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## **THE DOMINICAN REPUBLIC'S MINING INDUSTRY IN 2018**

### **The Dominican Republic is the biggest mineral producer in the Caribbean**

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### **INTRODUCTION**

This article is a review of the current state of the Dominican mining industry in 2018. Minerals, principally gold, are now the largest single export sector of the Dominican economy. The Dominican Republic produces gold, silver, copper, zinc and ferronickel from four mines, making the country the biggest mineral producer in the Caribbean region.

Major expansions are underway at the three major mines. Barrick will convert the Pueblo Viejo power plant to natural gas, which will reduce costs, and installed pilot plants for a pre-feasibility study with the objective of increasing gold production by 50%. At the Cerro de Maimon polymetallic mine, Perilya started construction of a decline to access the new Cerro de Maimón South orebody, which will be the first underground metallic mine in the country. Finally, Falcondo announced that it will double nickel production. On the other hand, the Las Lagunas gold tailings reprocessing operation will end in mid-2019 when the reserves run out, and the company will move the plant to another country. In contrast, there was almost no exploration by the junior sector due to continuing delays in receiving exploration, exploitation and environmental permits. The Ministry of Energy and Mines proposed a new mining law, which went through several different drafts in the year.

### **MINERALS IN THE DOMINICAN ECONOMY**

The Gross Domestic Product (GDP) grew by 6.9% in the first three quarters of 2018, an increase from 4.6% in 2017. Mining decreased by 2.0% in the same period following a decrease of 3.4% in 2017 and growth of 26.5% in 2016.

Mineral exports were worth \$1,277 million (all figures are in US dollars) in the first three quarters of 2018, and increase of 1.7% compared to the same period in 2017 (\$1,255 million) (Table 1). Minerals were the largest sector of the country's exports and accounted for 34% of the total value of exports in the first three quarters of 2018, excluding the free

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trade zones, and 15% including the free trade zones. Three quarters (77%) of the mineral exports were gold worth \$982 million in the period, a decrease of 4.8% compared to the previous year due to lower production at Pueblo Viejo. This was followed by ferronickel worth \$159 million, worth 12.5% of total mineral exports, an increase of 44%; silver worth \$69 million (up 11%); copper worth \$50 million (up 39%); and zinc worth \$5.8 million (down 2%).

Mineral	2017 (US\$ million)					2018 (US\$ million)			
	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Total	Jan-Mar	Apr-Jun	Jul-Sep	Total Jan-Sep
Gold	314.0	383.2	333.8	425.7	1,456.7	349.3	295.8	336.5	981.6
Ferronickel	35.5	35.6	39.5	42.1	152.7	47.5	55.4	56.4	159.3
Copper	12.6	15.4	8.1	18.2	54.3	16.0	17.7	16.6	50.3
Silver	19.4	26.0	16.5	20.8	82.7	25.0	23.1	20.9	69.0
Bauxite	0.1	-	-	-	0.1	-	-	-	-
Limestone	0.9	1.0	1.0	1.0	3.9	0.6	0.9	1.2	2.7
Zinc	3.2	1.1	4.6	1.5	10.4	5.0	2.9	0.8	8.7
Other minerals	1.6	1.4	1.1	1.2	5.3	2.1	1.4	2.3	5.8
<b>Total (US\$ million)</b>	<b>387.3</b>	<b>463.7</b>	<b>404.6</b>	<b>510.5</b>	<b>1,766.1</b>	<b>445.5</b>	<b>397.2</b>	<b>434.7</b>	<b>1,277.4</b>

**Table 1. Quarterly mineral exports from the Dominican Republic 2017-18 (US\$ millions).**

(Source: Banco Central de la República Dominicana.)

## PRODUCTION

### Pueblo Viejo gold mine

The Pueblo Viejo gold mine, located 60 km northwest of Santo Domingo in Sánchez Ramírez Province, is operated by Pueblo Viejo Dominicana Corporation (PVDC), a joint venture between the Canadian companies Barrick Gold Corporation (60%), which is the operator, and Goldcorp Inc. (40%). Recently, both companies were involved in mergers to create the largest two gold mining companies in the world. Barrick merged with Randgold Resources Limited of London as of 1 January 2019, and the company continues to operate as Barrick. Meanwhile, it was announced in mid-January 2019 that Goldcorp will merge with Newmont Mining Corporation of Colorado to form Newmont Goldcorp.

The oxide zone was mined by state-owned Rosario Dominicana S.A. from 1975 to 1997 and produced 5.389 million ounces of gold and 24.679 million ounces of silver from 58.154 million tonnes of ore. Rosario Dominicana was originally a 51%-49% joint venture between Rosario Resources Corporation of New York, a subsidiary of Amax Inc., and the Dominican government. The government bought Rosario's interest in 1979.

