

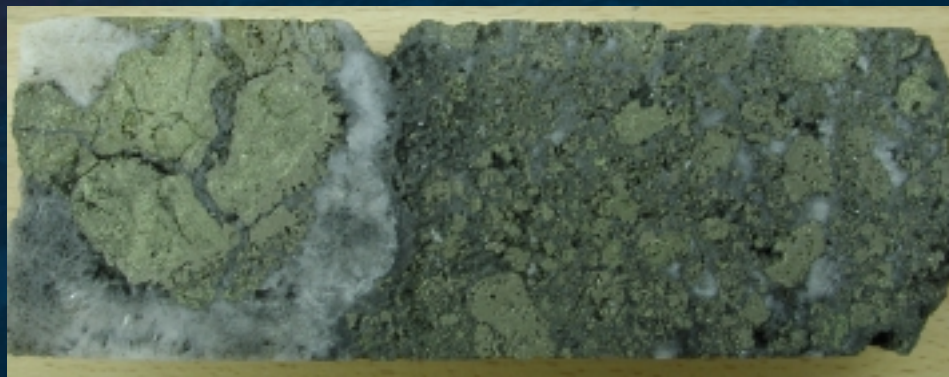
Mining on land vs the  
seafloor - **a case study.**  
Antamina Mine  
comparison

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Submission to ISA workshop  
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# Nautilus Seafloor Project

- 5.5% Cu, 12% Zn, 8g/tAu
- Mine 2mtpa
- 190m lbs Cu, 380m lbs Zn pa
- 345mlbs Cu (equivalent)
- Capex US\$310m
- Opex C1 39c/lb (exclude Gold credits)







# Comparison to Antamina



# Antamina Mine

The Antamina mine, located at more than 4,300 meters above sea level in the Andes mountains, 385 kilometres north of Lima in Peru, is the one of the largest zinc and copper producers in the world.

Teck Cominco, Noranda  
BHP-Billiton and  
Mitsubishi Corp.

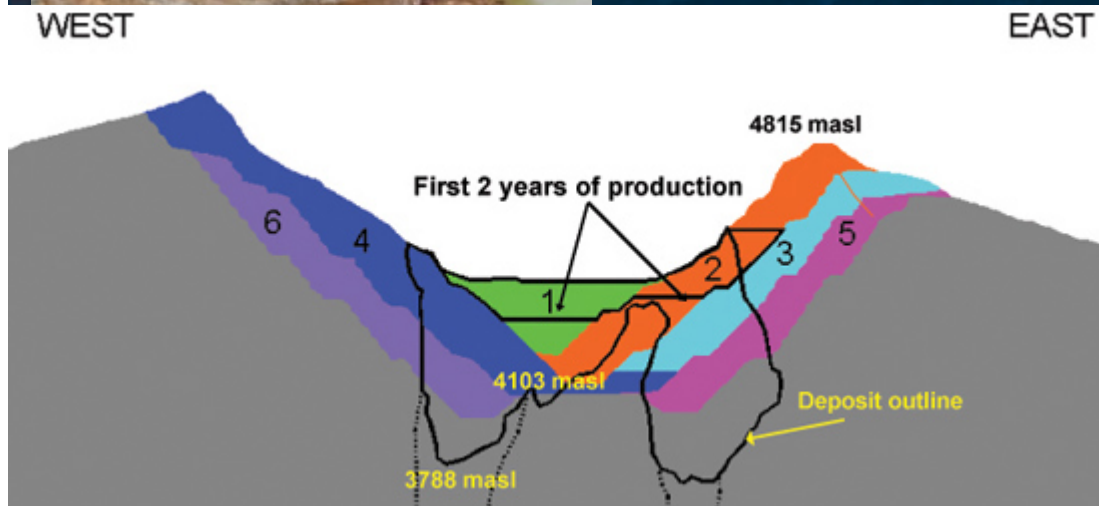




# Antamina 110mt of mountain pre-stripped & lake drained.



Drill/blast hard rock, 112mt waste in 2003,  
1,400 workers, 550mt tailings/slimes in 20yrs





# Overview

- **Antamina**
  - 1.23% Cu, 1.03%Zn
  - 675m lbs copper (avge)
  - 625m lbs zinc (avge pa)
  - 930m lbs Cu equivalent
- BHPBilliton owns 33.7%
- 313m lbs Cu equiv BHP
- **Nautilus**
  - 5.5%Cu, 12%Zn
  - 190m lbs copper (avge)
  - 380m lbs zinc (avge pa)
  - 345m lbs Cu equivalent
- Nautilus total is 37% of Antamina's copper
- 345m lbs Cu equivalent  
**More copper than BHP's share of Antamina**



# Costs

- **Antamina**
  - 110mt pre strip 4 years
  - \$2.26 billion Capex
- **Nautilus (2.7 times)\***
  - No pre strip - cash flow
  - \$833m Capex
  - 36% of the capital cost!!
  - C1 39c/lb (exclude gold)
  - \* Match full scale Antamina equiv. copper production





# Mine, Mill Operations

- **Antamina**

- Mine built at 4,300m asl
- Mill built at 4,300m asl
- 112mt (2003) waste
- 26mt Ore pa
- 17,000 tonnes/hour
- Drill/Blast
- 4 Electric shovels
- 43 Diesel dumpers
- 2,000m tunnel to mill
- 300 km pipeline
- Ship concentrates o'seas

- **Nautilus (2.7 times)\***

- "Mine" built in shipyard
- Mill built on coast - access
- No overburden
- 5.4mt Ore pa
- 1,000 tonnes/hour
- No drill/blast
- 5 continuous machines
- Semi submersible platform
- 2,000m riser pipe
- Ore carriers to concentrator
- Ship concentrates overseas

- \* Match full scale Antamina equiv. copper production





# Environmental

- **Antamina**

- 110mt pre strip 4 years
- 32ha lake drained
- 112mt (2003) waste
- 550mt slimes/tails
- 1,400 staff
- 100MW electricity
- 43 Diesel dumpers

- **Nautilus (2.7 times)**

- No pre strip - cash flow
- -
- No waste dumps
- 95mt slimes/tails STD (redox)
- <500 staff
- 40MW electricity
- No Diesel mining



# Mine at 4,500mabls or 2,000mbsl?



- **<40% of capital**
- **39c/lb Cu, C1 Opex**
- **higher grade**
- **less waste, enviro**
- **Higher exploration success**
- **No land claims**





We all know we will  
mine the seafloor one  
day.



Why not today?

What stops us?

Costs? **No!**

Technology? **No!**

