



1421 Miracerros St. □ Santa Fe □ NM □ 87505 □ USA □ etechinternational.org
Richard Kamp, Director □ richardkamp@etech-intl.org

E-Tech International's Mirador Mine Strategy for 2024-2025

March 2024

Disclaimer

The information contained herein is E-Tech International's technical work product, based on our own analysis of publicly available information and field visits. This document is presented in response to interest from the public, does not constitute an opinion or legal advice, and is not intended for use by third parties without the express authorization of E-Tech International. E-Tech International is not responsible for third-party use of the information in this document.

1. Background

E-Tech International, a New Mexico, United States-based environmental technical nonprofit, has been assessing the ECSA Mirador Mine since 2011, initially at the request of the Prefecture of Zamora-Chinchipe and shortly thereafter the Ecuadorian Ministry of the Environment (MAE) to review and evaluate the earlier Environmental Impact Assessments (EIAs). Our team has produced many technical documents, which are available on our website [here](#). Our work has continued at the request of indigenous communities, academic institutions, and provincial governments to this day. Our past, recent, and ongoing work and a plan for continuing work on the Mirador Mine in 2024-25 are discussed in this strategy document.

Location and mine facilities

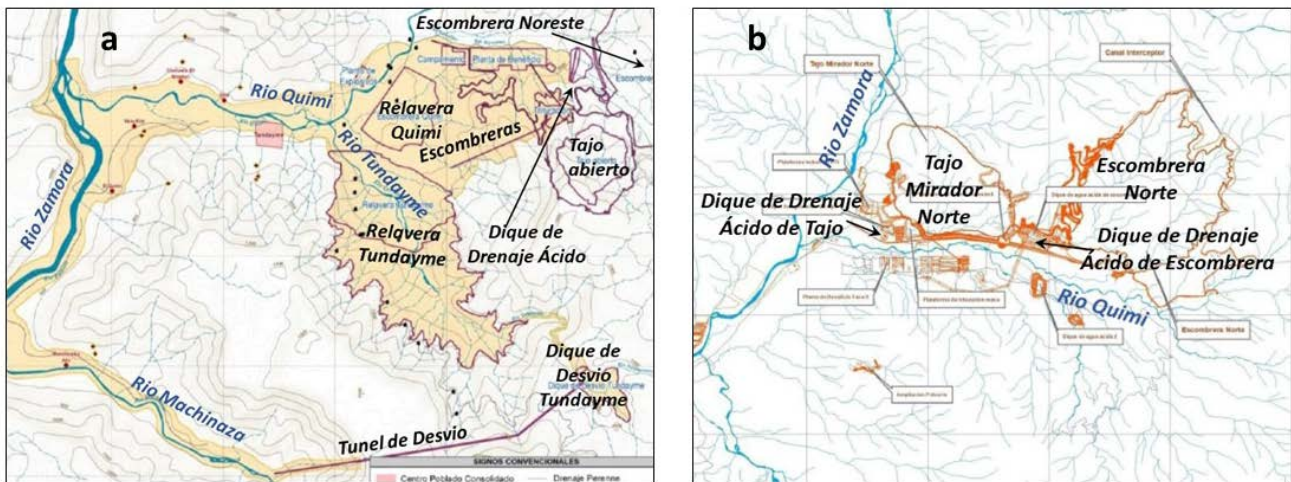
The Mirador Mine is located in southeastern Ecuador in the Zamora-Chinchipe Province. The area is part of the highly biodiverse Cordillera Del Cóndor region. The mineral resource includes two copper-gold-silver porphyry deposits: the main Mirador deposit and the Mirador Norte deposit. Exploration began in 2000 by Corriente Resources Inc., construction began in 2015, and copper production began in 2019. The project is owned by Ecuacorriente S.A. (ECSA), which is a wholly owned subsidiary of the Chinese consortium CRCC-Tongguan consisting of two state-owned companies: the China Railways Construction Corporation and the Tongling Non Ferrous Metals Group. The sulfide ore at the main Mirador Mine is extracted from an open-pit, beneficiated using flotation, and the tailings are deposited in two tailings impoundments – the original and smaller Quimi impoundment and the much larger Tundayme impoundment. Large waste rock piles are also located on the mine site. All mine facilities for the main Mirador Mine are located south of the Rio Quimi (Figure 1a), while the proposed open pit and waste rock facility for Mirador Norte are located north of the Rio Quimi (Figure 1b). The Rio Quimi flows into the Rio Zamora and then into the Rio Santiago, which flows into Peru. Tailings from the main Mirador operation were deposited in the Quimi impoundment, and tailings from both deposits are planned to be disposed of in the Tundayme impoundment. Collection ponds for acid drainage from the open pits and waste rock piles are located on the site (diques de drenaje ácidos, Figs. 1a and 1b).

