

# Colombian mining Pipeline

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Convinced of the mining potential of Colombia as well as understanding the need to promote projects that represent important opportunities for the country, John T. Boyd Company and Jaime Arteaga & Asociados have joined forces to create the Colombian Mining Pipeline.

The Colombian Mining Pipeline is conceived as a useful tool for public and private investors interested in learning about existing projects in the country.

Likewise, it will be a reflection of how the projects are being developed, which are the minerals that stand out, what are the main barriers to moving from the exploration stage to the exploitation stage and, in general terms, how is the future of mining perceived in the country.



2022



**John T. Boyd Company**  
Mining and Geological Consultants

**JA&A**

JAIME ARTEAGA & ASOCIADOS  
Sinapsis para el desarrollo

# Pipeline Minero

Colombiano 2022

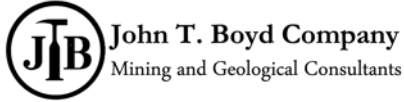
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This document constitutes the first version of the Colombian Mining Pipeline, which will serve as the baseline for analyzing the progress of the projects over time.

In subsequent editions, when there is an opportunity to compare the progress of projects and public policy in promoting mining, the Colombian Mining Pipeline will include an analysis of their dynamics over time.



Colombian Mining  
**Pipeline 2022**



With the support of





**Carlos Felipe Barrera**

Managing Director – South América  
John T. Boyd Company

**T**he Colombian Mining Pipeline has been developed with the main objective of offering investors, the Colombian public, and other interested parties, a list of mining projects under development and an analysis of their effort to reach the production stage.

Conceived as a public policy and investor support tool, the Colombian Mining Pipeline describes the main characteristics of each mining project, such as: location, stage, progress, origin of financing, target minerals and size.

This information is accompanied by local context that makes it possible to understand the project environment from a social and environmental perspective.

Likewise, as each project advances through the complexities of the sector, the Colombian Mining Pipeline will identify the milestones reached by the project, as well as the areas of risk for the investor and the opportunities for improvement for the government.

## Colombian Mining Pipeline 2022



**W**e hope that this will be a tool for constant consultation, since it brings together the main mining projects in Colombia, presents their status and allows their progress to be identified through permanent updating. The Colombian Mining Pipeline will provide timely information for all those interested in the evolution of the country's mining sector.

**Diana Cuestas**

Executive Director  
Jaime Arteaga & Asociados

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# Mining in Colombia

*Mining has been and will be the protagonist of Colombian history. From the religious function that it played in pre-Columbian times, the cultural transformation during the colonial era, and the financing of the independence struggle, to the industrial and economic transformation of the country, mining has played a fundamental role for the country and it will be this, mining, which opens Colombia's possibilities for the future.*

**T**oday, the Colombian mining sector is characterized by the production of coal (anthracite, metallurgical and thermal), materials for industry and construction, and metals such as gold, silver, platinum, nickel, copper, iron and the production of emeralds. . Although it could be said that Colombia is a mining country, the sector still has the potential to consolidate itself as an engine of development and, in the face of the pandemic, as a marker of economic reactivation.

Of

**114** million hectares in Colombia, only

**5** million are titled for mining activity.

Of which

**2.3%** are in exploration

**1.6%** In construction and assembly, and

**1.1%** In Exploitation

**Only the 1.1% that is in exploitation generates around 2% of the Colombian GDP**

## Colombian Mining Pipeline 2022

Although there is geological potential to exploit new deposits and diversify mineral production, the possibilities of mining in Colombia are uncertain. Only a small percentage of the country has been explored in geological terms and the feasibility of the projects does not only depend on the technical possibilities.

**D**uring the last 10 years the mining dynamic in Colombia has changed. On the one hand, in 2001 Law 685 or the mining code was issued, which has generated debates about the relevance and capacity of the institutions to promote, control and regulate mining in the country. According to this law, the exploration activity does not require an environmental license as it does not have a major impact on the environment, which makes it easier for companies to carry out this stage. However, exploration has generated conflicts when developing projects in the territories.

Communities in regions with mining operations have demanded greater participation in decisions about whether or not to grant permits for the activity, even if it is only exploratory. This has even escalated to judicial instances such as the Constitutional Court, in which the prior consultation processes and the validity or otherwise of popular consultations have been debated.

Despite Colombia's geological wealth and potential, the country's attractiveness for investment still has room for improvement. According to the latest report from the Fraser Institute, Colombia has improved its position as a destination for investment in exploration due to the geological possibilities, this has added points. However, in the second element evaluated in the list, political perception, the country has lost points.



## Colombian Mining Pipeline 2022

Despite the notable advances in public policy, the lack of legal certainty, the regulation of protected areas, land claims and the disconnection between the national government and local governments in the face of prior consultation have created limitations for new project investment. This partially explains why, despite Colombia's strong position in the Fraser Institute's ranking, the country does not attract significant interest from the global investment community in resource exploration

According to the Fraser Institute's ranking of mining investment destinations of the Fraser Institute, Colombia's competitiveness has fallen versus countries such as Chile, Peru, Indonesia and South Africa. Although the list recognizes advances in information and geological possibilities in Colombia, it has lost ground in public policy measures such as security, legal system, uncertainty in land legalization and community development conditions.

According to the same study, up to 40% of decisions about investments and new projects are made based on attractiveness in terms, precisely, of public policy.

In line with the results of the Fraser Institute, investment in exploration in Colombia has decreased by 75% over the last 8 years.

The time involved to advance the exploration in the territory as well as determining the difference between the exploration and exploitation phases of the projects have diminished investors appetite for the country.

For their part, more than 55% of the directors of mining companies that participated in the 2022 edition of *Brújula Minera*, recognize the progress made in public policy matters such as the Management and generation of specialized information, the Confidence of communities in mining, the operational capacity to attend to emergencies, the energy transition, the confidence of investors in the sector, the social dialogue, the coordination between the authorities involved with mining and the formalization of traditional and artisanal mining.<sup>1</sup>

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<sup>1</sup> For more details, consult *Brújula Minera*, the first syndicated study of the Colombian mining sector that since 2013 has generated information and conversations around mining in the country.

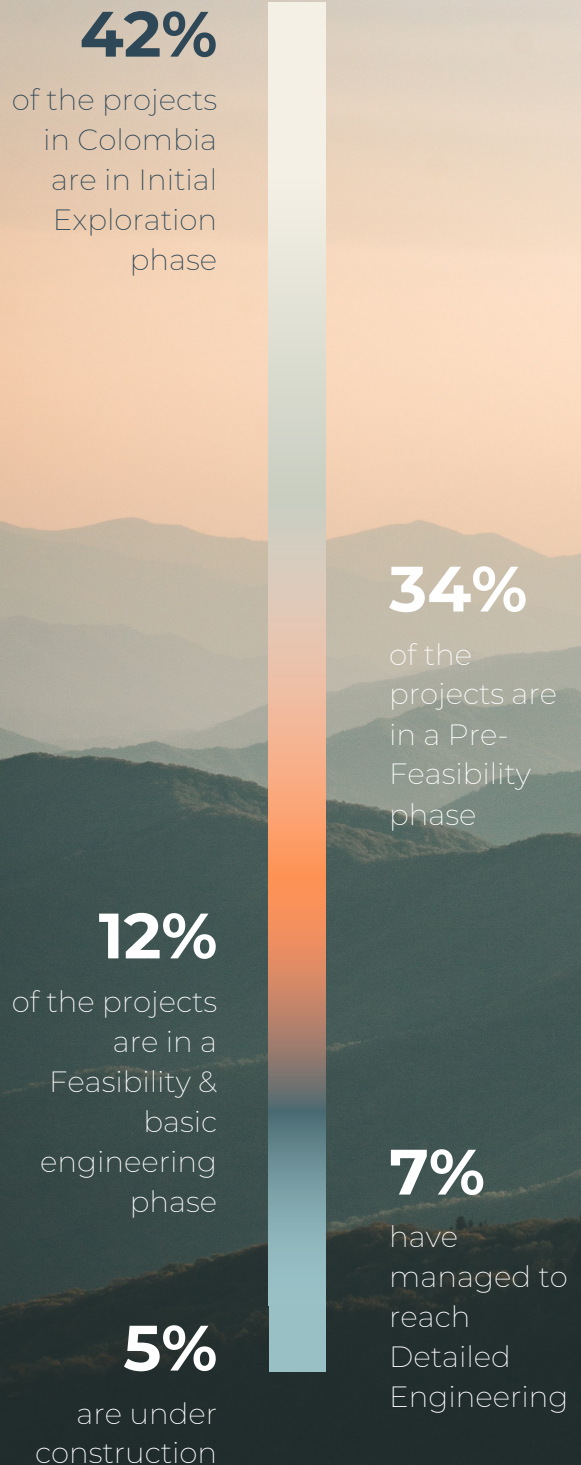
## Colombian Mining Pipeline 2022

Given this scenario, and given the need to reactivate the economy and generate new income for the Colombian State, it is crucial to promote mining exploration as well as accelerate the start-up of projects that have progressed satisfactorily in the previous stages. According to the Colombian Mining Association, “Only with the development of projects that are in advanced stages of exploration, Colombia could double its current gold production and thus go from being the twenty-first world producer, to becoming the fifteenth. In copper, the country could go from position 42 to 17 as a world producer” (ACM, 2020).

# Development Stages

A mining project generally goes through the Initial Exploration, Pre-Feasibility, and Feasibility phases before starting with the Detailed Engineering phase (a phase made up of a series of more in-depth studies) which will subsequently allow for the Construction, Operation, and Final Closure. from the mine

The Colombian Mining Pipeline 2022 only focuses on those projects that are in the phases prior to operation:



### **Initial Exploration:**

This is the stage where opportunities for the development of projects are identified, so as different alternatives for the development are determined

### **Pre-feasibility:**

This is the stage where project alternatives are created and selected. Based on technical-economic feasibility studies, the business opportunity is validated, identifying the best alternative.

