

# **Characteristics of High Sulphidation Epithermal Gold Deposits of the Mio-Pliocene Age Volcanic Belt, Chile and Argentina 2018**

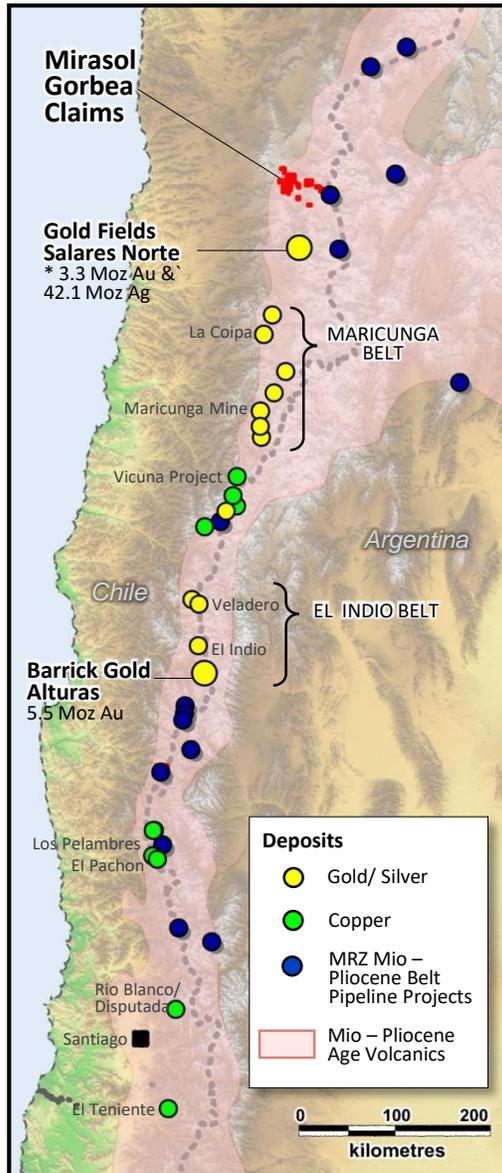
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Stephen Nano, a “Qualified Person” under National Instrument 43-101, has reviewed and approved the scientific and technical information in this presentation.

# Characteristics of High Sulphidation Epithermal Gold-Silver Discoveries Mio-Pliocene Age Mineral Belt, Chile/Argentina



The following presentation has been compiled by Mirasol Resources from website publications, scientific journals and Mirasol's in field exploration experience.

This compilation presents a summary of the geological and exploration characteristics of some key Mio-Pliocene age (23 to 2.5 million year old) High Sulphidation Epithermal (HSE) gold-silver deposits of the Chile – Argentine Cordillera, including information on the recent large Salares Norte and Alturas discoveries.

The Gold Fields Salares Norte and Barrick Gold Alturas projects represent examples of a new wave of discovery of large-scale, bulk-minable, oxide gold-silver deposits that have been identified in recent years in the Mio-Pliocene age volcanic mineral belt.

Mirasol Resources is actively exploring for these types of large oxide HSE gold deposits through the Gorbea Gold Belt and through Mirasol's Atacama-Puna project generative program in Chile and Argentina.

The objective of this presentation is to provide Mirasol's investors with information on geology and exploration signatures of this deposits class, giving context to our exploration program and results.

For more information on Mirasol's exploration results please refer to the website and press releases.

# Geological and Geophysical Characteristics of Large HSE Gold-Silver Deposits, Mio-Pliocene Belt, Chile/Argentina

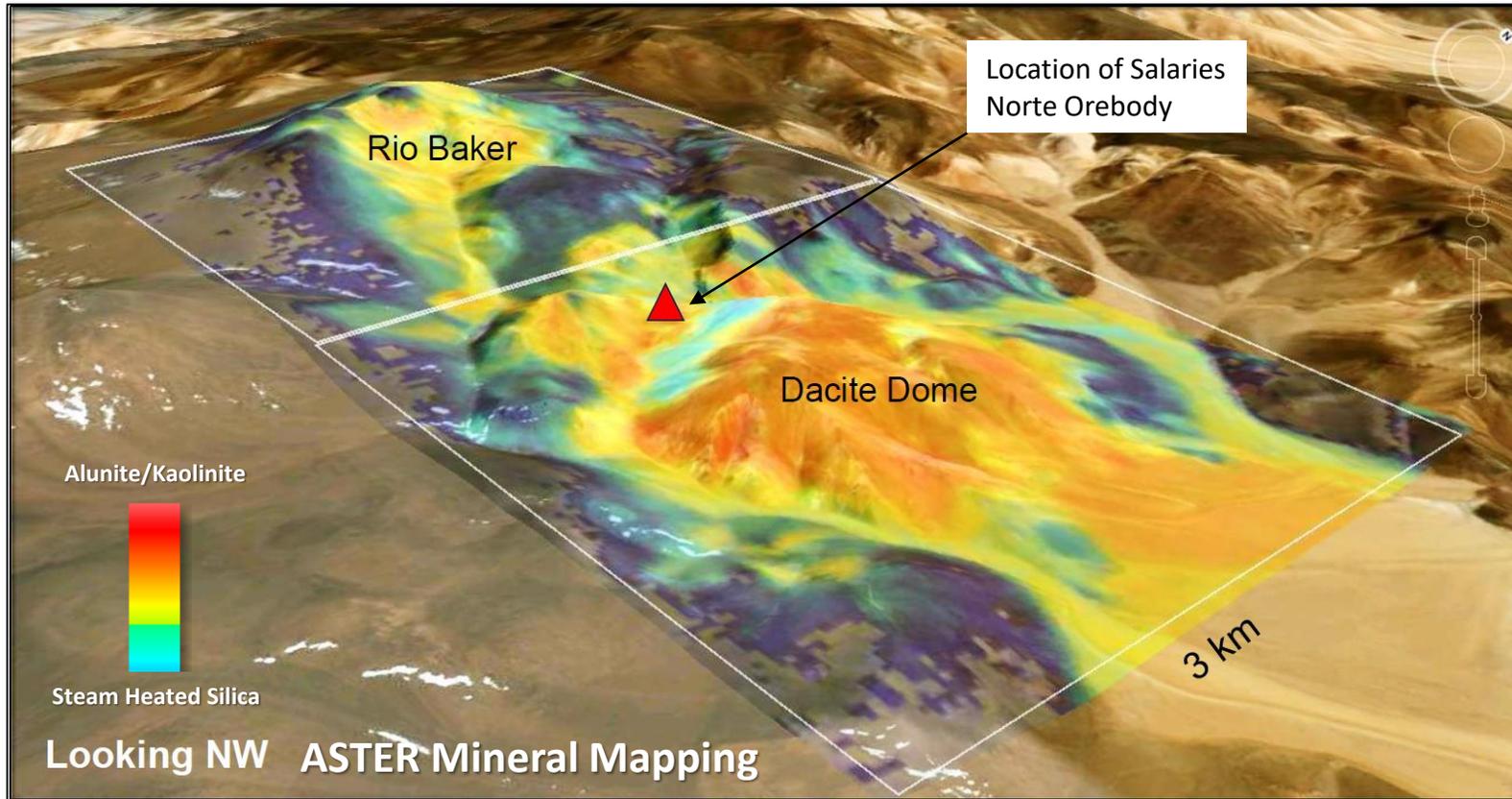
Characteristics of large economic high sulphidation epithermal (HSE) systems of the Mio-Pliocene age mineral belt of Chile and Argentina:

