
Drilling Deeper | Webinar Invitation
Join Live | Ask Questions
Forging a Multi-Billion Dollar Discovery Legacy
Malcolm Norris and Bruce Rohrlach's Exploration Partnership
12pm (AEDT)
Friday 6 February
Drilling Deeper
Lode Stars Webinars
with the Lowell Resources Fund
Host John Forwood
CIO
Lowell Resources Fund
Guest:Malcolm Norris
Chairman
Sunstone Metals
Guest:Bruce Rohrlach
Geology Manager
Sunstone Metals

Malcolm Norris

- BSc University of Queensland; Tennant Creek honours project and working underground with Geopeko
- Geologist with WMC 1981 – 2005;
  - Three Springs Talc mine
  - Nifty Copper project, very early days
  - Study leave Canada, completed an MSc on the Nifty Copper Deposit
  - Orogenic Gold in Tanami
  - Philippines, primarily exploration management role
  - Global Nickel, Technical Risk
- Junior sector after BHP acquired WMC
  - Indophil – ex WMC people, very good transition to the junior sector and understanding how it works
  - Intrepid – Tujuh Bukit
  - SolGold – company rebuild and Cascabel
  - Sunstone – foundation assets and growth

- ❑ Visit to Broken Hill as an 8yo – amazed at the rocks and the mining town
- ❑ Driven by discovery – the highs are incredible, the lows are challenging
- ❑ Abundance of opportunity to work with great people
- ❑ Love of the mining industry and what it delivers to society

Bruce Rohrlach

- Formative years growing up in PNG.
- Introduction to Exploration – Work Experience with D.Lindley, Wild Dog Prospect.
- University of Adelaide (1984-1987).
- WMC (1988-2001).

  1988: Goodall JV in the NT - (Orogenic Au)
  1989: Broken River Province in Nth Qld – (Epithermals)
  1990-1996: Westmoreland & Lawn Hill with S. Hancock (Pb-Zn-Ag).

- WMC (1996-1997) - Tampakan Copper Project (Mindanao) prior to study leave.
- 1998-2002: PHD (on Tampakan) at the Research School of Earth Sciences (RSES) at ANU, Canberra, under tutelage of B.Loucks, M.Palin, I.Campbell.

Tectonic Evolution, Petrochemistry, Geochronology and Palaeohyrology of the Tampakan Porphyry and High Sulphidation Epithermal Cu-Au Deposit, Mindanao, Philippines.

- Junior Companies

  2003-2006 Lafayette (Rapu Rapu VMS) + Consulting
  2006-2012 Intrepid (Tujuh Bukit).
  2013-2015 Solgold (Cascabel)
  2015-2026 Sunstone (Sweden, Finland, Ecuador).

Bruce and Malcolm – first worked together in the Philippines

Introduction to porphyry copper-gold deposits and epithermal deposits

Enabled the study and exposure to some incredible mineral deposits e.g. Lepanto and Far Southeast – relationships of porphyry deposits (FSE) to epithermals (Lepanto, Victoria) – HSE, LSE, ISE

Technical reviews and training programs with the likes of Dick Sillitoe

Exposure to, and comfort with, low grade deposits

Building experience

Appreciation for the challenges of operating in geologically young, equatorial, rugged terrains

Tampakan

- **Tampakan – original discovery in 1993 driven by diligent field work, and teams that had been well trained in the deposit type, and strong support from management**

- Pre 1930's knowledge of gold in creeks
- Some exploration in 1960's?
- Claim applications by Filipino companies in 1980's; some investigations by local and international companies
- WMC visited prospect in 1990; were encouraged by widespread silica alteration, gold in Pulang Bato creek, rock chip sample results (J. Balkau, A. Buenavista, D. Marcos)
- Data collection under difficult conditions
  - Good quality geological mapping supported by petrography, XRD (later PIMA), fluid inclusions, clay species indicating pH/T conditions, complex brecciation, structural controls, local team had UNDP training
- WMC was a preferred partner – could get a deal done (T. Robbins, J. Balkau)
- Large scale system
- Standard stream sediment geochemistry based on orientation program in adjacent area; 1 sample/km^2 then 2 samples/km^2
- Soil geochemistry based on orientation survey
- Geophysics; magnetics and Induced Polarisation
- Commitment to drill test

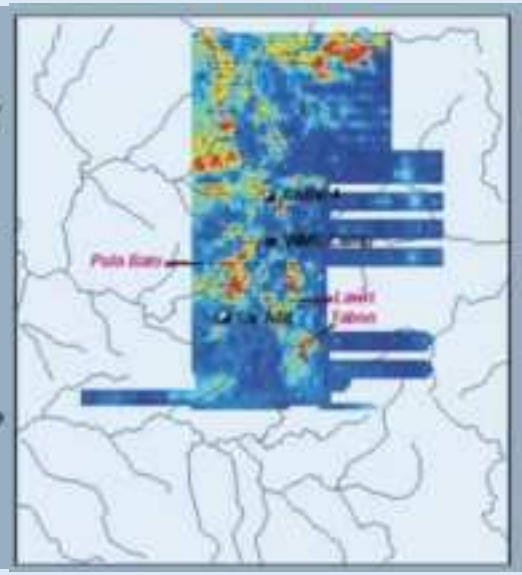
Tampakan - fundamental data collection in very challenging terrain

TAMPAKAN DISCOVERY
PHILIPPINES

Figure 6
STREAM SEDIMENT
GEOCHEMISTRY
GOLD

>90 ppb gold anomaly
Gintong Bato Cu Resource

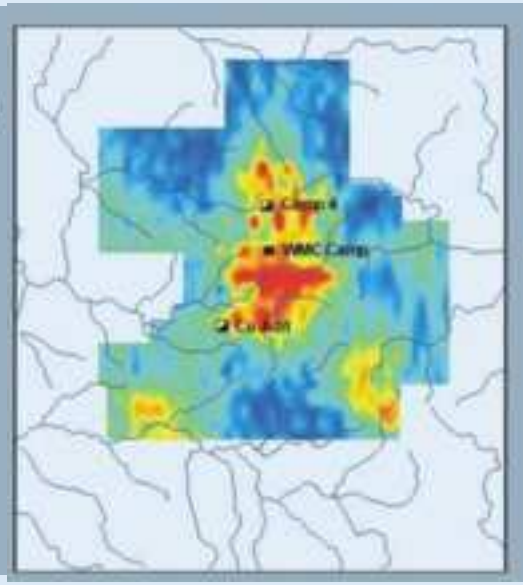
0 5
Kilometres



TAMPAKAN DISCOVERY
PHILIPPINES

Figure 8
SOIL GEOCHEMISTRY
GOLD

0 5
Kilometres



TAMPAKAN DISCOVERY
PHILIPPINES

Figure 9
INDUCED POLARISATION
PFE RESPONSE : N=3

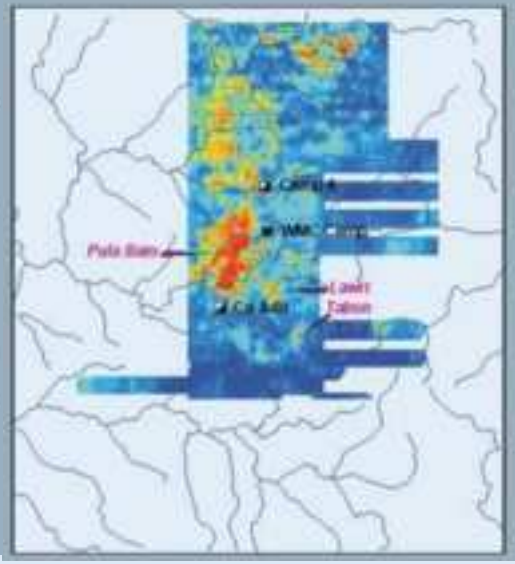
0 5
Kilometres

TAMPAKAN DISCOVERY
PHILIPPINES

Figure 5
STREAM SEDIMENT
GEOCHEMISTRY
COPPER

>310 ppm copper anomaly
Gintong Bato Cu Resource

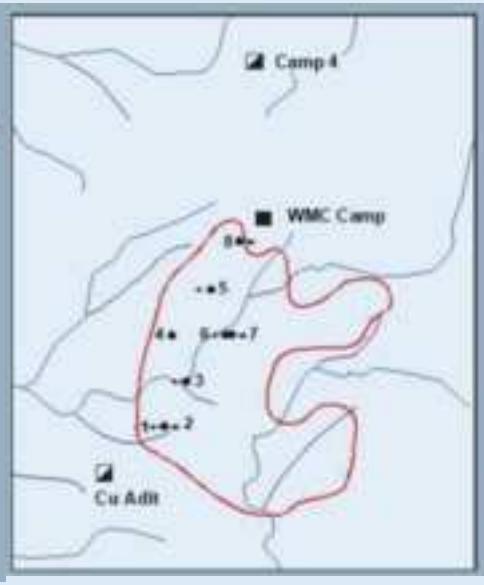
0 5
Kilometres



TAMPAKAN DISCOVERY
PHILIPPINES

Figure 7
SOIL GEOCHEMISTRY
COPPER

0 5
Kilometres



TAMPAKAN DISCOVERY
PHILIPPINES

Figure 10
DRILL HOLE
LOCATIONS

Drill hole with dip direction.
(Prefix : TMPG...)

Gintong Bato Cu Resource

0 2
Kilometres

Tampakan: Key Technical Learnings

WMC Exploration Discovery (HSE) in Mindanao 1993

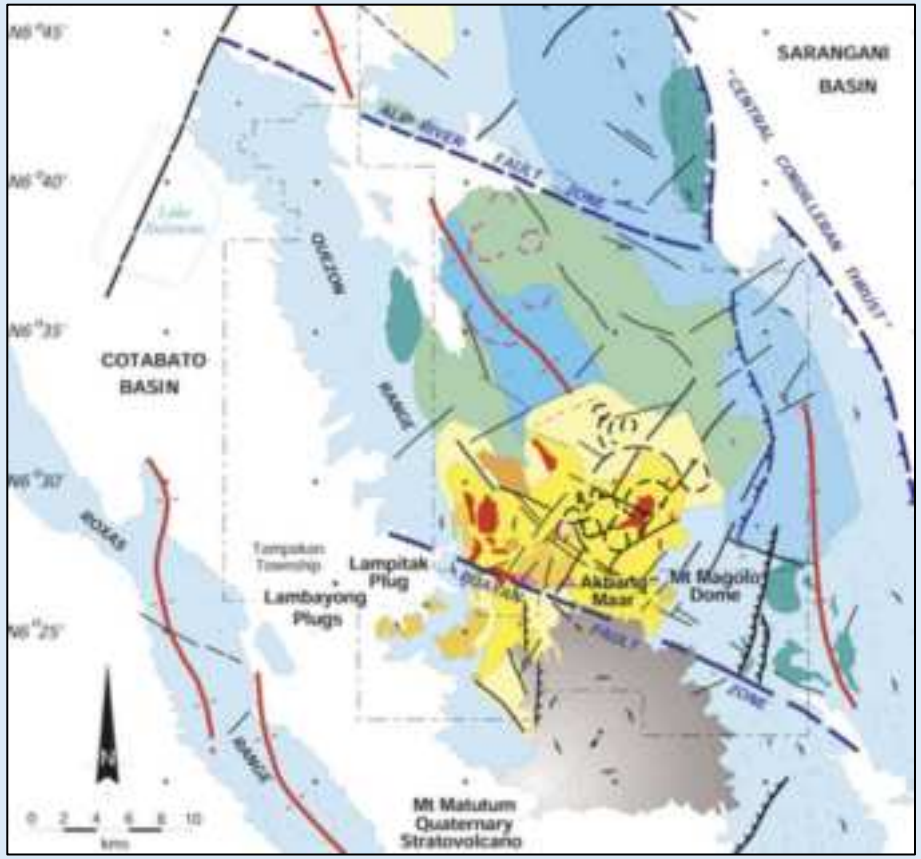
2.94 Bt @ 0.51% Cu, 0.19 g/t Au (15Mt Cu, 17.6 Moz Au)

Technical

1. Importance of alteration system scale (100 km^2).
2. Post discovery - How to target within lithocaps.
3. Lithocap alteration zonation and utility of Terraspec.
4. Textural variation in lithocaps.
5. Adv-Arg geometry (beds/structures) to chase porphyry.
6. Tectonic setting for district selection + fertility indicators.

