
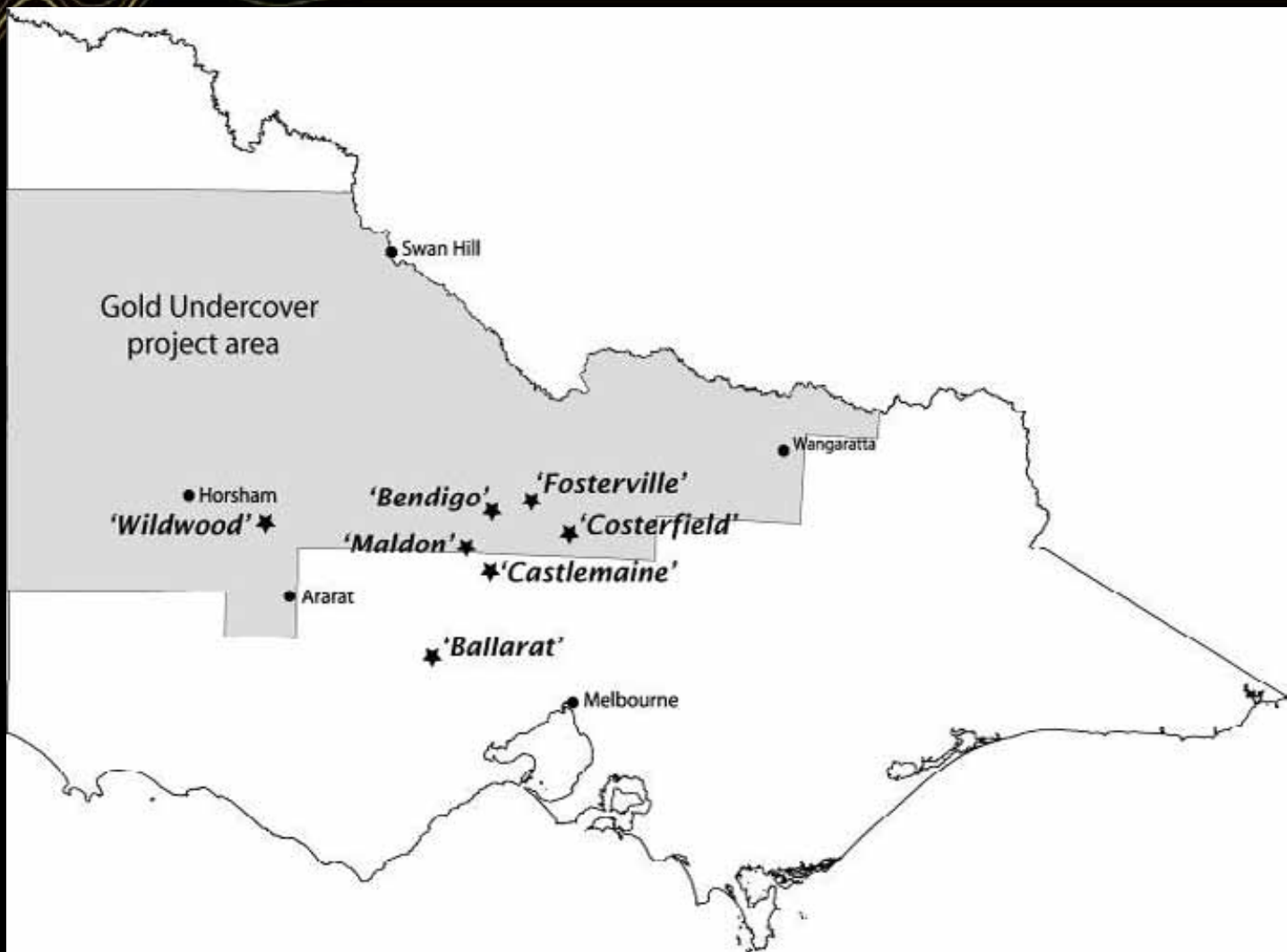


# Gold Undercover

◀ Recognition of Cryptic Alteration Surrounding  
Central Victorian Gold Deposits

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- ◆ Rationale & definitions
  - ◆ Historical context
  - ◆ Provisional lithogeochemical profiles
    - ◆ Sulphidic halo
    - ◆ Sericite alteration
    - ◆ Ferroan carbonate
    - ◆ More complex mineralogy at Stawell
    - ◆ Carbonate alteration absent at Maldon
  - ◆ Gold Undercover lithogeochemistry project



# Why Cryptic?

## Etymology

Late Latin 'crypticus', from Greek 'kruptikos', from 'kruptos' (*hidden*), from 'kruptein' (*to hide*).

