SMART SURVEYORS FOR LAND AND WATER MANAGEMENT

TECHNIFICATION OF OPEN PIT EXPLOITATION THROUGH TOPOGRAPHY AND IMPLEMENTATION OF MINING PLANS IN MINAS BELENCTO - MONJAS - SAN ANTONIO
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Key words: Plan implementation, Geology and Mining, Photogrammetry, Women in mining topography (Gender diversity)
HOW DO YOU GET TO THIS RESULT?

SAN ANTONIO MINE STERILE DISPOSAL AREA IN RESTORATION

BELENCOITO MINE STERILE DISPOSAL AREA IN RESTORATION
The mining exploitation under study is located in the Republic of Colombia; Boyacá department. There are three mining titles:

- San Antonio Title 14665 Mine with an area of 659 Hectares
- Belencito Title 11387 Mine with an area of 692 Hectares
- Monjas Title 911-15 Mine with an area of 117 Hectares
## MINING PLANNING PROCESS

<table>
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<tr>
<th>Input</th>
<th>Activity</th>
<th>Product</th>
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| - Geological model (Lithology, Structure, Geometry, Profile)  
  - Block Model  
  - Updated topography with location infrastructure and drains, connections  
  - Area Restrictions: Withdrawals, Reserve Zones and Protection  
  - Licence limit, non-property  
  - Geotechnical studies: Height, width, basis, FS  
  - Minimum areas of work fronts | 1. Mine Design | - Definition final area of exploitation  
  - Geometry work benches and end slopes  
  - vein roads |
| - Block model  
  - Cutting factor (% Composition)  
  - Cost Movement Raw material and ore | 2. Booking calculation and RD | - Quantity and quality of bookings  
  - Location of booking blocks  
  - Convertible ratio |
| - Annual raw material requirements, increases  
  - Required Quality (Modulus)  
  - Type and capacity equipment available | 3. Mining Planning | - Area of sectors to be exploited  
  -40% sequence: CRF and stantant volumes to be extracted annually in each sector, quality (Tables-Maps)  
  - Back filling sequence  
  - Equipment requirements |
| - Topography  
  - Natural drains  
  - Visibility of stances to be removed  
  - Character: Material (FL, FC, Avg. Royt, density) | 4. Dump design | - Dump sites  
  - Boot geometry  
  - Capacity and its dumps  
  - Filling sequence |
| | 5. Infrastructure Location. | - Infrastructure location plan: Workshops, fuels, Crushers, buildings,3D model |
| | 6. Design Auxiliary Works | - Geometry works  
  - Design drains, pit channels and dumps  
  - Location loggones  
  - Pumping system |
| | 6. Closure and recovery plan | - Water layer storage  
  - Recovery sequence exploited areas and dumps |
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INPUT INFORMATION

OUTPUT INFORMATION

TOPOGRAPHY

3DM
MINING DESIGN
TOPOGRAPHICAL REPLANTING IN THE FIELD
Geometric cut terraces, slopes with design angles and bench heights according to geotechnics.
Geometric conformation of sterile disposal area and subsequent geomorphological restoration.
Before and after

Geometric conformation of area of disposition of steriles preserving heights and angles established in the design.
Geometric cut with heights and widths of berms established in the design.
Slopes with stable angles, floors on one level. Slope heights according to design.
Implementation of access and ramp designs with widths and slopes according to the standard.
Design of terraces of constant height and berms in a single nibe.
CONCLUSIONS

➢ It is possible to demonstrate the technology in a mine through topographic control, well-defined berms and slopes and developed ore cloaks.

➢ Topography has become a very dynamic profession, it must incorporate more knowledge into daily applications in addition to the essence of the surveyor is required to have a broader field of action.

➢ The technology of mining operations is necessary to be able to guarantee the extraction of minerals, it must be at the forefront of technology.

➢ Between different Teamworks with people with different capacities allows to achieve success in any project, this with a clear guideline established in a previous planning.

➢ Topography is an indispensable tool in the implementation of a mining planning, since it allows to make precise cuts and fills, rethink established alignments and comply with the monitoring and production indicators.

➢ An unsentweight mine cannot guarantee its long- or medium-term existence.

➢ Untracked topographical mining becomes a mine with unsafe operations.

➢ A No Topography mine will generate arbitrary geometries, even though a Mining planning has been established, it will not be able to reach the objectives set with the design data.
GRACIAS

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