### **Feasibility & basic engineering:**

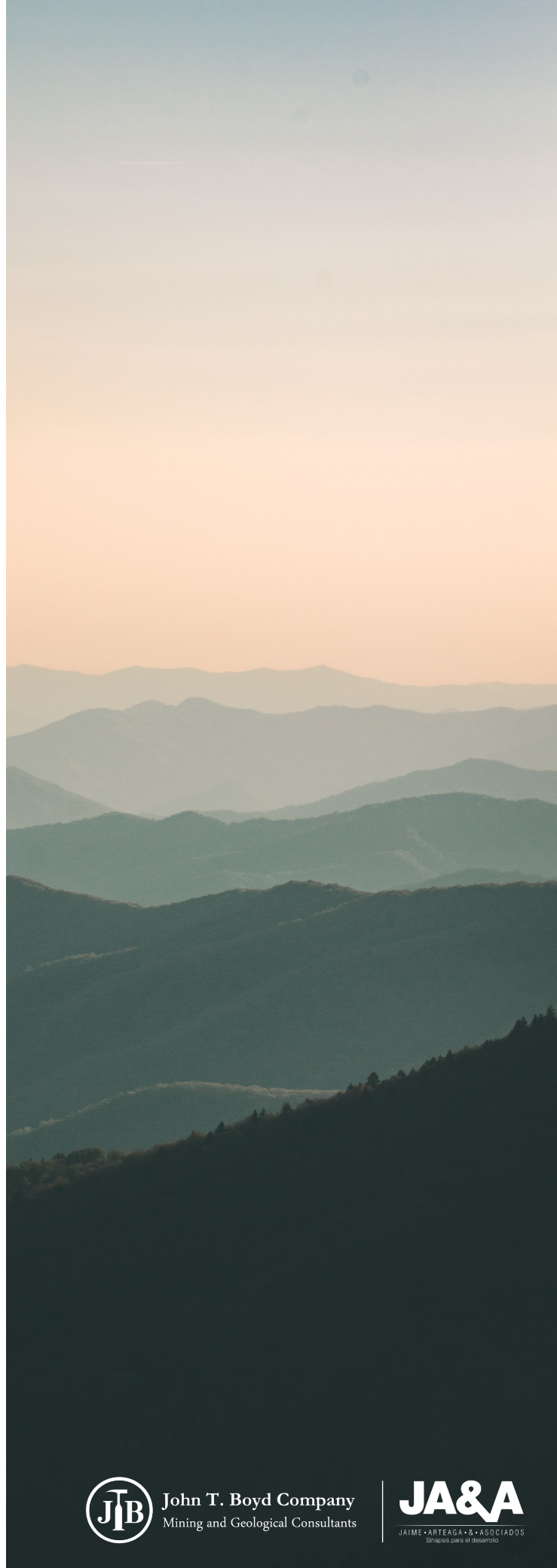
This is the stage in which, based on the selected alternative, the general planning of the project is developed based on the initial studies carried out in the previous stage.

### **Detailed Engineering:**

This is where the scope is developed, the execution plan is created, the team and necessary structure is formed, and the final estimate of the investment is made, with a minimal margin of error.

### **Construction:**

The assembly and start-up of the Project is done at this stage, seeking to optimize variables such as time, cost, quality and sustainability.



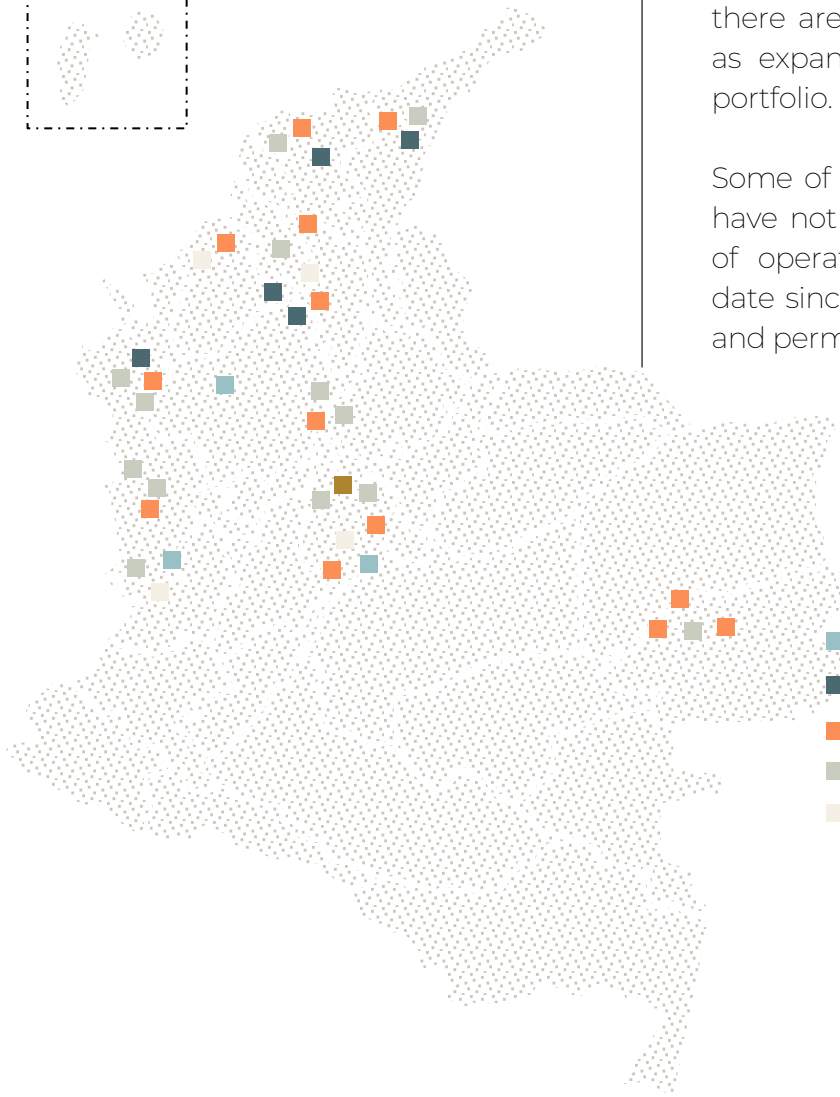
# Investment Portfolio

**T**he mining investment portfolio in Colombia is made up of 52 main projects; It includes projects in the exploration

stage up to projects in the construction stage, as well as projects with an approved environmental study or in the evaluation process.

It is worth mentioning that although there are other projects considered as expansion, they are not in this portfolio.

Some of the 52 projects mentioned have not defined their date of start of operation or their construction date since they are still in the study and permit stage.



## Development Stage

- Construction
- Detailed Engineering
- Feasibility & basic engineering
- Pre-Feasibility
- Initial Exploration

# Colombian Mining Pipeline 2022

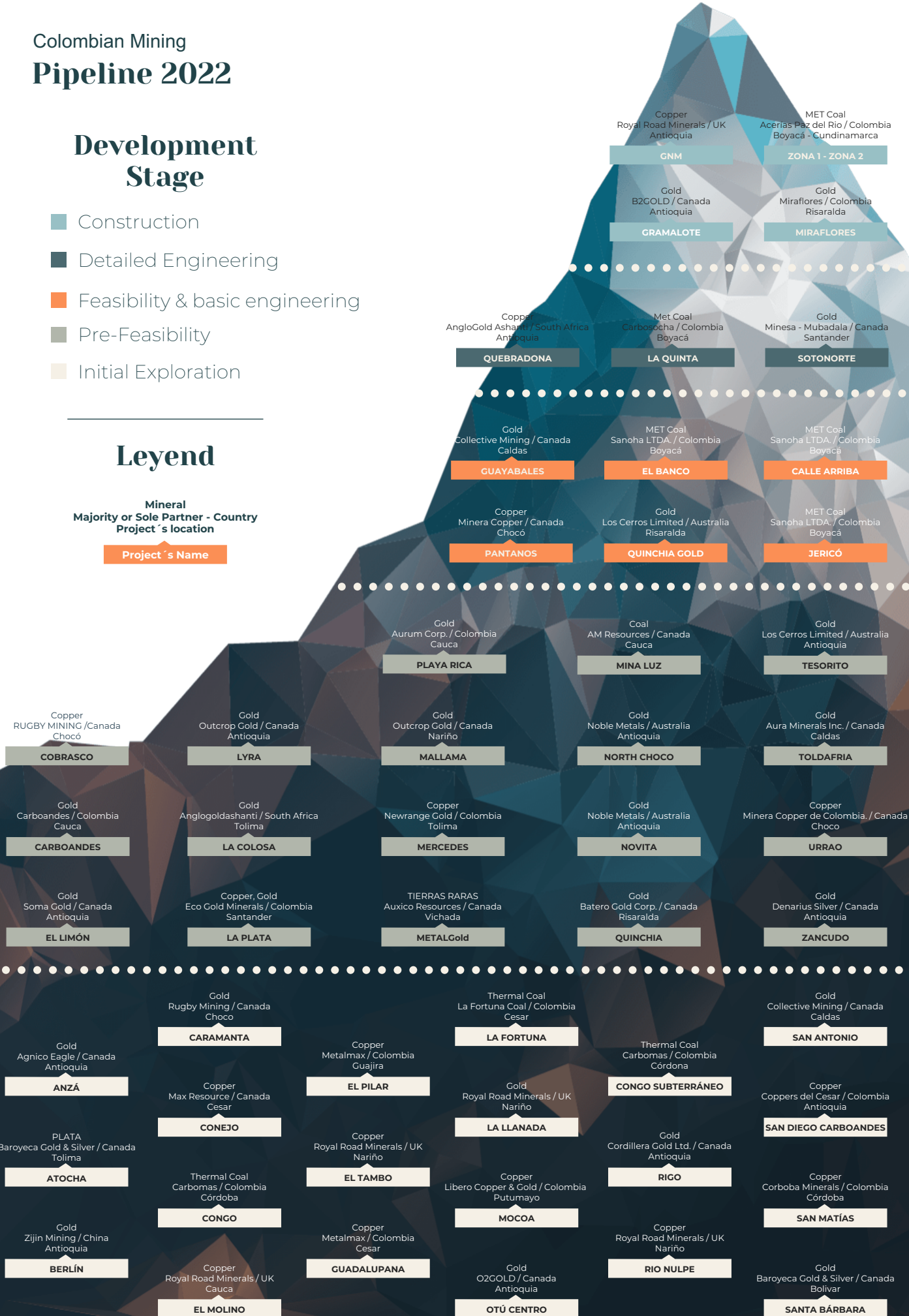
## Development Stage

- Construction
- Detailed Engineering
- Feasibility & basic engineering
- Pre-Feasibility
- Initial Exploration

## Leyend

Mineral  
Majority or Sole Partner - Country  
Project's location

Project's Name





# Projects

Development Stage:

# Initial Exploration



In this stage, an exploration campaign is carried out (normally a series of drillings) that provide a preliminary identification of the deposit, together with the first risk studies.

During this phase, a study is presented with the general description of a series of possible scenarios and possibly a slightly more detailed description of a conventional

scenario (of minimum risk) that will determine if the place has the potential to become a successful project. and consequently give way to the next phase.