- ◆ Having hidden meaning
- ◆ Mystified or of an obscure nature
- ◆ Involving use of code or cipher

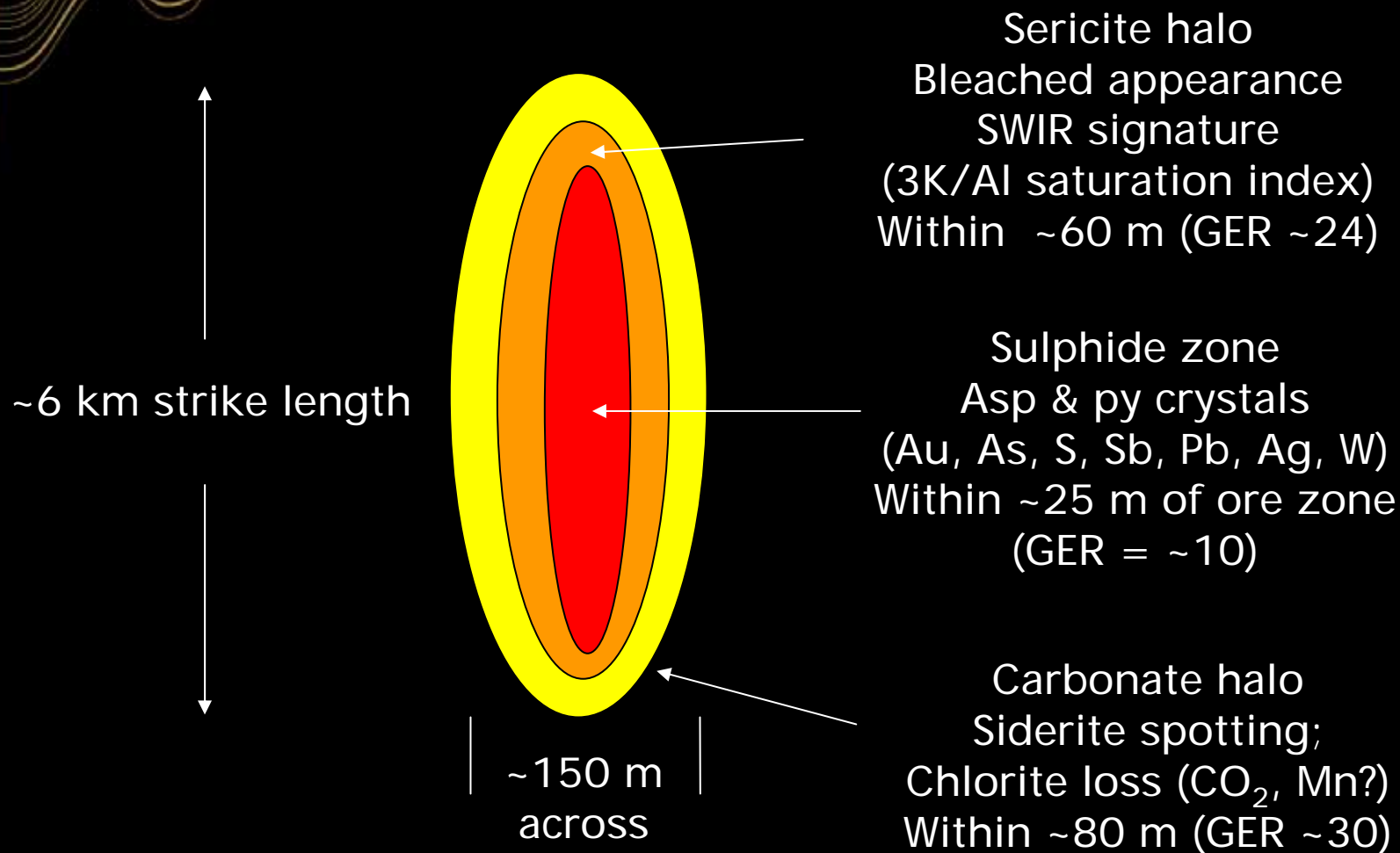
# Why Bother?


- ✦ Enhance the size of the exploration target
- ✦ Quantified using the Geochemical Enhancement Ratio (GER) – ratios of 2 to 50
- ✦ Recognised alteration haloes consist of at least two, and possibly three overlapping zones
- ✦ Provisional assessment assumes symmetry of hydrothermal alteration; not geologically realistic

# Historical Context

- ◆ Don (1897 & 1898) – Bendigo, Ballarat & Walhalla
- ◆ Bowen (1972) – Wattle Gully & Sambas mines
- ◆ Binns & Eames (1989) – Clunes
- ◆ Gao & Kwak (1997) – Maxwells, New Cambrian, Wattle Gully & Brunswick
- ◆ Bierlein *et al.* (1998) – Ballarat West/Wattle Gully
- ◆ Li *et al.* (1998) – Bendigo
- ◆ Arne *et al.* (2000) – AMIRA Project 478
- ◆ Bierlein *et al.* (2000) – Ballarat, Fosterville, Tarnagulla, Maldon & Fiddlers Reef
- ◆ Bierlein *et al.* (2004) – stable isotopes
- ◆ Dugdale *et al.* (2006) – Stawell

