CODELCO Orgullo de Todos | Gabriela Mistral

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MINEPLANNING2013

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MINE PLANNING FOR AUTONOMOUS HAULAGE SYSTEM

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GECAMIN Conferencias para la Minería

EXECUTIVE SUMMARY

- Codelco Chile, Gabriela Mistral in it´s 8th Division operates the largest fleet of autonomous trucks in the world. A fleet of 17 Trucks Model 930E4 AT, Brand Komatsu, allowing to transport 210,000 ton / day of materials.

- The positive development of its performance in its five years of operation of the truck AHS - Performance and Effective Utilization - has allowed to continue its decision by operating the site named Gabriela Mistral to exhaustion of reserves.

GENERAL BACKGROUND

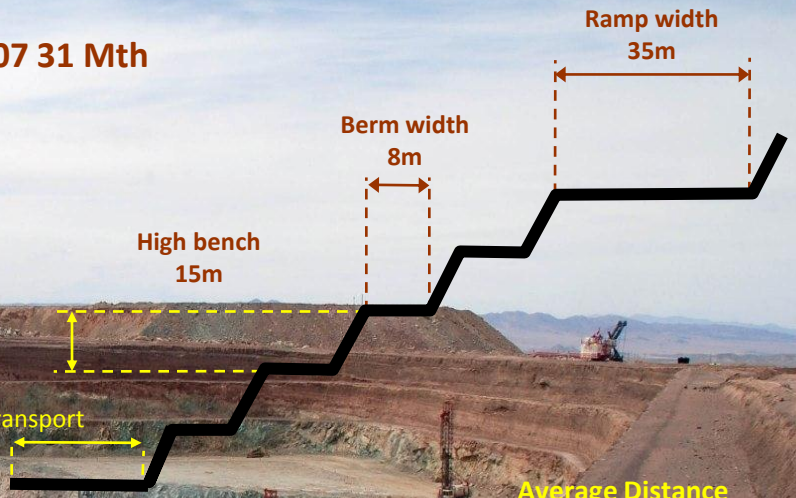
Porphyry copper deposit, its main mineralized body is oxidized in a mineralized zone, mainly Chrysocolla, Black and Atacamite oxides in low presence, deposited under sterile coverage of post mineral gravels with an average thickness of 50 m.

- Reserves of 620 millions/tons, oxides
- Average grade of 0.41% CUT and 0.29% CUS, for a cutoff of 0.2% of CUT.
- Acid fuel consumption of 25.5 kg / t.
- Cells between 6 - 7,5 m with P80 12.7 mm (1/2 ").
- Metallurgical extraction averaged 77.2%
- Potential production capacity of 170 ktpa of fine copper in cathode electro-obtained.
- Mina Movement 76 Mton / year
- Lifespan until 2024

MINE PROCESS

Pre-stripping: Ago-06/Jul-07 31 Mth

Mine
Lenght : 2.700 m
Width : 1.700 m
Prof. : 290 m



Distance Media Crushing
Primario 3,2 Km.

Average Distance
Botaderos 3.1 Km.

MINERAL
620 Mts – 0,41 % CuT
CRISOCOLA - ATACAMITE- BLACK OXIDE


TRUCK AHS 330tc
17 unidades


SHOVEL 73 yd^3
2 unidades


DRILLER
4 unidades


FRONT LOADER
2 unidades


TRUCK TIRE
5 unidades


TRUCK Oruga
3 unidades


BACKHOE
1 unidad

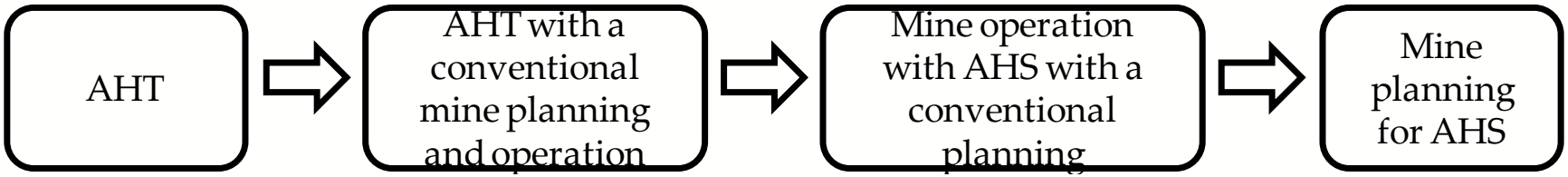

WATER TRUCK
3 unidades


MOTORNIVELATOR
3 unidades

METHOLOGY

- The operation of the AHS CAEX, and their interaction with the rest of the unit operations of the mine, mine planning states must incorporate variables of technology and performance. Achieving an Operation Planning for an Autonomous Trucks.