Below is a table that describes the level of progress of the projects that are in this phase:



## Initial Exploration:

**Accuracy:** +/- 30 a 35%

### General information :

- General description that includes the location of the project, the associated personnel and their skills and experience, available services, political situation, etc.

### Information support studies:

- Elaboration of the Geological Model + General characteristics.
- Finalize the Calculation of Resources (CRIRSCO) to guarantee the viability of the Mining planning.
- **Mineralogy:** Preliminary tests have been completed.
- **Geotechnics:** Regional conditions identified.
  - Empirical characterization
- **Hydrogeology:** Regional conditions identified and surface water flows understood.
- **Metallurgical:** Understanding of basic metallurgy and identifying potential problems.
- **Resources and Reserves:** +80% of the Resource is classified as Indicated and the rest as Inferred (Within the production time of the project) according to international standards (JORC or equivalent).

### Mining plan:

- Possible mining methods, forms of access to the deposit are identified and the general schedule is developed.
- The Mining Plan is created conceptually, it includes geological complexities.
- Approximate Capital Costs are known (taking into account the Mining Plan). Cost estimates are approximate and based on recent similar projects, experience, factored costs, industry standards, etc.
- Estimated Annual Production (Estimated Quality).
- Labor cost estimates are given.
- Estimated Operating Costs are given.
- 25% to 30% contingency in the Mining Plan.

### Infrastructure:

- Review and initial topography..

### Time to complete studies:

3 – 6 Months.

### Environmental studies:

- The applicable legislation and regulations are known.
- The environmental restrictions applicable to the project and the management mechanisms on the restrictions are known.
- The main problems and possible environmental impacts have been identified.
- The high-level environmental plan is proposed together with the risk assessment / mitigation plans.
- An initial version of the closure plan is known.

### Licensing and Permits:





- It has a mining title and exploration permit.
- Review of the mining concession.
- Initial discussions with the MME and ANM on project development and mining methods establish the information that will need to be submitted for the PTO and/or initial production.

### General Risks:

- Main risks identified and listed.

# Development Stage: Initial Exploration

 Featured projects

#	Company	Company's Country	Project's Name	Location	Mining Method	Principal Mineral
1	Agnico Eagle	Canada	Anzá	Antioquia	Surface Mining	Gold
2	Baroyeca Gold & Silver	Canada	Atocha	Tolima	--	Silver
3	Baroyeca Gold & Silver	Canada	Santa Barbara	Bolivar	Surface Mining	Gold
4	Carbomas	Colombia	Proyecto Congo Subterráneo	Córdoba	Underground	Thermal Coal
5	Carbomas	Colombia	Congo	Córdoba	Surface Mining	Thermal Coal
6	Coppers del Cesar	Colombia	San Diego Carboandes Copper	Cesar	Surface Mining & Subterránea	Copper
 7	Collective Mining	Canada	San Antonio	Caldas	Surface Mining	Gold
8	Cordillera Gold Ltd.	Canada	Rigo	Antioquia	Surface Mining	Gold
 9	Corboba Minerals	Colombia	San Matías	Córdona	Surface Mining	Copper
10	La Fortuna Coal S.A.S	Colombia	La Fortuna	Cesar	Surface Mining & Underground	Coal
 11	Libero Copper & Gold Corporation	Colombia	Mocoa	Putumayo	--	Copper
12	Max Resource	Canada	Conejo	Cesar	Surface Mining	Copper
13	METALMAX	Colombia	El Pilar	Guajira	Surface Mining	Copper
14	METALMAX	Colombia	Guadalupana	Cesar	Surface Mining	Copper
 15	O2Gold	Canada	OTÚ Centro	Antioquia	Surface Mining	Gold
16	Royal Road Minerals	UK	La Llanada	Narino	Surface Mining	Gold
17	Royal Road Minerals	UK	Rio Nulpe	Nariño	Surface Mining	Copper
18	Royal Road Minerals	UK	El Molino	Cauca	Surface Mining	Copper
19	Royal Road Minerals	UK	El Tambo	Nariño	Surface Mining	Copper
20	Rugby Mining	Canada	Cararamanta	Cauca	--	Gold
21	Zijin Mining	China	Berlín	Antioquia	Underground	Gold

Featured projects:

# Initial Exploration



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Siempre para el desarrollo



**Development stage:**  
Initial Exploration

**Project**

# Mocoa

## Libero Copper & Gold Corporation

**T**he Mocoa Project is located in the municipality of the same name in the department of Putumayo in southern Colombia. In principle, it was a project that consisted of 5 mining titles and covered 9,752 hectares, but after a reduction request in 2019 and the renunciation of one of the titles, today it encompasses 1,983 hectares.

During 2008 and 2021, B2Gold carried out drilling in the area of the project, which since 2018 was acquired by Libero Copper.



**Location:**

Department of Putumayo,  
Municipality of Mocoa



After the pandemic, Libero Cobre (as the company's subsidiary in Colombia is known) announced the reactivation of exploration, as well as employment and training programs to support the needs of local communities. According to Ian Harris, CEO of Libero Copper & Gold Corp, Mocoa has the largest metal resource in Colombia, with reserves of around 4.6 billion pounds of copper and 511 million pounds of molybdenum.

Projected exploration activities are aimed at increasing inferred resources and, in more advanced stages, mineral reserves.

## General Information



### Operator:

Libero Copper Ltd



### Investors:

Libero Copper & Gold Corporation  
100%



### Company country of origin:

Colombia, Antioquia



### Project Area:

8.000 Ha



### Mining Method:

Surface Mining



### Principal Mineral:

Copper



### Associated Minerals:

Molybdenum



### Inferred Resources

Copper: 4,6 Mlbs Cu 0,33% Cu  
Molybdenum: 510.5 Mlbs Mo  
0.036%Mo from 636 Mtons



### Proved Reserves

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### Production Capacity:

TN --

**LIBERO**  
COPPER



### Web page

<http://www.liberocopper.com>



**Development stage:**  
Initial Exploration

**Project**

# San Matías

## Córdoba

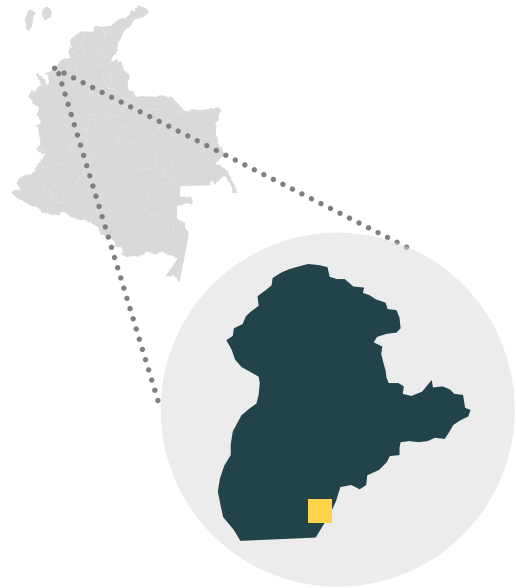
## Minerals

The San Matías project is located 160 km north of Medellín between the municipalities of Caucasia, Antioquia and Puerto Libertador, Córdoba. The project, which is proposed as an open pit mine, expects to exploit 417,300 t of copper, 724,500 ounces of gold and 5,930,000 ounces of silver separated in four deposits within its concession: El Alacrán, Costa Azul, Montiel Este and Montiel Oeste. although the volume of resources has not yet been certified.



**Location:**

Department of Córdoba  
Municipality of Puerto Libertador



This deposit, which was discovered in 1975, has been informally exploited without title by the community of the village of El Alacrán in Puerto Libertador. Since 2015, with the arrival of Córdoba Minerals, an agreement has been reached for the non-use of machinery by the community and for the hiring of local labor in exploration activities.



## General Information



### Operator:

Minerales Córdoba S.A.S



### Investors:

Córdoba Minerals 100%



### Company country of origin:

Colombia, Antioquia



### Project Area:

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### Mining Method:

Surface Mining



### Principal Mineral:

Copper



### Associated Minerals:

Gold and Silver



### Inferred Resources

Copper: 1,142.7 Mlbs Cu 0.45% Cu  
Gold: 942.9Koz Au 0.26 g/t Au  
Silver: 8.89 Moz Ag 2.42 g/t Ag from  
114.3 Mton



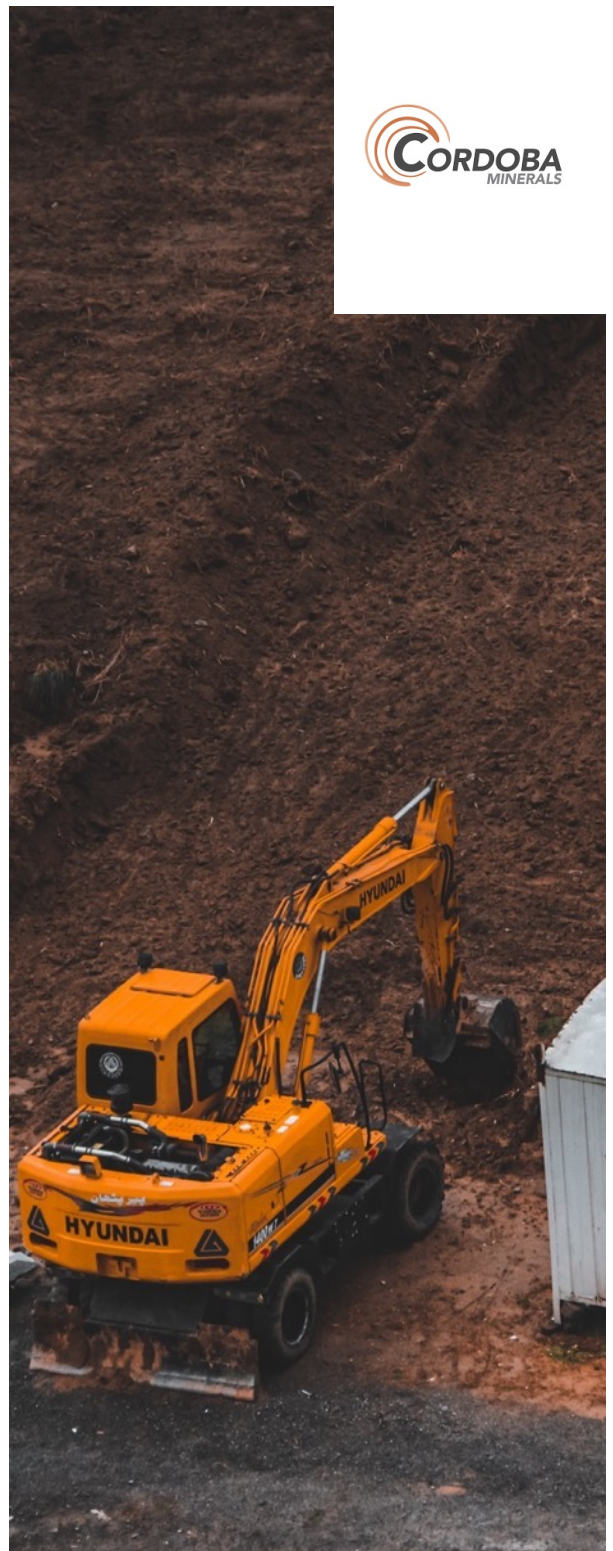
### Proved Reserves

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### Production Capacity:

18.1 Kton Cu, 31.5 Koz Au and 257.83 Koz  
Ag in polymetallic concentrates



### Web page

<https://www.cordobamineralscorp.com/projects/san-matias>



**Development stage:**  
Initial Exploration

**Project**

# San Antonio

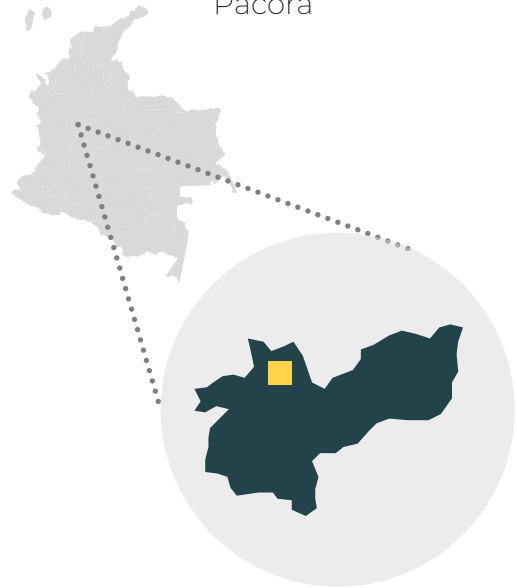
## Collective Mining

The San Antonio project is located in Aguadas and Pácora, both municipalities in the department of Caldas, 70 km south of Medellín and 50 km north of Manizales, and has porphyry copper, gold and molybdenum mineralization.



**Location:**

Department of Caldas  
Municipalities of Aguadas and Pacorá



Collective Mining has advanced exploration since 2018 and while they do not yet have a reserve estimate, mapping to date has shown multiple porphyry events as well as alterations that stand out near the surface of the project area.

Geophysical and topography LIDAR surveys have been completed. An initial 5,000m drilling program is currently underway with results expected early in the fourth quarter of 2021.



## General Information



**Operator:**

Collective Mining



**Investors:**

Collective Mining 100%



**Company country of origin:**

Colombia, Antioquia



**Project Area:**

--



**Mining Method:**

Surface Mining



**Principal Mineral:**

Copper, Gold and Molybdenum



**Associated Minerals:**

--



**Inferred Minerals:**

--



**Proved Reserves:**

--



**Production Capacity:**

TN --



**COLLECTIVE**  
MINING



**Web page**

<https://collectivemining.com/projects/#sanantonio>



**Development stage:**  
Initial Exploration

**Project**  
**OTÚ Centro**  
**O2Gold**



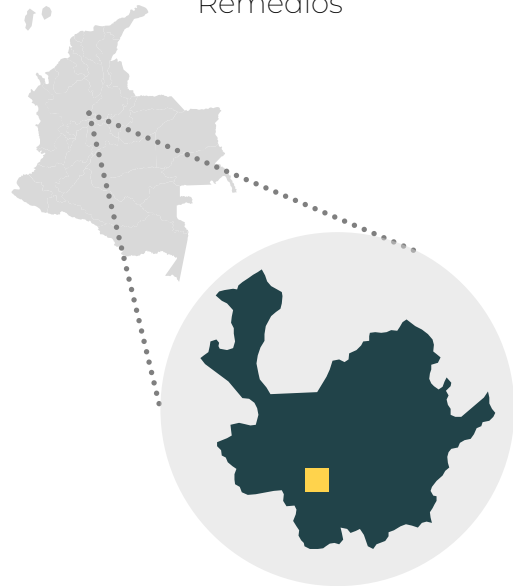
**O**2Gold's Otú Centro project is located in the vicinity of the municipalities of Segovia and Remedios, about 140km from Medellín. It is also located within a 20km radius of Gran Colombia Gold's El Silencio mine and Soma Gold's El Limón mine.

The Otú project is divided into four zones. Aurora, the most advanced, is where exploration is currently concentrated with a drilling program of 8,000 meters in 2021. To the south is Chispero, the second zone, which has the presence of informal miners and where an exploration program will be carried out. exploration similar to that of the Aurora area.



**Location:**

Department of Antioquia  
Municipalities of Segovia and Remedios



To the west of this area is Amalfi, where two informal mining targets are known and will be the subject of detailed sampling and mapping in the near future. Finally, north of Amalfi is Aurora West, where geological studies show a surface magnetic anomaly similar to that of the Aurora area.

In the Aurora zone, where artisanal miners have excavated up to 1,000 meters reaching 100 meters depth, samples of 6-8 g/t Au have been taken and a potential of more than 100,000 oz.



**John T. Boyd Company**  
Mining and Geological Consultants



## General Information



**Operator:**

O2Gold



**Investors:**

O2Gold



**Company country of origin:**

Canada, TGoldnto



**Project Area:**

30.000 ha



**Mining Method:**

Underground



**Principal Mineral:**

Gold



**Associated Minerals:**

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**Inferred Resources:**

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**Proved Reserves:**

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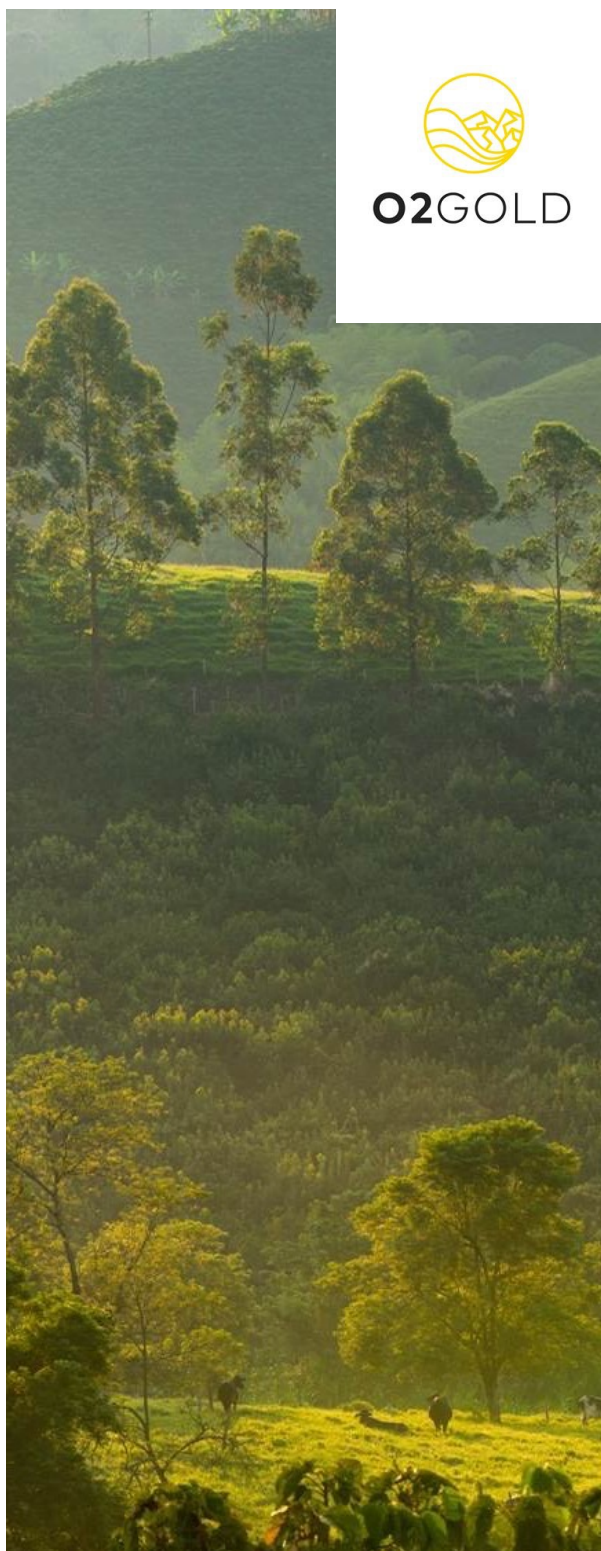


**Production Capacity:**

TN --



**O2GOLD**



**Web page**

<https://otugold.com/project/>

Development Stage:

# Pre-Feasibility



During this phase, a scenario presented in the previous phase is selected and a pre-feasibility study is carried out on it, which provides a certain level of confidence in the production capacity of the project / the mineral reserves / an initial financial analysis / a preliminary project schedule, associated risks and project opportunities, as well as additional work, including

detailed geotechnical and hydrogeological studies and initial process studies (process flow diagram), initiation of a formal community consultation process, initiation of the Environmental Impact Assessment and the processes for obtaining permits.

Below is a table that describes the level of progress of the projects that are in this phase:

## Pre-feasibility:

**Accuracy:** +/- 20 a 25%

### General information:

- Complete understanding of the issues.
- Approved locations.
- Methods for providing access and approved services.

### Information support studies:

- The refinement of the Geological Model is made.
- The Calculation of Resources (under CRIRSCO standards) is completed, which supports the economic analysis and the technical pre-feasibility of the Mining Planning.
- **Mineralogy:**
  - There is a preliminary characterization of the ore and waste rock.
  - Mineralogy issues related to recovery, concentrate quality and environmental issues are widely understood.
- **Geotechnics:**
  - Preliminary site-specific geotechnical information collected, preliminary assessments completed, and questionable or problem areas are identified.
  - Analytical characterization
- **Hydrogeology:**
  - Site conditions are thoroughly investigated and potential mine inflows and water quality are understood.
  - Any potentially problematic areas have been identified.
- **Metallurgical:**
  - Completed detailed investigation and laboratory test work to evaluate process parameters.
  - The points related to metallurgy that require a deeper study are developed.
- **Resources and Reserves:** +80% of the Resource is classified as Measured and the rest as Indicated (Within the production time of the project) according to international standards (CRIRSCO).