Evaluation of tailings dam failure and trainings in 2023

The Mirador Mine has large-scale mine facilities and important physical and chemical risks that present a potential imminent danger to downstream communities and the environment; the risks continue to increase as the mine rapidly expands. The production, and therefore the approximate amount of tailings

created, has increased from an estimated 25,000 metric tonnes per day (tpd) in 2006 to 30,000 tpd in 2008 to 60,000 tpd in 2014 to 140,000 tpd in 2022. The 2022 figure includes production at Mirador Norte. In addition to increased production, the tailings impoundments and dam heights have increased over time. The design height of the Quimi tailings impoundment is 28 meters, and the design height of the Tundayme impoundment, which is currently under construction, is 260 meters. The capacity of the Quimi impoundment is 12.2 million cubic meters, and the capacity of the Tundayme impoundment at a dam height of 260 meters is 380 million cubic meters, or more than 30 times the capacity of the Quimi impoundment. In November 2023, in the final days of the Lasso administration, the Tundayme tailings impoundment dam was permitted to increase to 320 meters, which will make it the highest tailings dam in the world when constructed.

Figure 1. Mine facilities for the main Mirador Mine (a) and the proposed Mirador Norte (b). Facilities for the main Mirador Mine are located south of the Rio Quimi, while Mirador Norte facilities are located north of the Rio Quimi. Both mines would use the Tundayme tailings impoundment.



Sources: (a) Cardno, 2014, Fig. 8-11 and (b) Gesambconsult Consultores CÍA LTDA., 2022. Fig. 5-1.

The area has high precipitation and high potential for earthquakes, both of which increase the likelihood and consequences of a tailings dam failure. Both deposits have high acid drainage potential, which also increases the environmental, ecological, and human health consequences of a potential tailings dam failure. At least seven Shuar communities are located along the lower Rio Quimi and downstream from the confluence with the Rio Zamora and many dozens more settlements are present; Shuar literally live on the river. No plan currently exists for an emergency evacuation in the event of a tailings dam or other mine failure that could severely affect downstream communities.

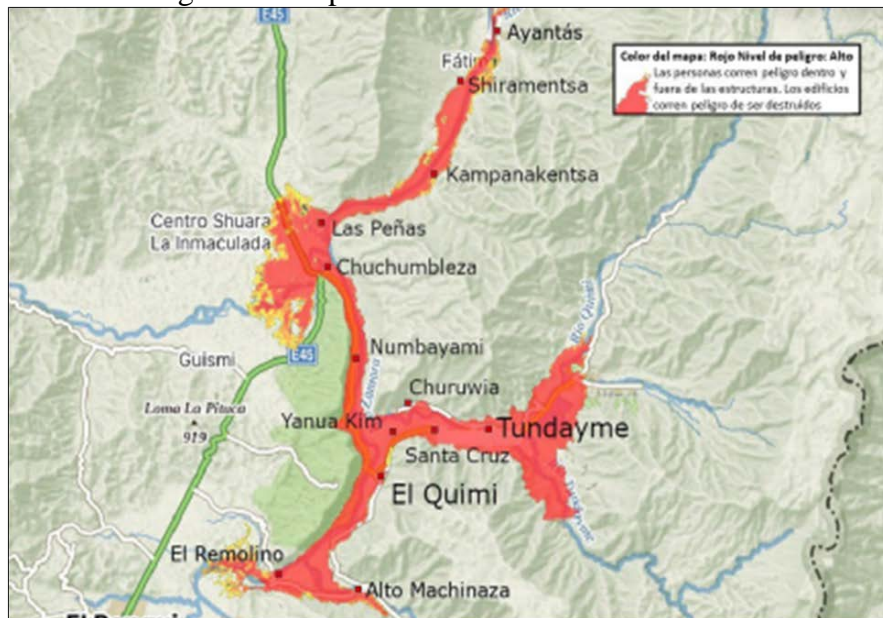
In 2023, at the request of E-Tech International, the consulting company Riada Engineering, Inc. created a model of Mirador Mine tailings dam failures using the computer program FLO-2D (Riada Engineering, Inc., 2023). Models were created to simulate the failure of the Quimi and Tundayme dams separately, and a simultaneous failure of both dams was also examined. The summary of the report is available [here](#). The results of the study showed that downstream areas would be inundated with up to 10 meters thick of tailings in the event of tailings dam failures and highlighted the critical importance of creating and implementing an emergency response and evacuation plan for the downstream

1421 Miracerros St. □ Santa Fe □ NM □ 87505 □ USA □ etechinternational.org
Richard Kamp, Director □ richardkamp@etech-intl.org

communities. A map from the report showing the areas with a high level of risk from the simultaneous failure of the Mirador dams is presented in Figure 2.

