Dramatic Improvements at Margajita River at Pueblo Viejo Gold Mine
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Environmental Manager
Overview

- Background
- Legacy of Environmental issues
- ETP Overview
- Dramatic Results
Location
Location
BARRICK

Pueblo Viejo Gold Mine
Background
PV Background & History

- First Mining Camp of the new world (Circa 1510-1530)

- Rosario Dominicana operated from 1975 -1999

- In 2001, the DR Government called for an international tender of PV Mining rights and to remediate environmental liabilities

- Barrick Gold Corporation assumed Pueblo Viejo Project responsibilities in 2006 (Placer Dome)
Rosario Dominicana operated for 25 years.

Poor mining practices derived in acid drainage contamination of nearby land and streams.

Remediation of historical contamination is responsibility of DR State.
Legacy Environmental Issues
Legacy Environmental Issues
• **Margajita Stream and Hatillo Reservoir** have been most negatively impacted with ARD and heavy metals

• Under SLA of Mining Rights, Barrick committed to remediate some historically impacted areas.

• Other areas remain under DR Government’s responsibility (PVDC committed **$75 M** to fund some DR Government remediation costs).
Pueblo Viejo Dominicana Corporation (PVDC)
Joint Venture Barrick 60/40 Goldcorp
2006 - Present
Background & History

$3.7B in mine construction capital

+26 years mine life

16M oz reserves

0.813M oz of production in 2013

1.0-1.1 M oz of production in first five years
Collection and Treatment of Mining-Influenced Water
Division of Responsibilities
Proposed DR State Water Mgmt.
PVDC Water Balance

Capacidad de captación de agua de lluvia en Hatillo: 137,520 m³/hr.
PV capta: 2,255 m³/hr
PV descarga: 964 m³/hr
Diferencia: 1,291 m³/hr

Esta diferencia representa menos del 1% de la captación de Hatillo.

En este escenario se "almacena" solución en El Llagaal como prevención de la temporada seca.
Capture & Controlled ARD
Water Consumption (m3/hr)

- Hatillo: 2500
- ARD1: 300-1700
- ARD3: 24-485
- Reclaim W: 1800
- Margajita: 1581
ETP designed as a standard High Density Sludge (HDS) plant.

Dissolved metal sulphates and acid are collected into the CCD overflow, and subsequently neutralized and/or precipitated in a high density sludge (HDS) process using limestone and lime to precipitate metals as metal hydroxides.
High Density Sludge (HDS) Process

- Influent
- Limestone
- Lime
- Lime/Sludge Mix Tank
  - pH 9.0 – 9.5
  - 2-3 minute Retention Time
- Flocculant
- Clarifier
- Effluent
- Sludge

M

2-3 minute Retention Time
• Water is pumped to two limestone reactor tanks (40 ft Diam) and the slurry overflows into lime reactor tanks (36 ft Diam)
  • All tanks equipped with mechanical agitators
Overflow lime tanks gravity flows to a conventional clarifier (150 ft)
Solid/liquid separation
The clarifier tank will be used to separate the treated water from the treatment sludge
ETP Discharge to Margajita

ETP effluent after solid/liquid separation in the clarifier gravity flows to the final discharge point. Environmental compliance samples taken.
Positive Effects

THE METAMORPHOSIS of the Margajita River
The ETP plant is removing heavy metals to acceptable concentrations (As, Cr, Cu, Fe, Pb, Ni, Zn)

Also lower TSS and increases pH
Water quality
Water quality

Copper

Year


Copper / Cobre, mg/L

16.6 22.1 15.7 10.2 22.7 0.5 1

0 5 10 15 20 25
Water quality

![Arsenic Concentration Graph]

- **2004**: 12.5 mg/L
- **2005**: 0.00005 mg/L
- **2006**: 15.3 mg/L
- **2007**: 9.81 mg/L
- **2008**: 5.8 mg/L
- **2011**: 2.4 mg/L
- **2012**: 0 mg/L
- **2013**: 1 mg/L

The target arsenic concentration is shown by the red line. The values indicate a significant reduction over the years, with a notable peak in 2006.
Water quality
Water quality
# Water quality

## 2014 ETP Discharge (January - July)

<table>
<thead>
<tr>
<th>Parameters (mg/L)</th>
<th>DR Standards</th>
<th>Average</th>
<th>Range (Min – Max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>6-9</td>
<td>8.47</td>
<td>7.6 - 9.19</td>
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<tr>
<td>Copper (Cu) mg/L</td>
<td>0.5</td>
<td>0.0202</td>
<td>&lt;0.0003 - 0.1696</td>
</tr>
<tr>
<td>Arsenic (As) mg/L</td>
<td>0.1</td>
<td>0.0071</td>
<td>&lt;0.0003 - 0.0433</td>
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<td>Iron (Fe) mg/L</td>
<td>3.5</td>
<td>0.3539</td>
<td>&lt; 0.001 - 0.541</td>
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<tr>
<td>Zinc (Zn) mg/L</td>
<td>2</td>
<td>0.1225</td>
<td>&lt;0.003 – 0.586</td>
</tr>
</tbody>
</table>
Hondo Stream Positive Impact

Before

After
Margajita River Positive Impact

Before

After
Positive Impacts Margajita

- MARGAJITA RIVER BEFORE
- MARGAJITA RIVER NOW
Life back at Margajita River
Life back at Margajita River
Life back at Margajita River
Positive Impacts Hatillo Reservoir

Bringing Nile Tilapia to the Hatillo Reservoir
In 2007, Hatillo fishermen suffered a setback in their hopes on a fish farming project which they expected to attain social and economic growth for their families.

Due to large storms, high sediments and poor water quality, facilities were lost and project was abandoned.
Positive Impacts Hatillo Reservoir
In 2013, Barrick PVDC supported the Hatillo community to re-initiate a fish farm project.

Recently, fishermen are seeing good results from first harvest. They expect to get about 8100 lbs/year of fish to market in nearby communities.

108 families now have a chance to improve their life and get their dreams realized.
Positive Impacts Hatillo Reservoir
Sustainable Mining focus in development of communities, people and the environment