Jan-25	% Change	Jan-21	% Change
Gold ($/oz)	$4,317.60	$2,639.40	64	$1,950.50	121
Silver ($/oz)	$71.54	$29.58	142	$27.51	160
Platinum ($/oz)	$2,054.00	$944.00	118	$1,088.00	89
Palladium ($/oz)	$1,608.00	$933.00	72	$2,433.00	-34
Rhodium ($/oz)	$9,175.00	$4,575.00	101	$18,500.00	-50
Ruthenium ($/oz)	$1,275.00	$465.00	174	$270.00	372
Aluminum ($/mt)	$2,995.50	$2,475.00	21	$2,027.50	48
Copper ($/mt)	$12,423.00	$8,701.00	43	$7,914.00	57
Lead ($/mt)	$2,011.00	$1,898.00	6	$2,043.50	-2
Nickel ($/mt)	$16,646.00	$14,770.00	13	$17,517.00	-5
Tin ($/mt)	$40,556.00	$28,625.00	42	$21,350.00	90
Zinc ($/mt)	$3,117.50	$2,864.50	9	$2,785.00	12
Molybdenum ($/mt)	$48,576.00	$46,354.00	5	$22,375.00	117
Cobalt ($/mt)	$53,355.00	$22,046.00	142	$35,000.00	52
LiOH ($/mt)	$13,400.00	$10,025.00	34	NA	NA
Iron ore ($/dry mt)	$107.13	$99.44	8	$166.08	-35

Source: E&MJ *Price Index*

E&MJ PRICES INDEX

(December 31, 2025)

Precious Metals ($/oz)		Base Metals ($/mt)		Minor Metals ($/mt)		Exchange Rates (U.S.$ Equivalent)	
Gold	$4,317.60	Aluminum	$2,995.50	Molybdenum	$48,576	Euro (€)	1.173
Silver	$71.54	Copper	$12,423.00	Cobalt	$53,355	U.K. (£)	1.344
Platinum	$2,054.00	Lead	$2,011.00	Lithium Hydroxide	$13,400	Canada ($)	0.729
Palladium	$1,608.00	Nickel	$16,646.00			Australia ($)	0.667
Rhodium	$9,175.00	Tin	$40,556.00	**Iron Ore ($/dmt)**		South Africa (Rand)	0.060
Ruthenium	$1,275.00	Zinc	$3,117.50	Fe CFR China	$107.13	China (¥)	0.143

Gold and silver prices provided by KITCO Bullion dealers (www.kitco.com). Platinum group metals prices provided by Johnson Matthey (www.platinum.matthey.com). Non-ferrous base and minor metal prices provided by London Metal Exchange (www.lme.co.uk). Iron ore prices provided by Platts Iron Ore Index. Currency exchange rates were provided by www.xe.com.

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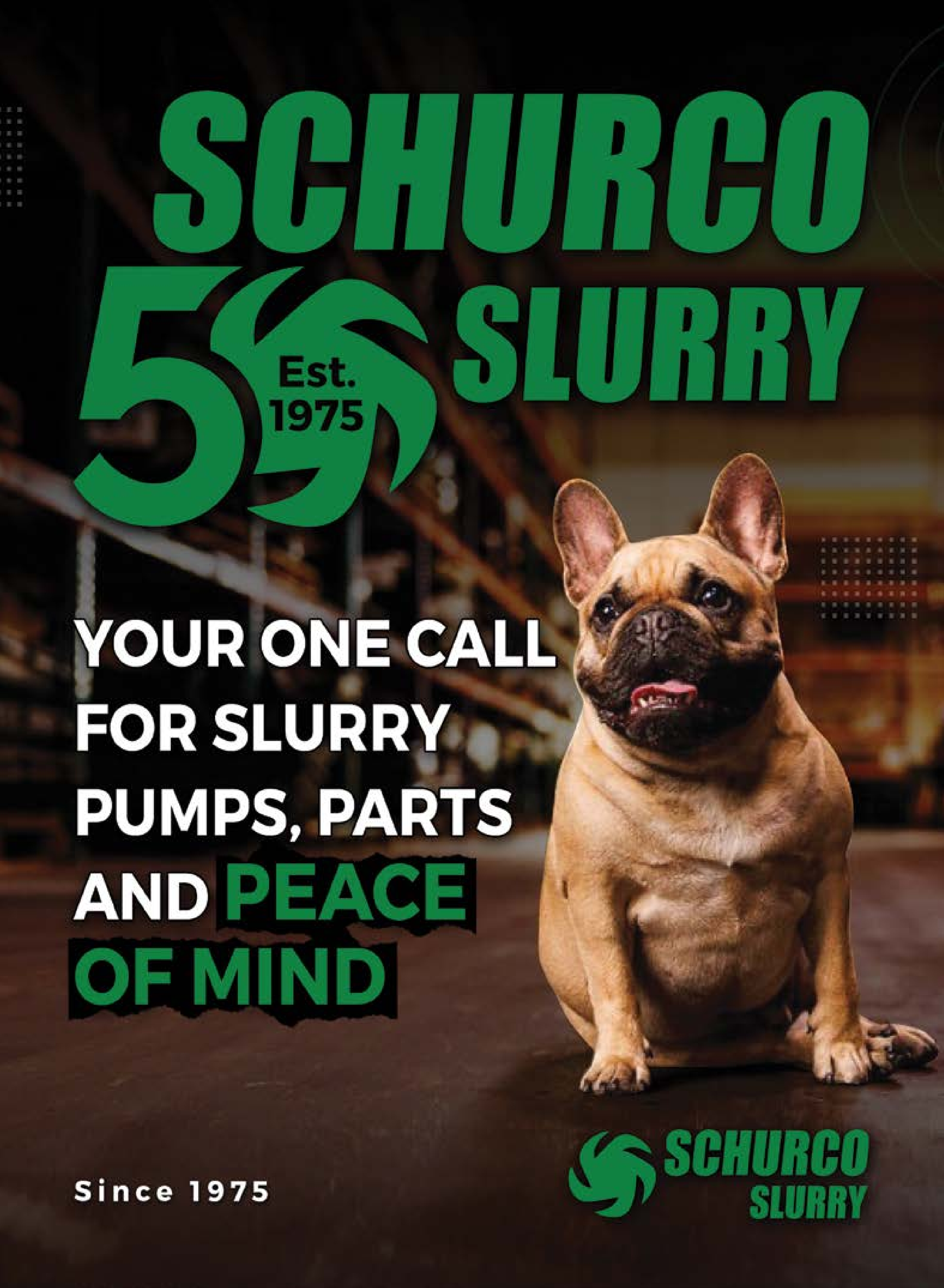
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