



BARRICK

25 years

Spatial and Temporal Zonation at the El Indio Cu-Au-Ag Deposit, Chile: Evidence for an Evolving High Sulphidation Epithermal System.

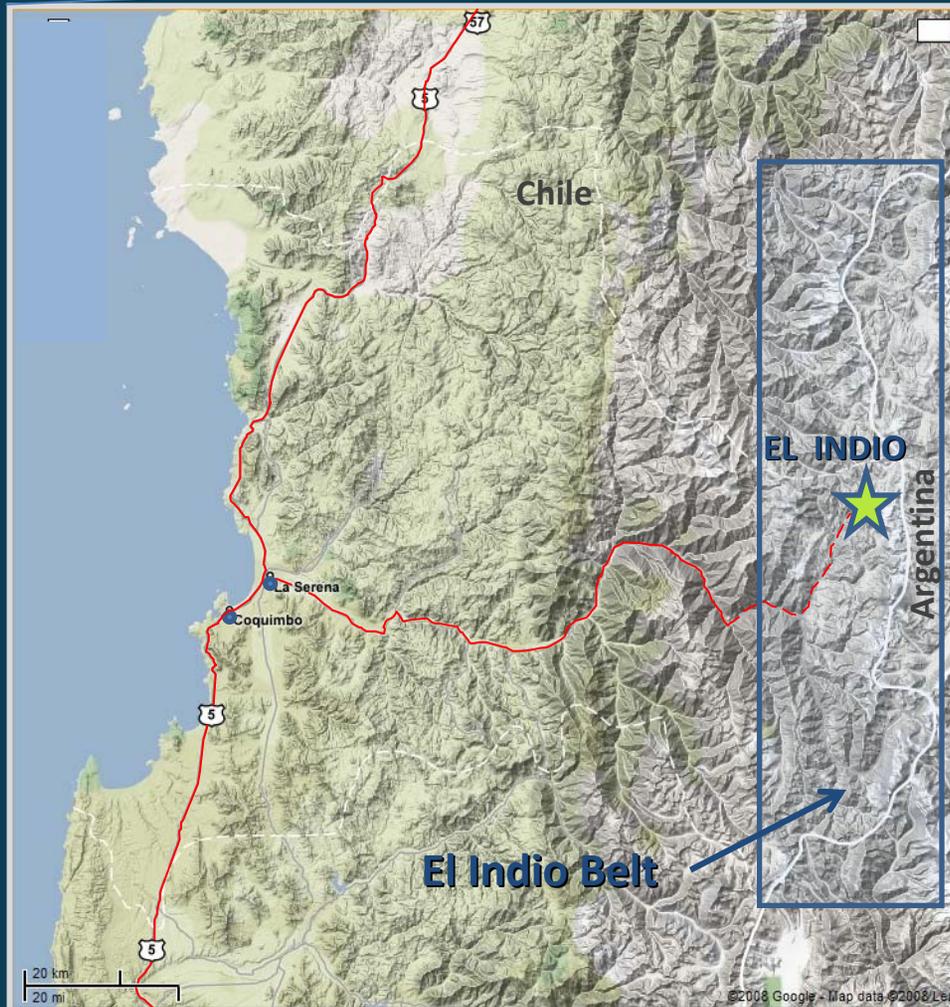
Dave Heberlein

Terry Leach Symposium
Sydney – October 17th, 2008

QUICK FACTS

- 23 Years of Production (1979-2002)
- Underground and Open Pit Mine
- 4.5 Moz of Au, 25 Moz of Ag and 472kt of Cu produced from 16.8 Mt of ore.
- 1.2 Moz from 190 kt of ore – DSO.
- Average life of mine Au grade 8.33 g/t Au.
- Considered as a 'classic' High Sulphidation Epithermal Au-Cu-Ag vein deposit.