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The sulfide project was awarded to Placer Dome Inc. of Toronto in a public bid in 2001 and a Special Lease Agreement was signed with the Dominican Government in 2002. Placer Dome was acquired by Barrick in 2006, which brought in Goldcorp as a joint venture partner.

After the first gold pour on 14 August 2012, the mine achieved commercial production on 15 January 2013 and reached full production in the first half of 2014. A copper recovery circuit was commissioned in the first quarter of 2015.

Pueblo Viejo is the only mine in the world with more than one million ounces of annual gold production and at an all-in-sustaining cost below \$700 per ounce. The total gold produced from the sulfide plant from 2012 to 2018 (third quarter) was 5.9 million ounces (Table 2). By-product silver and copper are also produced.

In the first nine months of 2018, 29.8 Mt of ore grading 3.98 g/t Au was mined, and 6.0 Mt grading 4.60 g/t Au was autoclave processed to produce 691,667 ounces. The cash cost was \$481 per ounce, and the all-in-costs were \$648 per ounce, which were higher than 2017. Production decreased from the previous year due to lower ore grades and mining in areas of the Moore pit that contain a higher proportion of carbonaceous ore which has lower recoveries, partially offset by higher plant throughput rates. The forecast production for the whole year is 958,000 to 983,000 ounces.

Year	Gold (oz)	Grade (g/t)	Ore mined (Mt)	Ore processed (Mt)	Cash cost (\$/oz)	AISC (\$/oz)
2012	111,667	5.23	16.1	0.7		
2013	813,333	6.14	15.3	4.4	561	735
2014	1,108,333	5.53	35.1	6.7	446	588
2015	953,333	4.94	37.9	6.9	467	597
2016	1,166,667	5.29	38.8	7.5	395	490
2017	1,083,333	4.57	39.1	8.0	405	525
2018 (Q1-Q3)	691,667	3.98	29.8	6.0	481	648
Total	5,928,333	5.01	212.0	40.2		

**Table 2. Gold production and costs at the Pueblo Viejo mine, 2012-2018 (Q1-Q3).**

(Source: Barrick Annual and Quarterly reports. Silver and copper production are not reported.)

The proven and probable reserves are 135.6 Mt grading 2.76 g/t Au, 17.40 g/t Ag and 0.097% Cu containing 10.92 million ounces of gold, 68.8 million ounces of silver and 290 million pounds of copper, as of 31 December 2017. In addition, there are 169.5 Mt of measured and indicated resources grading 2.46 g/t Au containing 12.2 million ounces of Au, and 46.1 Mt of inferred resources grading 2.43 g/t Au containing 3.2 million ounces. The total gold contained in reserves plus resources is 26.4 million ounces, and the total gold endowment (reserves + resources + past production) is 37.0 million ounces.

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This makes Pueblo Viejo the second largest gold deposit in Latin America, after Yanacocha (Peru), and the ninth largest producing gold mine in the world.

The Quisqueya I power plant at San Pedro de Macoris will be converted from heavy fuel oil to natural gas following the signing of a 10-year natural gas supply contract with AES Andres DR, S.A., a subsidiary of AES Corporation. This is expected to reduce the mine's average cost of sales and all-in supporting costs by about \$54 per ounce over the life of the mine, including the sale of excess power to the national grid. The conversion cost will be about \$7.5 million, and AES will build a new gas pipeline to the plant. Completion is expected in the second half of 2019.

Barrick is carrying out a prefeasibility study for a plant expansion at Pueblo Viejo that could increase throughput by about 50% to 12 Mt per year, allowing the mine to maintain average annual gold production of approximately 800,000 ounces after 2022. The prefeasibility study is evaluating options including the addition of a pre-oxidation heap leach pad with a capacity of 8 Mt tonnes per year, a new mill and flotation concentrator with a capacity of 4 Mt per year, and additional tailings capacity. The project has the potential to convert about 7 Moz of measured and indicated resources to proven and probable reserves. During the year, a pilot pre-oxidation heap leach pad started operation, and construction of the pilot flotation circuit was well advanced, including the holding tank and thickener.

Pueblo Viejo is a high sulphidation epithermal gold deposit hosted by volcano-sedimentary rocks of the Lower Cretaceous Los Ranchos Formation. The sulfide orebody is mined from two open pits, Moore and Monte Negro, with processing by milling, roasting in four autoclaves, and CIL at a rate of 24,000 tonnes per day. Lower grade ore is stockpiled for later processing, giving a mine life of 18 years and a processing life of 36 years. Silver and copper are recovered as sub-products, but zinc is not recovered.



**Figure 1. The Pueblo Viejo plant.**  
(Source Barrick Gold website.)

### **Las Lagunas gold tailings plant**

PanTerra Gold Limited of Sydney, Australia operates the Las Lagunas gold tailings reprocessing plant adjacent to Pueblo Viejo, Sánchez Ramírez Province, 60 km northwest of Santo Domingo.