# Fosterville Summary



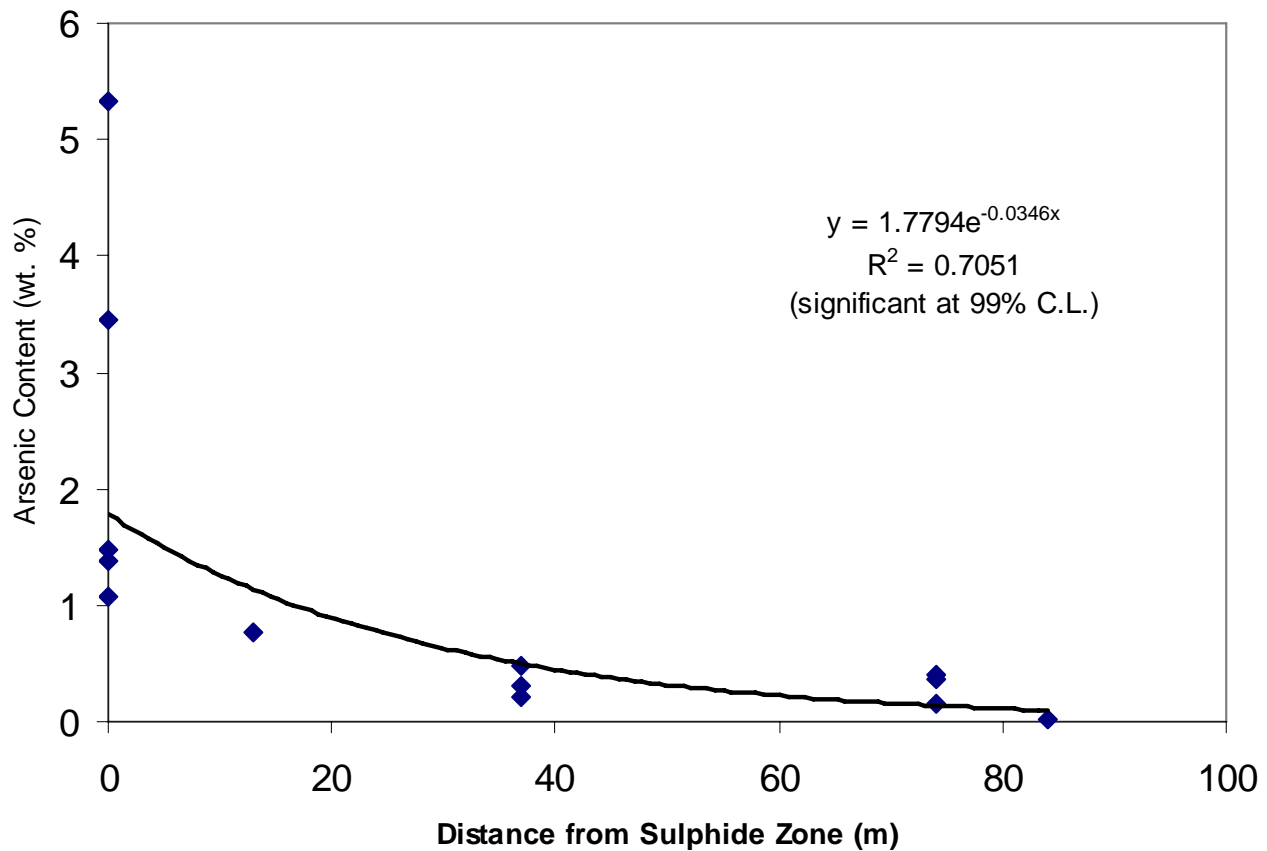
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- ✦ Generally defined by disseminated arsenopyrite and pyrite crystals in wallrock; +/- pyrrhotite
  - ✦ Pyrite crystals often enriched in arsenic
    - ✦ As content decreases away from ore zone
    - ✦  $\delta^{34}\text{S}$  also distinctly different (near 0 per mil)
  - ✦ Generally extends for 10s of metres from mineralized structures (GER = ~2 to 10)