- **Zoned alteration systems:** HSE precious metal systems are associated with large systemically zoned advanced argillic to argillic alteration systems. These systems are both laterally and vertically zoned in a predictable and systematic way.
  - Advanced satellite-based alteration mapping can be used to vector field exploration to more productive parts of the system
  - Field and lab infrared spectrometers (PIMA/ASD/PSM/CORESCAN) can be used to map alteration patterns and vector drilling
- **Steam heated alteration caps:** Characterized by thick (100's of metres), extensive (10's of km<sup>2</sup>) sheet-like advanced argillic (kaolinite/alunite/jarosite/opaline native sulphur) alteration zones that are gold-silver poor (0 – 50 ppb concentrations of gold-silver) but are often strongly anomalous in epithermal pathfinder elements (As/Sb/Hg/Te/Ba)
  - Gold-Silver “barren” steam heated cap rock can conceal a large ore body
  - Exploration challenge to identify zones of mineralization within much larger “barren” alteration systems
  - Epithermal pathfinder elements are used to prioritize exploration drilling, as they can form a plume above concealed ore bodies
  - Field portable XRF (PXRF) instruments can be used to give in field, instantaneous measurements, fast tracking exploration decisions
- **Andesitic to dacitic volcanic complexes:** HSE deposits are strongly associated with volcanic complexes that show mixed andesitic and dacitic compositions. Pyroclastic volcanics and porphyry flows are typically intruded by later subvolcanic and volcanic flow domes.

Characteristics continued:

- **Strong geophysical anomalies:** Large scale alteration process causes the destruction of magnetic minerals in the host rocks that can be measured/mapped with airborne and terrestrial magnetic techniques. Gold-silver mineralization is typically hosted in intensely altered host rocks that have a porous sponge-like texture and are composed of residual silica from the original host rock and/or hydrothermal silica introduced during the alteration and mineralizing phases
  - Magnetic surveys outline large scale magnetic lows mapping the extent and intensity of areas of hydrothermal alteration
  - Electrical and electromagnetic geophysical techniques (IP, CSAMT, AMT) can be used to map large scale resistivity anomalies that in HSE systems define the extent of concealed zones of vuggy and hydrothermal silica, potentially hosting gold-silver mineralization and outlining drill targets
- **Hydrothermal / phreatomagmatic brecciation:** Large (100's of metres to >1km in diameter) funnel shaped bodies of brecciation are typical characteristics of large to giant high sulphidation gold-silver deposits
  - Host rock preparation to focus hydrothermal alteration and as a host to gold-silver mineralization
  - Evidence of alteration coincident with large scale brecciation is a key factor to prioritizing surface exploration and drilling
- **Deep oxidation:** Improves metallurgical characteristics of the mineralization; enhancing the gold-silver recovery for large scale dump leach and milling operations

# Zoned Alteration Systems: Alteration Signature of HSE Deposits: ASTER Satellite Alteration Map of Salares Norte



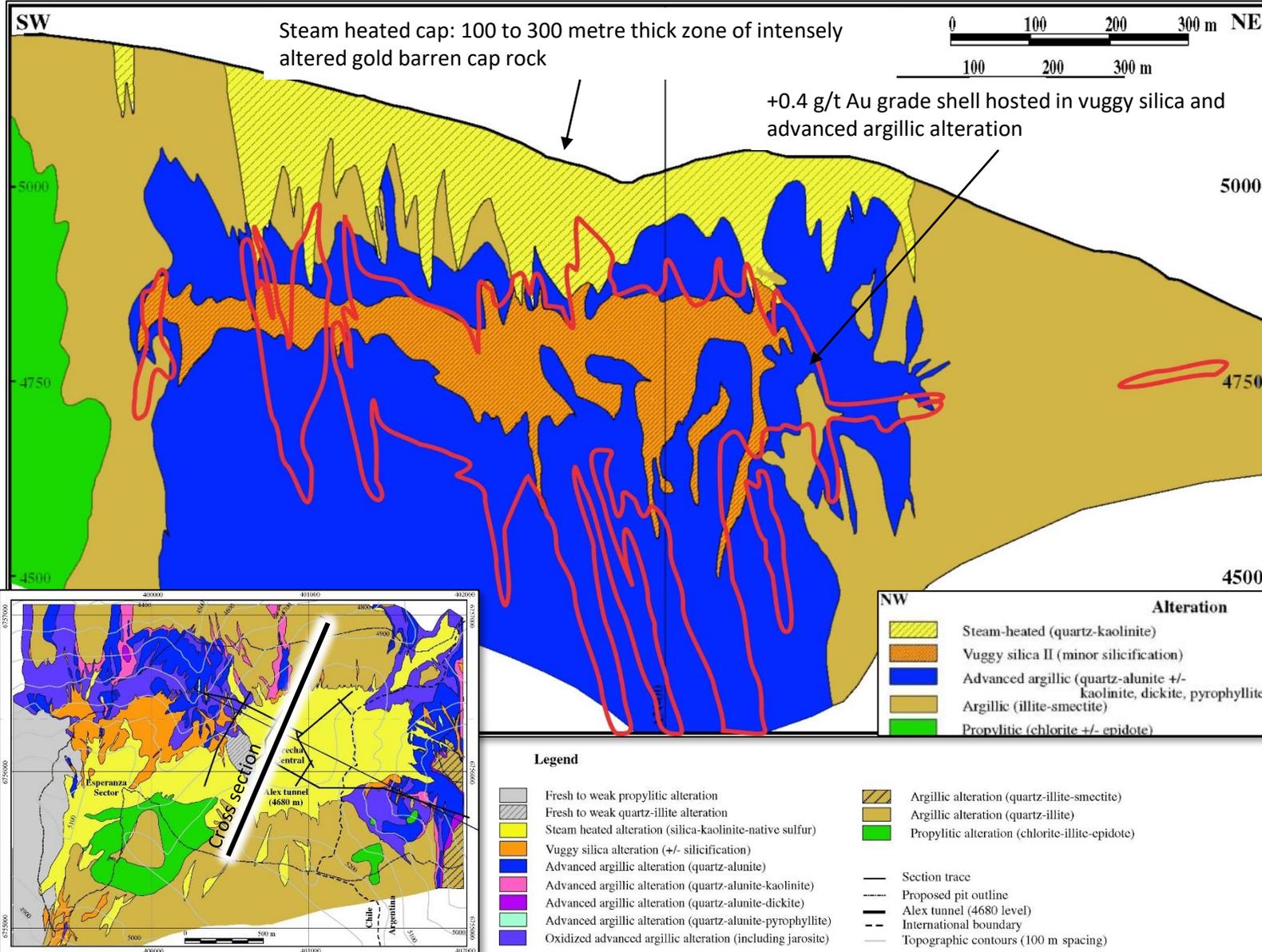
- Large advanced argillic alteration system in comparison to scale of orebody
- Steam-heated silica alteration in pale blue; based on ASTER data
- Alunite and kaolinite alteration in orange and yellow