PanTerra Gold is listed on the Australian Stock Exchange. It operates the project through its subsidiaries EnviroGold (Las Lagunas) Limited of Vanuatu and EnviroGold Dominicana S.A. The project reprocesses refractory sulfide tailings from past production at the Pueblo Viejo mine in 1992 to 1999. The refractory nature resulted in poor recoveries of <30% of gold and silver when treated by the conventional carbon-in-leach process plant in place for the oxide ore. EnviroGold (Las Lagunas) Limited won an international tender and signed a contract with the Dominican Government in 2004 granting it the right to reprocess the tailings under a profit sharing agreement. Under this agreement, the company is exempted from income tax in the Dominican Republic but will share 25% of its operating profit with the Government from 2016, after the company has recovered its direct investment in the process plant construction.

The operation started in June 2012. In 2018 the operation produced 43,243 ounces of gold and 132,932 ounces of silver from 623,618 tonnes of ore grading 4.08 g/t Au and 40.7 g/t silver. Gold production increased by 0.6% and silver decreased by 13.5% compared to

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the previous year. The operating costs in the final quarter were \$621 per ounce of gold equivalent.

Recoveries of 52.9% Au and 16.7% Ag in 2018, which are typical of the project, are much lower than those expected from the pilot plant of 70% gold and 62.3% silver. This is attributed to deficiencies in the design and equipment supplied for the Albion oxidation circuit.

The total production since 2012 is 228,396 ounces of gold and 1,265,326 ounces of silver (Table 3).

Year	Plant feed (tonnes)	Au grade (g/t)	Ag grade (g/t)	Au production (oz)	Ag production (oz)
2012				2,387	22,852
2013	181,746	3.47	38.05	23,645	219,081
2014	653,307	3.56		32,342	261,376
2015	758,390	3.43		37,760	239,088
2016	730,320	3.92	39.14	46,021	236,284
2017	667,910	3.89	38.47	42,998	153,713
2018	623,618	4.08	40.7	43,243	132,932
Totals	3,615,291			228,396	1,265,326

**Table 3. Gold and silver production from the Las Lagunas tailing project, 2012-18.**

(Source: PanTerra Gold annual and quarterly reports. The data for 2012 is for Q3 only. No data was reported for Q4, 2012. For 2013, the plant feed and grade are for Q3 only – no data was reported for the other quarters, but the Au and Ag production data are complete.)

According to the feasibility study, the Las Lagunas plant was expected to produce 435,000 ounces of gold and 3,955,000 ounces of silver over a 6.5-year mine life. Actual production has been less than half, in part due to lower recoveries. The original JORC indicated resource of 2011 was 5.137 Mt grading 3.78 g/t Au and 38.6 g/t Ag. There was a residual resource of 0.998 Mt grading 3.46 g/t Au and 38.52 g/t Ag at the end of 2017 after 3.875 Mt of tailings had been processed.

Mining of the tailings is by a bucket-wheel dredge followed by ultrafine grinding, concentration of gold-bearing sulfides by flotation, sulfide oxidation by Glencore Technology's patented Albion Process, and then extraction of gold and silver by standard carbon-in-leach cyanidation. This is the first use of the Albion-CIL process to recover precious metals from sulfidic refractory ore.

The project life is until mid-2019. The company had planned a second project stage to treat 100,000 tonnes per year of high grade refractory concentrate imported from third parties in China and possibly Cuba. However, it received no support for this from the Dominican Government and in 2017 it announced that it would close the plant in 2019 and possibly ship it to a new project in Cuba.



**Figure 2. PanTerra Gold's Albion/CIL processing plant at Las Lagunas.**  
(Source: PanTerra website.)

### **Cerro de Maimón polymetallic mine**

The Cerro de Maimón polymetallic mine, located in Monseñor Nouel Province, 60 km northwest of Santo Domingo, produces concentrates of copper and zinc with gold and silver. It is operated by Corporación Minera Dominicana S.A. (CORMIDOM), a subsidiary of Perilya Limited of Australia.

Perilya is owned by Zhongjin Lingnan Mining (HK) Company Limited of Hong Kong. It bought the remaining 48% of the shares that it did not already own in December 2013, and de-listed Perilya from the Australian Stock Exchange. Zhongjin Lingnan is a wholly owned subsidiary of Shenzhen Zhongjin Lingnan Nonfemet Co., Limited, China, which is 39.23% owned by the Government of the People's Republic of China, and is listed on the Shenzhen stock exchange. It is China's third largest zinc producer.