### Mining plan:

- The Mining Method and the detailed sequencing are defined.
- The detail of unit operations is clarified: ventilation, support, pumping, subsidence, among others.
- Detailed cost estimate is based on vendor quotes for major items, along with current cost database, recent experience on similar projects, current or similar site labor costs and productivities, etc.
- Capital Costs are approximate and based on selected equipment listings and mine design.
- Estimated Annual Production (Estimated Quality).
- 20% to 25% Contingency in the Mining Plan.

### Infrastructure:

- Topography of access, concession and defined surface works.

### Time to complete studies:

6 – 12 months

### Environmental studies:

- Very advanced reference studies.
- Environmental impact studies in progress.
- The draft environmental monitoring plan has been implemented.
- Mitigation strategies identified and preliminary closure plan developed.

### Licensing and Permits:

- Community consultation in progress.
- Assembly of permit application documentation.
- Permanent communication with the MME and the ANM
- The cadastral review is completed and conversations with the landowners begin

### General Risks:

- Risks of the project identified and quantified

# Development Stage: Pre-Feasibility



Featured projects

#	Company	Company's Country	Project's Name	Location	Mining Method	Principal Mineral
22	AM Resources	Canada	Mina Luz	Cauca	Surface Mining	Coal
★ 23	Anglogoldashanti	South Africa	La Colosa	Tolima	--	Gold
24	Aurum Corp	Colombia	Playa Rica	Cauca	--	Gold
25	Aura Minerals Inc.	Canada	Toldafria	Caldas	Surface Mining	Gold
26	Auxico Resources Canada	Canada	MetalGold	Vichada	Surface Mining	Rare earth
27	Batero Gold Corp	Canada	Quinchia	Risaralda	Surface Mining	Gold
28	Carboandes	Colombia	Carboandes Cauca Gold	Cauca	Underground	Auriferous porphyries and epithermal veins
29	Denarius Silver	Canada	Zancudo	Antioquia	Surface Mining	Gold
30	Eco Gold Minerals	Colombia	La Plata	Santander	Surface Mining	Gold
31	Los Cerros Limited	Australia	Tesorito	Antioquia	Underground	Gold
32	Minera Copper de Colombia	Canada	Urrao	Chocó	Surface Mining	Copper
33	Newrange Gold	Colombia	Mercedes	Tolima	Surface Mining	Copper
34	Noble Metals	Australia	North Choco		Surface Mining	Gold
35	Noble Metals	Australia	Novita	Chocó	Surface Mining	Gold
36	Outcrop Gold	Canada	Lyra	Antioquia	Surface Mining	Gold
37	Outcrop Gold	Canada	Mallama	Nariño	Surface Mining	Gold
38	Rugby Mining	Canada	Cobrasco	Chocó	Surface Mining	Copper
39	Soma Gold	Canada	El Limón	Antioquia	Surface Mining	Gold

Featured Projects:

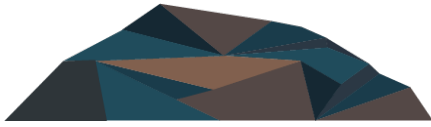
# Pre-Feasibility



John T. Boyd Company  
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**JA&A**

JAIIME RIVERA & ASOCIADOS  
Sinopsis para el desarrollo



**Development stage:**  
Pre-Feasibility

## Project

# La Colosa

## Anglogold Ashanti

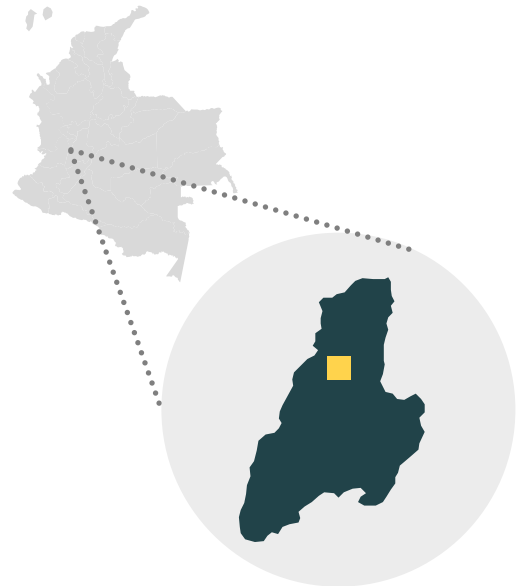
**L**a Colosa project is a large porphyry-type gold deposit discovered by AngloGold Ashanti in 2006 in the municipality of Cajamarca, Tolima, 14 km from the urban area of the municipality and 30 km west of Ibagué.

Although La Colosa has been suspended since 2017, due to the well known consultation process that took place in said municipality in 2018, the project is one of the largest discoveries of gold deposits in Latin America.

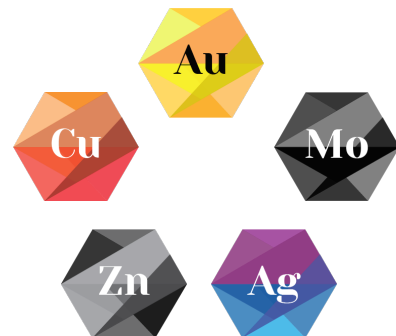


### Location:

Department of Tolima  
Municipality of Cajamarca



During the 9 years leading up to its suspension, more than 1009,000 meters of exploration (via 279 drill holes) was conducted at La Colosa. This exploration work determined an inferred mineral resource of 28.5 million ounces of gold and derivatives such as copper, silver, zinc and molybdenum.





## General Information



**Operator:**

AngloGold Ashanti



**Investors:**

AngloGold Ashanti 100%



**Company country of origin:**

South Africa, Johannesburgo



**Project Area:**

--



**Mining Method:**

--



**Principal Mineral:**

Gold



**Associated Minerals:**

Copper, Silver, Zinc and Molybdenum



**Inferred Resources:**

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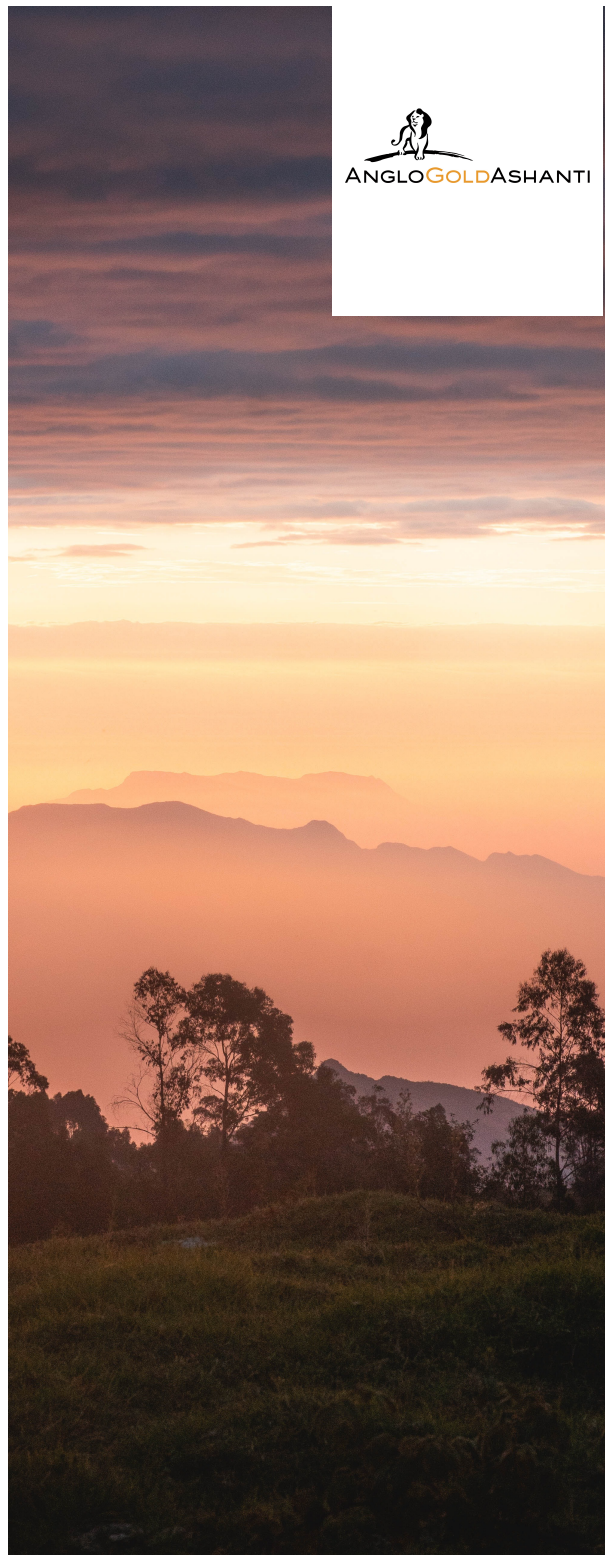
**Proved Reserves:**

--



**Production Capacity:**

TN --



**Web page**

<https://www.anglogoldashanti.com/portfolio/americas/colombia/>

Development Stage:

# Feasibility & basic engineering



During this phase, additional project-specific cost information (including vendor quotes) is gathered in order to refine the project budget and schedule.

In addition, a document is generated that must provide a certain level of confidence in senior management and allow them to commit funds and other resources that will serve to carry out the detailed design,

the construction of the project and the operation / closure of the facility.

A successful feasibility study will allow other activities such as procurement of equipment and materials, completion of permit applications, construction planning, training programs, safety, etc. to run in parallel.

Below is a table that describes the level of progress of the projects that are in this phase:

## Feasibility & basic engineering:

**Accuracy:** +/- 10%

### General information:

- All issues have been fully addressed.
- Locations, access methods and provision of services have been confirmed. Impacts on costs and schedule have been defined.

### Information support studies:

- An update of the Geological Model is made.
- The Calculation of Resources (CRIRSCO) that supports the economic analysis and the feasibility of the Mining Planning is finished.
- **Mineralogy:** Detailed understanding of ore and waste rock mineralogy, as well as impacts on metal processing and recovery, contaminant concentrates, and discharge water quality.
- **Geotechnical:** Completed detailed geotechnical investigations, including conditions for safe mining, and investigations for the foundations of the site infrastructure.
  - Numerical characterization
- **Hydrogeology:** Intake and water quality issues have been addressed.
- **Metallurgical:** Metallurgical problems identified and resolved.
- **Resources and Reserves:** Reserves must be classified as Proven and/or Probable (CRIRSCO), economically viable.