## Puren Deposit La Coipa Mining District

- La Coipa mine started production in 1991
- Extensive exploration; Puren satellite deposit (17 Mt @ 2.8 g/t AuEq for 1.5 Moz AuEq) discovered 10 years after start of mining
- Oxidized HSE style Ag-Au deposit, concealed beneath barren colluvium and steam heated alteration
- Steam heated zone is generally geochemically barren with only local indications of ppb level gold-silver
- Discovery of Puren provided confidence to search for new, large mineralized bodies concealed beneath gold-silver poor steam heated caps

# Steam Heated Alteration Caps: Pascua HSE Gold+Silver Deposit - El Indio Belt

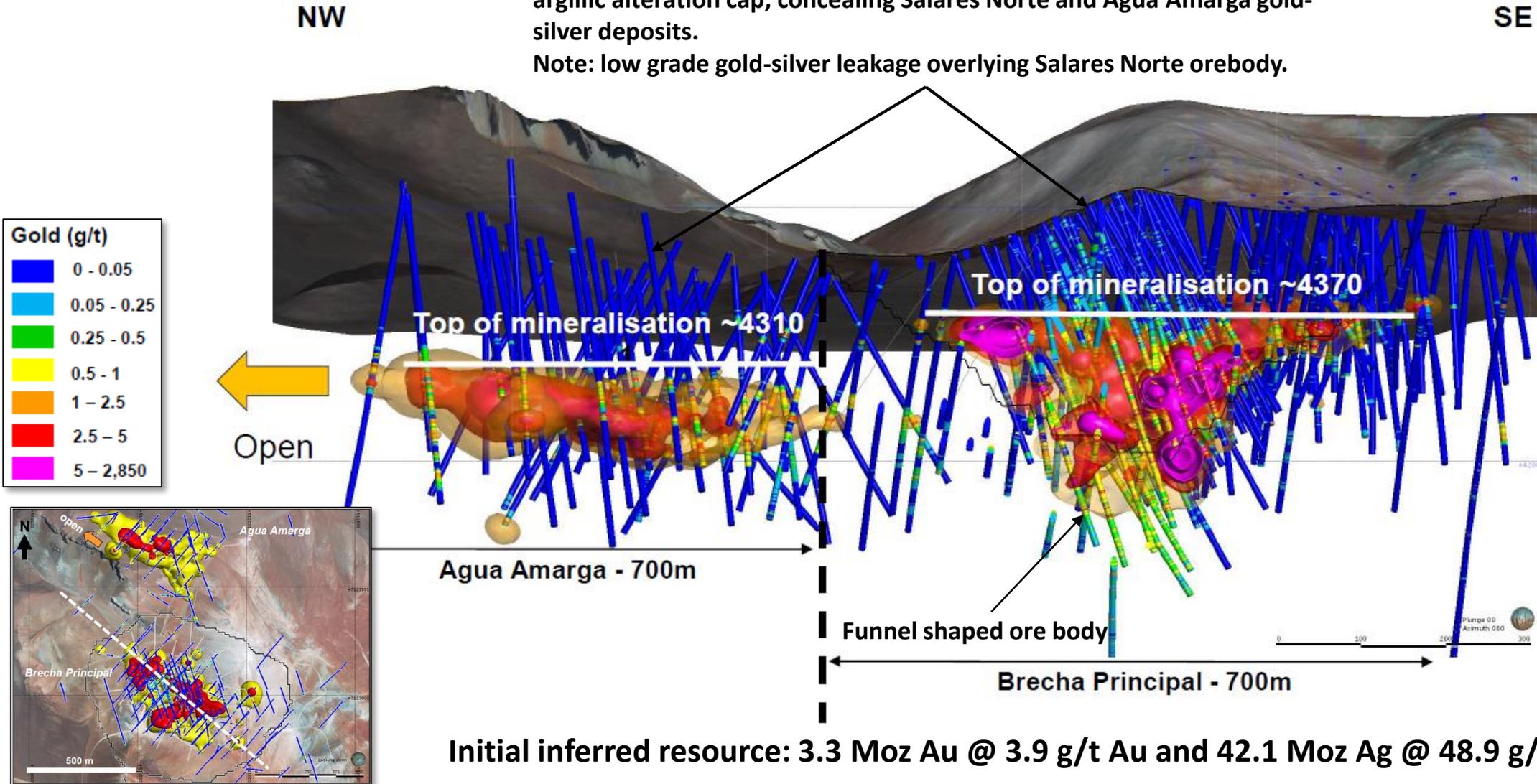


The Pascua HSE system model shows preservation of the gold poor steam heated alteration cap overlying the concealed 27 Moz AuEq mineralization hosted by vuggy silica and advanced argillic altered breccia system

- Surface expression - steam heated cap, 100-300 m (quartz - kaolinite - native sulphur)
- Transitions vertically to advanced argillic (quartz - alunite +/- dickite)
- Mineralization is hosted in the advanced argillic zone spatially coincident with vuggy silica alteration, up to 250 m below the surface
- At Pascua the extents of vuggy silica broadly mirror the extents of the overlying steam heated alteration
- Argillic illite - smectite and propylitic alteration is distal halo to mineralization

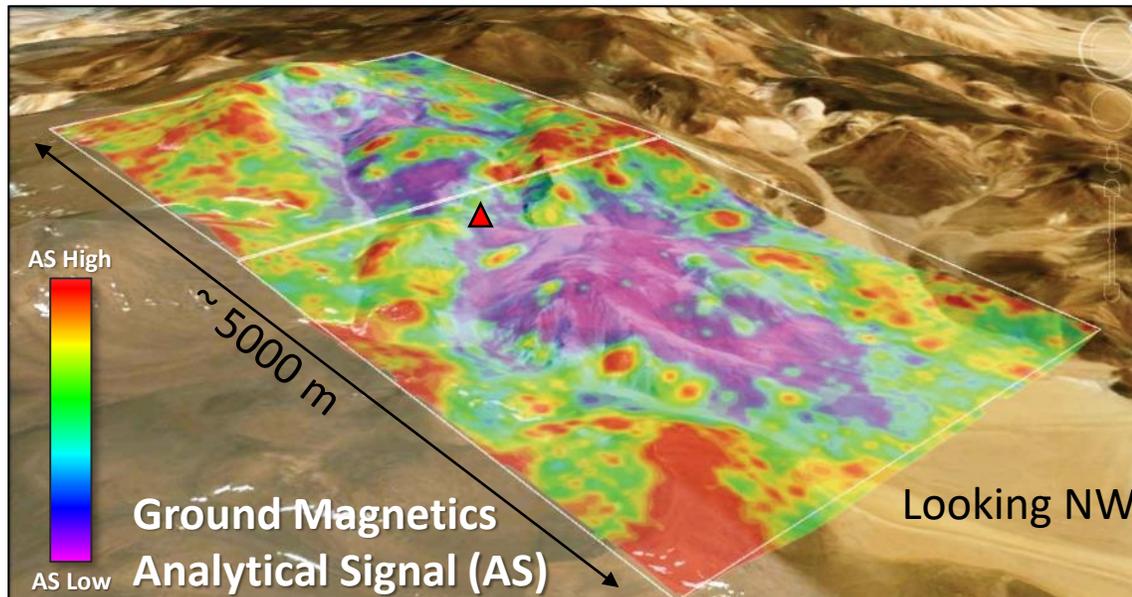
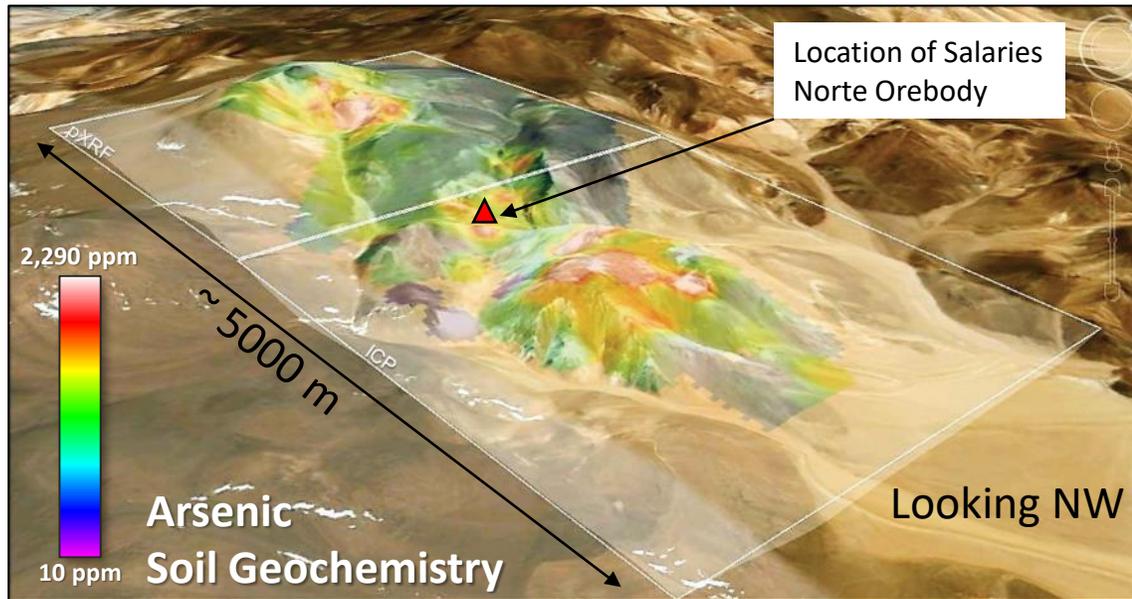
# Steam Heated Alteration Caps: Salares Norte Gold-Silver Deposit – Long Section 3D Modelled Gold Grade Shells