The Cerro de Maimón mine has been in operation since 2008. The mine was built by Globestar Mining Corporation of Toronto, and was bought by Perilya Limited in 2010. The most recent (now historic) published JORC measured and indicated resource for the deposit was made in August 2012 and was 11.2 Mt grading 1.6% Cu, 0.73 g/t Au and 25.7 g/t Ag. Older resource estimates showed a zinc content of 1.3%. The most recent published proven and probable ore reserves, dated 31 December 2010, were 5.37 Mt in sulfides grading 2.20% Cu, 0.85 g/t Au and 27.6 g/t Ag, and 0.90 Mt in oxides grading 1.58 g/t Au and 26.9 g/t Ag. No updates have been released since then.

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CORMIDOM announced the discovery of the Cerro de Maimón South deposit in 2017, located 470 m south of the open pit mine at a depth of 400 m. This has a measured, indicated and inferred JORC resource of 8.49 Mt @ 2.5% Cu, 1.4 g/t Au, 47 g/t Ag and 3.2% Zn containing 209,760 tonnes Cu, 405,000 ounces Au, 14,087,000 ounces Ag and 275,150 tonnes Zn. This could extend the mine operation by more than ten years. The deposit was discovered in mid-2016, and 20,000 m of drilling was carried out to define the resource.

A decline is under development to access the Cerro Maimon South orebody. This is the first underground metallic mine in the country (there is already an underground marble mine in Samaná). Cormidom awarded a \$24 million order to Epiroc of Sweden in July to supply underground drill rigs, loading and hauling equipment. The Minister of Energy & Mines, Antonio Isa Conde, visited the decline on 10 September, which was reported widely in the national press. Isa Conde said that “environmental, economic and social sustainability is the most expedited route for mining development with social acceptance, which has in these times great technological opportunities for extractive operations with less impact on the ecology.” He also explained that “the sustainability of the mining industry depends a lot on its attitude to make viable a "win-win" model, in favor of the companies, the Government and the communities.”

Since the company was delisted in 2013 there is no public reporting requirement and no production data has been published. CORMIDOM kindly provided GEONOTICIAS with a copy of the production data that it supplies to the Dominican Central Bank. In 2018 (January to October) the mine produced 6,530 tonnes of Cu (2017: 8,549 tonnes), 4,716 ounces of Au (2017: 6,868 ounces), 178,877 ounces of Ag (2017: 270,852 ounces) and 3,086 tonnes of zinc (2017: 3,920 tonnes).

The life of mine production since 2008 was 98,492 tonnes of Cu, 114,604 ounces of Au, 4,092,616 ounces of Ag and 15,297 tonnes of zinc, as shown in Table 4.

The Cerro de Maimón deposit is a volcanic-hosted exhalative massive sulfide deposit (VMS). The deposit outcropped at surface and plunges southeast at 25° and dips 30° south-west. The dip flattens to 20° down plunge. Mineralization is up to 1,000 m long, up to 40 m wide near surface and narrows to 5 m down plunge. The new discovery at Cerro de Maimón South appears to be the continuation of the body at depth to the southeast. Mining at Cerro de Maimón is carried out by a contractor in an open pit and ore is trucked to separate sulfide and oxide ore processing plants. The sulfide plant produces a copper, gold and silver concentrate by flotation, and a zinc flotation circuit was added in 2015 to produce a zinc-silver concentrate also. The 700 tonnes per day oxide plant produced a gold-silver precipitate and was closed in April 2015 on exhaustion of the oxide reserves. The sulfide plant has a design throughput of 1,300 tonnes per day. A decline is under construction to access the South deposit.

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Year	Cu (tonnes)	Au (ounces)	Ag (ounces)	Zn (tonnes)
2008 (Dec)	2,109	1,314	94,334	-
2009	12,937	13,678	665,147	-
2010	10,015	17,131	733,550	-
2011	11,777	15,914	596,531	-
2012	11,736	13,887	341,801	-
2013	10,379	14,633	324,277	-
2014	9,263	10,308	251,581	-
2015	6,884	8,757	336,971	4,655
2016	8,314	7,397	298,697	3,636
2017	8,549	6,868	270,852	3,920
2018 (Jan-Oct)	6,530	4,716	178,877	3,086
<b>Total 2008-2018 (YTD)</b>	<b>98,492</b>	<b>114,604</b>	<b>4,092,616</b>	<b>15,297</b>

**Table 4. Metal production from the Cerro de Maimón mine, 2008-2018 (January to October).**  
(Courtesy of CORMIDOM.)



**Figure 3. The Cerro Maimón mill and tailings pond.**

(Source: <https://i.vimeocdn.com/video/522667138.jpg?mw=1920&mh=1080&q=70>)



Figure 4. The portals of the declines at Cerro de Maimon (<https://acento.com.do>).