# Arsenopyrite at Bendigo



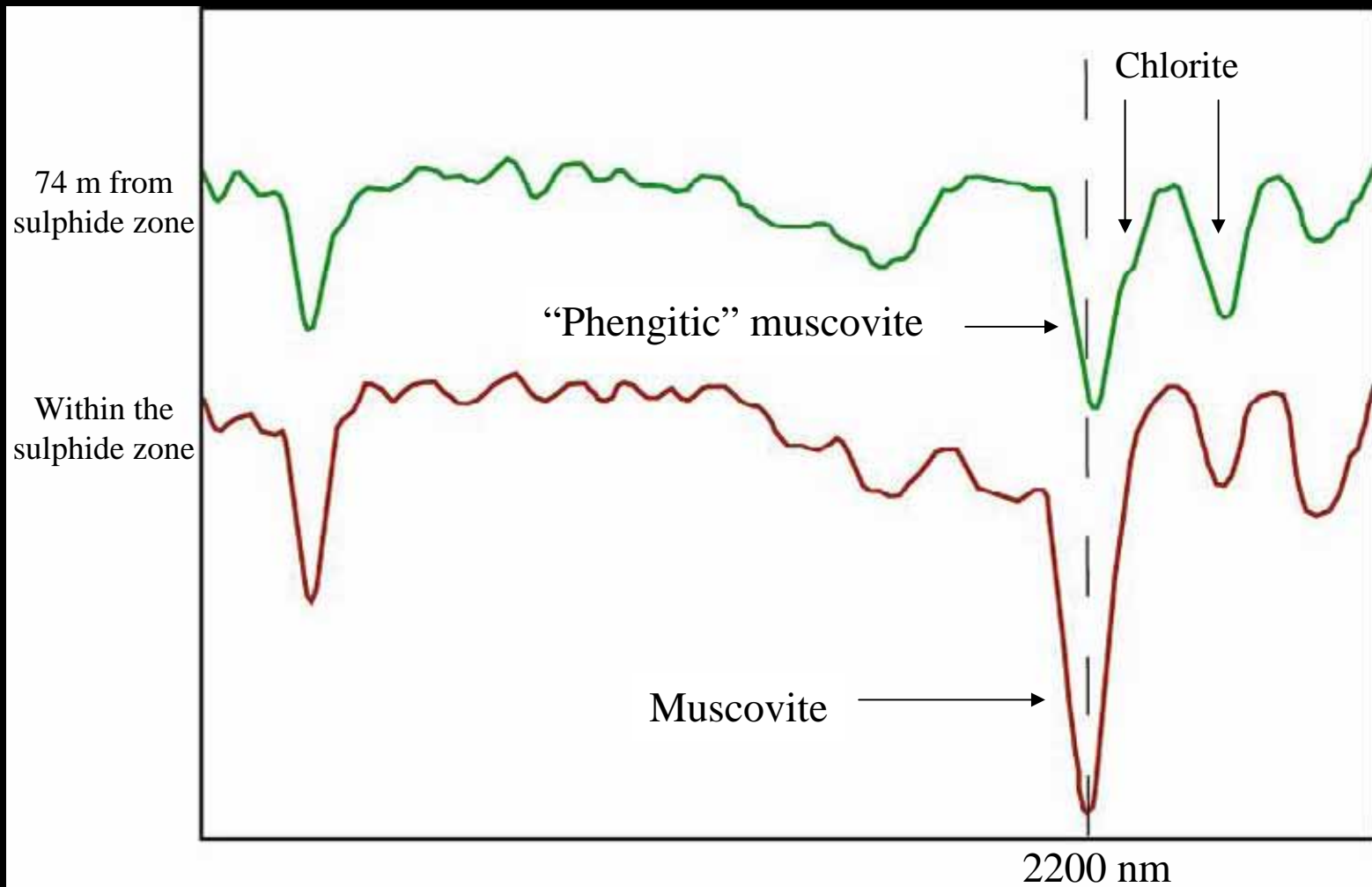
# Arsenic in Pyrite



# Sericite Alteration

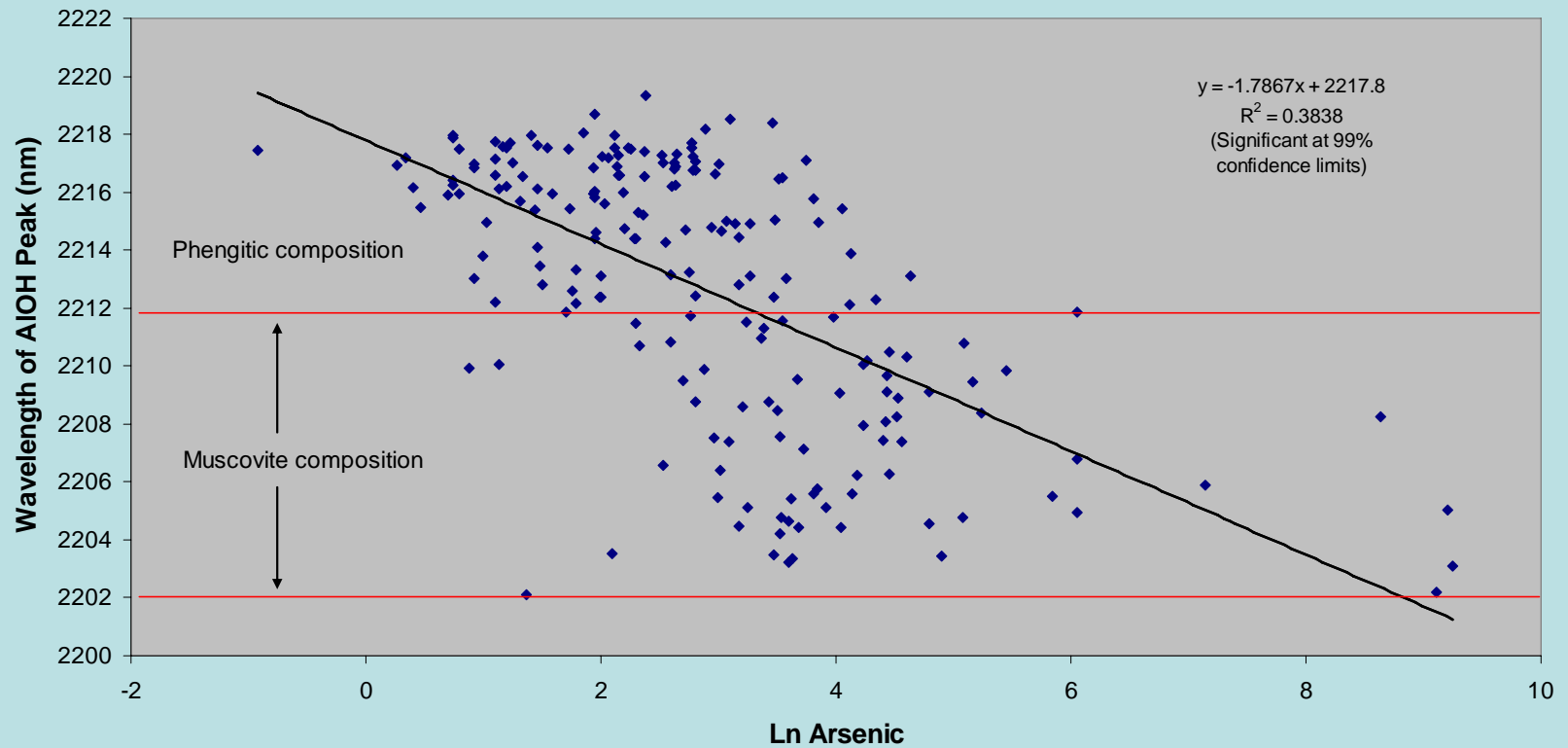
- ◆ GER estimated at between 5 and 25
- ◆ Identification:
  - ◆ petrographically (sericite replacement of albite)
  - ◆ slight enrichment in K and depletion in Na
  - ◆ an increase in the muscovite saturation index ( $3K/Al$ )
  - ◆ subtle shift in the position of AlOH peak using PIMA