Operational and People

1. Walk all your ground (A.Buenavista/D.Marcos/J.Balkau).
2. Free-up your best technical geologists.
3. Continually integrate all your people, knowledge, data.
4. Local community involvement all the way.
5. Interaction between project and exploration teams.
6. Foster the team, shared experience, involvement.



The jump from Major to Junior companies ....

Major companies – Excellent training grounds (great career starters).

- Roy Woodall legacy (company exploration culture)
- Yearly company-wide, inclusive project review process
- Much expertise on hand and build a network
- Study leave opportunities.

Junior companies – Hard work, survival challenges, but liberation to chase your ideas.

- Agility - freer from corporate road-blocks (have been reminded of this when in JV discussions!)

Period 2003-2006 we made the transition to junior companies.

- Malcolm: WMC ..... Indophil (Philippines) > Intrepid Mines, SolGold, Sunstone Metals.
- Bruce: WMC ..... Lafayette (Philippines) > Intrepid Mines, SolGold, Sunstone Metals.

(2003-2006): Exposure to numerous properties in the Philippines and Indonesia.

This allowed us to further calibrate and develop ideas on what it takes to identify large, world class systems.
Interesting systems with scale seen in Leyte, Negros, Kalimantan ..... but conditions not right for deals.

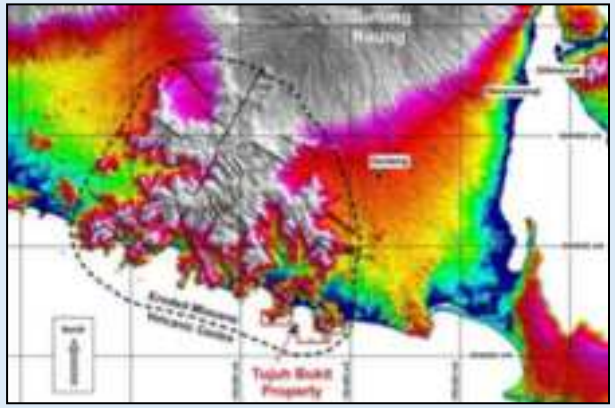
The Breakthrough – Tujuh Bukit

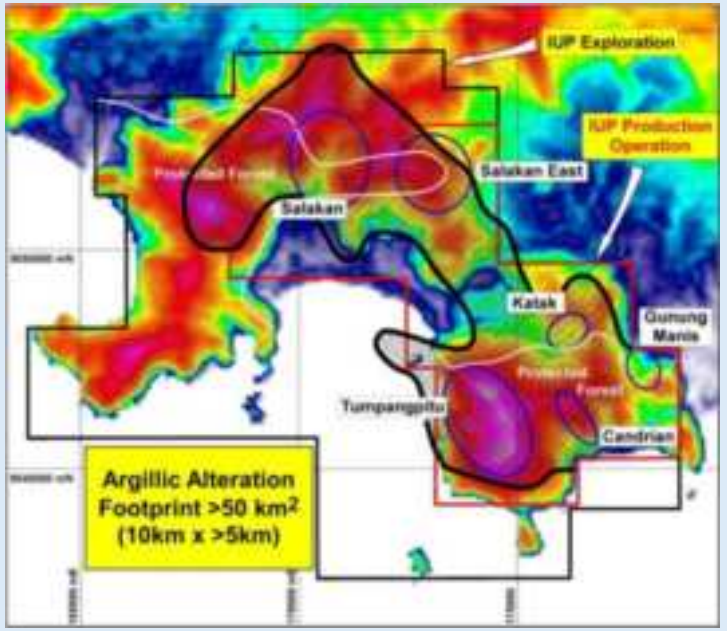
Our first major discovery opportunity came when we visited the Tumpangpitu Project (Tujuh Bukit) in Java (2006).
The ingredients we were looking for fell into place.

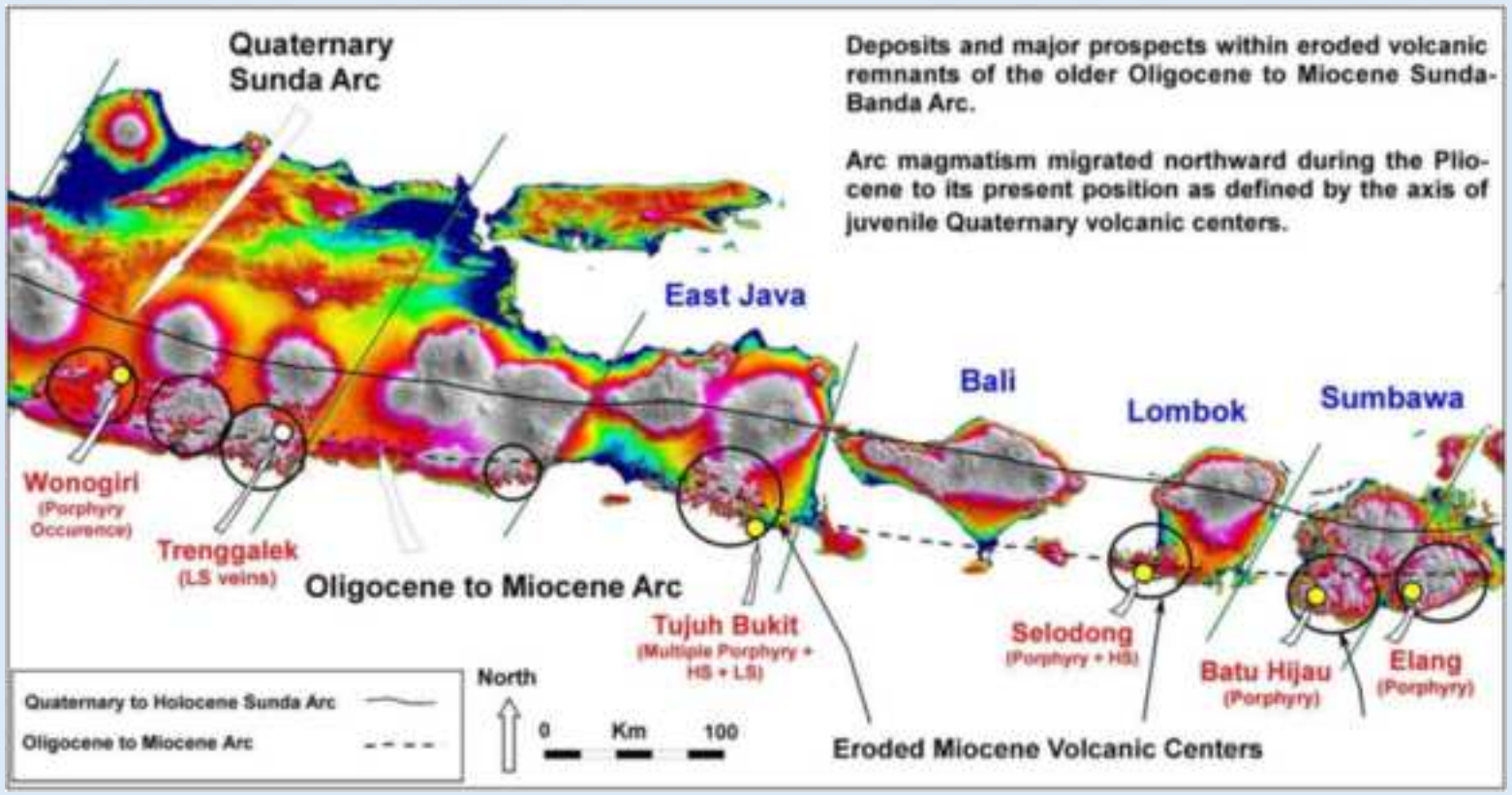
Tujuh Bukit (7 Hills)

Intrepid Mines Discovery (HSE + Porphyry) in Java (2008)
1.77 Bt @ 0.50 g/t Au, 0.47% Cu (8.3 Mt Cu, 28.1 Moz Au)

- Eroded Oligo-Miocene arc - south coast of Java.
- Well mineralised belt – notably host to Batu Hijau and Elang porphyry systems.
- District-scale alteration footprint > 50km$^{2.}$







Tujuh Bukit

Intrepid Mines Discovery (HSE + Porphyry) in Java (2007)
1.77 Bt @ 0.50 g/t Au, 0.47% Cu (8.3 Mt Cu, 28.1 Moz Au)

- First field visit hosted by Indoaust allowed us to draw analogues with Tampakan.
  - District-scale alteration system with lithocap and high-sulphidation mineralisation at Zone A.
  - Textural similarities in lithocap to Tampakan.
  - Extensive vuggy silica cap.
  - Distal hematite (Pula Bato Ck vs Pulau Merah Is) from oxidised meteoric recharge.

