



# Low level gold by pXRF: a new paradigm for gold explorers

Simon Bolster & Dr Mel Lintern

3 March 2020

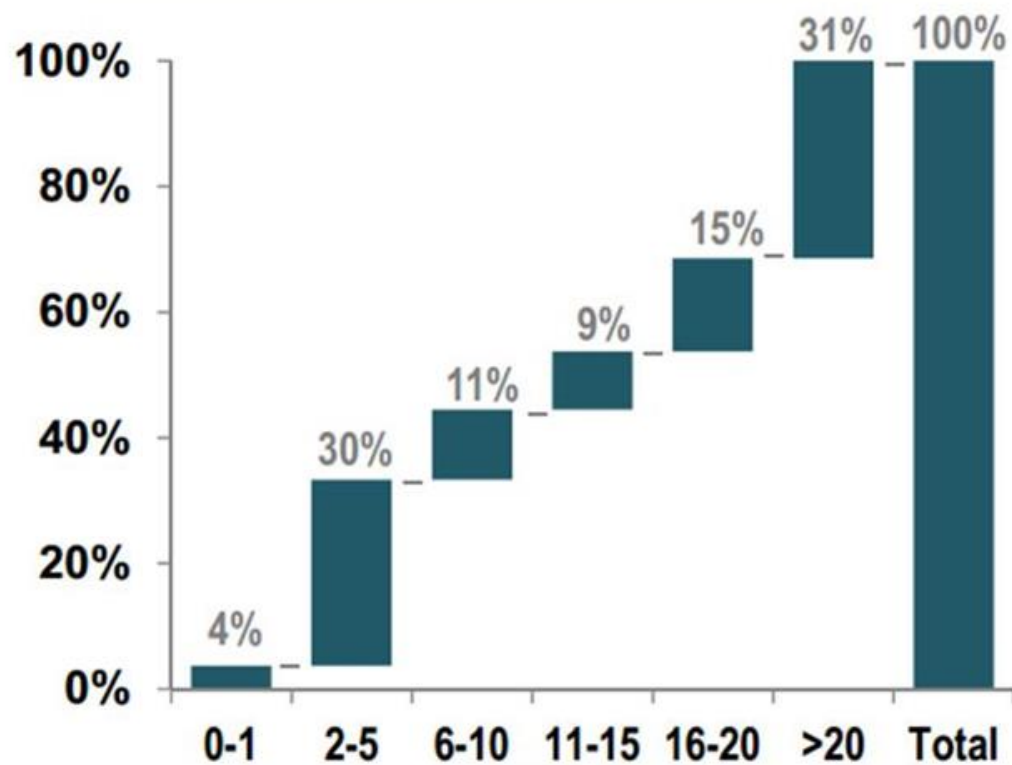
PDAC

## Gold exploration can be very slow..

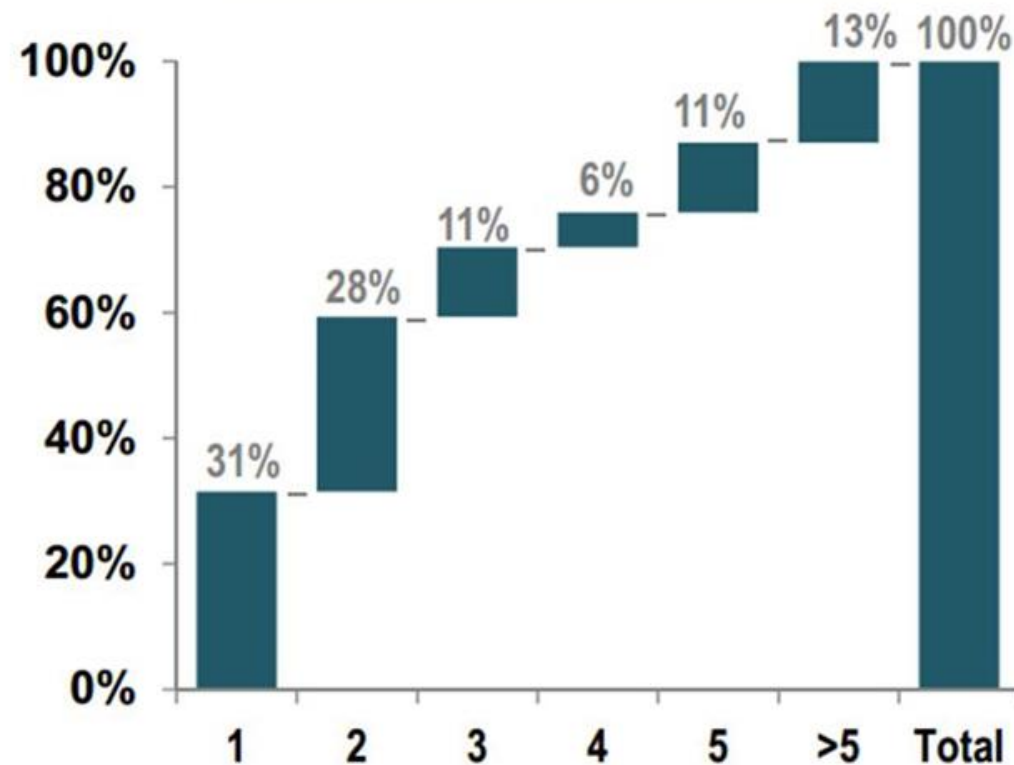
**19 years is the average discovery time**

**2.8 companies on average explore property before discovery is made**

Discoveries



Time (Years)

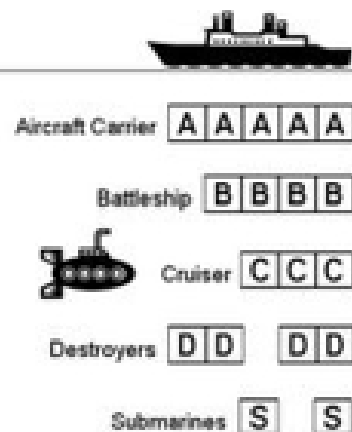