150 – 250m thick gold-barren (0 – 50ppb) steam heated and advanced argillic alteration cap, concealing Salares Norte and Agua Amarga gold-silver deposits.  
Note: low grade gold-silver leakage overlying Salares Norte orebody.



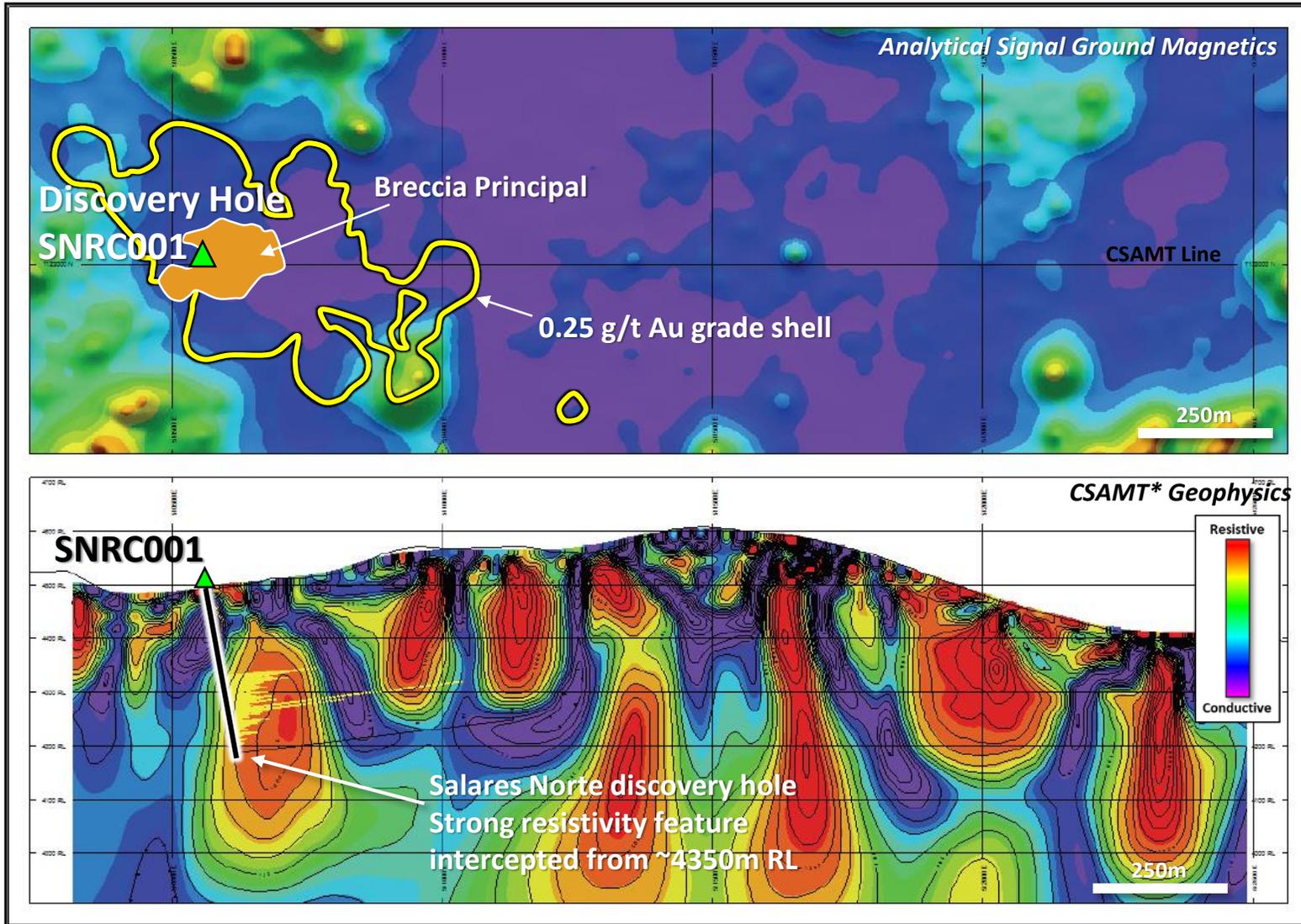
\*\*Gold Fields Mineral Resources and Mineral Reserve Supplement to the Integrated Annual Review, 31 December 2015

# Steam Heated Alteration Caps: Salares Norte Au/Ag Deposit: Trace Element Geochemistry



- Geochemical sampling from a combination of field analysed PXRf (portable x-ray fluorescence) and laboratory ICP (inductively coupled plasma)
- Magnetic lows mapping areas of steam heated and advanced argillic alteration
- Soil and rock chip sampling above the Salares Norte ore body typically returned assays from 0 to 24 ppb gold with one isolated anomalous rock chip sample of +600 ppb gold
- Hydrothermal alteration is coincident with soil geochemical anomalies of As, Sb, Pb, Bi, Hg
- Soil Arsenic anomalies values range from 10 ppm (blue regions) to 2,290 ppm (red regions)

# Strong Geophysical Anomalies: Salares Norte Au/Ag Deposit: Ground Magnetics and CSAMT Resistivity Geophysics



- Extensive hydrothermal alteration of magnetic minerals is highlighted by analytical signal processing of ground magnetics. Note the alteration is far more extensive than the size of the Salares Norte orebody.
- CSAMT\* geophysical section shows resistive response (red) from silica in Salares Norte ore body at depth (~4350m RL), beneath geochemically barren principal breccia outcrop. Note that there are a number of resistivity anomalies in this section. The discovery hole was drilled to test the resistivity anomaly beneath an area of epithermal pathfinder +ppb gold anomalies in the “barren” alteration cap.