# SWIR Signature



# SWIR Signature

## White Mica Composition vs Arsenic Content

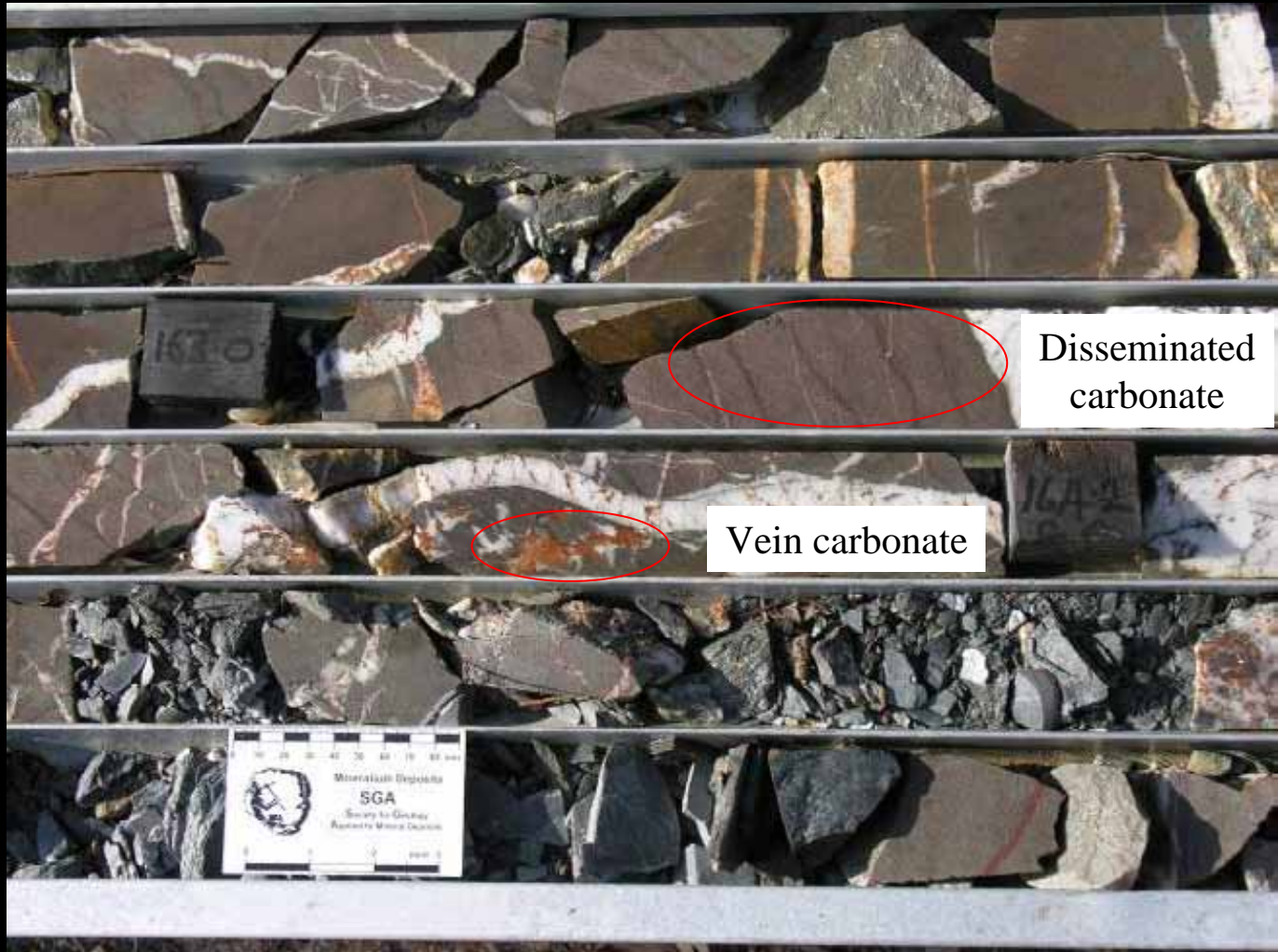


## ◆ Identification:

- ◆ weathering over 6-12 months
  - ◆ potassium ferricyanide staining
  - ◆ thin section petrography
  - ◆ elemental carbon analysis
  - ◆ quantitative XRD analysis
  - ◆ infrared analysis (PIMA & Hylogger/Hychips)
- ◆ Intensity not always well correlated with gold
- ◆ Defines the largest alteration halo, on the order of 100s of metres out from major deposits (GER 8 to 50)