- Evolution of the Operation and Planning

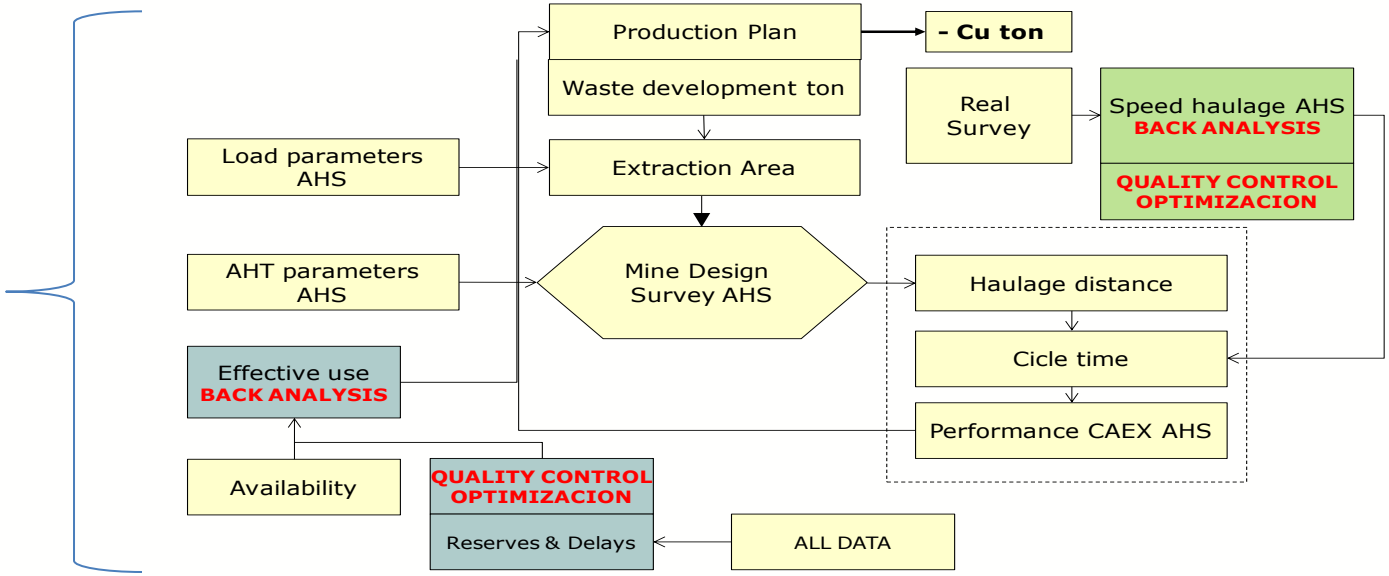


Layout of the Mine.
Dimensional survey routes, allows to obtain widths and profiles that maximize performance.
Curves consider turning radios.
Speed control.
Continuous improvement of the mine design.

AHS OPERATIVE PLANNING

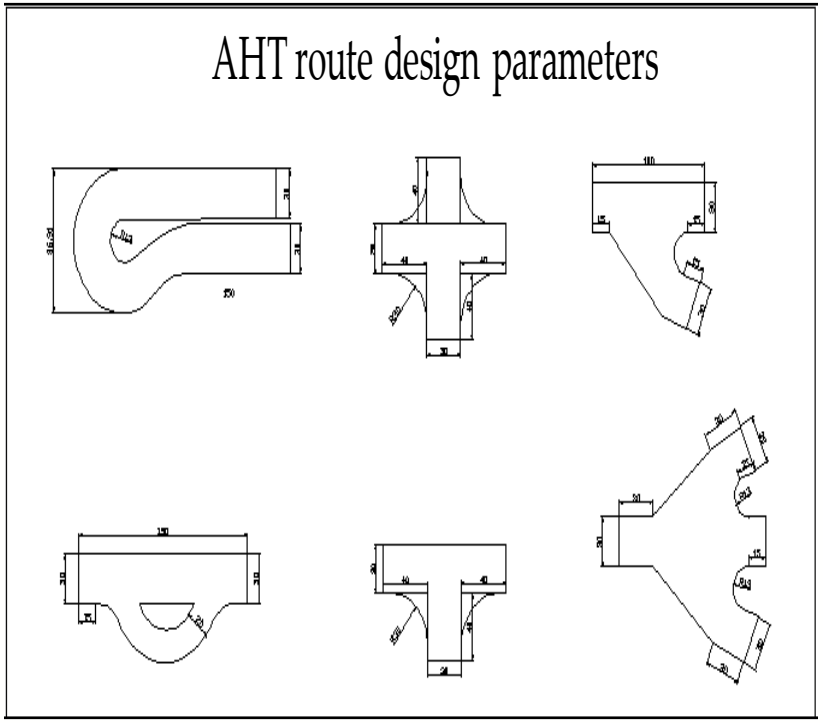
- The autonomous trucks planning is performed by using deterministic inputs these are: Availability, Delays AHS, Performance, Speeds that have an array of forms of calculation. Are assessed weekly according to the layout planned to transport the materials, because the truck's performance is directly related to the mining circuit and its implementation in the field.