Exploration companies (n)

# Battleships Game – similar to gold exploration?

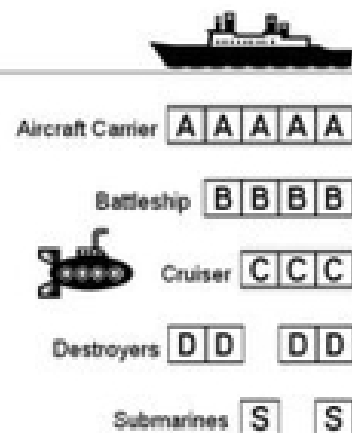
## My Ships

A									
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## Their Ships

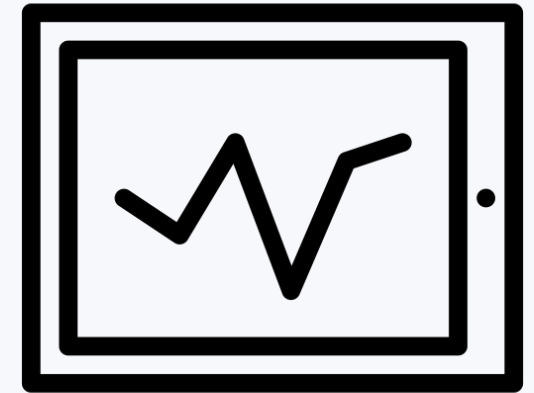
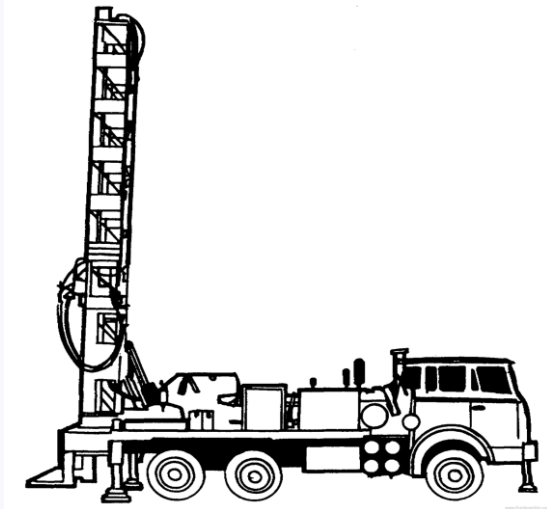
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	A	B	C	D	E	F	G	H	I	J
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10										