### Mining plan:

- Complete Mining Plan Configuration. Final sequencing developed.
- Capital costs based on final equipment listings and mine design. Detailed estimates based on quotes from multiple vendors, site-specific labor rates, site-specific productivities, detailed cost of materials for the site, etc.
- Estimated Annual Production (Estimated Quality)

- Final labor costs and detailed description of the profiles of each position and functions per year.
- The staff camp has been defined.
- Adjusted operating costs.
- 20% Contingency in the Mining Plan.

### Infrastructure:

- Floor plans, sections and complete facades (Detail plans for buildings and other infrastructures, etc.).

### Time to complete studies:

+/- 18 Months.

### Environmental studies:

- All potential environmental impacts identified and mitigation measures implemented in the project design concepts.
- Environmental monitoring plan established.
- Mitigation strategies approved and implemented.
- Approved and auditable closure plan.

### Licensing and Permits:

- Community concerns identified and addressed where possible in project design and operations planning.
- Permit applications collected, submitted and tracked in progress.
- Dialogues continue with mining authorities.
- Agreements are made with the owners of the land.

### General Risks:

- Steps taken to minimize project risks.
- Update of the risk register based on design improvements.

# Development Stage: Feasibility & basic engineering

 Featured projects

#	Company	Company's Country	Project's Name	Location	Mining Method	Principal Mineral
40	Collective Mining	Canada	Guayabales	Caldas	--	Gold
 41	Los Cerros Limited	Australia	Quinchia Gold	Risaralda	Underground	Gold
42	Minera Copper	Canada	Pantanos	Chocó	--	Copper
43	SANOHA LTDA	Colombia	El Banco	Boyacá	Underground	Met Coal
44	SANOHA LTDA	Colombia	Calle Arriba	Boyacá	Underground	Met Coal
45	SANOHA LTDA	Colombia	Jericó	Boyacá	Underground	Met Coal

Featured Projects:

# Feasibility & basic engineering



**Development stage:**  
Feasibility & basic engineering

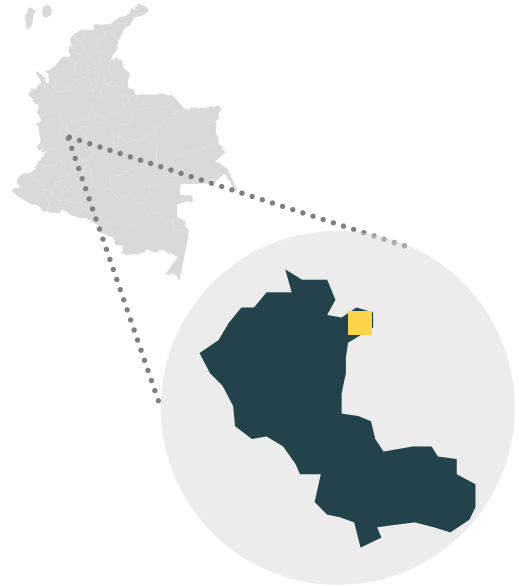
**Project**  
**Quinchía**  
**Gold**  
**Los Cerros**  
**Limited**

**T**he Quinchía project is located 100 km south of Medellín, in the department of Risaralda. This is a region in which the existence of gold, silver and copper resources in breccia and porphyry is known. Geologically, it is part of the porphyry gold belt of the Middle Cauca, in which the Marmato mine and the La Colosa project stand out.



**Location:**

Department of Risaralda  
Municipality of Quinchía



Although the Quinchía project is made up of different titles and applications, in total it covers 10,542 hectares and includes different deposits and targets for exploration such as Miraflores, Chuscal, Dosquebradas and Tesorito. As part of the exploration program, more than 40,000 m of exploratory wells have been drilled in Quinchía, allowing the establishment of resources in the order of 877,000 ounces and reserves of 457,000 ounces in the Miraflores area alone.

## General Information



### Operator:

Miraflores Compañía Minera S.A.S



### Investors:

Los Cerros Limited 100%



### Company country of origin:

Colombia, Antioquia



### Project Area:

10.542 Ha



### Mining Method:

Underground



### Principal Mineral:

Gold



### Associated Minerals:

Silver



### Inferred Resources:

Gold: 0.457 Moz (12.96 tons) 3.29 g/t Au

Silver: 0.385 Moz (10.91 ton) 2.77 g/t Ag  
from 4.32 Mt. (Miraflores Deposit)



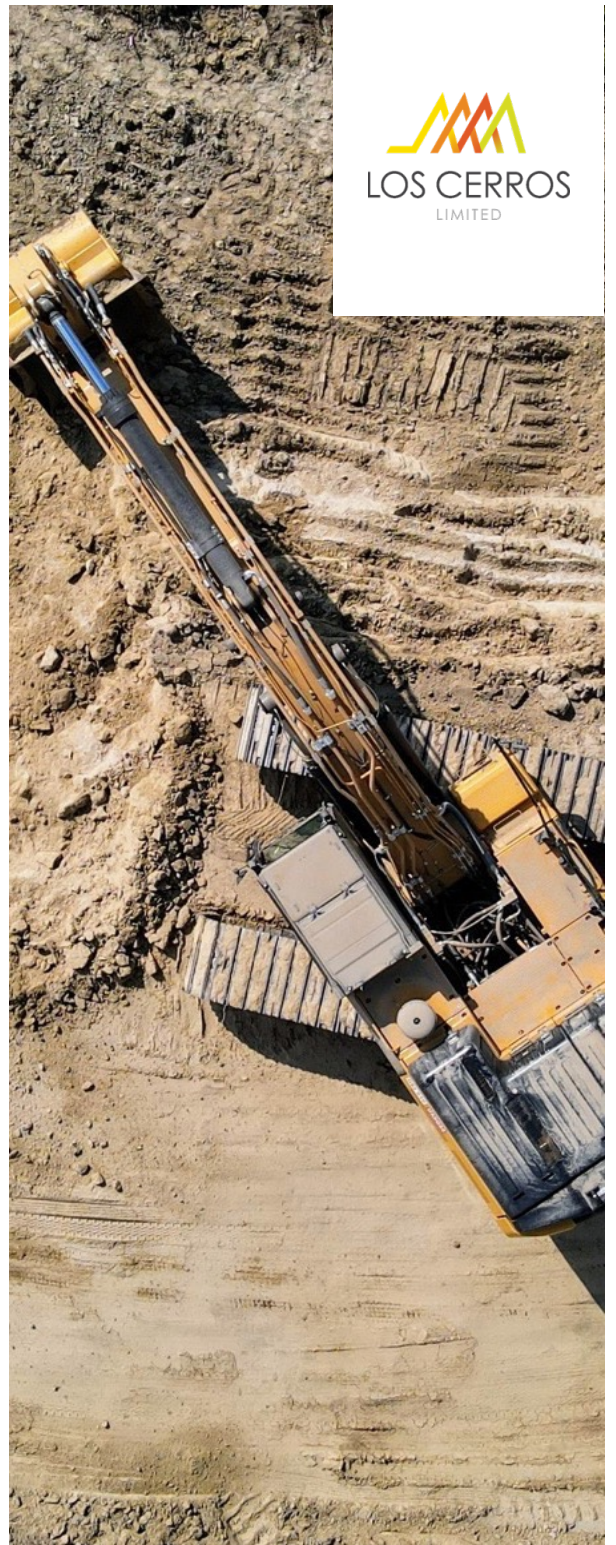
### Proved Reserves:

--



### Production Capacity:

48.000 oz



### Web page

<https://www.loscerros.com.au>

Development Stage:

# Detailed engineering



This phase includes the completion of detailed designs based on the scope and approach of the project, and approval is given to start construction, which involves provision of finance and technical equipment, scoping of work flows for the realization of contracts, the definition of procedures for quality control and other processes.

And if it did not happen in the previous phase, the purchase of key assets for the start-up of the Project is now undertaken.

Below is a table that describes the level of progress of the projects that are in this phase:



## Detailed engineering:

**Accuracy:** + 5%

### General information:

- Complete, except for some contingencies that may arise due to the stage.

### Information support studies:

- Complete

### Mining plan:

- The project is executed according to what was defined in the Feasibility phase.
- 10% Contingency in the Mining Plan.

### Infrastructure:

- Complete architecture with detailed plans (processing plant, bedrooms, among others).
- Detailed surface works (Works external to the project that support its operation such as roads, water service, energy, among others)

### Time to complete studies:

- N/A

### Environmental studies:

- Complete

### Licensing and Permits:


- Follow-up of the processing of licenses and permits



### General Risks:

- The risks are known and control mechanisms have been implemented.

# Development Stage:

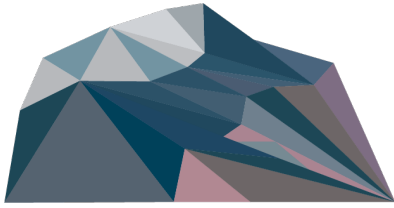
## Detailed engineering

 Featured projects

#	Company	Company's Country	Project's Name	Location	Mining Method	Principal Mineral
46	Carbosocha	Colombia	La Quinta	Boyacá	Underground	Met Coal
 47	AngloGold Ashanti	South Africa	Quebradona	Antioquia	Underground	Copper
 48	Minesa - Mubadala	Arab Emirates	Soto Norte	Santander	Underground	Gold

Featured Projects:

# Detailed engineering



**Development stage:**  
Detailed Engineering

### Project

# Quebradona

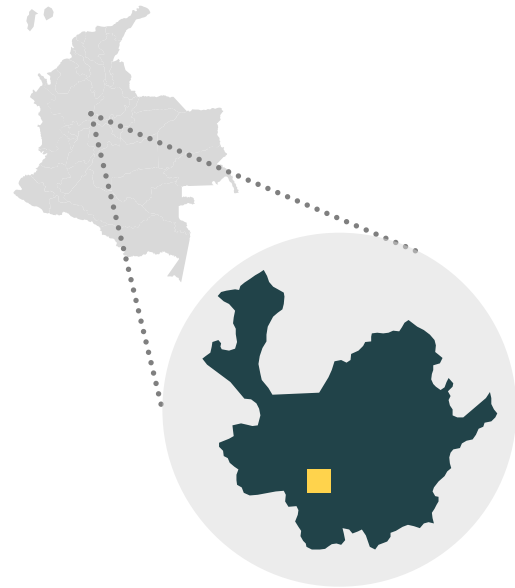
## Anglogold Ashanti

**T**he Quebradona project is located in Jericó, Antioquia, 104km from Medellín. The project has a deposit of 4.9 million tons of copper concentrate (80%), gold and other minerals located at a depth of 400m, for which an underground mine is planned.