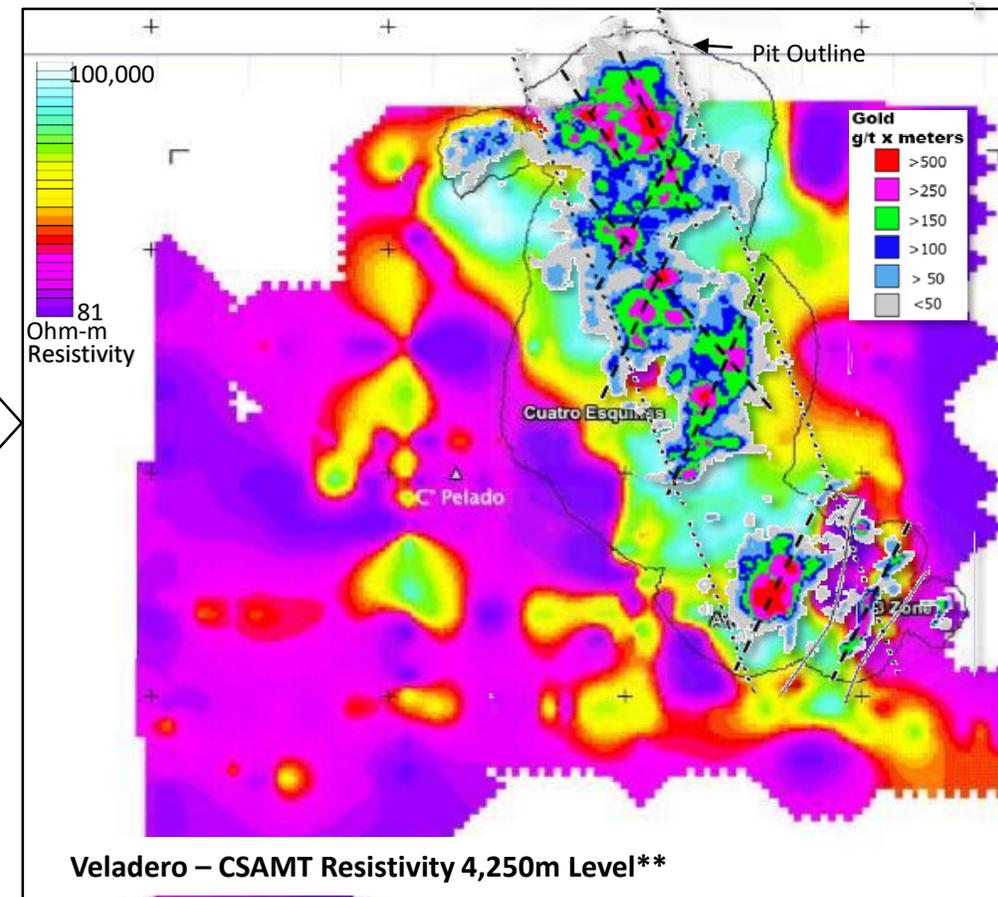
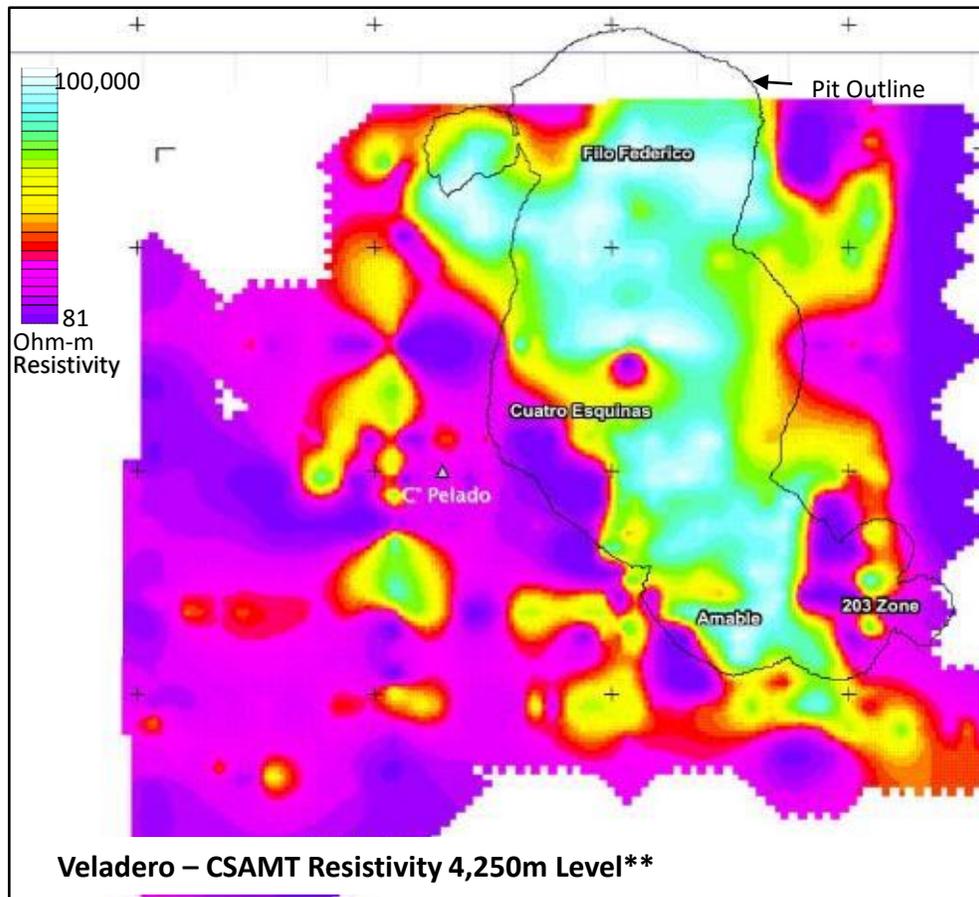
Figures modified from Gold Fields, Azevedo et.al 2015 page 14

Plan View: Ground Magnetics Analytical Signal and discovery collar  
Section View: 2D Scalar CSAMT Inversion (Log Res. 3 contours/decade)

\*CSAMT (controlled source audio-frequency magnetotellurics) is a commonly-used, surface-based geophysical method which provides resistivity information of the subsurface