## Why is exploration slow?

Drainage  
Soils  
Auger  
Trenching  
Drill samples



Weeks to  
Months



**Fast, field based, adaptive sampling  
>>> increase effectiveness, increased  
probability of discovery**

## Waiting for assays is expensive – do the maths!

Junior stock exchange listed exploration company often cost US\$500,000 / year or more to operate

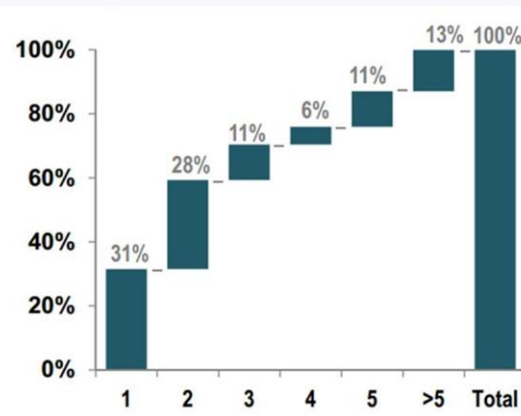
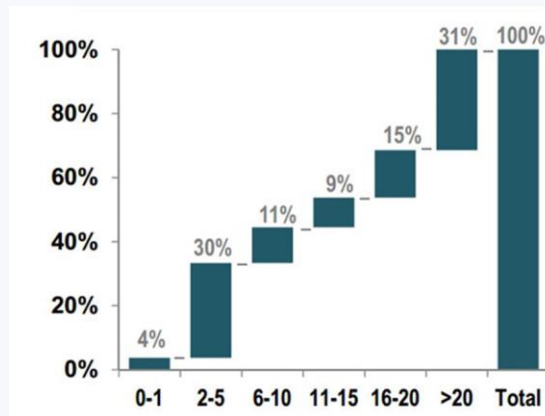
– i.e US\$1400/ day, each and every day

Assays are needed to direct exploration

Provide stock market updates

– maintain / grow investor confidence and company valuations

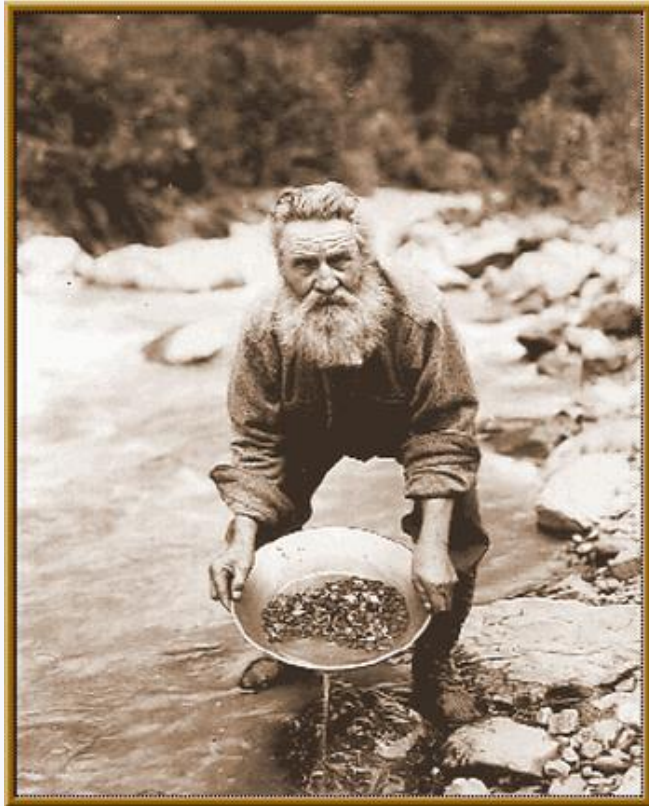
Costs of waiting for assays in large companies are even higher