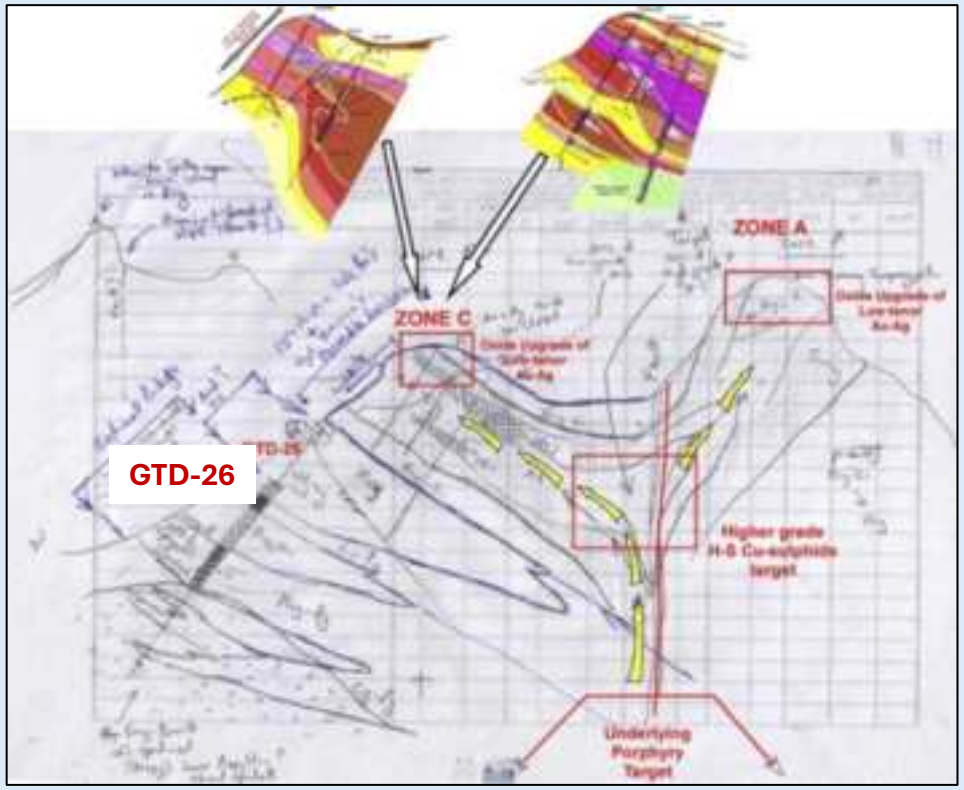
- Golden Valley Mines (Porphyry Exploration 5 holes)
- Placer Pacific (Epithermal exploration 9 holes)

- Lithocap Au-Ag mineralisation evident from shallow historical drilling and provided the immediate shallow targets at Zones A,B,C.

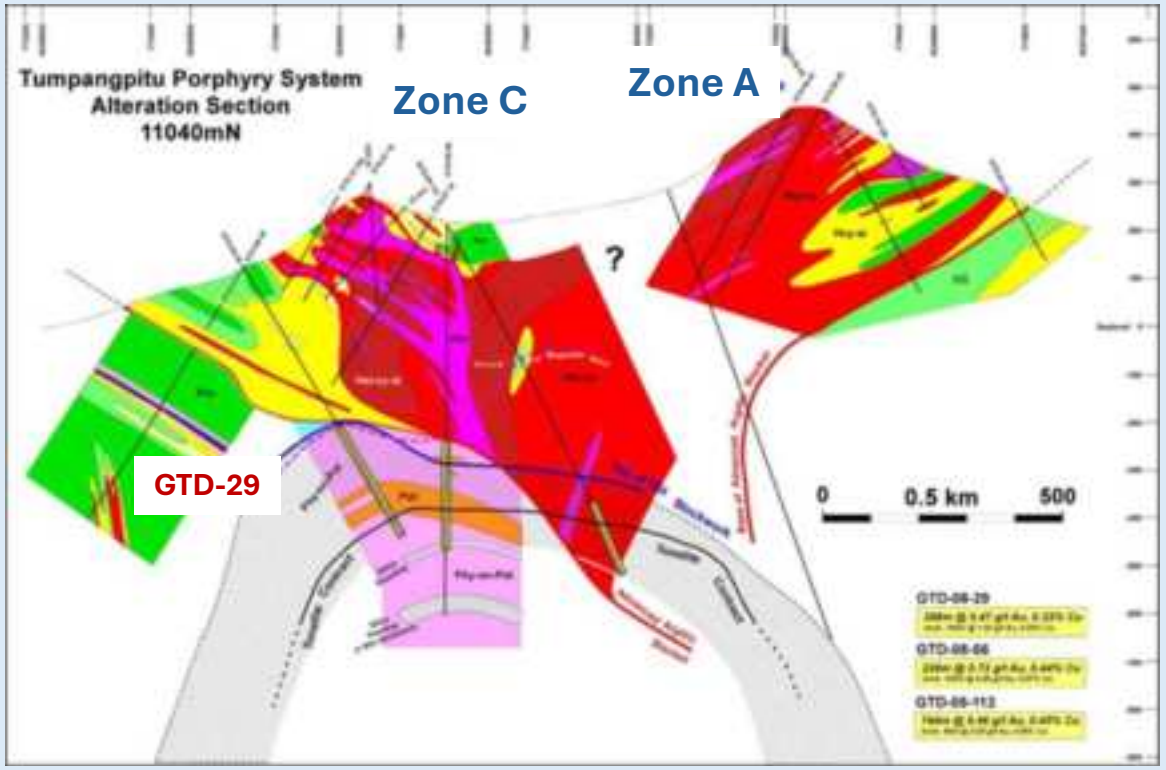
- Intrepid started to drill the high-sulphidation mineralisation to define an initial resource. This defined geometry of the silica ledges which assisted with deeper targeting of the porphyry.

Tujuh Bukit

- Initial drilling (first 11 holes) focused on epithermal zones (A, B, C).
- Evident that the Oxide Zone (Au-Ag HSE) was going to be heap leachable (encouraging).
- Good observations identified porphyry clasts in high-level breccias (confidence for deeper drilling).
- Then drilled 3 deeper holes in a traverse to build the underlying picture (GTD-26, 29, 35).
- GTD-08-26 was the first deep hole but drilled away from the system into an IP anomaly (Pyrite Halo Lesson).
- GTD-08-29 drilled in the opposite direction: 268m @ 0.47 g/t Au, 0.32% Cu (Incl. 100m @ 1.02 g/t Au, 0.55% Cu).
- TerraSpec mapping of alteration in core from the epithermal zone defined dipping ledges that reinforced understanding of pathways from the underlying porphyry.

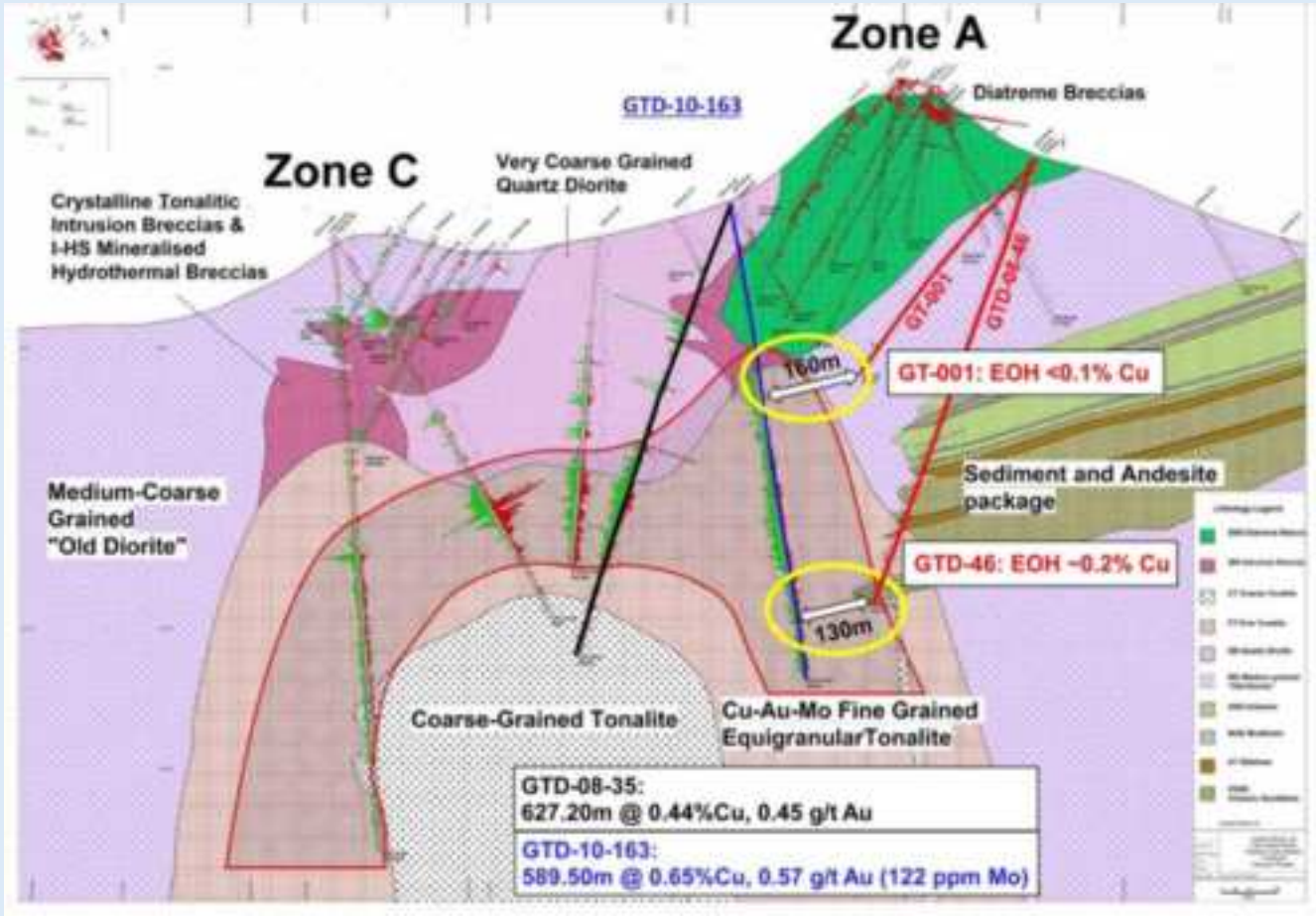


Alteration facies mapping in lithocap very predictive to porphyry source



Tujuh Bukit

- GTD-08-35 drilled down-dip of the A-Zone alteration ledge.
- Second major intersection GTD-08-35 (627.2m @ 0.45 g/t Au, 0.44% Cu; from 222m). Carapace.
- GTD-10-163 (589.5m @ 0.57 g/t Au, 0.65% Cu). Eastern limb.
- 13 deep holes – GTD 29, 35, 42, 46, 56, 112, 138, 139, 146, 162, 163, 165, 166 – delivered intersections spaced at ~200 metre intervals, supported the Inaugural resource: 500Mt @ 0.4% Cu, 0.5 g/t Au
- GTD-001 (GVM hole stopped 160m from a world class orebody in halo Cu values sub-1000 ppm.
- Knowledge applicable to our Limon (Sunstone) exploration.