LOCATION MAP





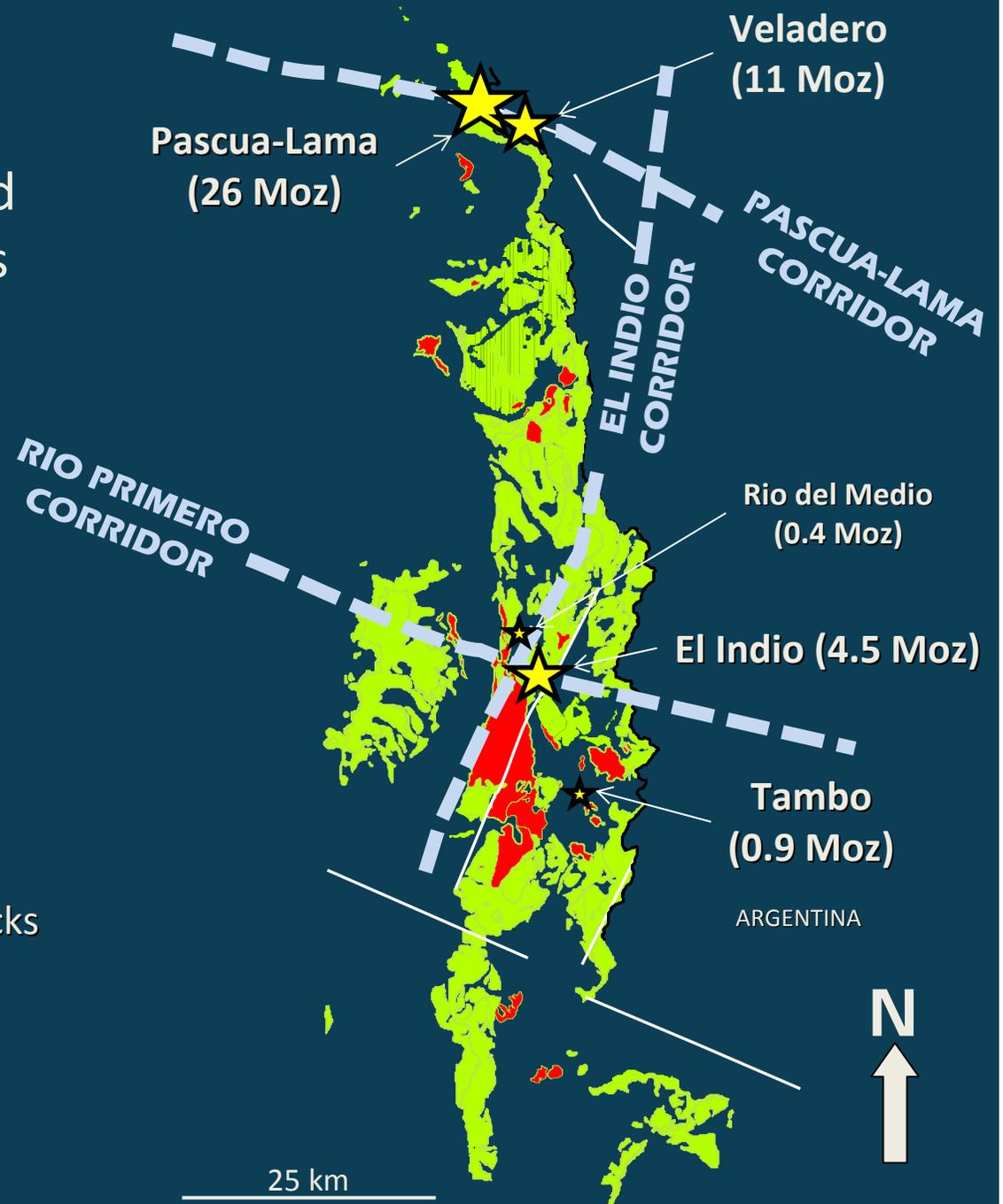
EL INDIO BELT

Tertiary Volcanic Setting and Regional Structural Controls

After Heather, 2000

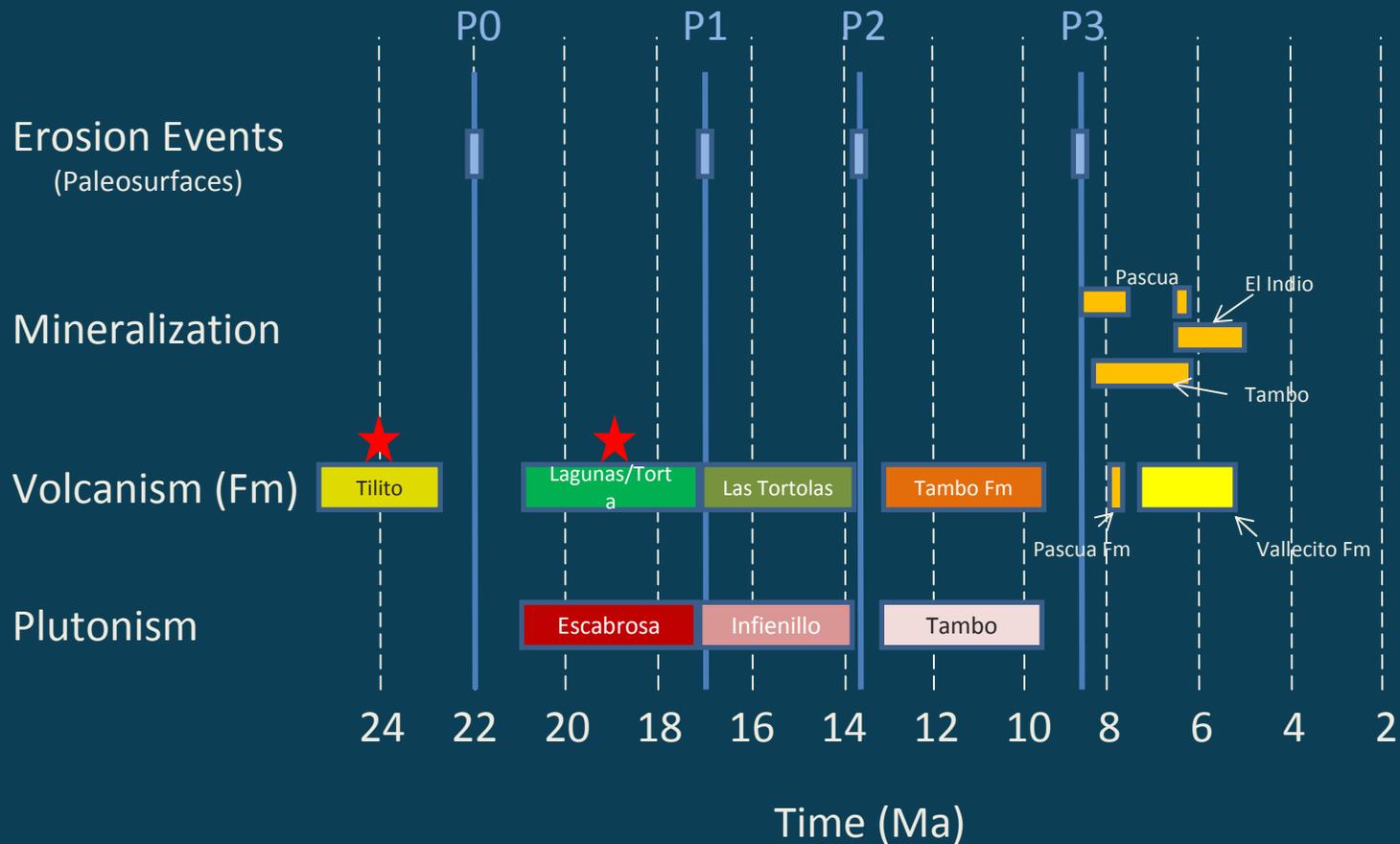
LEGEND

-  Intrusive rocks
-  Volcanic and sedimentary rocks



GEOCHRONOLOGY

(Modified from Heather, 2001)

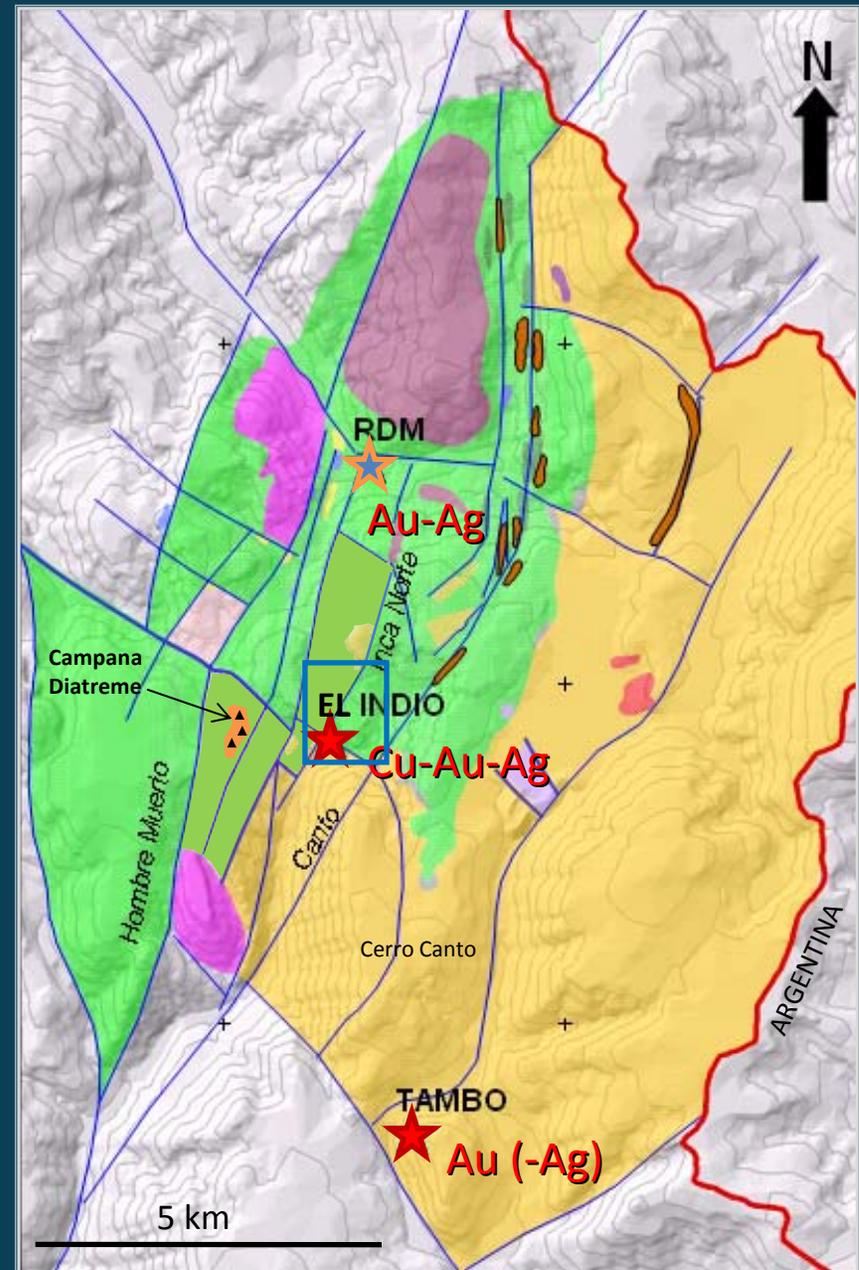


★ El Indio host rocks

EL INDIO MINE AREA SIMPLIFIED GEOLOGY

LEGEND

-  Intermediate intrusions
-  Epiclastic sediments
-  Volcaniclastic sediments
-  Felsic Tuffs and breccias (7 - 5 Ma.)
-  Andesite flows and flow breccias.
(21 - 16 Ma)
-  Rhyolitic and dacitic ash flows
(27 - 23 Ma)
-  Low Sulphidation
-  High Sulphidation