### **Falcondo nickel mine**

Production at the Falcondo nickel mine near Bonaó, Monseñor Nouel and La Vega Provinces, 70 km northwest of Santo Domingo, restarted in April 2016 under the new ownership of Americano Nickel Limited which is owned by a Bahamian private equity company, Global Special Opportunities Ltd. (GSOL). The mine had been on care and maintenance since October 2013 as a result of low nickel prices. Americano Nickel bought an 85.26% interest in Falconbridge Dominicana C. por A. (Falcondo) from Glencore Canada Corporation, a subsidiary of Glencore plc, on 13 August 2015 for an undisclosed price. The balance of Falcondo is owned by the Dominican Government (10%), Franco-Nevada Corporation of Toronto (4.06%), and several individuals (0.68%).

The Ministry of Energy and Mines authorized the restart of operations by a resolution dated 25 April 2016. The resolution also contemplates the exploitation of Loma Miranda once the social and environmental license is obtained. In addition, the ruling of the Constitutional Court No. 167/13 of 17 September 2013 definitively allows this exploitation once it is environmentally sustainable. The company awaits the approval of environmental and social permits in order to start mining at the Loma Miranda deposit.

The Falcondo nickel mine has been in operation for 48 years since 1971. The Quisqueya No. 1 mining concession, granted in 1956 for 75 years, covers 22,830 ha, including 4,658 ha with exploitation rights. Falcondo owns 5,448 ha of land over the mining areas, as well land at the Miranda Project and the mineral processing facilities.

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Exploration started in 1955 when several mineral concessions were granted to Minera y Beneficiadora Dominicana C por A (MYB). This company made an agreement with Falconbridge Nickel Mines Ltd of Canada (Falconbridge), later called Falconbridge Ltd., to form a new company, Minera y Beneficiadora Falconbridge Dominicana C por A (Benfalc) on 29 February 1956.

In 1962 the Dominican Government became owner of almost half of the capital shares that MYB held in Benfalc, equivalent to about 10% of Benfalc. The name of the company was changed to Falconbridge Dominicana, C por A (Falcondo) on 19 December 1962. The operation has mined laterite ore since 1971.

Falconbridge Ltd was bought by Xstrata plc of London in 2006. Xstrata merged with Glencore plc of Switzerland and London in 2013 to become Glencore Xstrata plc, now known just as Glencore plc.

The Falcondo operation consists of a mine, ore preparation plant, reduction plant, a smelter and a metal refining plant, together with an oil refinery and a 180 megawatt thermal power station.

The operation has a capacity to treat 4.1 million tonnes of ore per year and can produce 28,500 tonnes per year of nickel in ferronickel. The current NI 43-101 mineral resource estimate, as of 30 June 2018, is 55.3 Mt grading 1.45% Ni containing 801,850 tonnes of nickel in the measured and indicated categories, plus 4.9 Mt at 1.4% Ni containing 68,600 tonnes of nickel in the inferred category. The proven and probable mineral reserves are 55.6 Mt at 1.37% Ni.

From 1971 to 2017, the mine produced a total of approximately 106,400,000 tonnes of ore grading 1.42% Ni containing 1.5 Mt of nickel. The total production by Americano Nickel since restarting the operation in 2016 was 37,615 tonnes of nickel contained in 109,266 tonnes of ferronickel, with a total value of \$156 million, as shown in Table 5. Production in the first three quarters of 2018 was 12,060 tonnes of nickel in 33,525 tonnes of ferronickel.

The restart of production by Americano Nickel has been carried out in a sustainable way by lowering costs by modern selective mining methods and the diversification of fuel mix. At the same time the company's employment increased more than five times from 121 employees to more than 900. The company reported in September 2018 that it would start to produce at full capacity for the first time in a decade and would double production to 30,000 tonnes of nickel annually by restarting the second furnace, and employ 2,000 people. This will make Falcondo one of the top five nickel producers worldwide. The most important operational improvement introduced is selective mining using smaller mine shovels of 1.8 m<sup>3</sup> rather than 6 m<sup>3</sup>, which enables the same amount of nickel to be mined in 60% less ore. It has also changed the metallurgical process to eliminate the use of fuel and use less water, thus improving the environment.

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Year	Ferronickel (tonnes)	Nickel in ferronickel (tonnes)
2016 (Apr-Dec)	31,824	9,913
2017	43,919	15,642
2018 (Jan-Sep)	33,523	12,060
<b>Total</b>	<b>109,266</b>	<b>37,615</b>

**Table 5. Production of ferronickel and payable contained nickel at the Falcondo mine, 2016 to September 2018.**

(Source: Falcondo reports; Dominican Central Bank reports.)

The Falcondo nickel laterite deposits are found on the summits of a series of hills and ridges underlain by a belt of serpentinized peridotites of obducted Mesozoic oceanic crust located along the eastern flank of the Cordillera Central. Known as the Loma Caribe belt, it covers a distance of 95 km and varies in width from 100 m at its southeast end, near Santo Domingo, to approximately 6 km wide at its northwest end in the vicinity of La Vega.