Tujuh Bukit

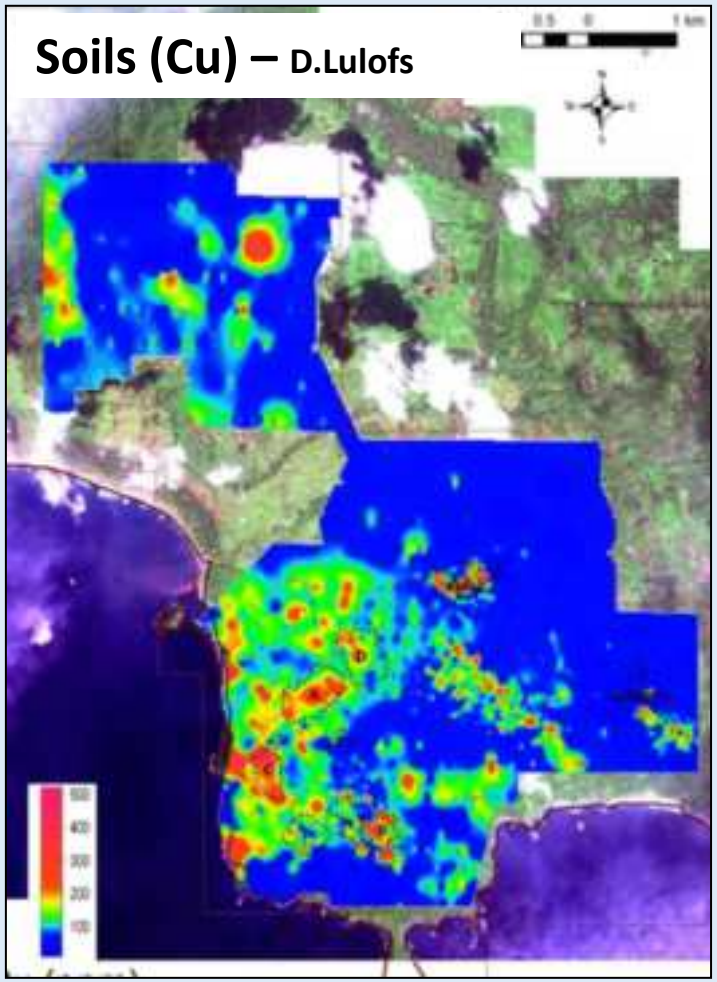
Key District-Scale datasets were acquired early in the program during initial drilling.

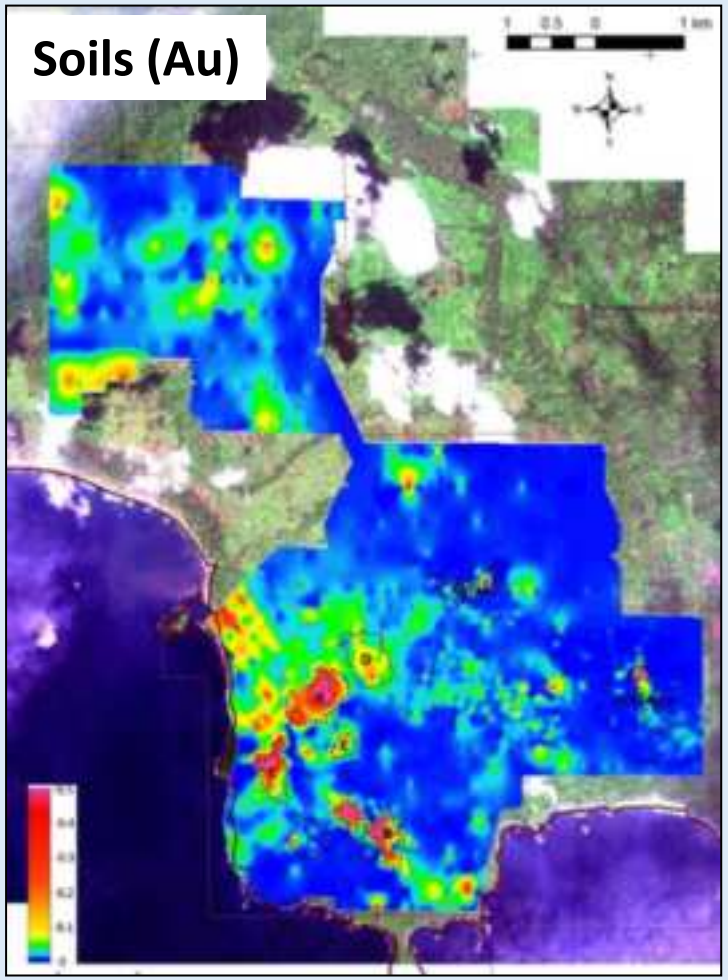
- **1) Multi-element grid soils**
  (3 x 2 km Cu footprint at Tujuh Bukit)
  (5 x 2 km Cu footprint at Tampakan)

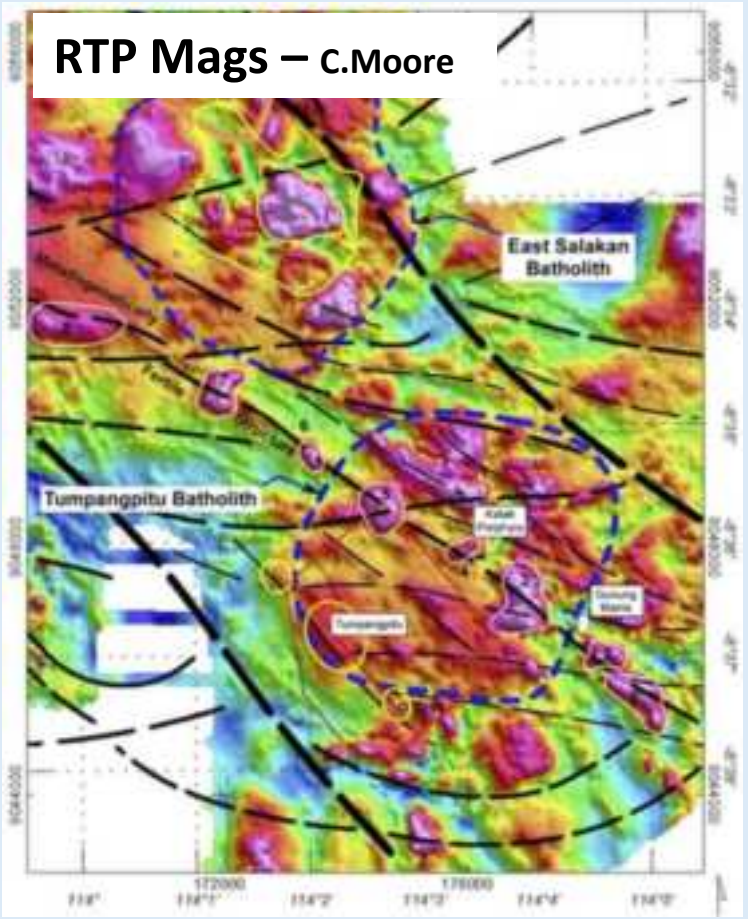
2) Ground magnetics
(Lithology, Alteration, Structure)

3) Terraspec alteration mapping

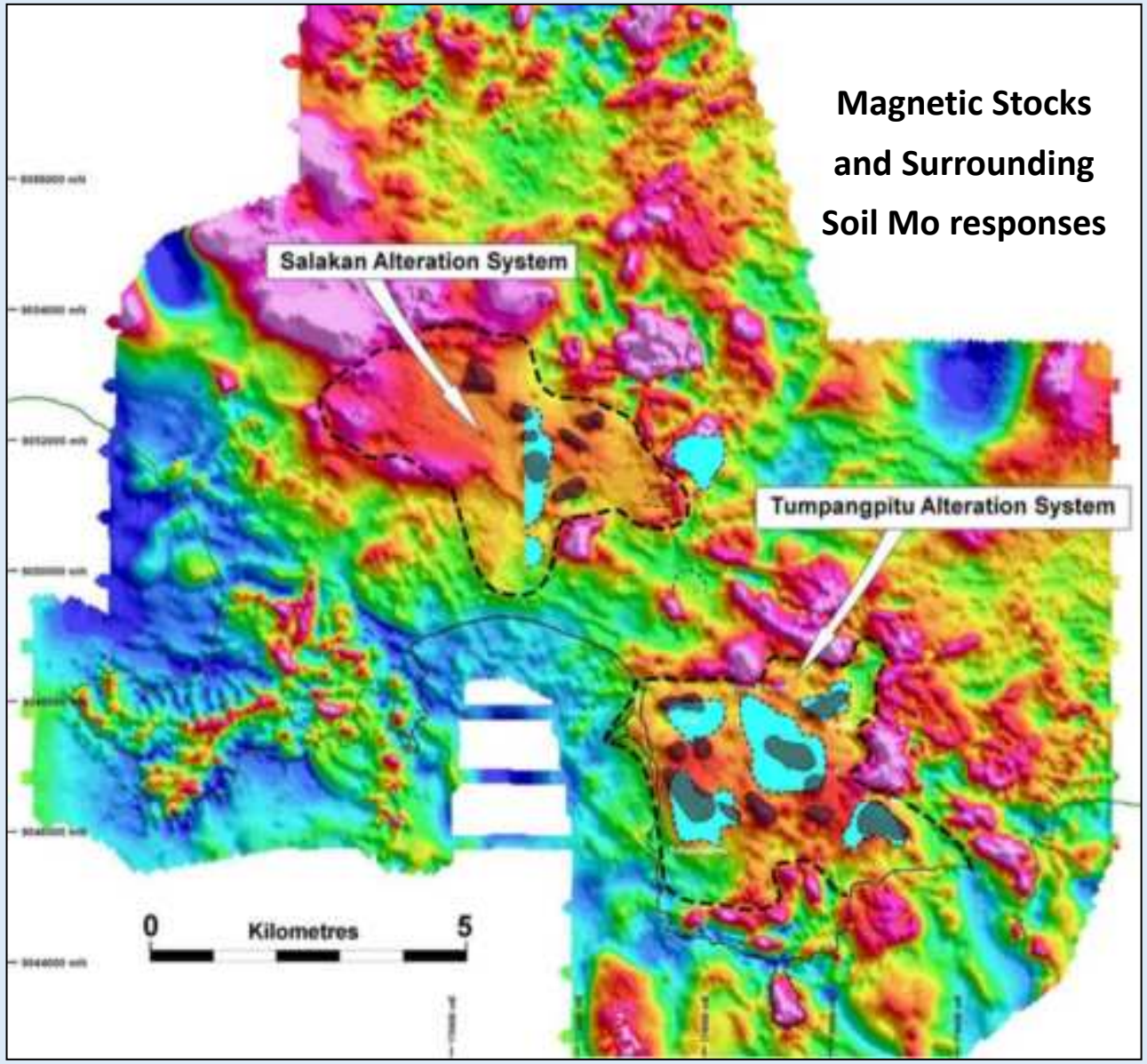
These 3 data-sets were key to understanding the district and unlocking the exploration potential for adjacent porphyry systems at Candrian, Salakan, Katak