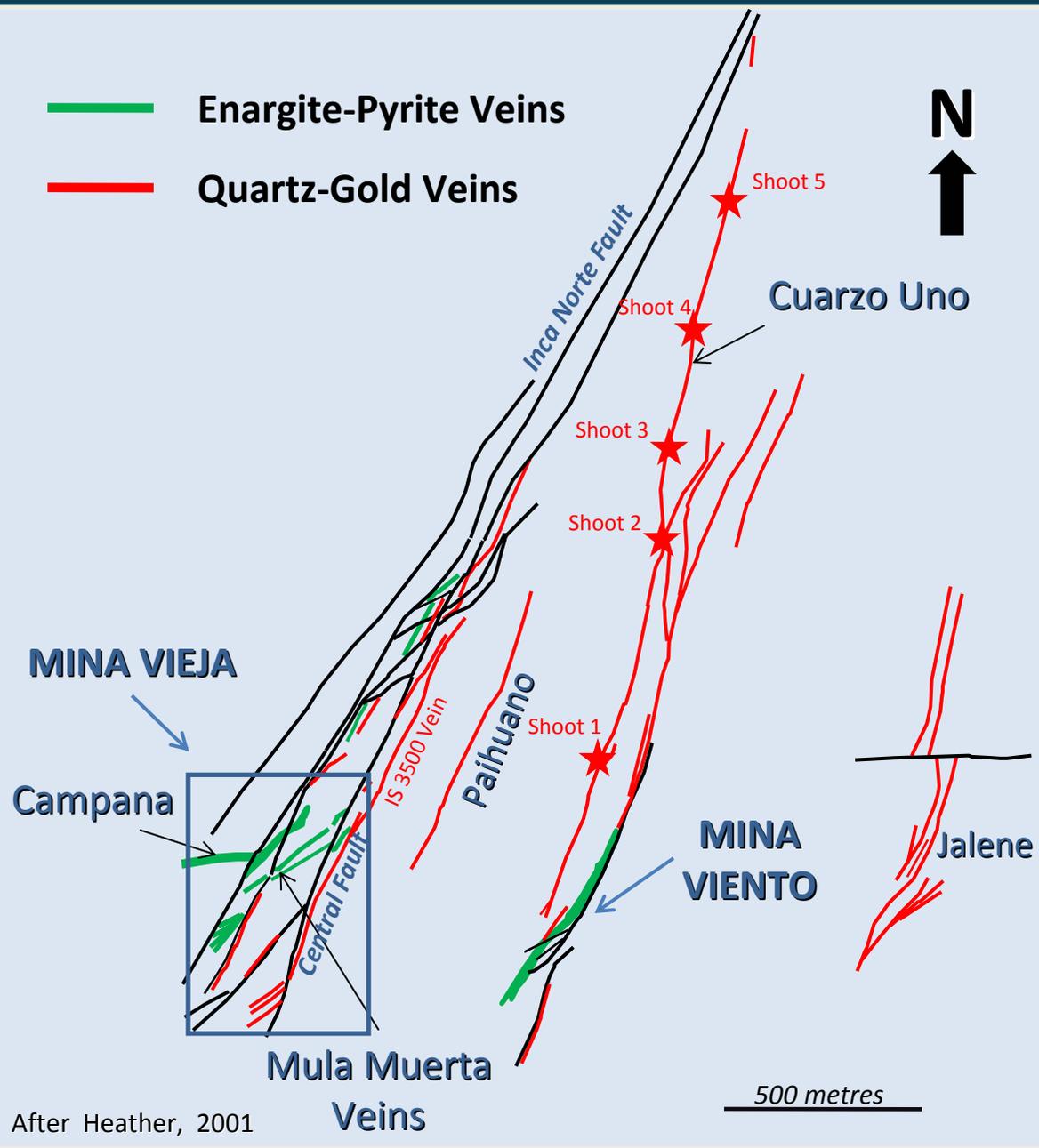


Modified from Heather, 2000

EL INDIO VEIN SYSTEM

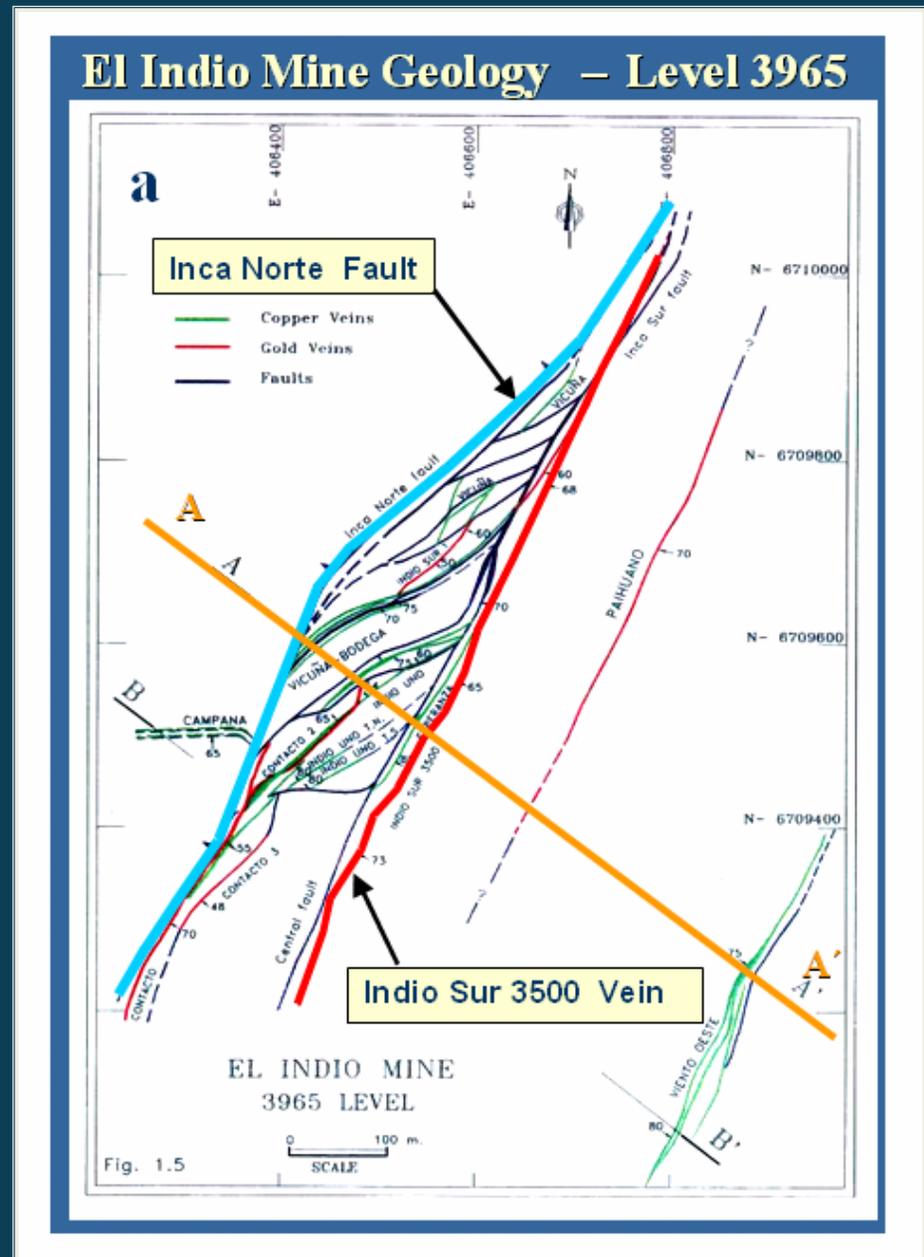


After Corbett, 2001



PLAN VIEW

Mina Vieja - 3965m level

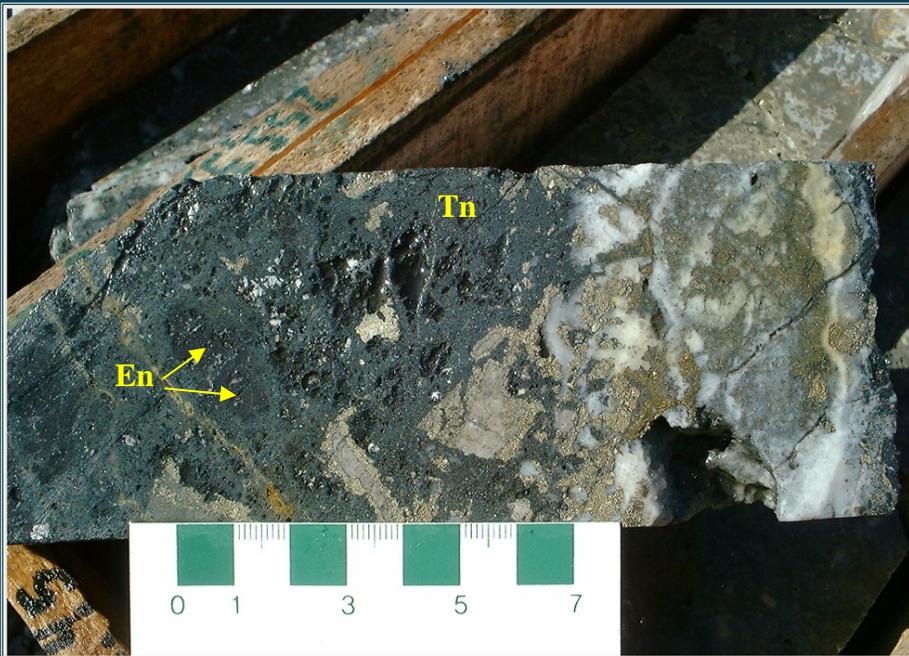


From Jannas, 1995

ENARGITE-PYRITE VEINS