E-Tech and Riada Engineering conducted a three-day workshop in Quito, available for free to the public, on the use of the FLO-2D model for two dozen participants with support of the Escuela Politécnica Nacional in October 2023. The workshop allowed a diverse group of stakeholders, including the Shuar community, academics, government agencies, and industry professionals, to learn to use the model. In addition to modeling tailings dam failures, the FLO-2D software can be used to simulate and understand volcanic eruptions, failure of hydroelectric dams, and urban and general floodplain planning.

Figure 2. Results of the FLO-2D modeling effort showing areas with high risk and the location of Shuar communities. These results are for the modeled failure of the Tundayme tailings dam, assuming the release of 77% of the tailings in the impoundment.



E-Tech and its consultants, Shuar leadership, and various members of civil society from Zamora-Chinchipe and Morona-Santiago met in Limón Indanza, Morona-Santiago, for two days in late October with Shuar community representatives and members of the regional decentralized autonomous government (Gobiernos Autónomos Descentralizados, GAD) to discuss the FLO-2D model results and to identify potential first responders and community and structures at risk using the model. E-Tech also met with the office of the Prefecture of Zamora Chinchipe.

2. Proposed Strategies for 2024

Creation of an emergency response plan is an immediate top priority

The results of the 2023 Mirador Mine tailings dam failure evaluation using FLO-2D make it extremely clear that an emergency response plan is needed for the mine. Downstream communities must have the opportunity to be alerted in advance of a mine facility failure and to have practiced evacuation routes in



**1421 Miracerros St. □ Santa Fe □ NM □ 87505 □ USA □ etechinternational.org
Richard Kamp, Director □ richardkamp@etech-intl.org**

the event of a catastrophic failure of any of the mine facilities. The focus for the Mirador Mine has been a catastrophic release of tailings and associated water from a tailings dam failure, but risks also exist from the transport and use of hazardous materials to and at the mine site and the potential for explosions, fires, spills, and releases of gases and toxic chemicals. Hazardous or toxic chemicals include strong acids (e.g., sulfuric acid), strong bases (e.g., sodium hydroxide), and cyanide used in the flotation operation or mine water treatment.

The entities E-Tech met with in the late October meetings hosted by Shuar leadership in Limón Indanza are among the regional entities that need to immediately advocate for the development of an emergency response plan and to work with the national Geologic Institute of Research and Energy (Instituto de Investigación Geológico y Energético, IIGE), which currently has a program to evaluate risks associated with the Mirador tailings, the Risk Management Secretariat (Secretaría de Gestión de Riesgos), and ECSA to initiate the plan.

Outside of the requirement under Ecuadoran law that such a plan be in place, emergency response planning is part of the Initiative for Responsible Mining Assurance (IRMA) Standard for operations with significant off-site risks, such as the Mirador Mine (IRMA, 2023). The emergency response plan must be developed with affected communities and include testing and drills of the plan with community stakeholders (IRMA, 2023. Chapter 2.5 Community Emergency Preparedness and Response). E-Tech proposes to work with Ecuadorian technical experts at universities in Quito, Shuar and CONAIE/CONFENAI leadership and communities, civil society, ECSA, all appropriate agencies of the Ecuadoran government, civil society working to identify areas at risk and communicate with potentially endangered communities, the Asamblea Nacional of Ecuador, Prefectures of Zamora-Chinchipe and Morona-Santiago, the GAD, and all emergency responders to help design and implement the emergency response plan.

Expansion of FLO-2D model

After completing the FLO-2D model for failure of the Mirador Mine tailings dams, E-Tech International learned that the height of the larger Tundayme dam is planned to be increased from a height of 260 meters to 320 meters. At a height of 320 meters, it will be the tallest tailings dam in the world.¹ E-Tech consultant Dr. Steven Emerman is currently running the FLO-2D program to estimate the effects of a failure of the Tundayme dam, considering the increased height and capacity of the dam and impoundment. A report that includes the results of the analysis and maps showing the predicted impacts will be produced.

Improved transparency of information

The transparency of information on the technical details of the Mirador Mine has been very poor. Between 2021 and 2023, despite multiple requests from the Asamblea Nacional and E-Tech, E-Tech received only limited information from Ecuadorian officials. Meanwhile, with little public discussion, the mine received permits for more than doubling production. E-Tech has requested more information

¹ Currently the tallest tailings dam in the world is at the Cerro Verde Mine in Peru at a height of 265 meters.
<https://earthjournalism.net/stories/the-dangerous-tailings-ponds-surrounding-ecuadors-largest-mine-have-no-controls#:~:text=Currently%20the%20world's%20tallest%20dam,%20McMoRan%20%2F%20Credit%3A%20PlanV.>

on the construction, operation, and monitoring of the Quimi and Tundayme impoundments and closure and post-closure planning for the mine. Cases have been filed by Ecuadorian legal experts with the constitutional court to insist that these documents are made public. E-Tech seeks to increase transparency with ECSA and the relevant agencies in the new Ecuadorian government that are charged with evaluating and auditing the mine's environmental performance and adherence to design criteria. ECSA appears to have a technical spokesperson, Cesar Vasquez, who is in charge of tailings management (Vistazo, 2023). According to Mr. Vasquez, approximately 50 studies have been produced on the Tundayme tailings impoundment. E-Tech has requested technical documents and data numerous times in the past and will officially request the mentioned 50 studies and conduct an evaluation of their contents.