**Location:**

Department of Antioquia  
Municipality of Jericó



After having presented the Environmental Impact Study -EIA-, the Quebradona project is currently in the process of obtaining the license to start the construction and assembly stage of the mine. Like the Gramalote project, Quebradona is also part of the PINES list of the National Government.

The project is expected to treat 6.2Mt/y to produce 3Mlb copper, 1.5Moz gold and 21Moz silver over a potential life of 23 years.

## General Information



### Operator:

Minera de Copper Quebradona S.A.S



### Investors:

AngloGold Ashanti Limited 100%



### Company country of origin:

South Africa, Johannesburgo



### Project Area:

610.68 Ha



### Mining Method:

Underground



### Principal Mineral:

Copper



### Associated Minerals:

Gold and Silveer



### Inferred Resources:

Copper: 3,068 Mlbs (1.39 Mt) 1.25% Cu  
Gold: 2.53 Moz (78.60 tons) 0.71 g/t Au  
Silver: 25.95 Moz (807 tons) 7.25 g/t Ag  
from 111.24 Mton



### Proved Reserves:

--



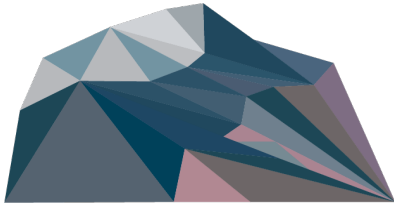
### Production Capacity:

272,000 tons of concentrate with  
72,575 ton Cu (160Mlbs), 90 Koz Au and  
939Koz Ag



### Web page

<https://www.anglogoldashanti.com/portfolio/americas/colombia/>



**Development stage:**  
Detailed Engineering

## Project

# Soto Norte

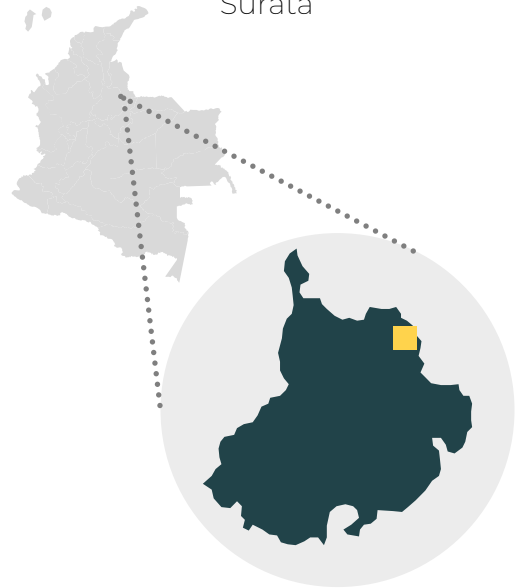
## Minesa

**T**he Soto Norte project is located in the municipalities of California and Surata, in the department of Santander, 57km from Bucaramanga. In previous years, Minesa, owner of the project and a subsidiary of Mubadala Investment Company, has presented two versions of its EIA, the first was withdrawn by the company and the second archived by the National Environmental Licensing Authority -ANLA-.



### Location:

Department of Santander  
Municipalities of California and  
Suratá



Although the project was shelved in 2021, the areas in which Minesa must deepen the information were identified and Minesa is currently preparing a new EIA that will allow it to start the environmental license process to develop the project.

Planned as an underground mine, Minesa's Soto Norte project foresees a production of 410,000 ounces of gold per year in polymetallic concentrates for 25 years.



## General Information



**Operator:**

Aris Gold



**Investors:**

Mubadala Investment Company

80%

Aris Gold 20%



**Company country of origin:**

Canada



**Project Area:**

162 Ha



**Mining Method:**

Underground



**Principal Mineral:**

Gold



**Associated Minerals:**

Polymetallic Gold, Silver and  
Copper Concentrates



**Inferred Resources:**

3.27 M Oz Au



**Indicated Resources:**

8.15 M Oz Au



**Production Capacity:**

+ than 9 million Oz in 26 years



**Web page**

[https://www.minesa.com/es\\_es/no\\_sotros/nuestro-proyecto-soto-norte/](https://www.minesa.com/es_es/no_sotros/nuestro-proyecto-soto-norte/)



**John T. Boyd Company**  
Mining and Geological Consultants



JAIME ARTEAGA & ASOCIADOS  
Sinopsis para el desarrollo

Development Stage:

# Construction



During this phase, changes in the construction of the project will be addressed and all the necessary clarification will be given to resolve any doubts that may arise about the plans or specifications of the project.

In addition, necessary inspections are carried out to confirm that the construction is in accordance with the design and compliance with quality control practices is confirmed.

Project engineers will confirm that proper construction records are being made, collection of supplier documents (installation instructions, operation manuals, maintenance manuals), and other control activities.

Below is a table that describes the level of progress of the projects that are in this phase:



## **Construction:**

**Accuracy:** +/- 5%

### **General information:**

- Complete, except for some contingencies that may arise during construction.

### **Information support studies:**

- Complete.

### **Mining plan:**

- The project is executed according to what was defined in the Feasibility phase.

### **Infrastructure:**

- Construction registration plans

### **Time to complete studies:**

- N/A

### **Environmental studies:**

- Complete.

### **Licensing and Permits:**

- Granted for the period required to make the project economically viable.

### **General Risks:**

- The risks are known and control mechanisms have been implemented.

# Development Stage: Construction

 Featured projects

#	Company	Company's Country	Project's Name	Location	Mining Method	Principal Mineral
 49	B2GOLD	Canada	Gramalote	Antioquia	Surface Mining	Gold
 50	Acerías Paz del Rio	Colombia	Zona 1 y Zona 2 Carbon	Boyacá y Cundina marca	Surface Mining	Coal
51	Miraflores	Colombia	Miraflores	Risaralda	--	Gold
 52	Royal Road Minerals	United Kingdom	Guinter - Niverengo - Margaritas	Antioquia	Surface Mining	Copper

Featured Projects:

# Construction



**Development stage:**  
Construction

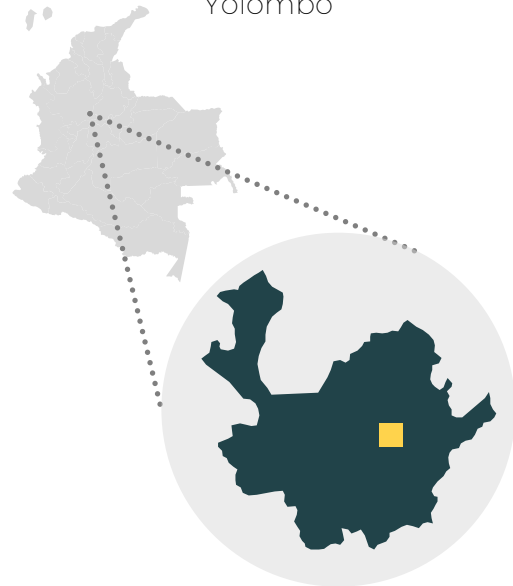
**Project**  
**Gramalote**  
**B2Gold y**  
**AngloGold**  
**Ashanti**

**G**ramalote, a project owned by B2Gold and AngloGold Ashanti (50% each) is located in the municipality of San Roque, Antioquia, 120 km northeast of Medellín. Since January 1, 2020 the project has been operated by B2Gold. The mining project, which is planned as an open pit mine, has total mineral resources amounting to 5 million ounces with a potential increase to 7 million ounces. The minable material corresponds to 3,651 million ounces of gold production, between 350 and 450 thousand ounces of gold will be obtained per year.



**Location:**

Department of Antioquia  
Municipalities of San Roque and  
Yolombó



By 2021, 18,000m of coring drilling was planned, of which 8,000m would be at Gramalote and 10,000m would be advanced at Trinidad and Monjas Oeste, two satellite deposits located near the planned project infrastructure.

The project, which was included in the list of Projects of Strategic National Interest -PINES- by the Government of Colombia, also includes a resettlement of neighboring communities and coexistence programs with small miners in San Roque.



## General Information



### Operator:

Gramalote Colombia Limited



### Investors:

B2Gold 50% - AngloGold Ashanti Ltd 50%



### Company country of origin:

Canada - South Africa



### Project Area:

--



### Mining Method:

Surface Mining



### Principal Mineral:

Gold



### Associated Minerals:

--



### Inferred Resources:

Gold: 2,83 Moz (80,23 Ton)  
0,68 g/t Au



### Proved Reserves:

--



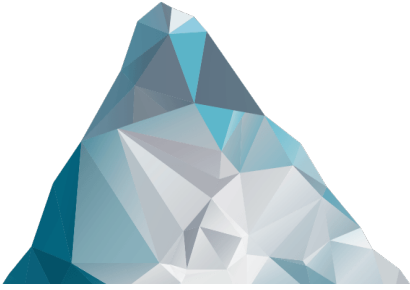
### Production Capacity:

283,990 oz Au (estimated annual)



### Web page

<https://www.b2gold.com/projects/development/gramalote/>



**Development stage:**  
Construction

## Project

# Zona 1 y Zona 2 Acerías Paz del Río

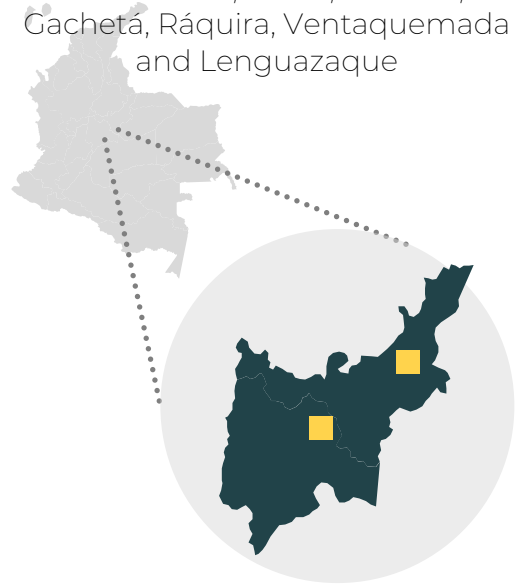
**T**he Zone 1 project is located exclusively in the department of Boyacá and Zone 2 is located in the departments of Boyacá and Cundinamarca.

Zone 1 and Zone 2 are characterized by having very good geological information resulting from an extensive exploration campaign that included more than 155 drillings. The drilling program determined the existence of several seams with varied thicknesses and with coking qualities throughout the area.