TENNANTITE- CHALCOPYRITE VEINS



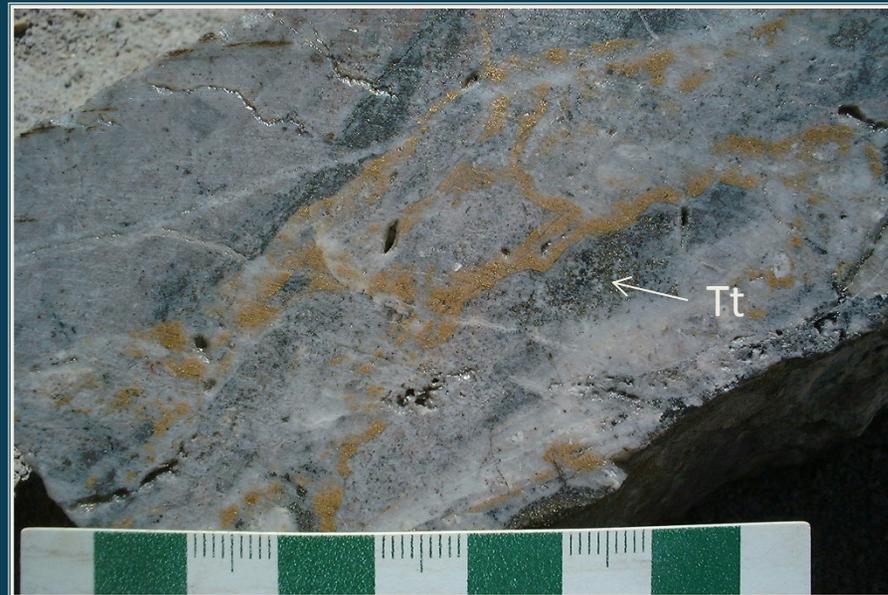
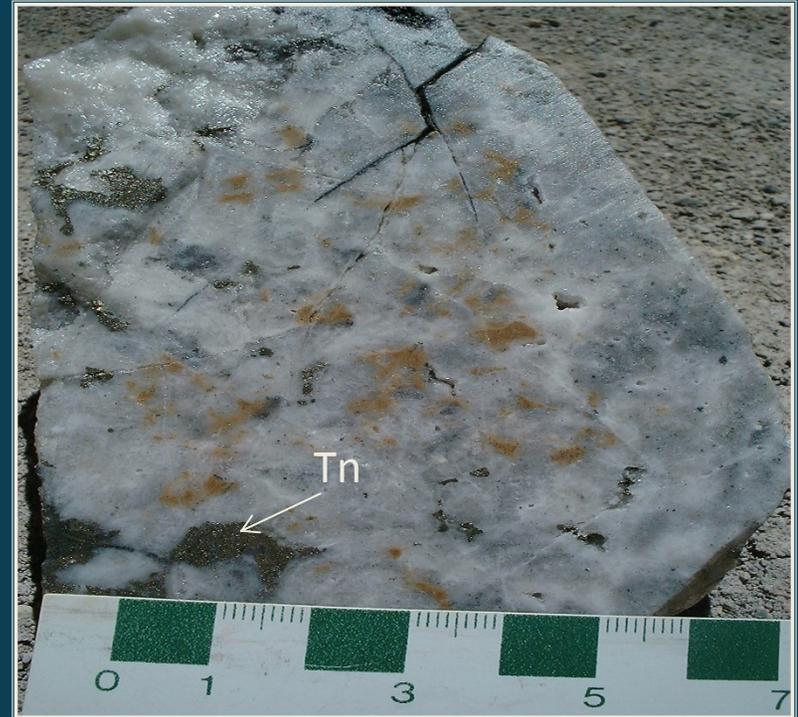
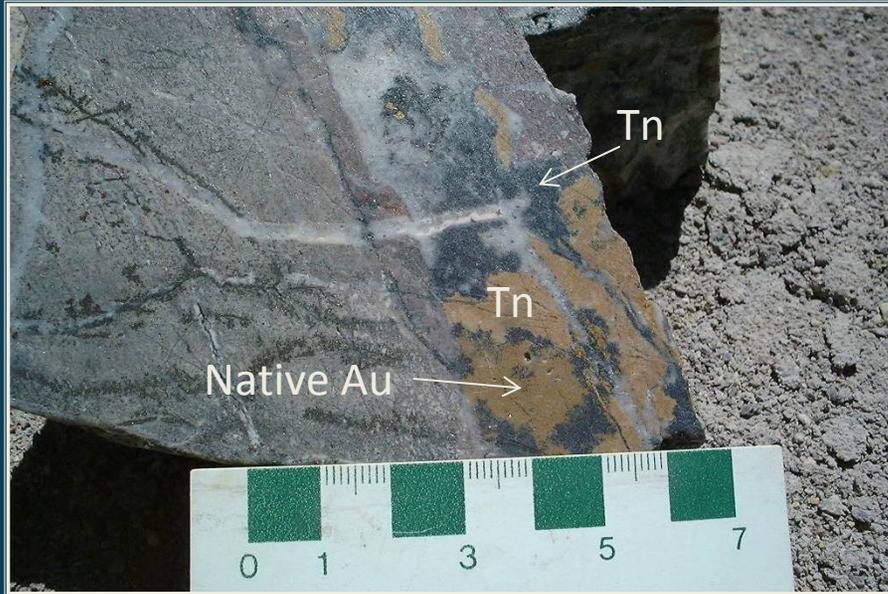
Tennantite replaces earlier enargite.



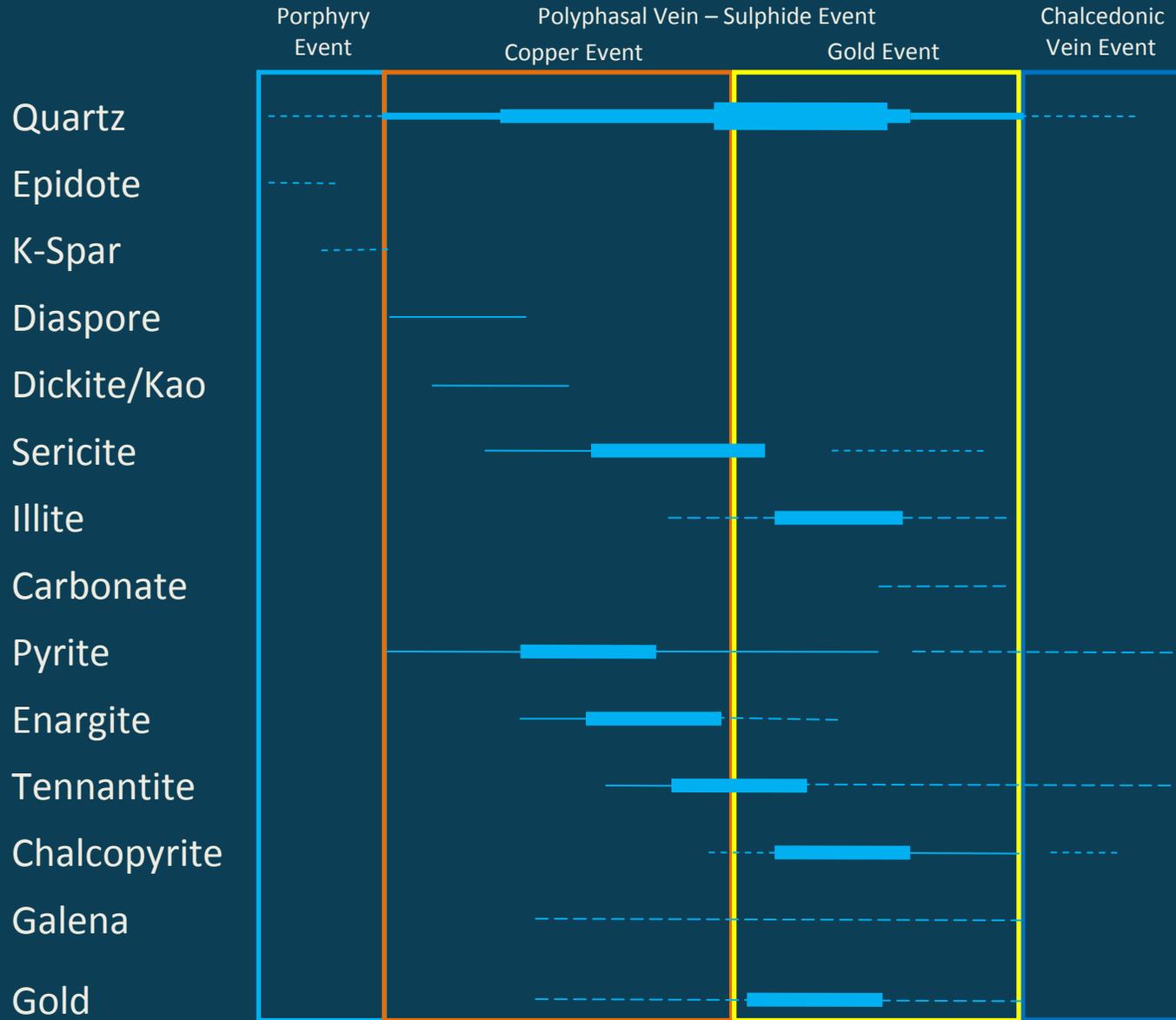
Chalcopyrite replaces tennantite.