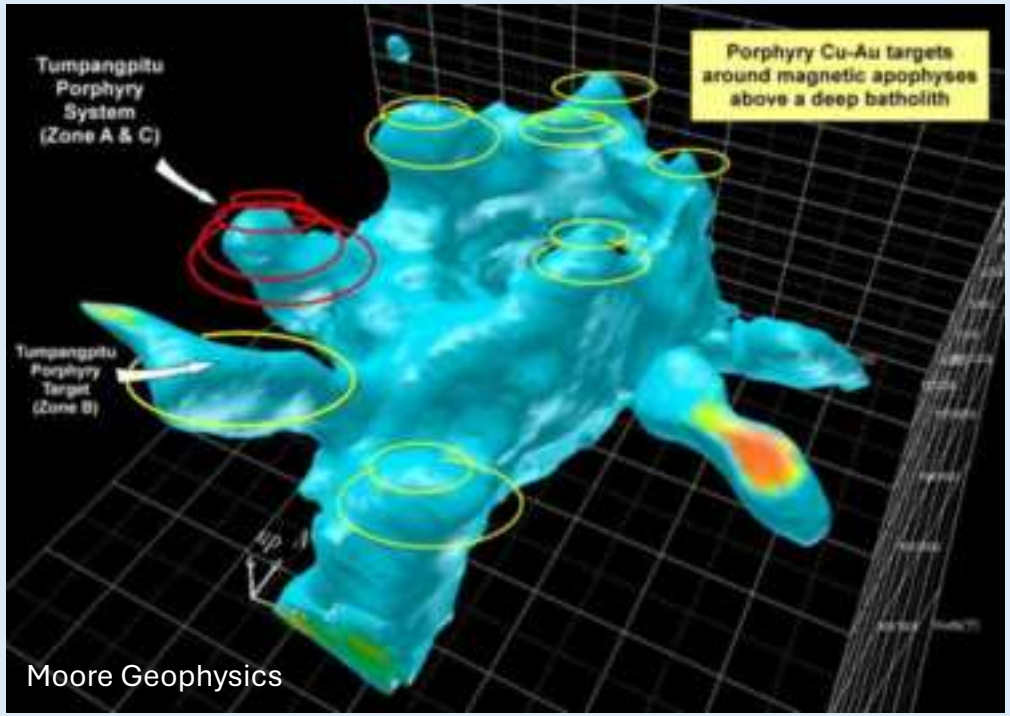




Tujuh Bukit



- Porphyry exploration can be fast-tracked with good quality RTP magnetic imagery.
- When lithocaps are deeply eroded, good 3D magnetic inversion modelling works well to map intrusive apophyses (the site of porphyry systems) around the upper edges of deeper batholiths.
- At Tujuh Bukit the coincidence between shallow RTP anomalies and immobile Mo-in-soil anomalies provided productive targets.



Tujuh Bukit

Some of Many Lessons Learnt at Tujuh Bukit

	Date	Share price	Announcement details
1	27-May-08	$0.36	Hole 29 intersected 268 Mts at 0.47 g/t gold and 0.32% copper from 390 mts, including 100 mts at 1.02g per tonne gold and 0.55% copper from 530 mts
2	18-July-08	$0.28	Hole 35-627.2m at 0.45g/t gold and 0.44% copper from 222m, including 188m at 0.9g gold and 0.9% copper from 530m.
3	28-July-08	$0.28	Inaugural resource oxide
4	19-February-09	$0.28	226 mts at 0.72g /t gold and 0.44% copper
5	30-September-10	$1.27	500 M tonnes at 0.4% copper and 0.5 g/t gold inagural porphyry resource
6	09-May-11	$1.92	990 million tonnes at 0.4% copper and 0.45g/t gold

- Every little observation is important at some point – Mentally file it.
- Interact and debate in the field – Continuously.
- Collect district-scale datasets – Especially soils, magnetics, alteration.
- 3D inversion modelling is very useful – (batholith and deposit scales).
- Diagrams, sketches, concept models are your friend.
- Reinterpret and integrate at every opportunity with new data.
- Don’t under-drill when testing porphyry systems.
- If the alteration system is large – Persist.
- Don’t underestimate conceptualisation time – it’s where discoveries lie.
- Team synergies – leverage intellectual skills.

The right skill mix

Local staff will underpin your success

Finding the Next Right Property ..... Putting Tampakan and Tujuh Bukit knowledge to the test

Take your time to identify the right property – The critical first step

Shyri - Ecuador

Tethyan Belt - Armenia

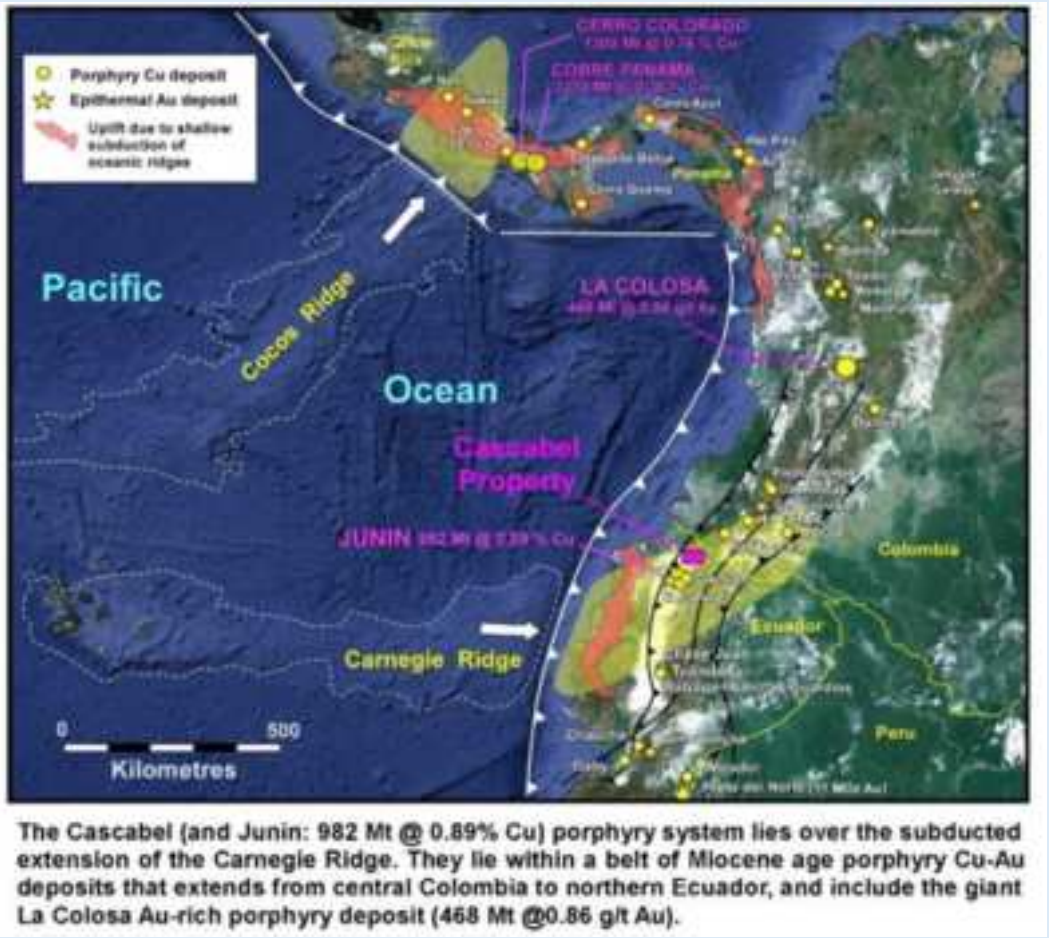
Sonora - Mexico

Guadalcanal - Solomon Is.

Cascabel

SolGold – Cornerstone Discovery (Porphyry) in Ecuador
M&I (2025) 3.01 Bt @ 0.35% Cu, 0.28 g/t Au (0.52% Cu-Eq)

- Relationship with project generator Cornerstone Capital Resources (CGP).
- Historical work in area by INEMIN and ODIN Mining (1980's)
- Santa Barbara Copper and Gold S.A. (SBCG) granted concession in 2007.
- Cornerstone purchased the property in 2011.
- Regional work by SBCG and CGP defined Cu-Au-Mo-Pb-Zn-Ag anomalism over 5km^2 with stockwork veins discovered in Alpala, Moran, Tandayama and America Creeks.
- SolGold entered JV with Cornerstone in May 2012 (prior to a first visit).



The Cascabel (and Junin: 982 Mt @ 0.89% Cu) porphyry system lies over the subducted extension of the Carnegie Ridge. They lie within a belt of Miocene age porphyry Cu-Au deposits that extends from central Colombia to northern Ecuador, and include the giant La Colosa Au-rich porphyry deposit (468 Mt @0.86 g/t Au).

- **South American Andean Porphyry Belt**
  Cascabel in northern Ecuador lies within the South American Andean porphyry Cu belt that extends from southern Chile to northern Colombia (and Panama). This regional belt is host to some of the worlds largest Cu, Cu-Au and Au deposits.
- **Northern Ecuador Miocene Porphyry Belt**
  Multiple porphyry deposits in the belt, including the giant undeveloped Junin Cu-porphyry (northern Ecuador) and the La Colosa Au-porphyry (Colombia).
- **Crustal-scale arc-parallel and arc-normal faults**
  Toachi Fault Zone
- **District-scale Geochemical Anomalism**
  Cu-Au anomalous geochemistry (in stream sediment and rockchip samples) occur over an area of 5 km (north-south) by 4 km (east-west).
- **Deep Lithocap Environment Preserved**
  Structurally-controlled argillic alteration covers 4 km by 1 km and is open along structural strike.
- **High Porphyry Grades Demonstrated**
  Sampling at Quebrada Alpala on the south end of the main target has yielded grades up to 4.86 g/t Au & 1.30 % Cu in sheeted porphyry B-veins.
- **A 20 km^2 soil survey (200x100m and 100x100m) underway**
  Multi-element soil geochemical survey underway to define full lateral extent of system, and assist drill targeting.
- **Heli-Magnetic and Radiometric survey commencing**
  Heli-magnetic survey about to commence over entire concession
- **A$2.8 Million first year exploration budget**
  The Cascabel concession is 100% owned by Cornerstone Capital Resources. SolGold can earn up to 85% equity in the Cascabel project.