### Location:

Department of Boyacá y  
Cundinamarca  
Municipalities of Tasco, Paz del Río,  
Socha, Socotá, Sativasur,  
Sativanorte, Jericó, Samacá,  
Gachetá, Ráquira, Ventaquemada  
and Lenguazaque



The project has technical studies prepared under international standards (CRIRSCO) that quantify coal resources in their different classifications.

Zones 1 and 2 are comprised of low to medium volatile bituminous coal with variable low to high sulfur ranges.



## General Information



### Operator:

Acerías Paz del Río



### Investors

Acerías Paz del Río and Trinity Capital



### Company country of origin:

Colombia and Brasil



### Project Area:

35.987 Ha



### Mining Method:

Underground



### Principal Ore:

Met Coal



### Associated Minerals:

--



### Inferred Resources:

--



### Proved Reserves:

--



### Production Capacity:

TN --



PazdelRío



### Web page

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Sinopsis para el desarrollo



**Development stage:**  
Construction

**Project**

# Güintar – Niverengo – Margaritas (GNM)

## Royal Road Minerals

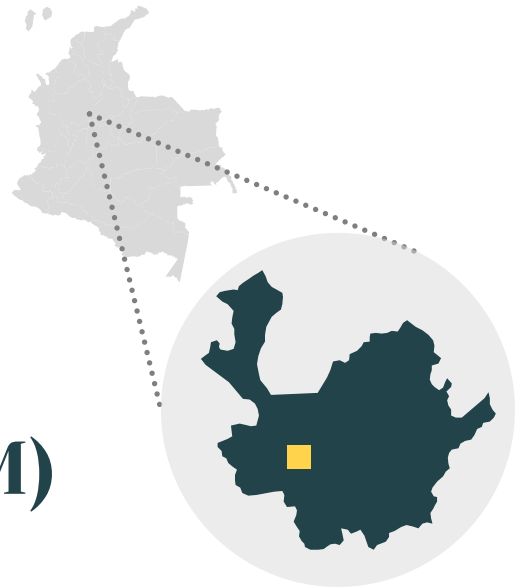
**T**he Güintar-Niverengo - Margaritas or GNM project is located 50km from Medellín, in the municipality of Anzá, Antioquia. The acronym signifies three different titles unified under a single project.

In 2019, catchment and discharge permits were issued by the Regional Autonomous Corporation of Antioquia -CorAntioquia- to continue exploration work in both the Güintar and Niverengo areas.



**Location:**

Department of Antioquia  
Municipality of Anzá



In the first quarter of 2020, the joint-venture option agreement was signed with Grupo Mineros SA, in which the Colombian multilatina can acquire 50% of the project by investing USD \$2.5 million in exploration expenses. Royal Road is the operator and remains the operator of the GNM project.

GNM is part of the exploration assets that Royal Road Minerals purchased from AngloGold Ashanti.





## General Information



**Operator:**

Royal Road Minerals



**Investors:**

Royal Road Minerals 100%



**Company country of origin:**

Channel Islands, UK



**Project Area:**

--



**Mining Method:**

Surface Mining



**Principal Mineral:**

Gold



**Associated Minerals:**

--



**Inferred Resources:**

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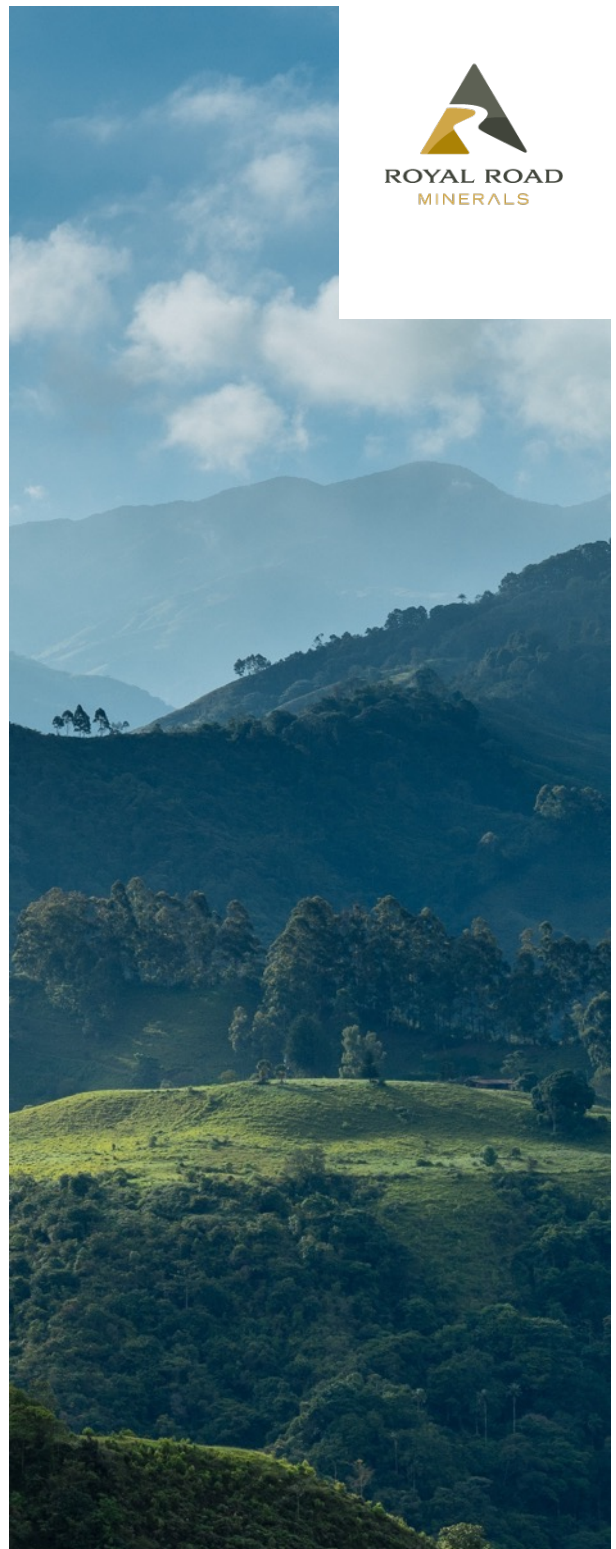
**Proved Reserves:**

--



**Production Capacity:**

TN --



**Web page**

<https://www.royalroadminerals.com/projects/guintar-niverengo/>

Colombian mining

# Pipeline

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# Team

**Carlos Felipe Barrera**  
Managing Director  
South America  
John T. Boyd Company

Carlos Felipe Barrera is the Managing Director for South America of John T. Boyd Company, a company based in Pittsburgh, Pennsylvania, USA. He has worked in the mining industry for more than 20 years with junior companies in Australia and England and has led technical and strategic consulting teams as Project Manager of multiple due diligence and sector strategy projects in the mining sector. Mr. Barrera has worked for mining projects in Colombia, Peru, Venezuela, Paraguay, Brazil, Guyana, USA and Nicaragua.

He is a registered member of the SME (Society for Mining, Metallurgy, and Exploration) and the PDAC (Prospectors & Developers Association of Canada). He is a Business Administrator from the University of Western Sydney in Australia, with a Master's degree in Commerce and International Business from The University of New South Wales in Australia and has studied negotiation at Harvard and Management of Mining Projects from The Colorado School of Mines in the United States.

**Andrés Montoya**  
Senior Mining Engineer  
John T. Boyd Company

Senior mining engineer with extensive experience in the formulation, definition, development and monitoring of mining projects in each of their different stages: From exploration, developing geological models, reports and technical studies in estimating reserves and resources, among others, to mining exploitation, where he has participated as advisor or coordinator of mine design and planning, mainly on the surface. Experience in the design and optimization of sterile material deposit areas (dumps) in large mining operations.

Experience in modeling Coal, Industrial and Metallic Minerals, especially Gold and Silver using state-of-the-art software such as Carlson Mining (SurvCADD), ArcGIS, ABB MineScape (Mincom), Surpac, Minex and Vulcan, among others.

# Team

**Diana Cuestas**  
Executive Director  
Jaime Arteaga & Asociados

Diana Cuestas is a Professional in Government and International Relations with a Master's Degree in Management for Development from the Externado de Colombia University.

She is currently Executive Director of Jaime Arteaga y Asociados and Manager of Brújula Minera and Barómetro Petrolero. He has led Open Government Index projects, management and creation of Public Policies, public-private alliances, advice to public and private entities for the relationship with communities and local intervention; and training and evaluation of Corporate Social Responsibility Programs

**Simón Mejía**  
Deputy Director of Private Investment  
Jaime Arteaga & Asociados

Simón Mejía is a political scientist and internationalist from the Sergio Arboleda University and graduated from the Senior Management Program in Corporate Reputation at the Externado de Colombia University. He has more than seven years of experience in analysis of issues associated with the mining-energy sector. He has worked in the areas of data analysis, PR Merco Colombia and Brújula Minera, as well as in matters of strategic relationship and sustainability. He has carried out diagnoses on the value chain of small and medium coal, emerald and gold mining.

## **John T Boyd Company**

### **About us**

The John T. Boyd Company is one of the world's largest independent consulting firms serving exclusively the mining, financial, utility, energy and minerals-related industries. Consulting services have been provided continuously since 1943 in more than 60 countries. Our full-time professional staff includes specialists in the areas of geology, geotechnical analysis, reserve and resource evaluation, mine planning and cost analysis, material handling, independent market review and benchmarking, business planning, transportation logistics and related issues, environmental.

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## **Jaime Arteaga & Asociados**

### **About us**

JA&A is a consulting firm for development, focused on the synapse between the public and the private to make development ideas a reality in the territories and Latin America. Since its inception, it has stood out for its initiatives and contributions to the Colombian extractive sector, which include State-Private Sector-Community relationship strategies, support in the generation of Public Policy for Mining Development, planning and oversight in producing territories, evaluation of social impacts in regions with mining and oil operations, creation of sustainability strategies for companies in the mining sector, Social License to Operate monitors for projects under development and/or exploration, among others.

Among the outstanding initiatives of JA&A aimed at the responsible development of the extractive sector are the Mining Compass, the Oil Barometer and the Buriticá Plan.

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The types of uncertainty that are relevant may relate to, but are not limited to, commodity prices, unpredictable

exploration results, uncertainty inherent in estimating mineral resources, fluctuations in the costs of goods and services, problems associated with exploration and mining operations, political uncertainty, changes in the regulatory framework that applies to the business and general economic conditions.

Given this uncertainty, readers are cautioned not to place undue reliance on such comments; there is no certainty that the disclosed objectives will be achieved or that the operations will be economically viable.

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# Colombian mining Pipeline



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**JA&A**

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Sinapsis para el desarrollo