En – enargite, Tn – Tennantite, Cpy – Chalcopyrite, Py - Pyrite

QUARTZ-GOLD VEINS

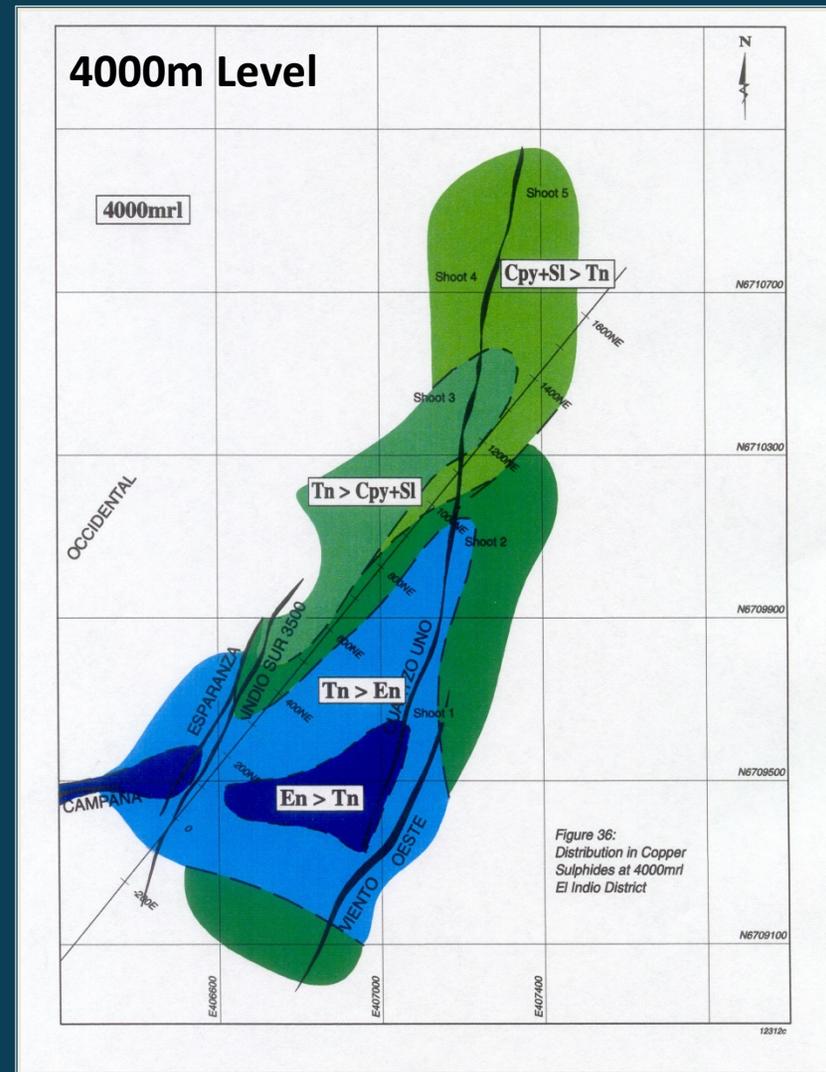
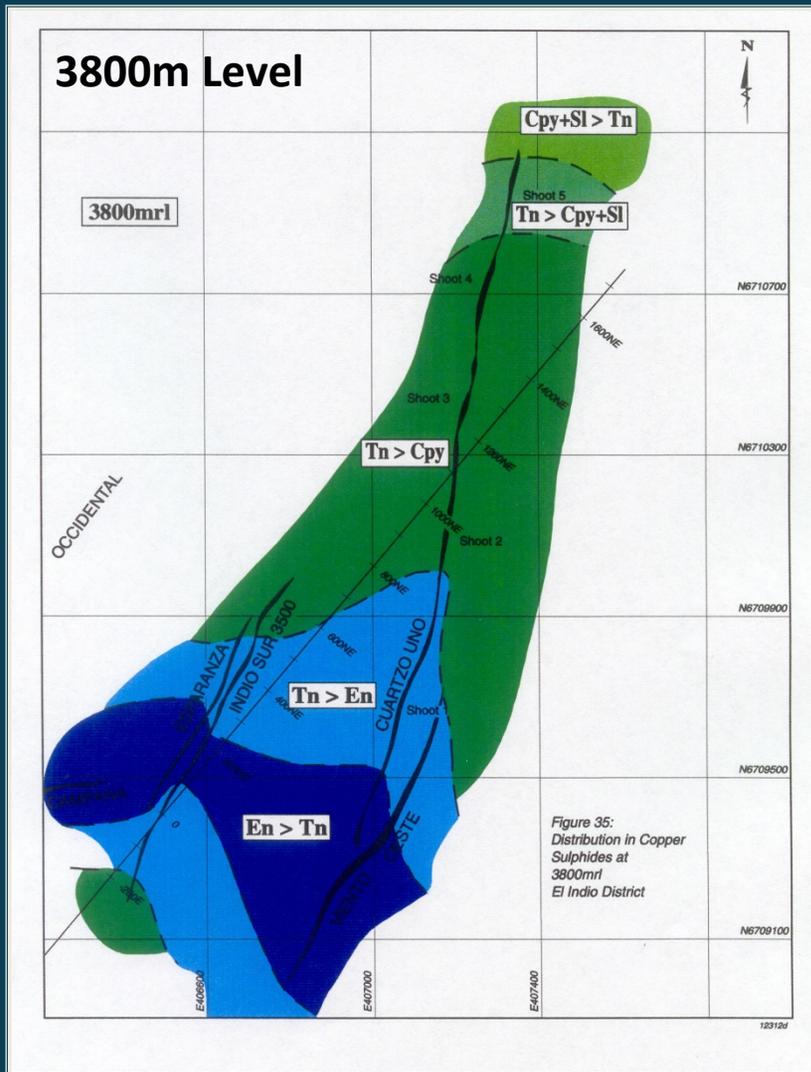


PARAGENESIS (Mina Vieja)



After Leach (2001)

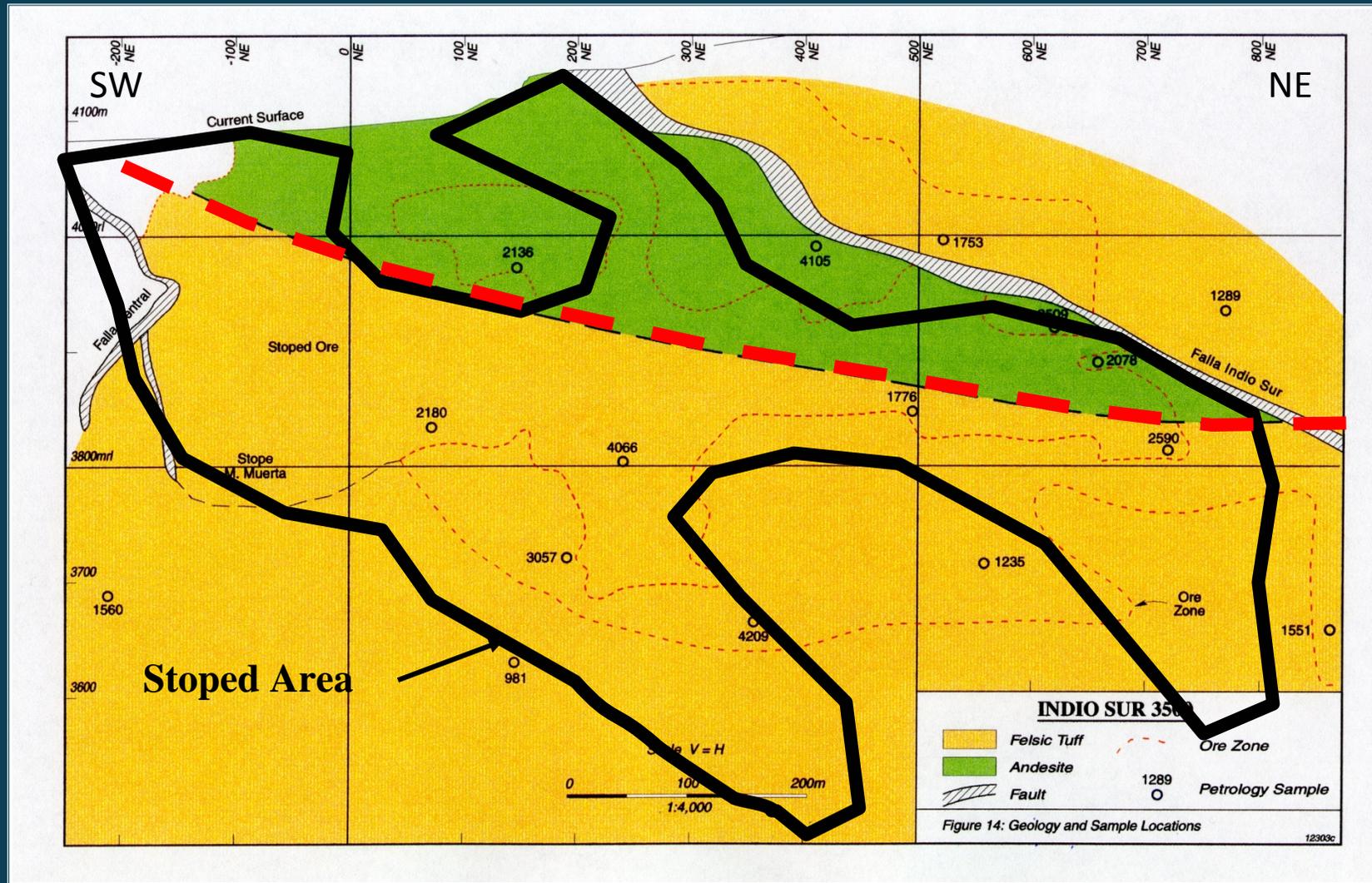
COPPER SULPHIDE ZONATION – Plan View



Tn - Tennantite, Tt – Tetrahedrite, En – Enargite, Cpy – Chalcopyrite, Sl - Sphalerite