Cascabel

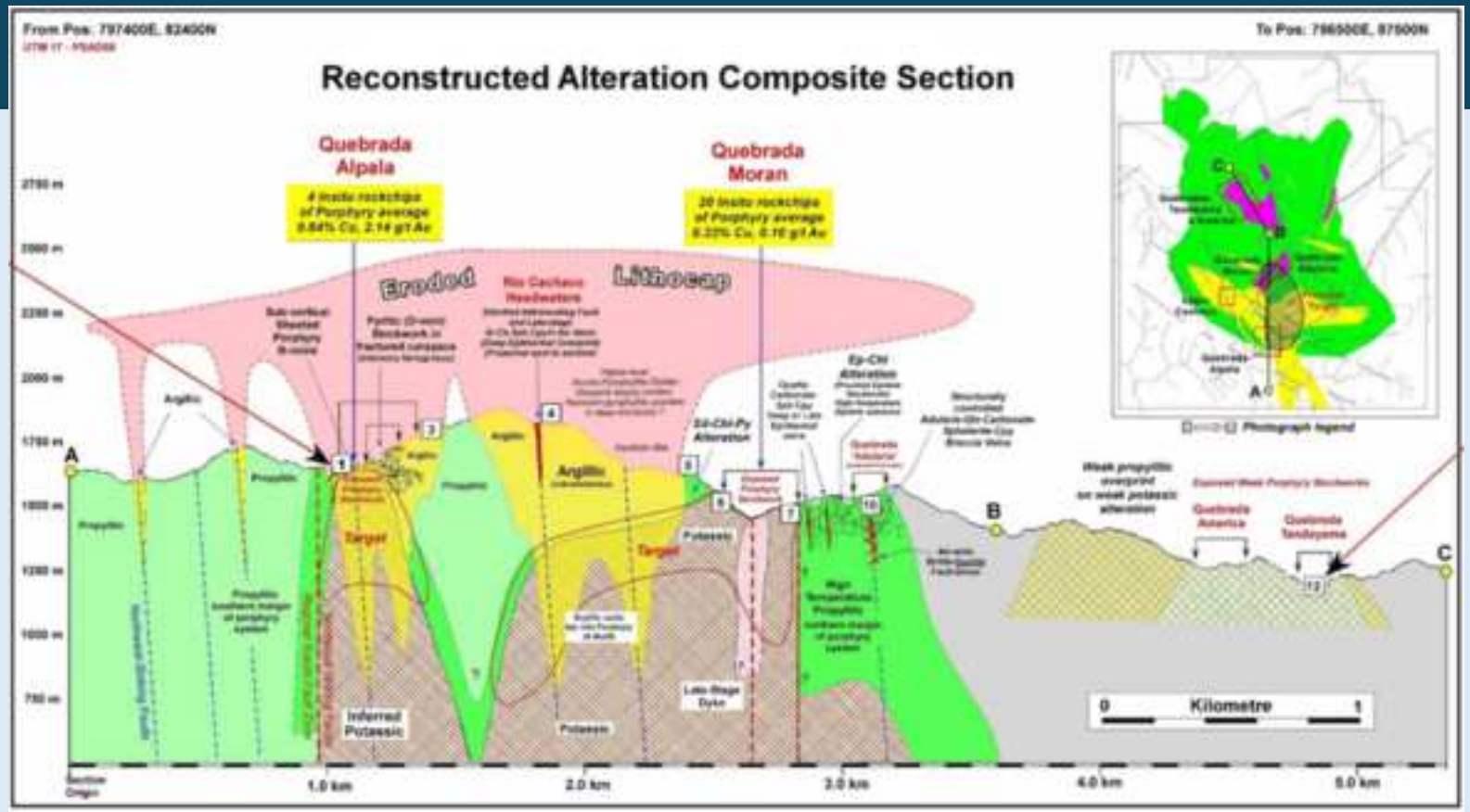
- **Our interest in the property was piqued by:**
  1. Scale of geochemical signature
  2. Right tectonic and temporal setting
  3. Early-mover opportunity

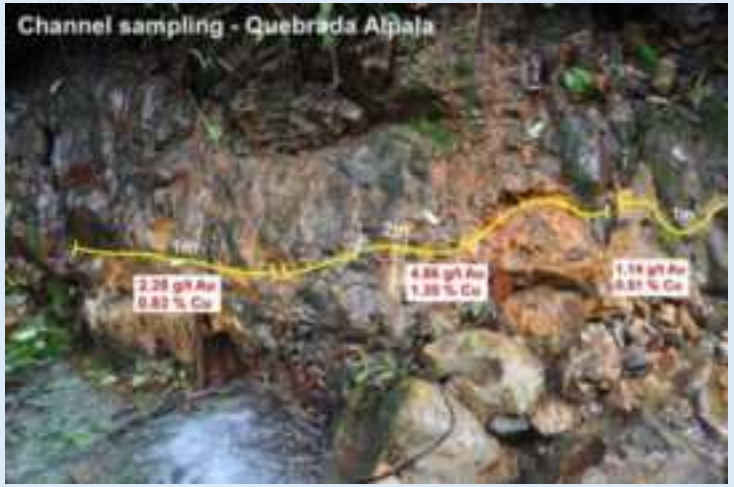
- **A geological and alteration model was developed during the initial field visit in 2012.**

- **Key sheeted B-Vein outcrops were identified by Osman Poma (Cornerstone) in Alpala Creek during earlier geological mapping.**

- **We acquired early blanket coverage of key datasets allowed rapid focus on the Alpala system (soils, rocks, mapping, helimags and spectral mapping on soil dataset).**

- **Early spectral mapping provided high-resolution alteration maps and vectors in the lithocap.**





Cascabel

SolGold Discovery (Porphyry) in Ecuador
M&I (2025) 3.01 Bt @ 0.35% Cu, 0.28 g/t Au (0.52% Cu-Eq)

- **Mapping and channel sampling in Quebrada Alpala and tributaries defined initial high-level drill target.**

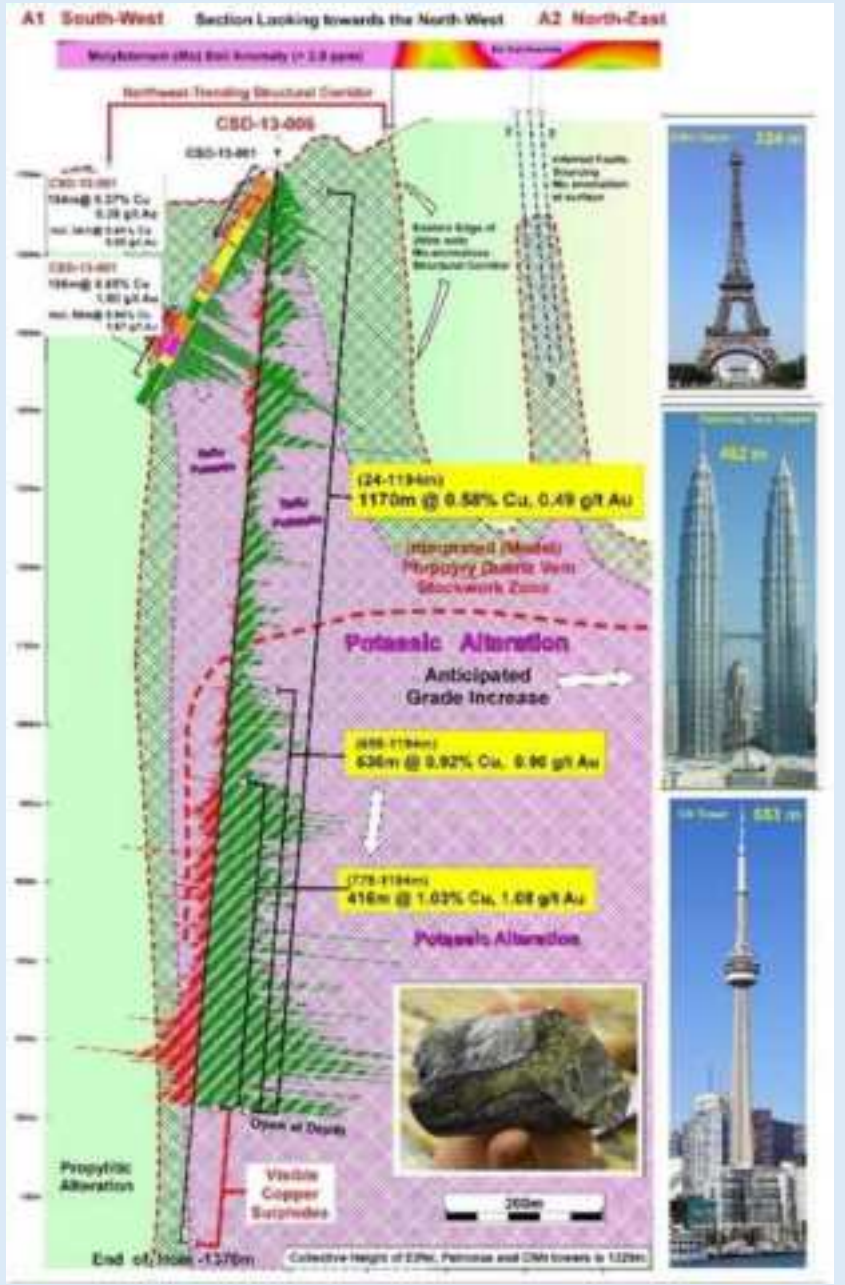
CSD-13-001: 60 degrees below trench TH46 to 349m depth. Bulk Zone + 2 zones:
302m @ 0.39% Cu, 0.48 g/t Au
Incl 104m @ 0.37% Cu, 0.38 g/t Au
and 100m @ 0.65% Cu, 1.00 g/t Au

CSD-13-005: Undercut Hole 001 (Coronel/Ward) Drilled to 1370m depth.
1320m @ 0.62% Cu, 0.54 g/t Au
Incl. 688m @ 0.92% Cu, 0.90 g/t Au
Incl. 258m @ 1.27% Cu, 1.40 g/t Au