# Gold Undercover Ferroan Dolomite at Fosterville

Unearth Victoria's Gold



Disseminated  
carbonate

Vein carbonate

# Potassium Ferricyanide

Before staining



After staining

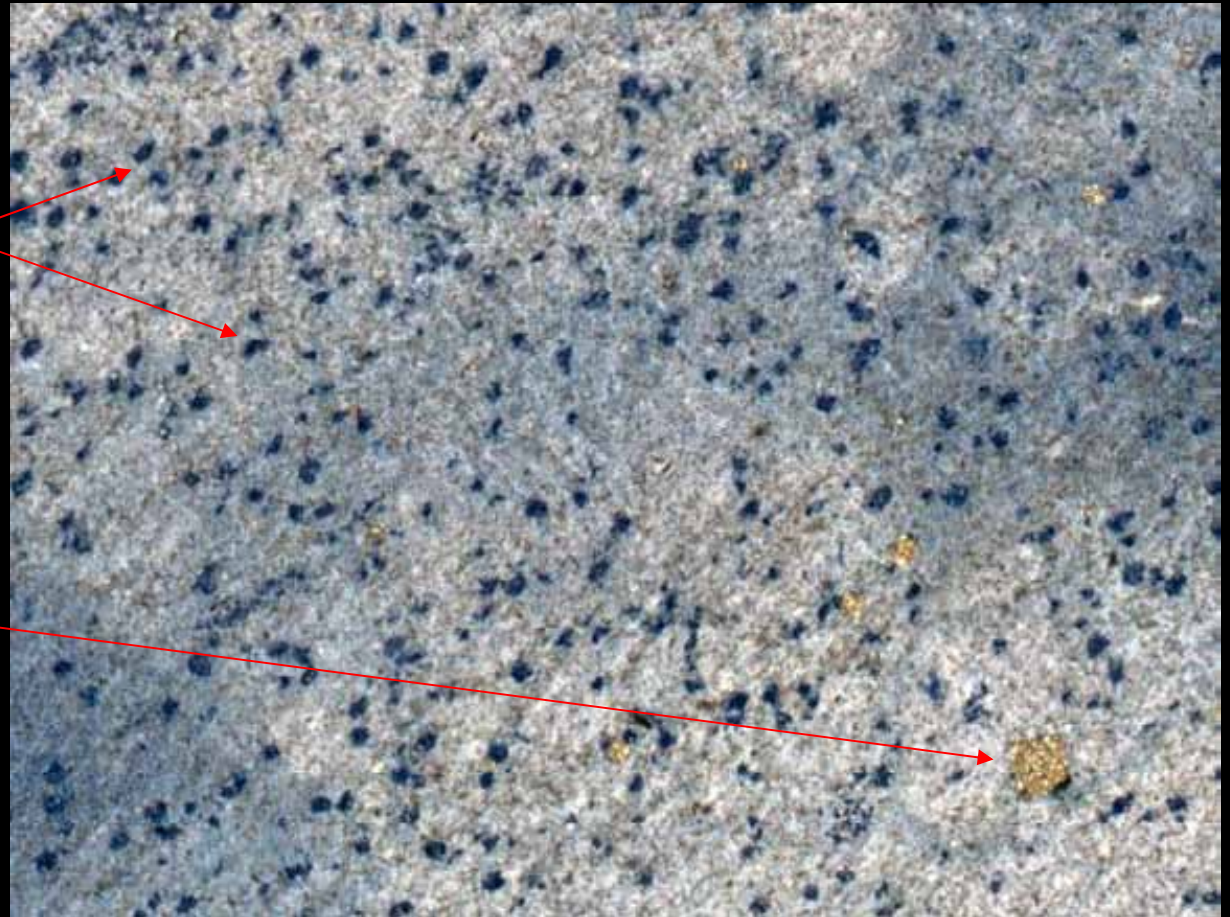




# Carbonate Spotting

Ferroan dolomite  
spots/porphyroblasts

Disseminated pyrite  
crystals with elevated  
arsenic contents

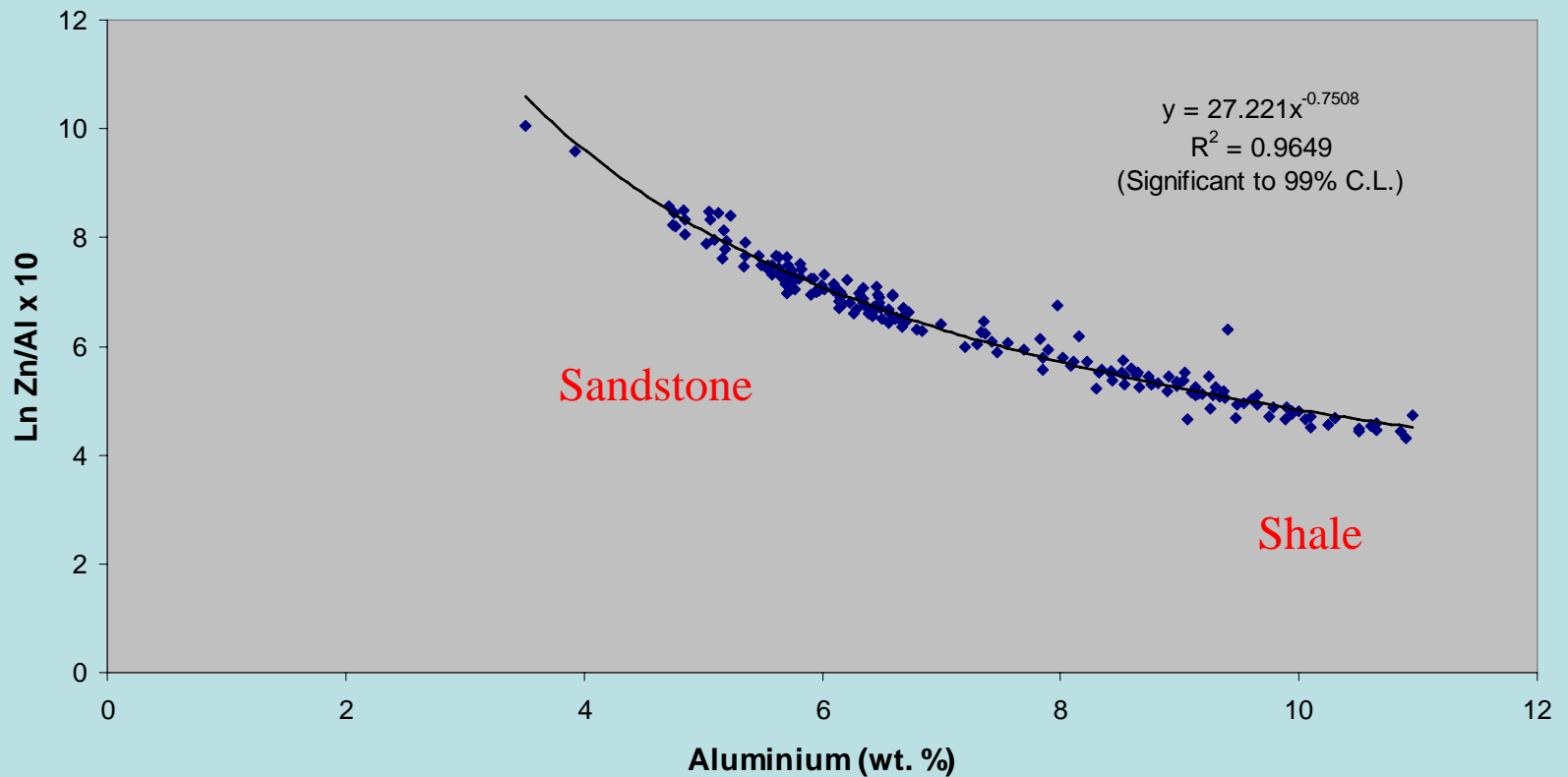


1 cm

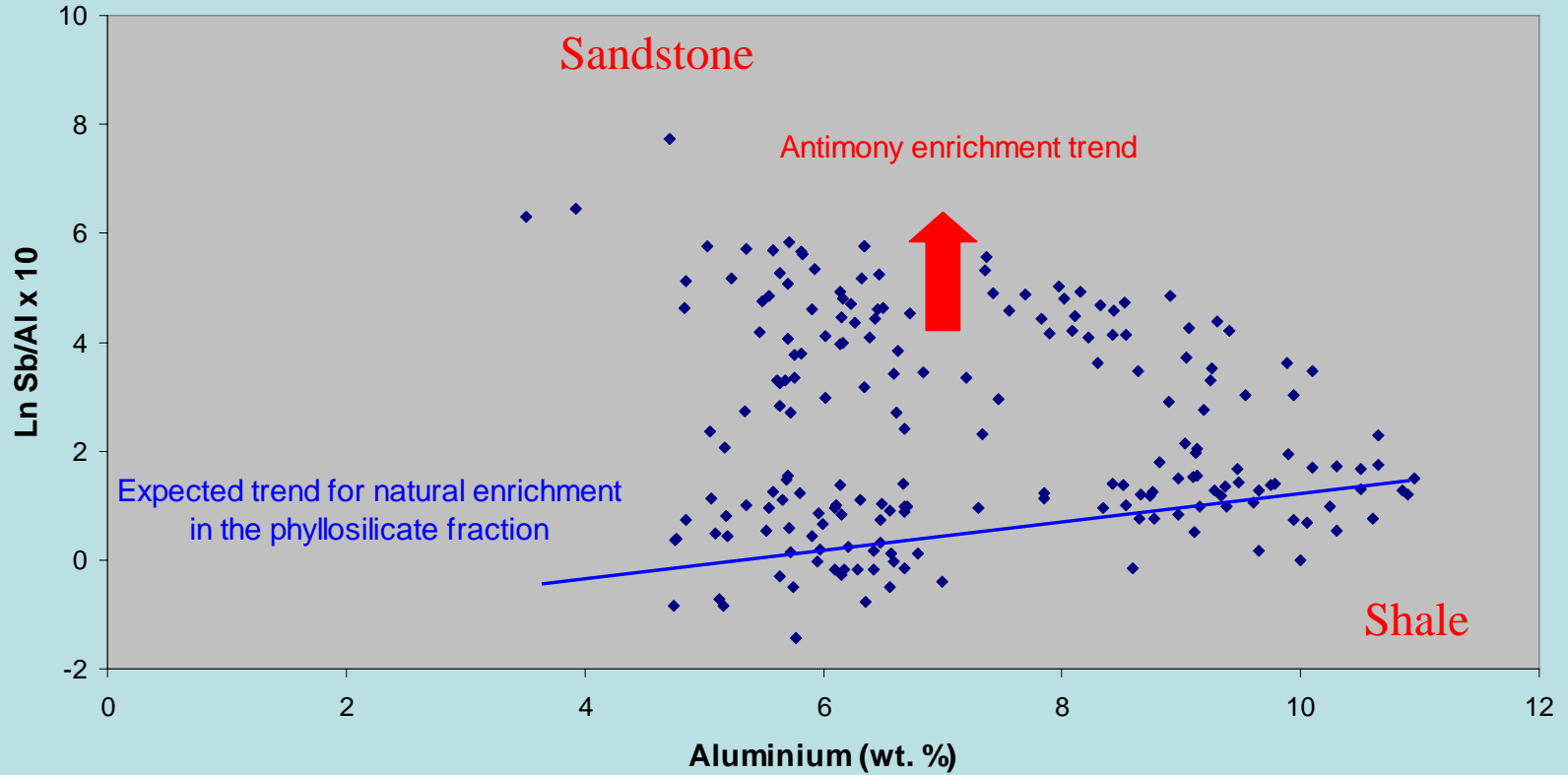
## ◆ Lithogeochemistry project study areas

- ◆ Bendigo
  - ◆ Ballarat
  - ◆ Castlemaine
  - ◆ Costerfield
  - ◆ Fosterville
  - ◆ Maldon
  - ◆ Wildwood
- ◆ HyChips™ trial completed August 2007
  - ◆ Primary haloes (~1,000 samples) by Jan. 2008
  - ◆ Secondary haloes (~1,000 samples) by June 2009
  - ◆ Graphical & statistical analysis to define background

### Variation of Zinc in Fresh Diamond Drill Core



## Variation of Antimony in Fresh Diamond Drill Core



# Hylogging Trial



Available for downloading at:  
[www.dpi.vic.gov.au/minpet/goldundercover](http://www.dpi.vic.gov.au/minpet/goldundercover)