Companies walk away from good properties too early

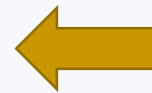
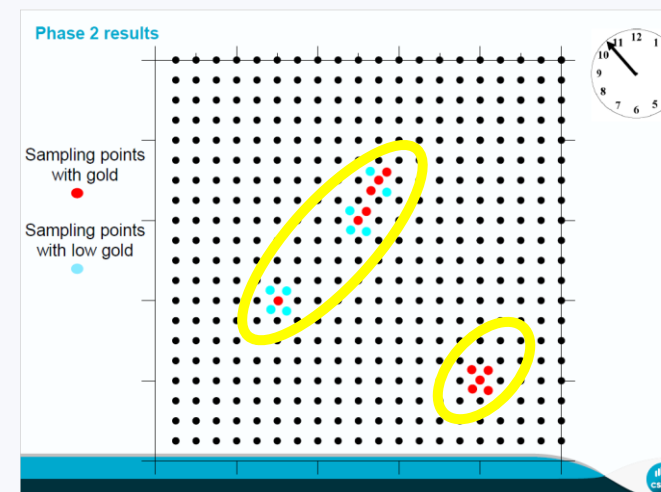
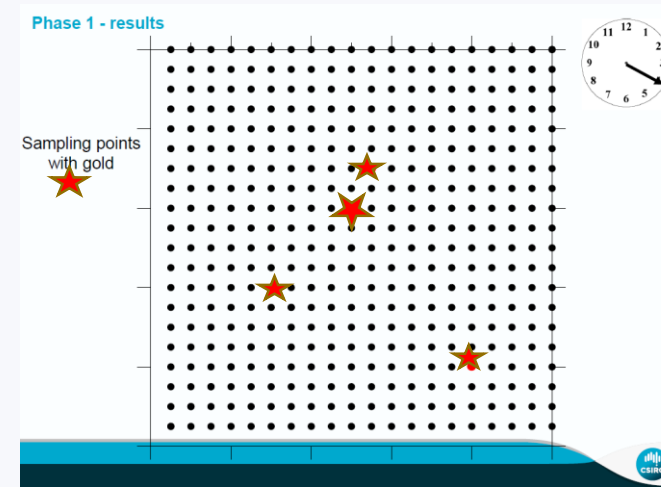
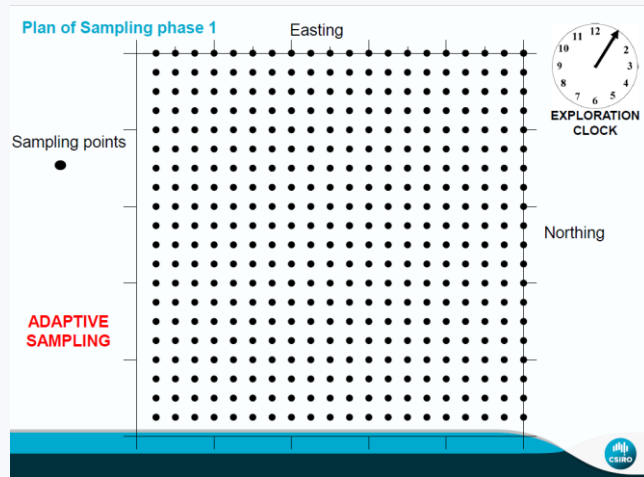
- project fatigue
- Inadequate sampling
- relinquish untested areas

In field gold detection has been possible for a while..