Two parallel zones of greenschist-facies rocks are present on opposite sides of the ultramafic belt. On the southwest side are metamorphosed mafic volcanic rocks known as the Duarte Formation and on the northeast is the Maimón Formation that consists predominantly of sericite schists. They are bound on the southwest by the Bonao fault and on the northeast by the Hatillo thrust fault.

The lateritization of the peridotite did not result in a homogenous deposit in either the nickel mineralization or the composition of the gangue. Non-weathered or partially weathered boulders are interspersed throughout the deposits which often limited the depth penetration of both test pits and auger drills during the early sampling programs.

A typical nickeliferous laterite profile is normally comprised by an extremely heterogeneous mixture of six types of zones of ore grade material. These are distinguished on the basis of nickel and iron contents, texture, and proportion of rock fragments. The general sequence from the surface downwards is as follows:

- Zone A: Chocolate - brown limonite
- Zone B: Ochre - brown limonite
- Zone C: Soft serpentinite
- Zone D: Hard serpentinite
- Zone E: Serpentinized peridotite
- Zone F: Unaltered ultramafic rock

The deposits are immature nickel laterites rich in magnesium which require a pyrometallurgical recovery process.



**Figure 5. The Falcondo nickel smelter.**  
(Source: Listin Diario).

### **Las Mercedes bauxite mine**

The Las Mercedes bauxite mine in the Sierra de Bahoruco mountains in Los Pedernales Province, 180 km west of Santo Domingo, made its last shipment in 2016 following notice by the government to close in order to develop tourism in the region.

The Sierra de Bahoruco bauxite deposits were mined by Alcoa Exploration Company, a subsidiary of ALCOA (Aluminium Corporation of America), from 1959 to 1982. Mining was carried out from 25 deposits, the largest of which was Las Mercedes. Between 1987 and 2014 mining was carried out intermittently at Las Mercedes by several companies, namely: Ideal (Dominicana) Mining, Lecanto Materials Company, Sierra Bauxita Dominicana S.A., Almacenes de Granos Dominicanos S.A. and Nova Mining S.A.

The most recent and final phase of mining at Las Mercedes between 2013 and 2016 was carried out by DOVEMCO, S. A. (Dominico-Venezolana Mining & Construction Company), a private Dominican-Venezuelan company with a strategic alliance with Indo Bauxite Mining Corp. (IBMC). It mined initially through a contract between the state and Nova Mining S. A. (2013-14), followed by a contract held by Sierra Bauxita Dominicana S.A. (2015-16), and latterly by a direct contract. DOVEMCO had a sales contract with Chinese company XINFA, the only smelter that can handle the high 20% iron content of the Dominican bauxite, which requires a high temperature digestion process.

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The bauxite was trucked 21 km from the Las Mercedes mine to Cabo Rojo where it was loaded onto lighters and transshipped to Cape size bulk carriers.

The bauxite deposits occur in the terra rossa aluminous laterites developed on karst-weathered, wave-cut terraces in Eocene to Oligocene limestone uplifted to elevations of 372 m to 1,525 m above sea level.

High levels of rare earth elements (REE) were recently discovered in the Las Mercedes bauxite which has attracted a lot of interest including the creation of a fiscal reserve for REE minerals. The average grade of REE, according to preliminary sampling, is between 400 and 5,000 ppm (0.04-0.50%), with an average of 1,200 ppm (0.12%), which makes Las Mercedes one of the richest REE deposits of its type. Rare earth elements have new uses in high technology materials and have been classified as critical raw materials by the European Commission.



**Figure 6. The Las Mercedes bauxite mine in Pedernales.**  
(Source: Listin Diario.)

## **EXPLORATION**

Mineral exploration in the Dominican Republic is carried out mainly by Canadian junior mining companies with venture capital from the Toronto stock exchange. Metals prices remained stable in 2018 but share prices fell in the stock markets and it was a difficult year for the juniors. There was a major decrease in exploration by the junior companies due to continuing delays in approval of exploration, exploitation and environmental permits, by increasing environmental opposition, as well as uncertainty over the proposed new mining law.

The main focus for exploration is for polymetallic deposits in the new Tireo Belt in the Central Cordillera in the western part of the country, following the discovery of the Romero copper-gold deposit. The other exploration areas are around the Pueblo Viejo and Cerro de Maimón mines.

### **GoldQuest Mining Corp.**

#### *El Romero gold-copper project*

The El Romero deposit, located 165 km west of Santo Domingo in the Province of San Juan, is an advanced stage gold-copper project discovered by GoldQuest Mining Corp. of Toronto in 2003. GoldQuest is owned 15% by Agnico Eagle Mines Ltd. of Toronto.

A Pre-Feasibility Study was released in September 2016. This is based on an indicated resource of 20.23 Mt grading 2.67 g/t Au, 0.61% Cu, 0.30% Zn and 4.0 g/t Ag containing 1.7 Moz Au, plus an inferred resource of 3.0 Mt grading 2.03 g/t Au, 0.33% Cu, 0.32% Zn and 2.1 g/t Ag, containing 0.17 Moz Au.