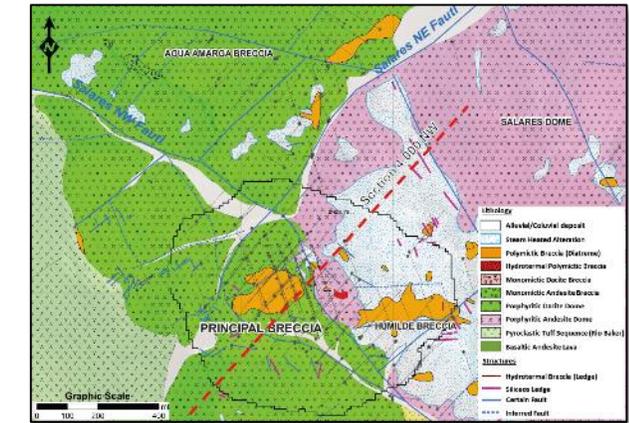
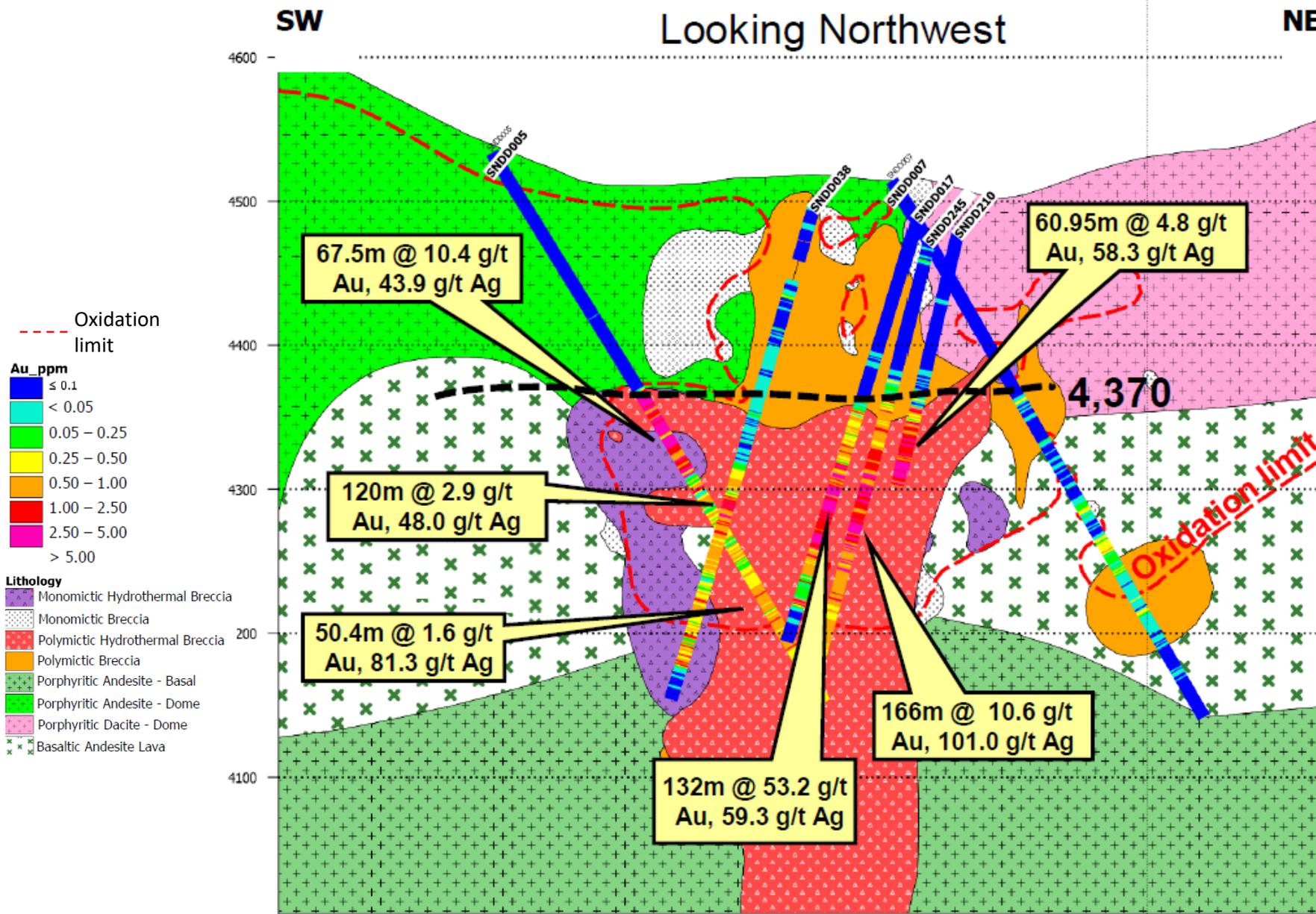
# Strong Geophysical Anomalies: Veladero HSE Gold-Silver Mine, El Indio Belt

- Barrick Gold, Veladero gold mine had a resource in Dec 2015 of 8.9 Moz gold @ 0.8 g/t Au
- Plan view of CSAMT resistivity outlines the extent of a dominantly concealed zone of vuggy and hydrothermal silica
- Note the high intensity resistive anomaly has a strong correlation with the distribution of gold grades as defined by an extensive drill program