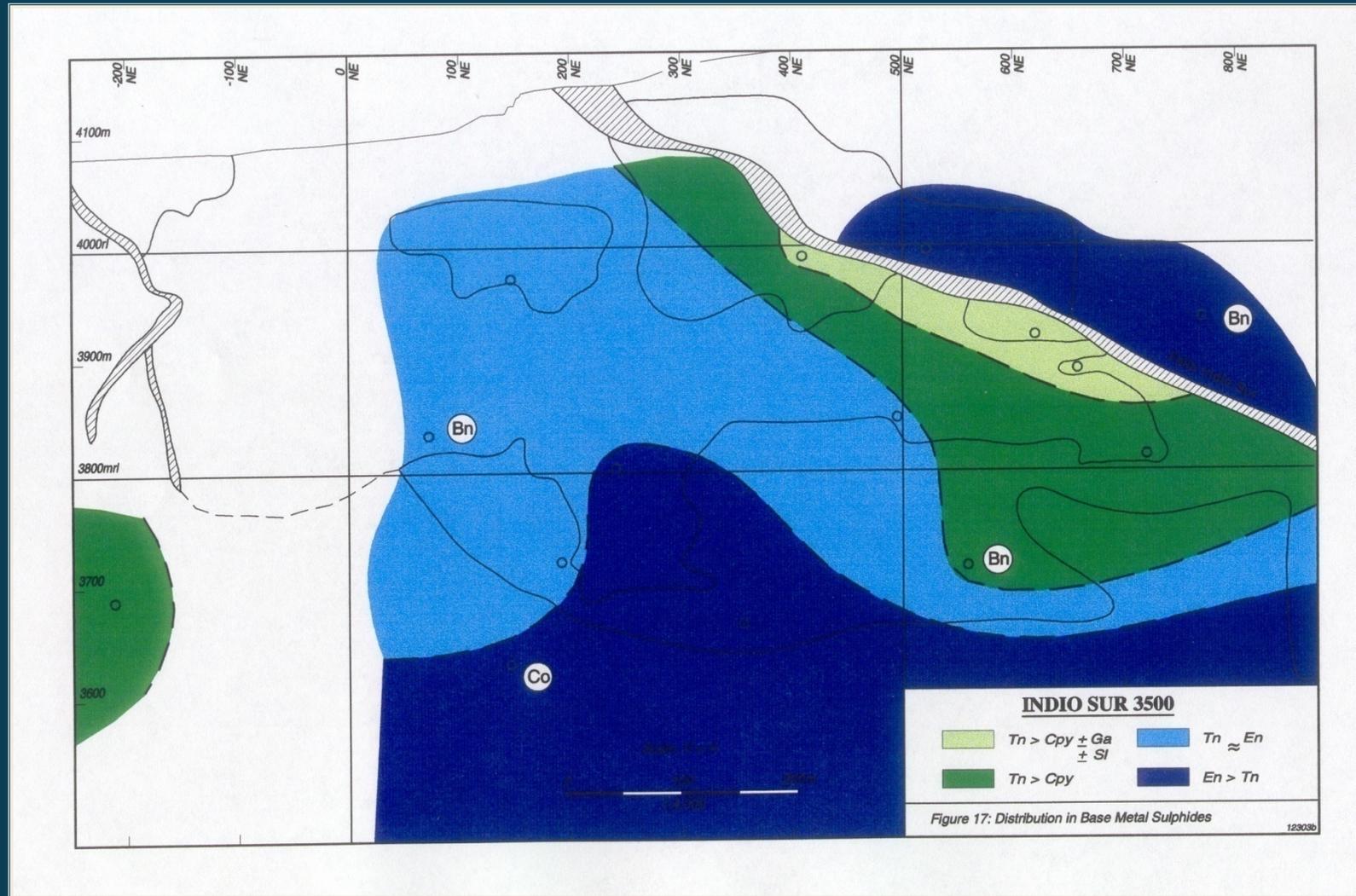
(after Leach, 2001)

IS-3500 VEIN; LONGITUDINAL SECTION - Lithology and Sample Location



IS-3500 VEIN - LONGITUDINAL SECTION

Vein Sulphides

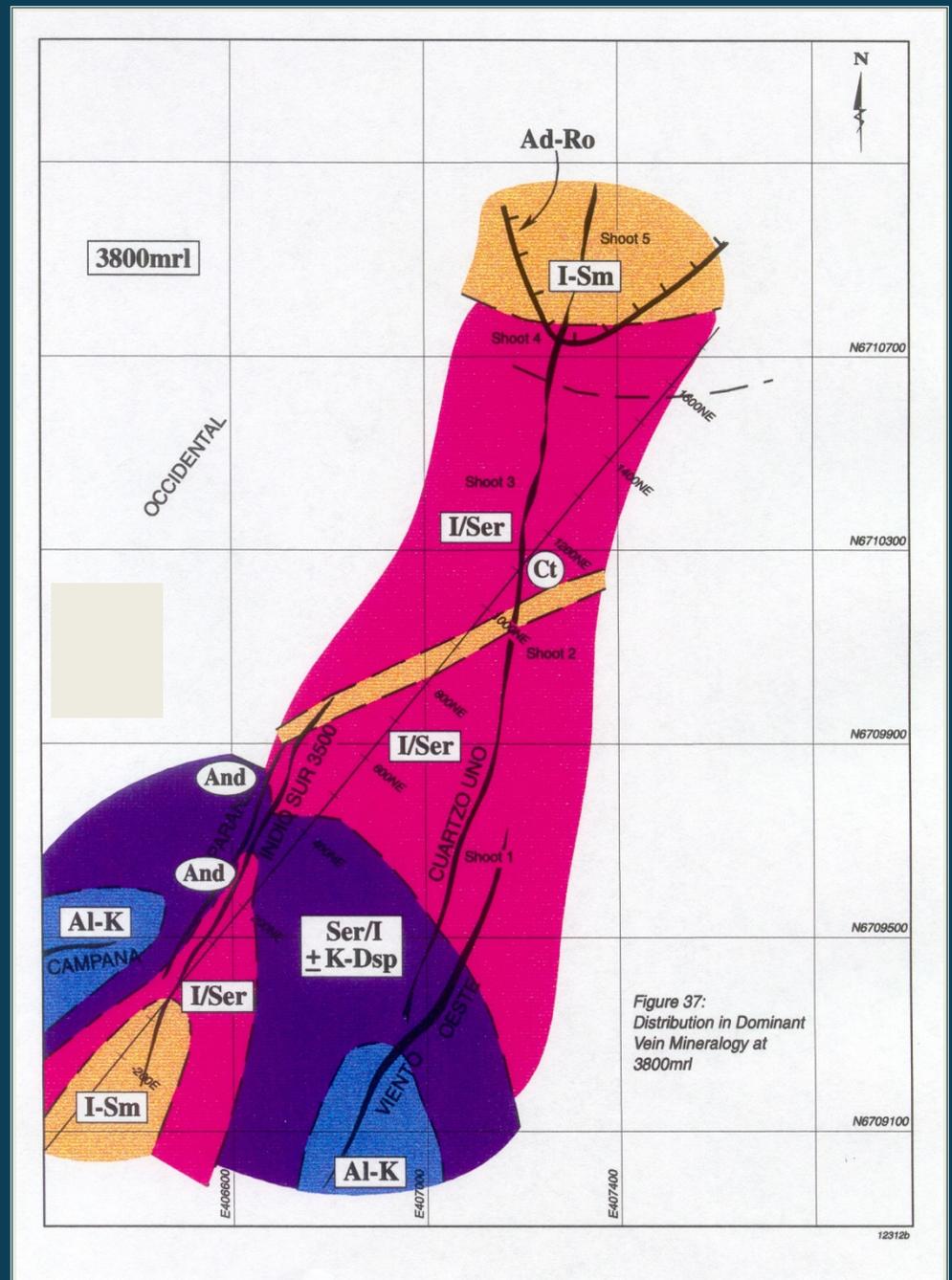


From Leach (2001)