The probable mineral reserve is 7.03 Mt grading 3.72 g/t Au, 0.88% Cu and 4.33 g/t Ag. This is based on an underground mine processing 2,800 tonnes per day. The NPV (5% discount) after tax is \$203 million, the IRR after tax is 28%, the AISC is \$595 per ounce of gold equivalent, and the pre-production capital cost is \$158.6 million.

The mineral resources at El Romero occur in a 1 km long deposit that trends north-west. It is up to several hundred meters wide and is thickest towards the core. The El Romero South deposit, 950 m south of El Romero, is a flat lying tabular body which is tens of meters thick. The deposits are hosted by the Upper Cretaceous Tireo Formation volcanic rocks and limestones. The mineralization is interpreted to be intermediate sulphidation epithermal in style, however an alternative interpretation is that it represents the gold-rich feeder zone of a volcanic-hosted massive sulfide system (VMS).

Site work at El Romero has been inactive for over three years since November 2015 when the company applied for a mining exploitation concession. Once it is granted an

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Environmental and Social Impact Assessment (ESIA) has to be carried out in order to apply for an Environmental License to operate an industrial operation. On 22 January 2018, the Minister of Energy and Mines announced that the company had fully complied with all the requirements for an Exploration License. It awaits the signature of the President. By a quirk of the mining law, no exploration or environmental work can be carried out until the exploitation concession is granted, resulting in a valuable loss of time, momentum, community support and shareholder support. Frustrated at the bureaucratic delay, GoldQuest announced in October that it was shutting down its activities and laying off most of its staff in the country, and would invest its capital in other, mining-friendly countries.

On 26 March 2018 it was reported in the local press that a judge in San Juan de la Maguana ordered that the company cease activities at the El Romero Project after an injunction was brought against the company by the Dominican College of Lawyers San Juan Branch and the United Southwest Committee for Water and Life. Upon review of the written decision, the company's legal counsel stated "The judgment simply restates the existing legal requirements under present Mining Law 146 and hence has no effect on the operations of the Company or its plans going forward. The judgment only requires the Company to obtain the required permits to move into the exploitation phase, which was already the case." Furthermore, the injunction is limited to the Exploitation Permit Application for the El Romero Concession and does not relate to the company's exploration licenses.

### *Cachimbo gold-copper project*

GoldQuest announced the discovery of the Cachimbo deposit (originally called Loma Viejo Pedro), 20 km south of Romero, San Juan Province, in January 2017.

The discovery hole TIR-16-09 intersected three horizons of high grade precious and base metals in a volcanogenic massive sulfide zone within a 60 m interval from 51-111 m depth:

- Top horizon of 4.6 m @ 4.5 g/t Au, 73 g/t Ag, 3.5% Zn and 0.5% Cu from 53 m.
- Main horizon of 15.2 m @ 5.3 g/t Au, 31 g/t Ag, 4.2% Zn, 0.4% Cu and 0.3% Pb from 70 m depth, including 4.9 m @ 13.8 g/t Au, 74 g/t Ag, 11.8% Zn, 1.1% Cu and 0.7% Pb.
- Lower horizon of 12.0 m @ 0.6 g/t Au, 11.9 g/t Ag, 0.33% Zn from 99 m depth.

Further drilling was carried out in 2017 and the final results were released on 30 January 2018 (holes TIR-17-46 to TIR-17-52). Highlights of the new results include hole TIR-17-50, a step-out to the east of previous drilling, with 148.1 m @ 0.82 g/t gold from 55.60-203.70 m, containing sub intervals of 5.05 m @ 8.4 g/t gold and 20.3 m @ 1.74 g/t gold. No exploration was carried out in 2018.

Mineralization at Cachimbo occurs in volcanic rocks capped by limestone similar to Romero, and is described as VMS-style.

***Las Animas polymetallic deposit***

GoldQuest also owns the Las Animas massive sulfide deposit in the Central Cordillera, located 105 km northwest of Santo Domingo in La Vega Province. It has an indicated resource of 1.0 Mt grading 2.40% Cu, 2.81 g/t Au, 49.58 g/t Ag and 2.57% Zn, plus an inferred resource of 0.44 Mt grading 2.56% Cu, 1.68 g/t Au, 36.91 g/t Ag and 4.67% Zn (2012). No work was carried out this year.

**Unigold Inc.**

Unigold Inc. of Toronto's Candelones Project in the Neita concession, located 40 km northwest of Romero and 210 km west of Santo Domingo in Dajabon Province, has inferred resources of 39.5 Mt grading 1.6 g/t Au containing 2.0 Moz gold. The company is owned 14.8% by Osisko Gold Royalties Ltd. of Montreal.