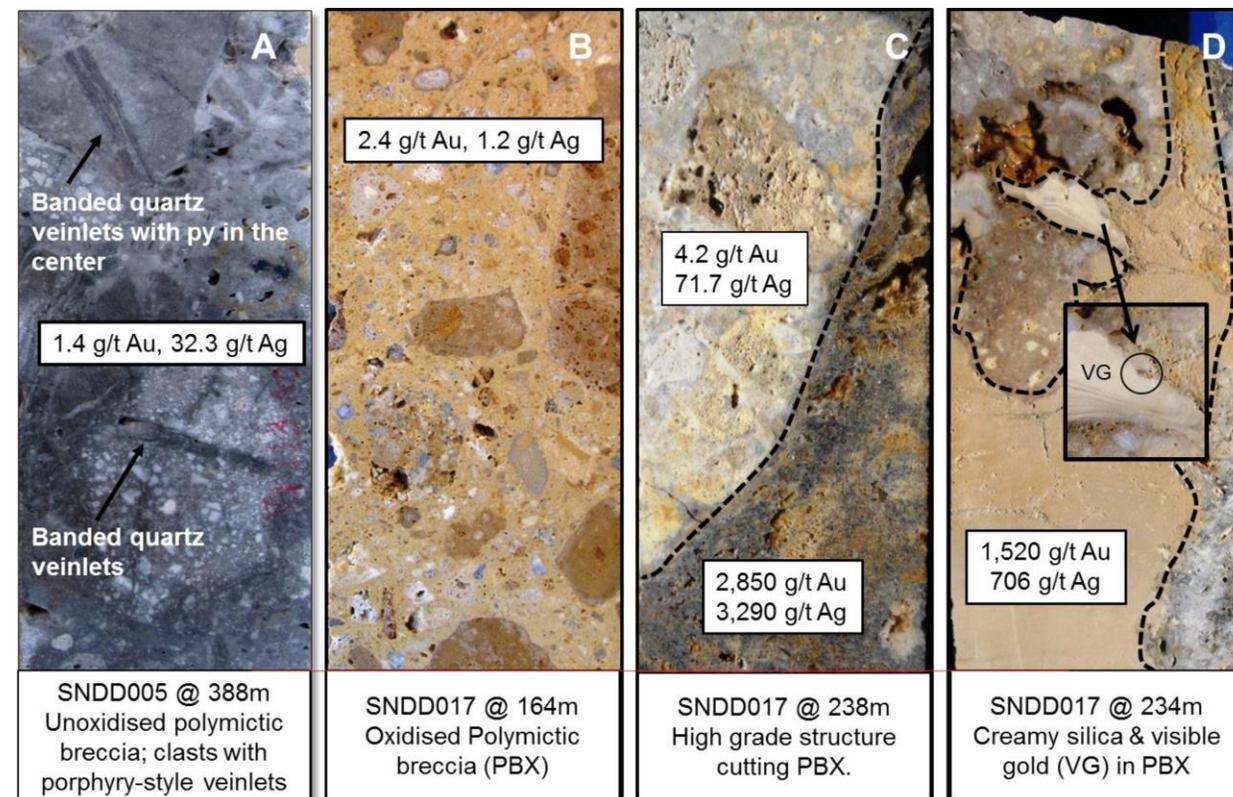
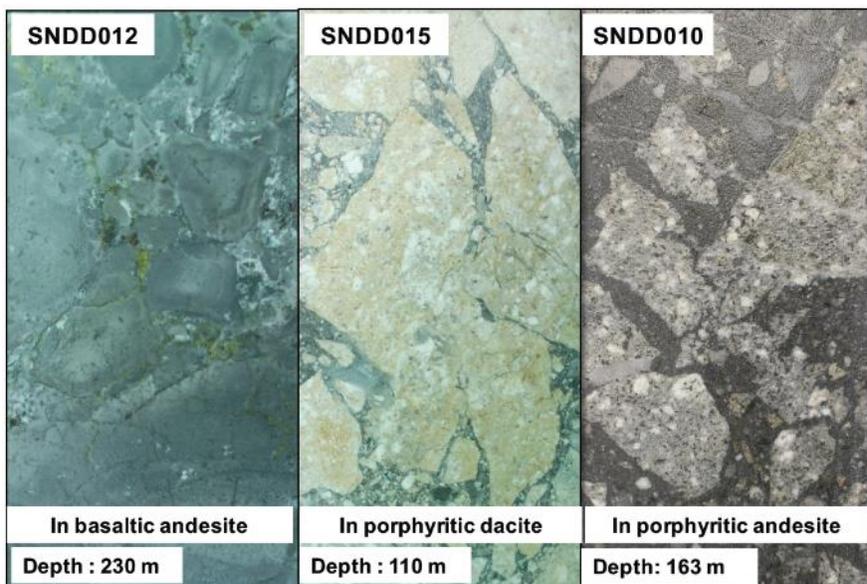
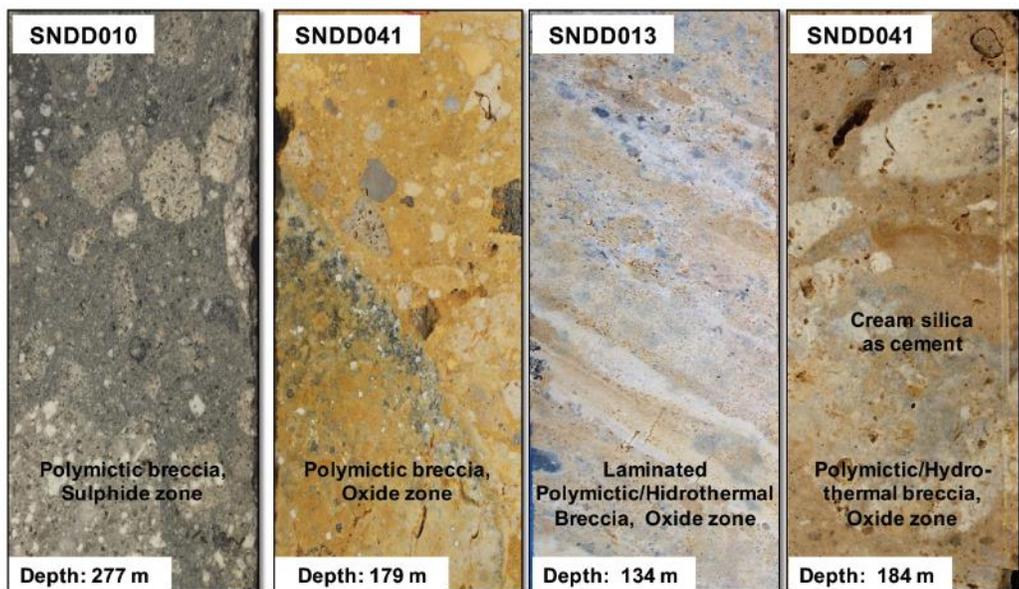
\*\*Modified from Geology and Mineralization of the Veladero Gold Deposit, San Juan Province, Argentina. Geological Society of Nevada Symposium May 18, 2005

# Hydrothermal Brecciation / Andesitic to Dacitic Volcanic Complex / Deep Oxidation: Salares Norte Au/Ag Deposit: Cross Section – Lithology and Au/Ag Drill Intersections