GANGUE MINERAL ZONATION

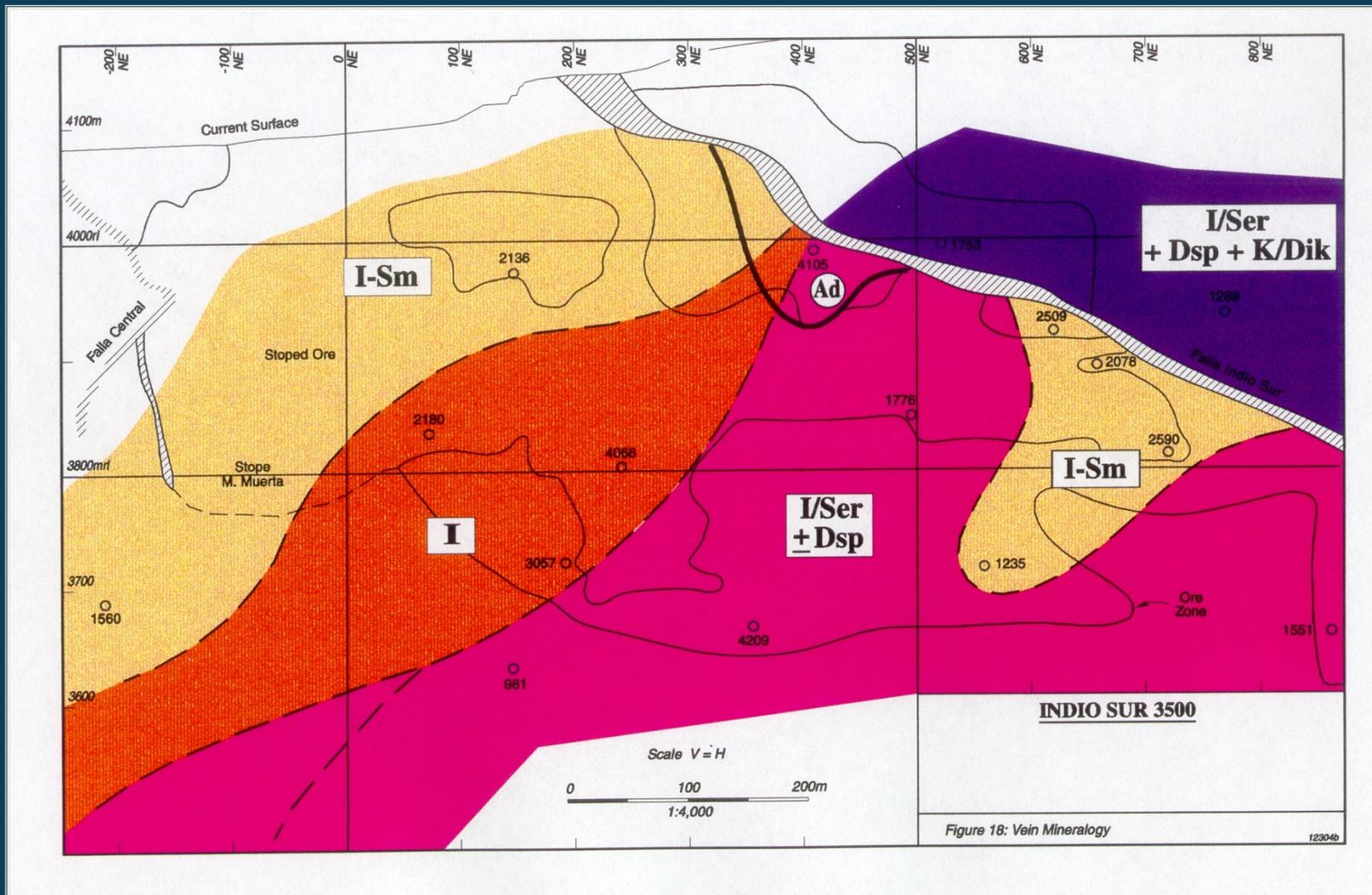
3800m Level

Al – Alunite,
 Dsp - Diaspore
 K – Kaolinite,
 Ser – Sericite,
 I – Illite,
 Sm – Smectite,
 Ct – Crystobalite,
 Ad – Adularia,
 Ro - Rhodochrosite



From Leach (2001)

IS-3500 VEIN – LONG SECTION WALL ROCK ALTERATION

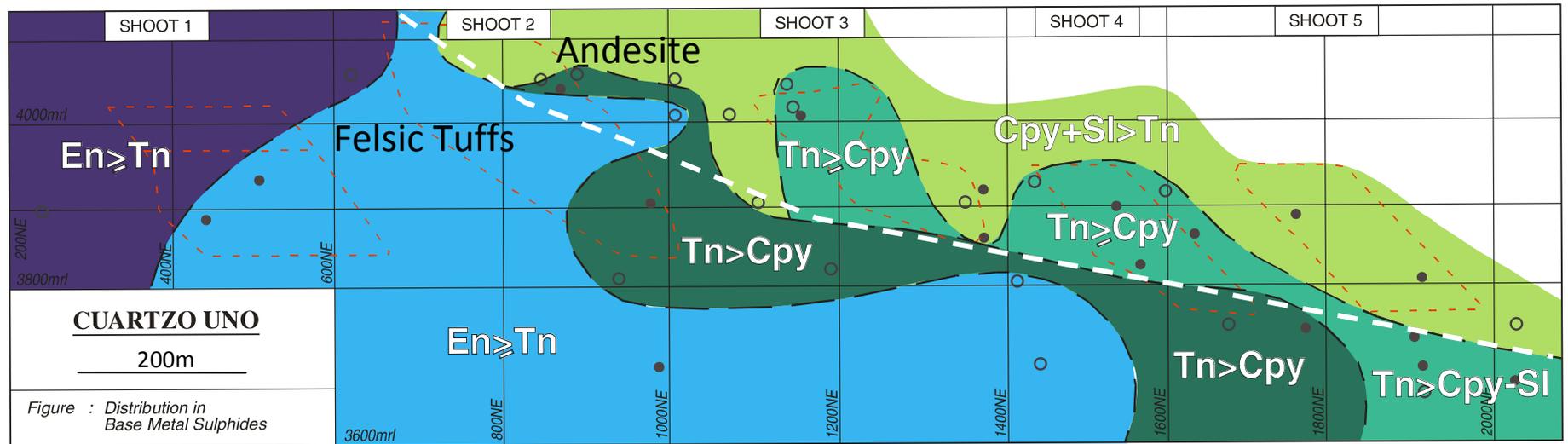


CUARZO UNO VEIN – LONG SECTION

Base Metal Sulphide Zonation

S

N



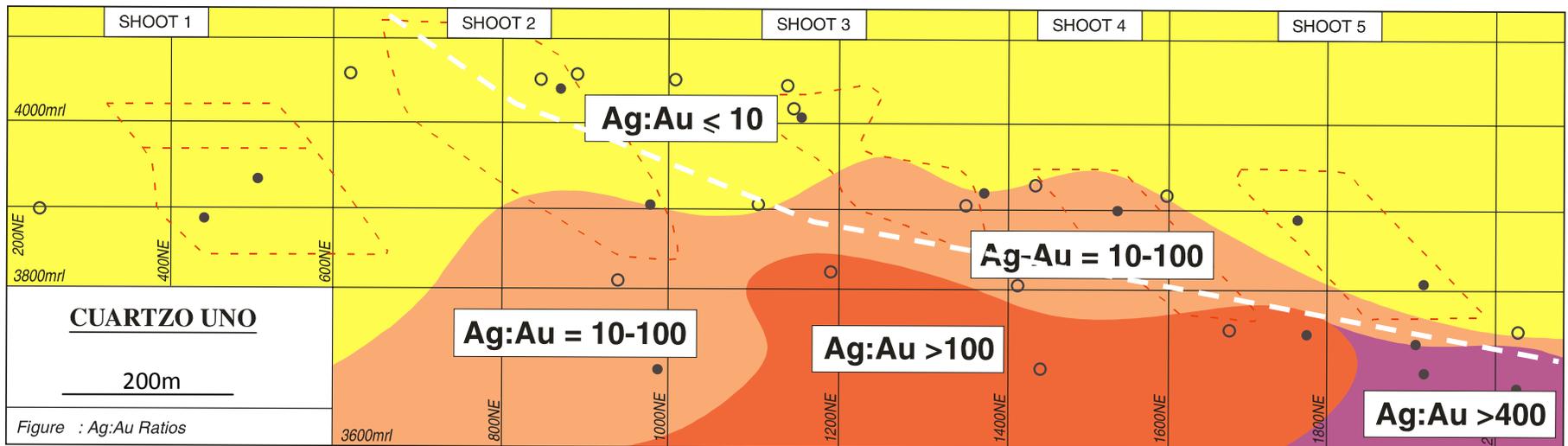
12295c

CUARZO UNO VEIN - LONG SECTION

Base Metal Sulphide Mineralization

S

N



12295b

FLUID FLOW MODEL

Stage I Prograde Event:
Dilution and cooling of N and
NE migrating HS fluid.