Unigold announced on 22 May 2018 that the General Mining Directorate had finally granted the new Neita Fase II exploration concession of 21,031 ha for 3 years. This replaces the Neita concession which expired on 7 March 2017. The company received the environmental license which allows it to resume exploration on 2 November. The exploration plan is to focus on increasing the current mineral resource of the Candelones Project by evaluating the near surface oxide mineralization at the Candelones Main and Connector Zones; and completing a follow up induced polarization survey targeting the high grade, gold-copper massive sulfide mineralization discovered at the Candelones Extension deposit in 2016. Unigold has not carried out any exploration since 2016.

**Precipitate Gold Corp.**

Precipitate Gold Corp. of Vancouver, which is owned 33.37% by Strategic Metals Ltd., is exploring the Juan de Herrera project in the Tireo Gold Belt adjacent to GoldQuest, San Juan Province, where it has a significant land position.

The company made a discovery at the Ginger Ridge zone in 2014 with drill intersections in Hole 5 of 21.15 m @ 0.62 g/t Au and 0.12% Cu from 25.0 m depth, and 18.0 m @ 4.5 g/t Au from 84.0 m, including 5.0 m @ 13.4 g/t Au, all within a 98.0 m long zone of disseminated and semi-massive to massive pyrite interpreted as a gold-rich VMS system. However, the results of ten follow-up holes completed in early 2017 returned low grades of gold, with a best result of 27.43 m @ 0.49 g/t Au.

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The Ginger Ridge East Zone was tested by 8 short holes later in the year, with highlights of 10.47 m @ 0.83 g/t Au and 0.20% Zn (EA17-03) and 3.04 m @ 2.1% Zn, 0.2% Cu (EA17-06).

The company carried out extensive soil geochemistry (17,400 samples) in 2017 and early 2018, and used portable XRF to analyze for Cu, Pb and Zn, which, together with previous rock and trench sampling and geophysics, identified gold-copper targets at the Southeast and South Jengibre zones located 6 km SE of the Ginger Ridge zone. The latter is just south of GoldQuest's Jengibre project.

Precipitate Gold bought 100% of Everton Resources' three properties surrounding the Pueblo Viejo mine, totaling 9,583 ha, it announced on 24 October 2018 and closed in mid-January 2019. It is a paper transaction with payment of 7 million Precipitate Gold shares, which gives Everton an interest of about 8.5% of the enlarged share capital, and CDN\$25,000 in cash.

The main asset is the Cabirma del Cerro (ex-Ampliacion Pueblo Viejo) property covering the lithocap on the west side of Pueblo Viejo. The second concession is Mermejál on the east side of Pueblo Viejo. Together with one other concession already owned by Precipitate Gold and two concession applications made by them, these form a block of five concessions totaling 9,983 ha surrounding the west, north and east sides of Pueblo Viejo which they named Pueblo Grande.

The third concession acquired is Arroyo Carpintero (ex-Pontón), of 3,250 ha, located 27 km east of Pueblo Viejo. Drilling of the Majagual Hill target in 2017 gave a best intersection of 134 m @ 0.27% Cu and 0.197 g/t Au from surface, including 27.10 m @ 0.46% Cu and 0.33 g/t Au.

The Cabirma del Cerro concession includes the La Lechosa massive sulfide deposit with historical drill intersections including 27.0 m at 2.46 g/t Au and 26.7 g/t Ag, 7.56 m at 2.56 g/t Au, 47.2 g/t Ag and 4.4% Zn, and 10.5 m at 2.29 g/t Au, 65.0 g/t Ag and 3.4% Zn. La Lechosa has an inferred mineral resource of 0.979 Mt @ 0.86 g/t Au and 17.7 g/t Ag in oxides, and 1.225 Mt @ 0.20 g/t Au, 5.0 g/t Ag and 0.57% Cu in sulfides (2011).

The Mermejál concession includes the Tres Bocas massive sulphide deposit with a drill intersection of 10.6 m grading 2.96 g/t Au, 104.9 g/t Ag and 9.4% Zn.

### **Everton Resources**

Everton Resources Inc. of Toronto sold its three projects in the country to Precipitate Gold in October as described above.

## **CONCLUSION**

The Dominican Republic is a favorable country for mining and exploration, with stable, pro-business politics and a stable economy with one of the highest growth rates in Latin America. The Caribbean nation is a major gold producer and also produces ferronickel, copper, silver and zinc, while bauxite production has recently stopped. The country is now the biggest minerals producer in the Caribbean region. Mining is the second most important economic activity and dominates the export sector. The country is a case study of the development of a balanced economy of modern mining co-existing with tourism, free trade assembly zones and the traditional agricultural sectors such as sugar cane and tobacco. The biggest challenges facing the industry are increasing environmental opposition, and delays in awarding exploration and mining licenses, and environmental permits. This led to a major decline in exploration in 2018, while at the same time the existing mining operations were implementing major expansions of production.

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