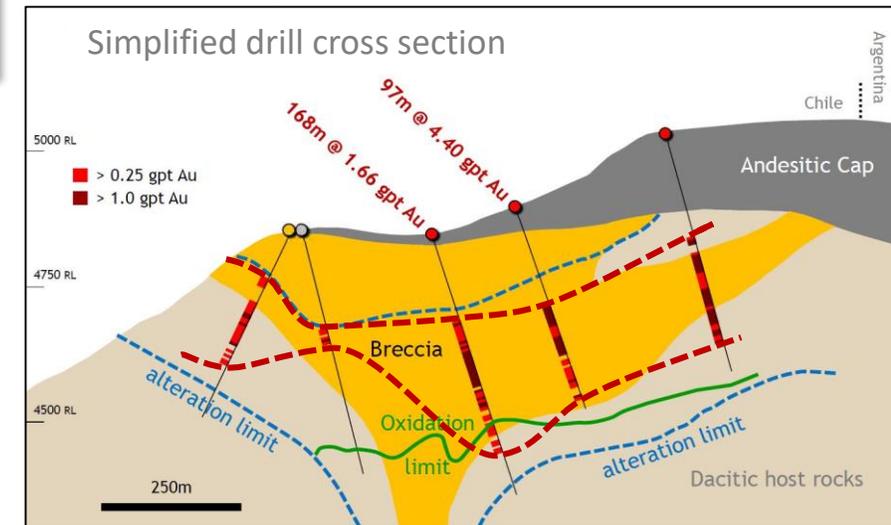
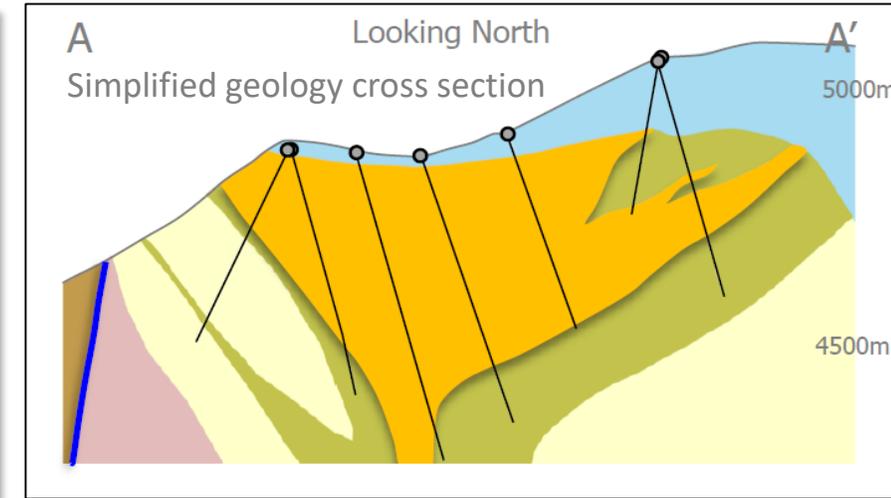
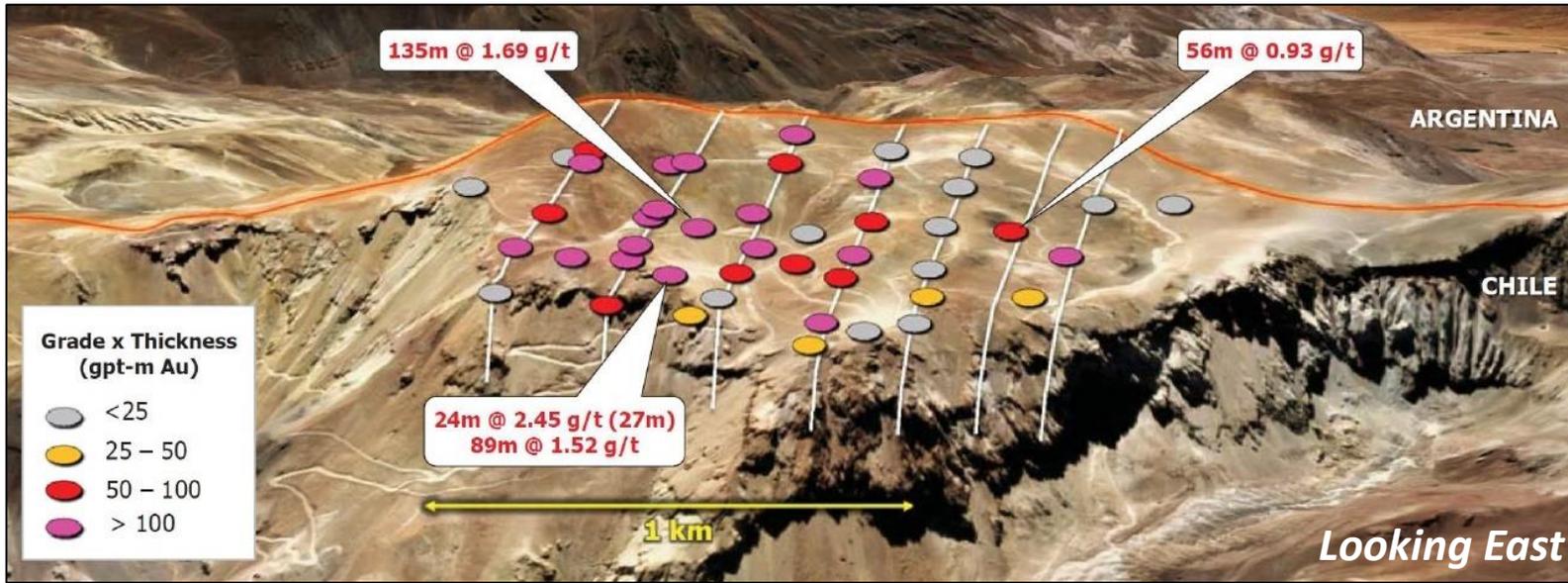


- Gold-silver deposit is concealed by 150-200 m thick gold-barren (0 – 50 ppb) steam heated and advanced argillic alteration cap
- Gold-silver mineralization is hosted in a funnel shaped breccia body
- Surface expression of the mineralized body (breccia principal) is gold “barren” and smaller than the underlying mineralized breccia with a diameter of approx. 150 m
- Mineralized breccia is ponded beneath the edge of andesitic and dacitic flow domes
- Oxidation is more deeply developed over the ore body where it extends to depths of >300 m

# Hydrothermal / Phreatomagmatic Brecciation: Salares Norte Drill Core – Breccia Textures and HSE Mineralization



# Hydrothermal Brecciation / Andesitic to Dacitic Volcanic Complex / Deep Oxidation: Alturas Au/Ag Deposit: Geology → Large Diatreme Breccia



- Alturas deposit (initial resource 5.5 Moz at 1.25 g/t Au) largely concealed by 150 – 200 m cap of post mineral lava flow and gold “barren” alteration
- Associated with phreatomagmatic diatreme breccia complex within an andesitic to dacitic volcanic complex
- Mineralization is hosted in funnel shaped diatreme breccia and adjacent vuggy silica altered wall rock
- Oxidized at depths of 250 – 300 m below surface

## Legend

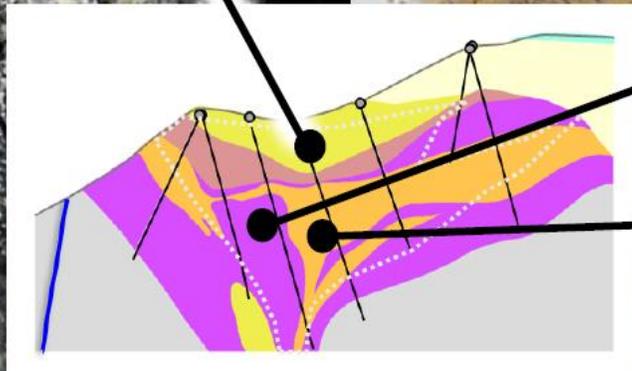
- Diatreme - phreatomagmatic breccia
- Dacite flows & domes
- Subvolcanic Dacite
- Subvolcanic Andesite
- Dacitic tuff
- Andesitic volcanics

# Hydrothermal / Phreatomagmatic Brecciation: Alturas Drill Core – Breccia Textures and HSE Mineralization

Polymictic breccia  
Illite - smectite - pyrite  
DDH-ALT 011  
82.5m  
Unmineralized

Polymictic breccia  
Quartz - alunite  
DDH-ALT 002  
392m  
0.42gpt Au

Polymictic breccia  
Silicificación Parda (brown silicification)  
DDH-ALT 021A  
403m  
17.5gpt Au

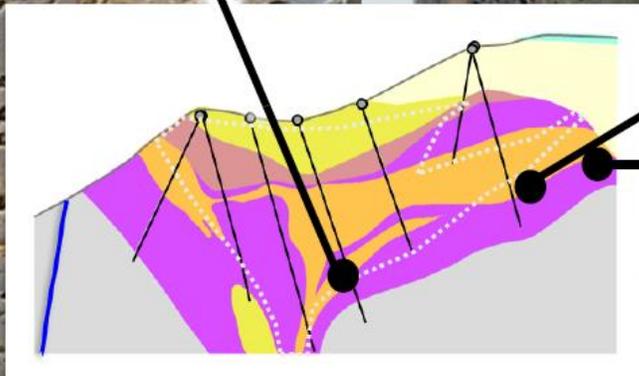


# Alturas Drill Core – Vuggy Silica Alteration and Mineralization

**Subvolcanic Dacite Porphyry**  
**Silicification overprinting residual qtz**  
**DDH-ALT 021A**  
**401m**  
**3.62gpt Au**

**Subvolcanic Dacite Porphyry**  
**Silicification overprinting residual qtz**  
**DDH-ALT 010**  
**245m**  
**2.19gpt Au**

**Subvolcanic Dacite Porphyry**  
**Residual micro-crystalline quartz**  
**DDH-ALT 018**  
**264m**  
**1.71gpt Au**



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