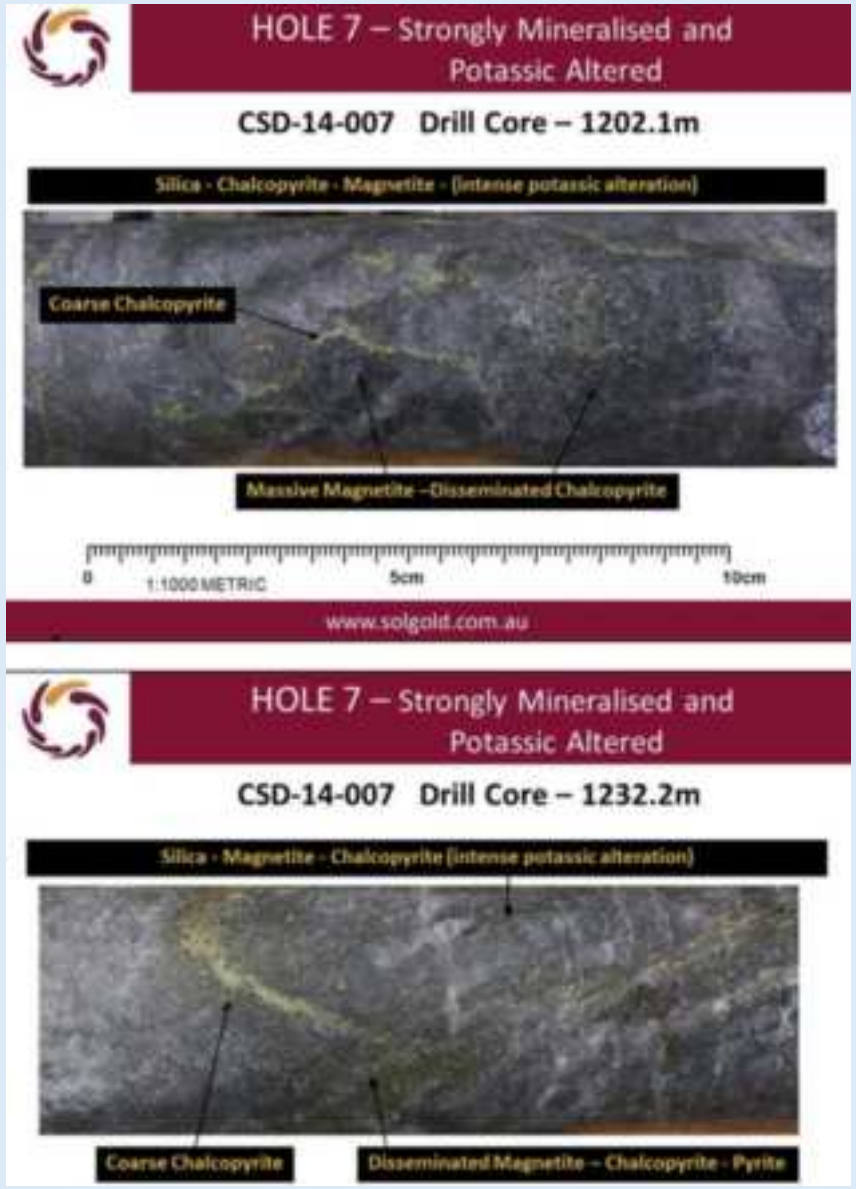
- **Management committed to deep drilling despite poor equity market. Belief and calculated risk.**

Alpala

F.Ordonez, J.Ward, B.Rosero, J.Coronel, E.Santinez



Cascabel



- Astute ground selection
- Leveraged network (Cornerstone).
- Leveraged skills learnt at Tampakan and Tujuh Bukit.
- Early property-wide key datasets.
- Spectral data a key dataset to map alteration.
- Modelling long-wavelength magnetic data to understand deep batholith geometry.
- Multiple phases of 3D inversion modelling. Test each model iteration against results.
- Newest MVI algorithms to circumvent remanence.
- Orion 3DIP and MT assisted in ranking of MVI mag anomalies.
- Benchmarking geochemical survey results against other large porphyry systems.
- Understanding vertical extent of porphyry system to commit to deep drilling.
- Management taking calculated risk with a big-picture in mind

Sunstone; Bramaderos and El Palmar (see www.sunstonemetals.com.au for detail

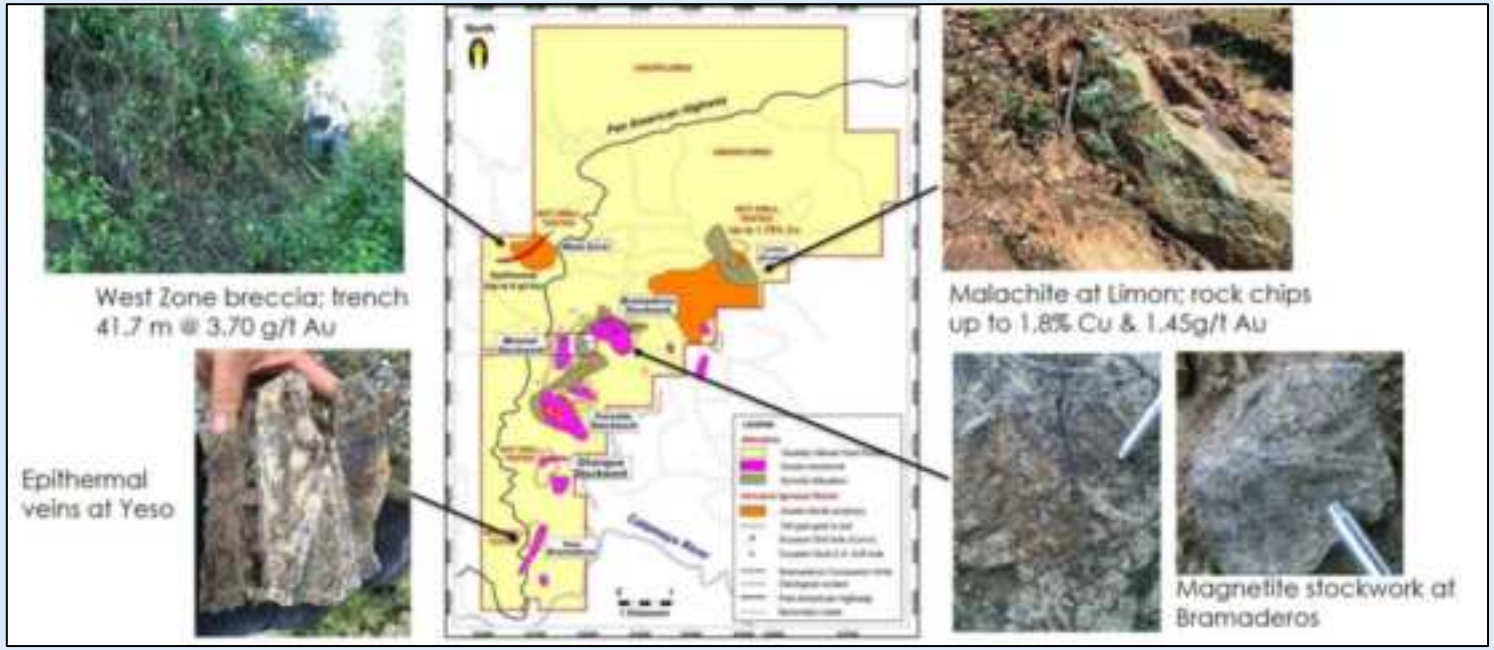
- **The Sunstone journey** – from Avalon Minerals in Scandinavia to Sunstone Metals exploring for porphyry copper-gold deposits.
- Move to porphyry copper-gold exploration was always planned, and aimed to be ahead of the growth cycle

- **2014** – new team; main project Viscaria copper project in Sweden; considered foundation asset for company growth; copper price not on our side!
- **2016** – acquired lithium and gold projects in Finland; allowed company to raise funds. A company 'evolution' dictated by external factors
- **2017** – moved into porphyry exploration in southern Ecuador, through Bramaderos JV with TSXV listed Cornerstone Capital – a repeating theme! Cornerstone was also our partner previously at Intrepid and SolGold. Work with people you respect and trust
- **2018** – Viscaria project divested for cash and shares
- **2020** – El Palmar project, Northern Ecuador - Staged Acquisition Agreement signed
- **2021** – Finland lithium and gold assets sold

- **2021 onwards** – Bramaderos and El Palmar discoveries
  - Rapid valuation growth in response to
  - Bramaderos, Alba drilling; **111m at 2.3g/t gold from 93m**
  - El Palmar first drill hole intersected

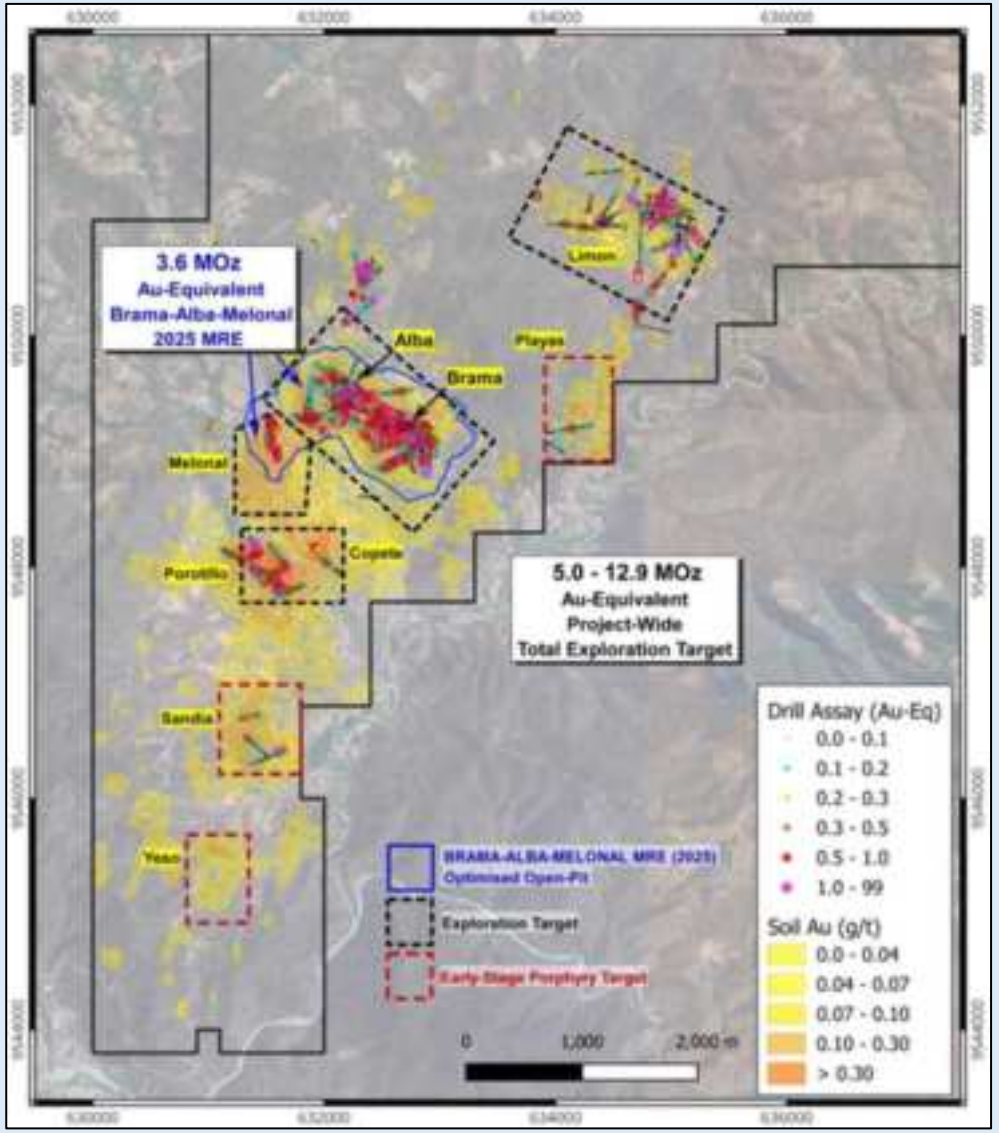
    163.55m at 0.71g/t gold and 0.20% copper (1.05g/t gold equivalent[1]) from 52.35m,
    within 480.85m at 0.41g/t gold and 0.15% copper (0.66g/t gold equivalent[1]) from 11.3m