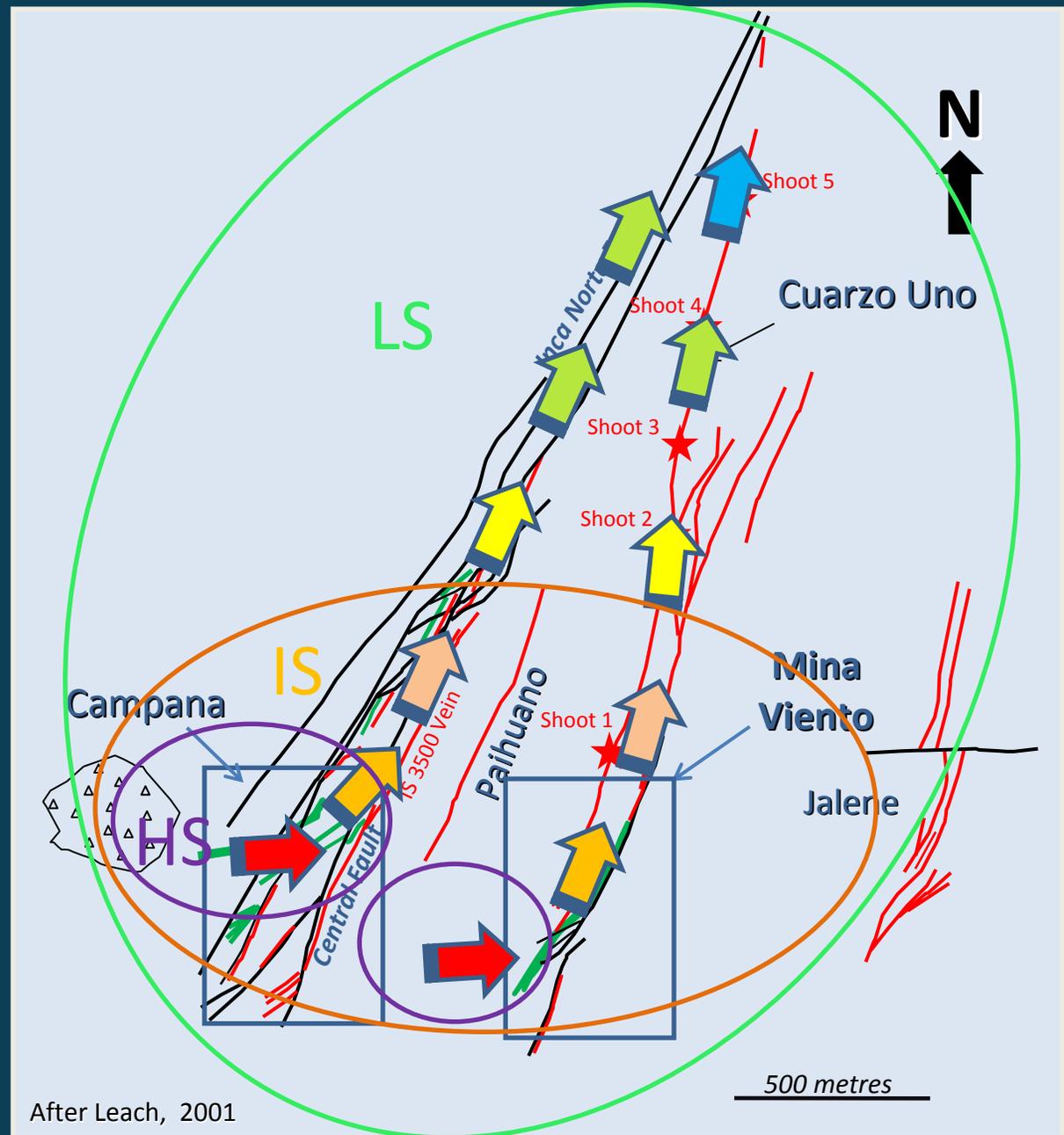
Qz--->MS Veins

En-Py--->Tn--->Cpy zonation.

Replacement of En-Py by Tn

Al-Kao--->Di-Dsp--->Ser

Cu>Au>Ag



After Leach, 2001

FLUID FLOW MODEL

Stage II Thermal collapse and drawdown of cool dilute meteoric fluids.

Carb-Qz--->Qz (Chal)+Ro Veins

Cp--->Sph+Gl.

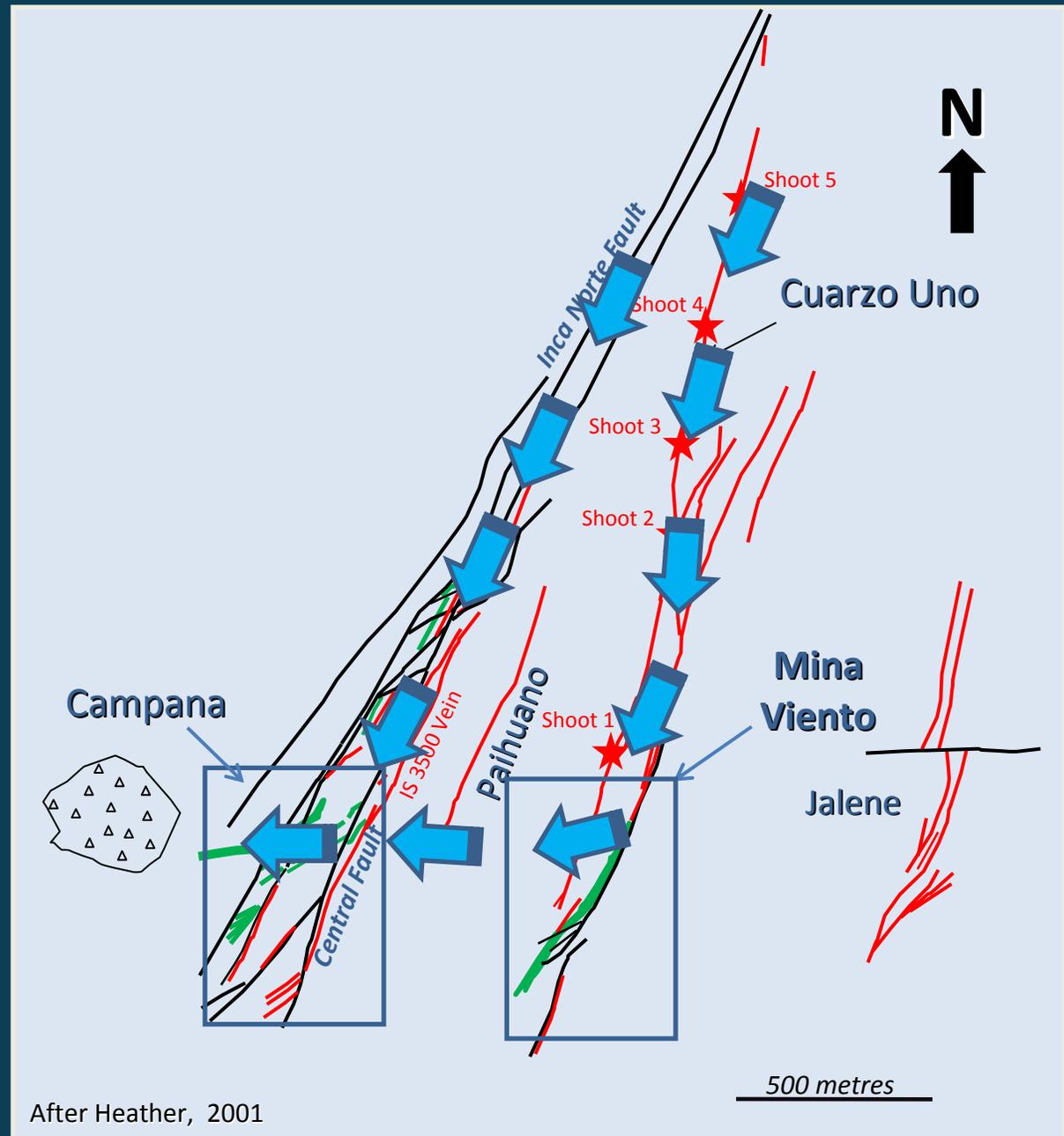
Cp replacing early Tn

Ser-->I-->I+S.

Ag>Au.

Bonanza grades.

LS overprint.



TAKE AWAY'S

1. El Indio is not a “classic” HS Vein deposit.
2. It is a spatially and temporally zoned epithermal system with components of HS, IS and LS styles of alteration and mineralization.
3. Bonanza gold grades are associated with later IS to LS Quartz-Gold veins that are superimposed over early HS enargite-pyrite veins.
4. Deposit formed by a two stage process: an earlier prograde event (HS to IS) and a later retrograde event (LS).

ACKNOWLEDGEMENTS



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