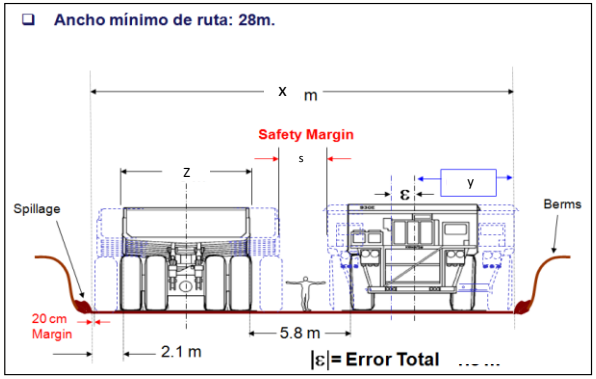
Simplified Flow Chart

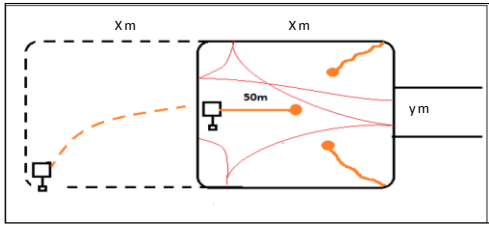


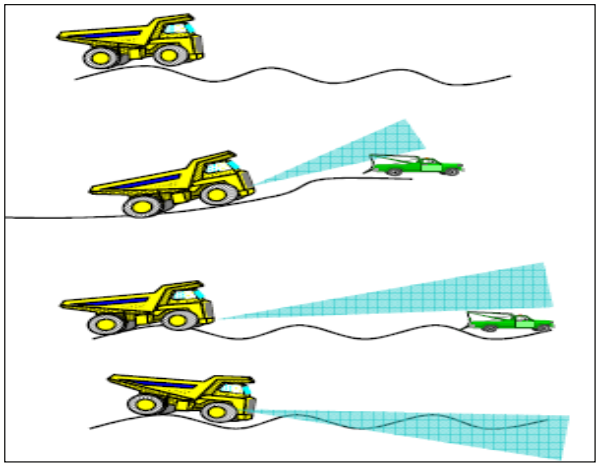
AHS OPERATIVE PLANNING

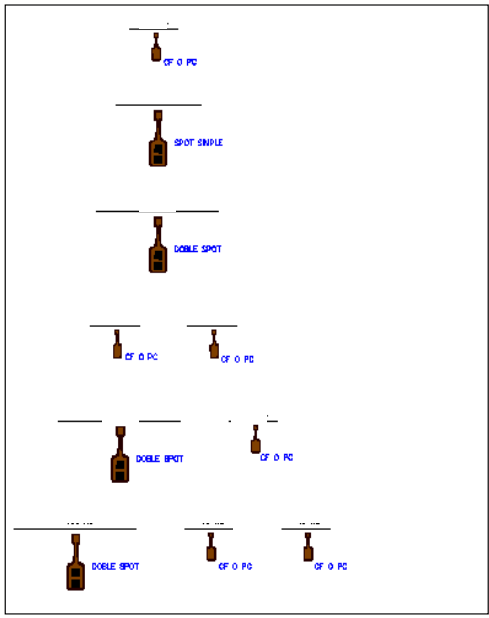
- DESIGN VARIABLES





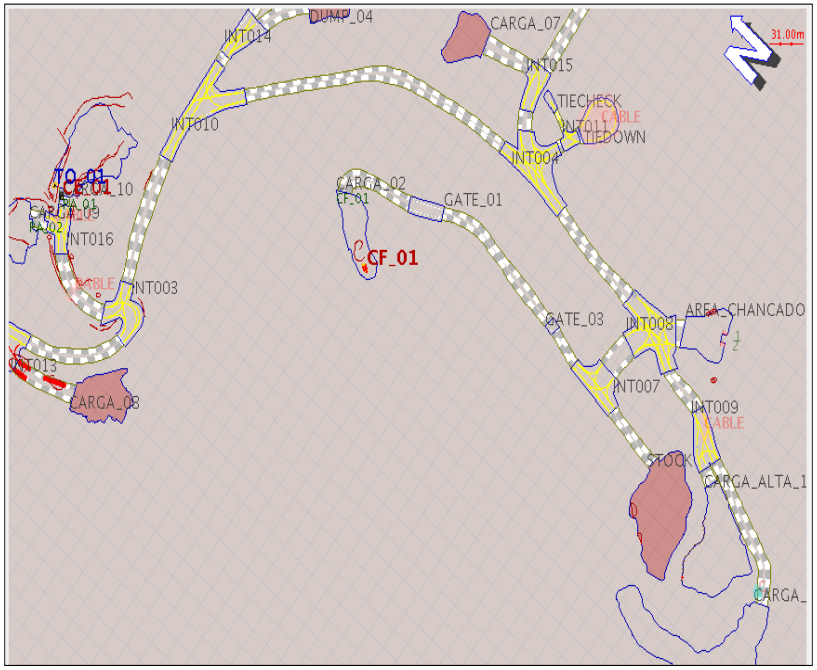


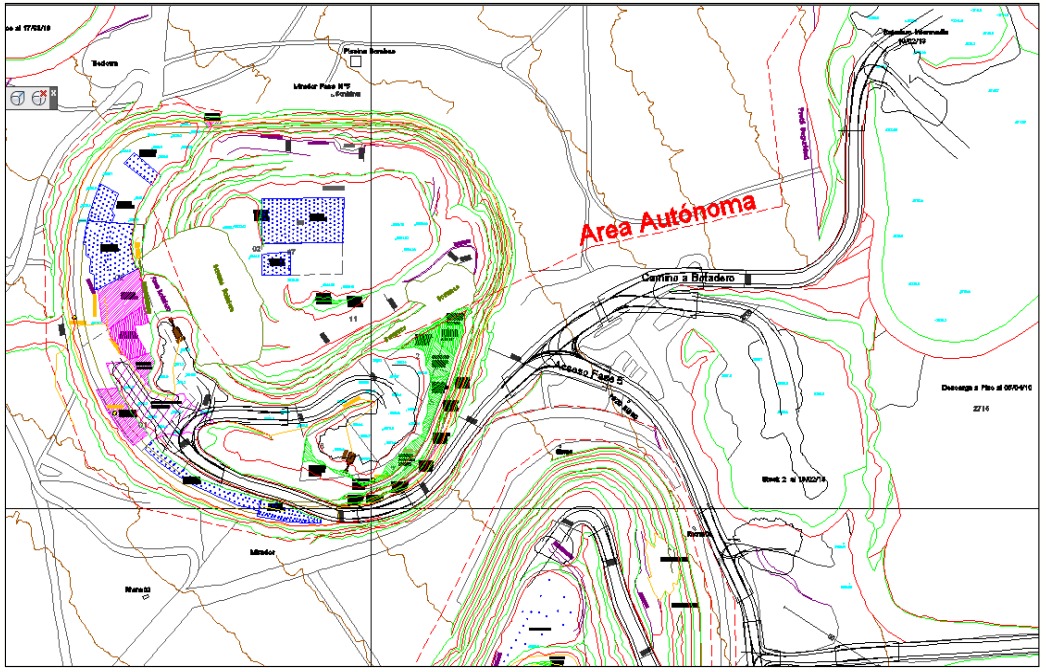




AHS OPERATIVE PLANNING

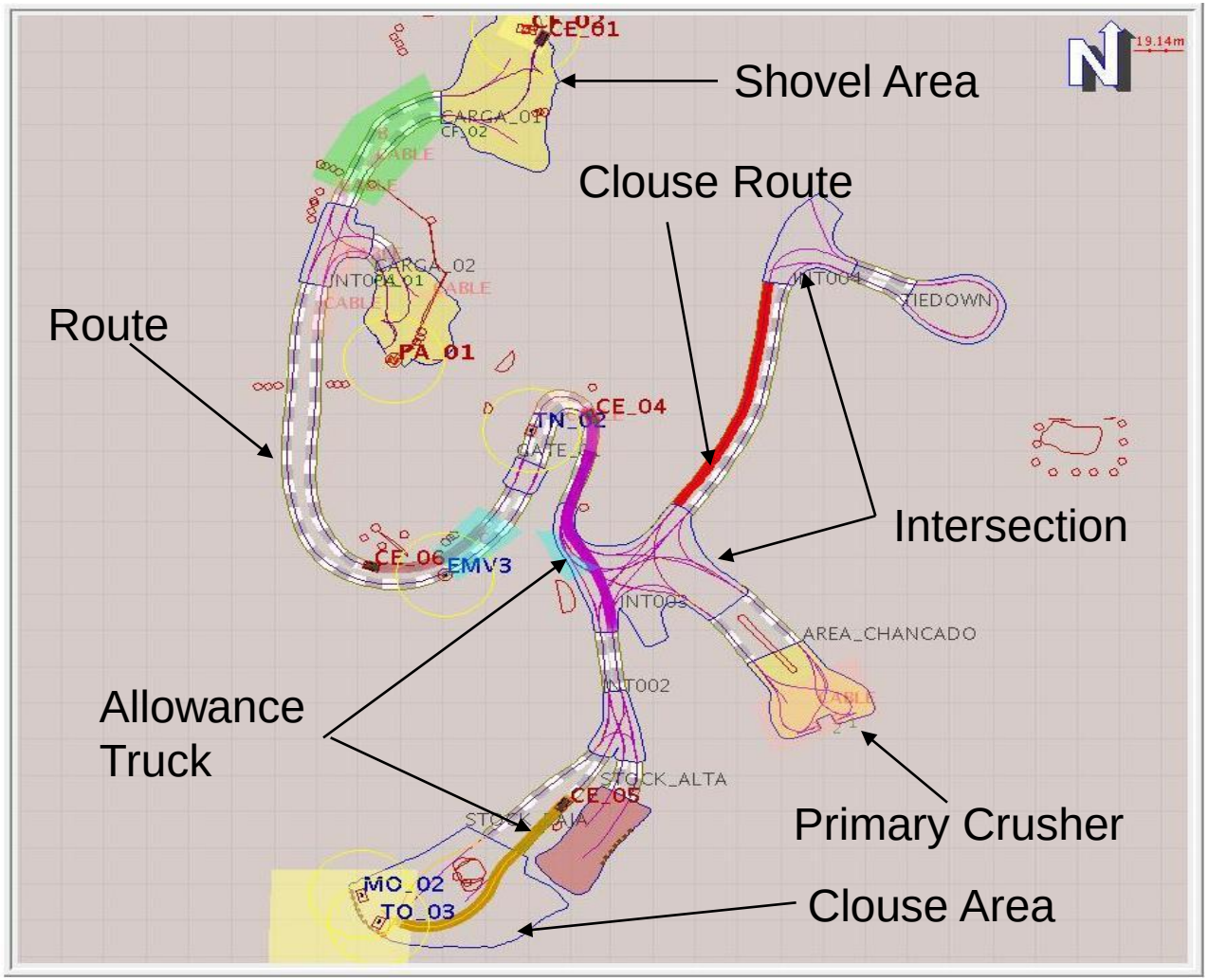
- Autonumous Truck Transport Routes





AHS OPERATIVE PLANNING

OPERATING SYSTEM OF TRANSPORT ROUTES



CONCLUSIONS

- The production associated with trucks transporting materials is directly related to autonomous mine design, and implementation in the field. Incorporate technology variables, the understanding of this and form a multidisciplinary team should be considered.
- The back analysis of the results allows us to understand the behavior of the truck in different operating scenarios.
- The analyzes allows timely to take decisions regarding the correct mine in the different designs to meet production commitments.

FUTURE STEPS

- Stochastic variable Incorporation in mine planning, which allows to obtain a better accurate production based on different scenarios or mine layout.

- Incorporation of AHS events that allows a better accurately plan the use of autonomous trucks based on different designs of the mine.

- Dynamic assignment of autonomous trucks.