Bramaderos – gold-copper porphyry deposit



- 2017 commencement of exploration
- 2019 commencement of drilling
- Some historical drilling reduced uncertainty
- Systematic data collection and selective drilling has
  - built gold and copper resources
  - discovered epithermal gold-silver deposits
  - identified more targets – a lot of upside still to deliver

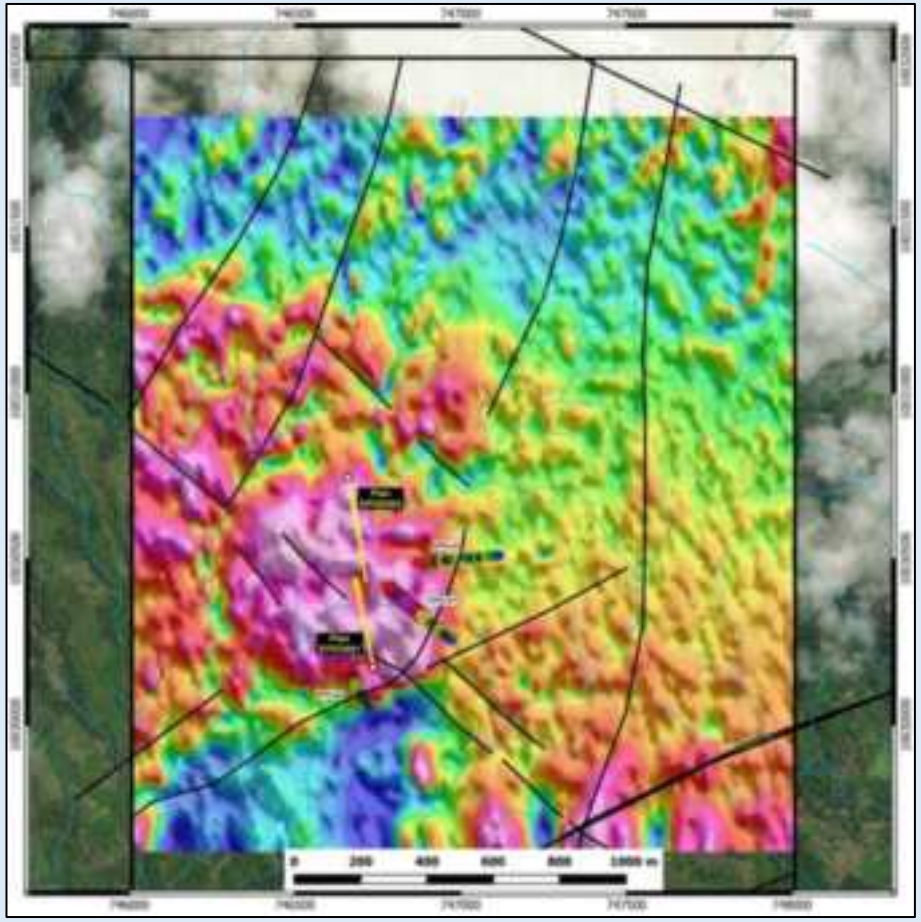
2025 ongoing resource growth

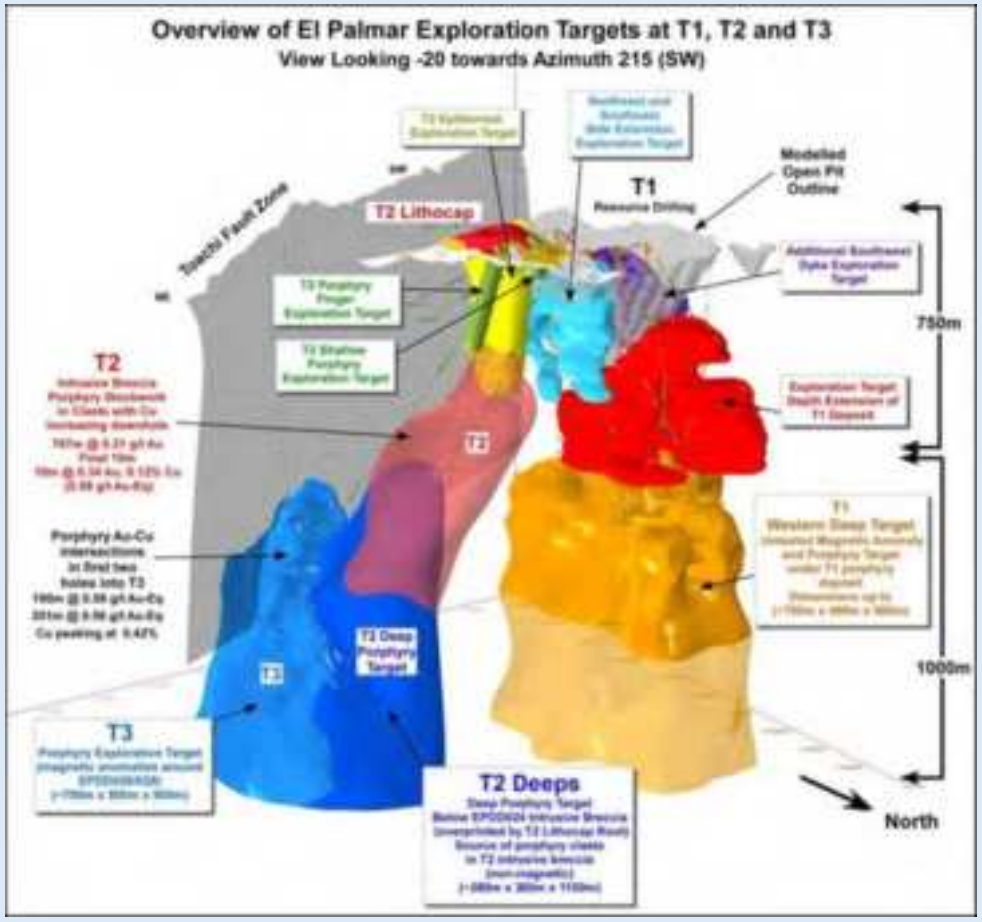


Bramaderos

- 2017 commencement of exploration through earn-in JV with Cornerstone Capital Resources
- The relationship with Cornerstone was very important – Cornerstone was a Canadian junior project generator with whom we had had a 20 year relationship – first interaction was with WMC during an assessment of a sediment hosted copper opportunity in Newfoundland in 1999
- Cornerstone had built a business in Ecuador at the time of the Fruta del Norte discovery by Aurelian in the mid 2000's
- Cornerstone had arguably the best team in Ecuador across all disciplines
- Made Sunstone's entry into Ecuador relatively straightforward and discovery followed soon after drilling commenced
- Some historical drilling reduced uncertainty, and enabled application of modern systematic exploration in an efficient way to define new targets

El Palmar – in regionally significant Toachi fault belt





- Some historical drilling (3 holes) reduced uncertainty
- Applied systematic modern exploration approach to define multiple targets
- Large system discovered in regionally significant belt
- Very significant upside still to deliver

El Palmar

- The Staged Acquisition Agreement on the El Palmar project was completed during the global COVID pandemic (no site visit undertaken during DD)
- Sunstone was familiar with the geological belt hosting the El Palmar project
- Our local network in Ecuador was responsible for linking the vendor, a retired geologist and former Rio Tinto Ecuador country manager, with Sunstone
- An agreement was struck and was focussed on the alignment of doing the right thing at a local level, application of modern geophysics (magnetics), soil sampling through thin cover, and early drilling
- Some minor historical drilling reduced uncertainty
  - Codelco drilled 3 holes in 2012, all were mineralised with best intersection of 186m at 0.33g/t gold and 0.16% copper from 33m downhole within a porphyry system
- This, together with its location in the regionally significant Toachi fault belt (host to the giant Cascabel and Llurimagua deposits), encouraged Sunstone to pursue the project

Some learnings and reflection

- **WMC**
  - Technical excellence underpins exploration
  - Collaboration and multi-dimensional teams
  - Demanding quality – challenge one another, frightening technical reviews
  - Confidence – the Roy Woodall lectures
  - Don't rely on past success, must continue to deliver

- **Junior sector**
  - Investors, backers, analysts always demanding more – embrace that
  - Technical success not enough, need to see alignment of discovery with
    - capital flows
    - 'fashions' in commodities
    - risk appetite
    - ability to access best people
    - communication to non-explorers (investors, boards etc)

- **Exploration and discovery is not just a process, it's a business, and in business you need to continually adapt**

Pasteur 1854 "In the fields of observation, chance favours the prepared mind"

Study, self improve, see lots of deposits, work with people who broaden your perspective, prepare yourself for success .....

Working Together

- **Working with Bruce**
  - Respect (actually in awe of some of Bruce's technical insights)
  - Trust
  - Confidence
  - Works very hard
  - Broadens the network – ability to tap into other experts to broaden team – in our case includes academics, mining engineers, geophysicists, industry experts, fund managers.
  - The network of contacts and advisors multiplies on itself
  - Innate ability to understand what each other is contemplating

- **Working with Malcolm**
  - Respect (excellent managerial/relational culture).
  - Malcolm's confidence, enthusiasm and drive is contagious.
  - Always keen to discuss/debate/shoot the breeze.
  - Two geological minds on the same issue – between us we cover many gaps.
  - Similar mind-set ..... chase every lead (MN has an innate exploration mind).
  - Understands the balance between delivery pressure and when quality (that demands time) is important.
  - Work environment becomes conducive to thrive.

Malcolm Norris and Bruce Rohrlach – current

- **MN - Non-executive Chair at Sunstone Metals – ASX:STM**
  - Advancing the Bramaderos and El Palmar gold-copper discoveries towards development
  - Alignment of commodities and a boom – a very exciting place to be
  - 4.8Moz gold equivalent in MRE across 2 projects; multiples of this in Exploration Targets

- **MN - Non-executive Chair at Nordic Resources – ASX:NNL**
  - Advancing the Kopsa gold-copper deposit in central Finland towards development
  - Exploring and growing the resource base over the nearby Kiimala and Hirsikangas gold projects
  - 1.23Mozs gold equivalent in MRE and growing rapidly
  - Pathway to production
  - Phenomenal opportunity for value growth

- **MN - Non-executive director at Magmatic Resources – ASX:MAG**
  - Exploration for orogenic gold in the Northern Goldfields of WA
  - Exploration for Porphyry copper-gold under JV with Fortescue Metals Group at Myall in the East Lachlan region of NSW
  - Porphyry copper-gold exploration adjacent to the 14.7Moz gold equivalent Boda-Kaiser discovery of Alkane

- **MN - Consulting**
  - Various companies, including Viscaria AB

- **BR – General Manager Geology Sunstone Metals**