As part of the ongoing Inter-American Commission on Human Rights (IACHR) investigation of the Mirador Mine,² E-Tech recommended that the Commission obtain technical documents, which should be made publicly available according to the Ecuadorian Constitution and their Ley de Transparencia (Freedom of Information Act). In addition, Ecuador has signed and ratified the 2018 Escazú Agreement,³ which protects biodiversity and human rights. Our report and requests are available [here](#). As mentioned, the information requests were only partially complied with by the MAE (renamed the Ministry of Environment, Water and Ecological Transition (Ministerio del Ambiente, Agua y Transición Ecológica, MAATE)) and the Ministry of Energy and Mines (Ministerio de Energía y Minas, MEM). We have also requested that the IACHR require the Government of Ecuador, represented by the Subministry of Mines of the MEM, to enter into a transparent dialogue that will result in the timely release of information related to the construction, operation, and management of the Mirador Mine. This information will allow the detailed evaluation of the potential for imminent endangerment related to the operation and management of the mine.

In addition to requesting documents and engagement with the Ecuadorian agencies and the Mirador Mine, E-Tech will seek to work with Ecuadorian colleagues who have relationships with the Chinese government to make every effort to discuss our evaluations and to discern their awareness of the seriousness of the environmental and ecological consequences related to a potential tailings dam failure. An international commission may be the best approach for determining and responding to the imminent endangerment related to the mine. It is long past time to openly audit the mine and determine the best steps moving forward to protect lives and the environment. At the very least a multisectoral Ecuadorian commission should be developed that includes national and international technical experts, Shuar representatives, and others potentially impacted by the mine to determine to best addresses known risks at the Mirador Mine.

Community and governmental engagement

E-Tech has been engaging with national-level government agency representatives, academic institutions (E-Tech has had faculty status at two universities in Ecuador), communities near the Mirador Mine, and the National Assembly for many years. New contacts and communication will be needed with members of the Noboa administration. We will meet with colleagues at the Escuela

² The Mirador Mine case was filed with the IACHR on 23 December 2023 by a team of Ecuadorian lawyers and the Nacional Assembly of Ecuador.

³ <https://environment-rights.org/the-escazu-agreement/>

Politécnica Nacional, representatives from relevant national agencies (MAATE, MEM), and other stakeholders that need to play an important role in the design of the emergency response plan. Meetings with the IIGE will be important because of their experience with preparing for emergencies related to volcanic eruptions.

Engagement will continue with attorneys working on the IACHR Mirador Mine complaint, and our work on an updated FLO-2D model will add to the information needed to determine the potential imminent danger to communities and the environment posed by the mine and to create future plans to address the risks. E-Tech aims to be a bridge between the technical information about the mine and NGOs; Indigenous organizations; local, regional, and national government agencies; and general citizens to help deepen the understanding of the risks associated with the Mirador Mine and the measures that can be taken to improve human and environmental protection.

3. References Cited

- Cardno (ENTRIX), 2014. Estudio de Impacto Ambiental y Plan de Manejo Ambiental Ampliación a 60 kt por día de la Fase de Explotación a Cielo Abierto del Proyecto Minero de Cobre Mirador.
- Gesambconsult Consultores CÍA LTDA, 2022. Estudio de Impacto Ambiental Complementario del Proyecto Mirador, Fase de Explotacion con una Produccion de 46,2 MTPA Concesion Mirador.
- Riada Engineering, Inc., 2023. FLO-2D Simulation of the Potential Failure of the Mirador Tailings Dams, September.
- IRMA, 2023. DRAFT Standard for Responsible Mining and Mineral Processing 2.0. (also available in Spanish). <https://responsiblemining.net/what-we-do/standard/standard-2-0/>
- Vistazo, 2023. Proyecto Mirador y la controversia por la que podría ser la presa de desechos mineros más alta del mundo, la relavera Tundayme. 21 Noviembre. Disponible: <https://www.vistazo.com/actualidad/nacional/proyecto-mirador-y-la-controversia-por-la-que-podria-ser-la-presa-de-desechos-mineros-mas-alta-del-mundo-la-relavera-tundayme-CX6347334>