Quick answers,  
immediate follow-up

# In-field results enable “reactive sampling”



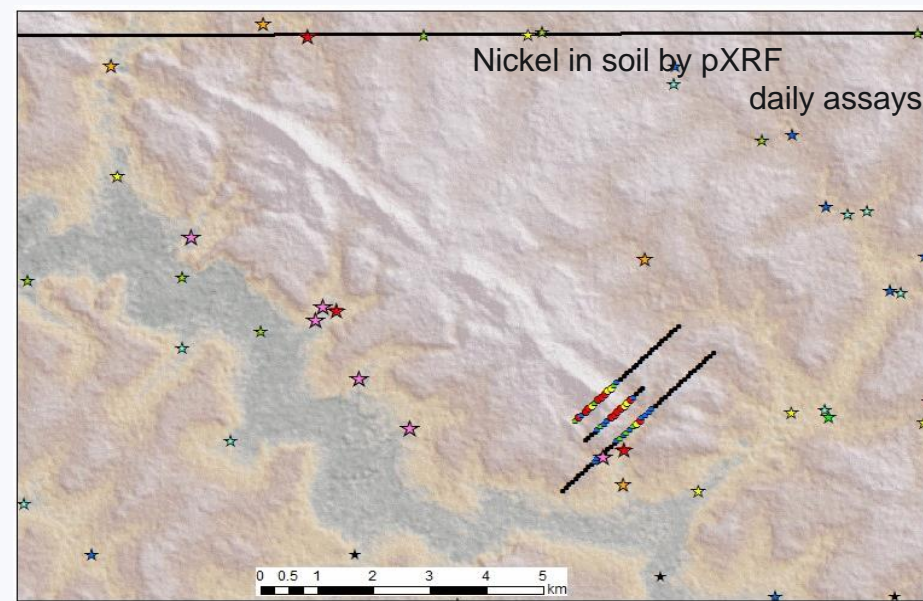
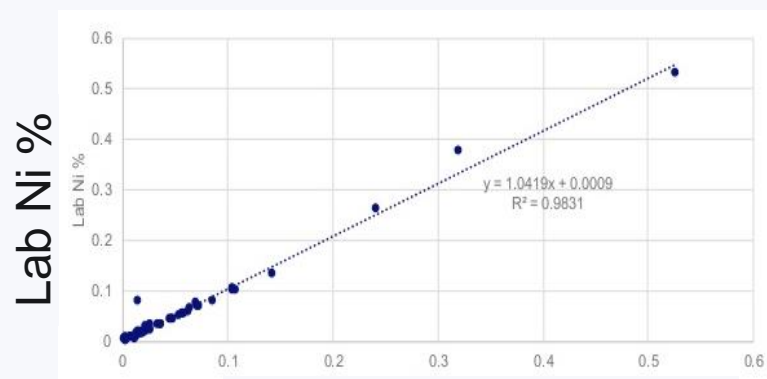


# In field analyses has been possible for a while..



Many pXRF owned by gold explorers

- not used for gold analyses
- pathfinder elements and lithogeochemical applications
- work well for in-field analyses of Ni, Cu, As etc



(Bolster, PDAC 2016) <sup>8</sup>





## Field portable XRF (pXRF) for gold

pXRF has been unreliable for gold explorers

- Gold concentrations often too low to detect
- Gold is too dispersed
- Interfering elements (W, As, Zn)



Low level gold by pXRF has been a “Holy Grail”

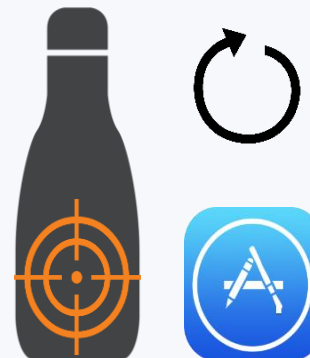
## What is detectORE™?

- Gold results to <10 ppb Au using pXRF, within 24 HOURS
- CSIRO Patented technology
- Exclusive global licence held by Portable PPB Pty Ltd (PPPB)
- Mel Lintern leads the research within PPPB
- Working towards commercial release by end of 2020



**Dr Mel Lintern**  
CSIRO Team Lead  
Inventor of  
detectORE™

35 years geochemist  
experience in gold



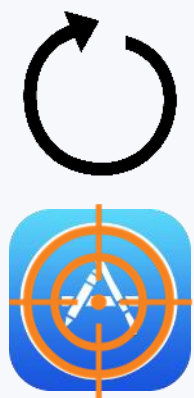
Sample



+



+



Cloud / app  
software

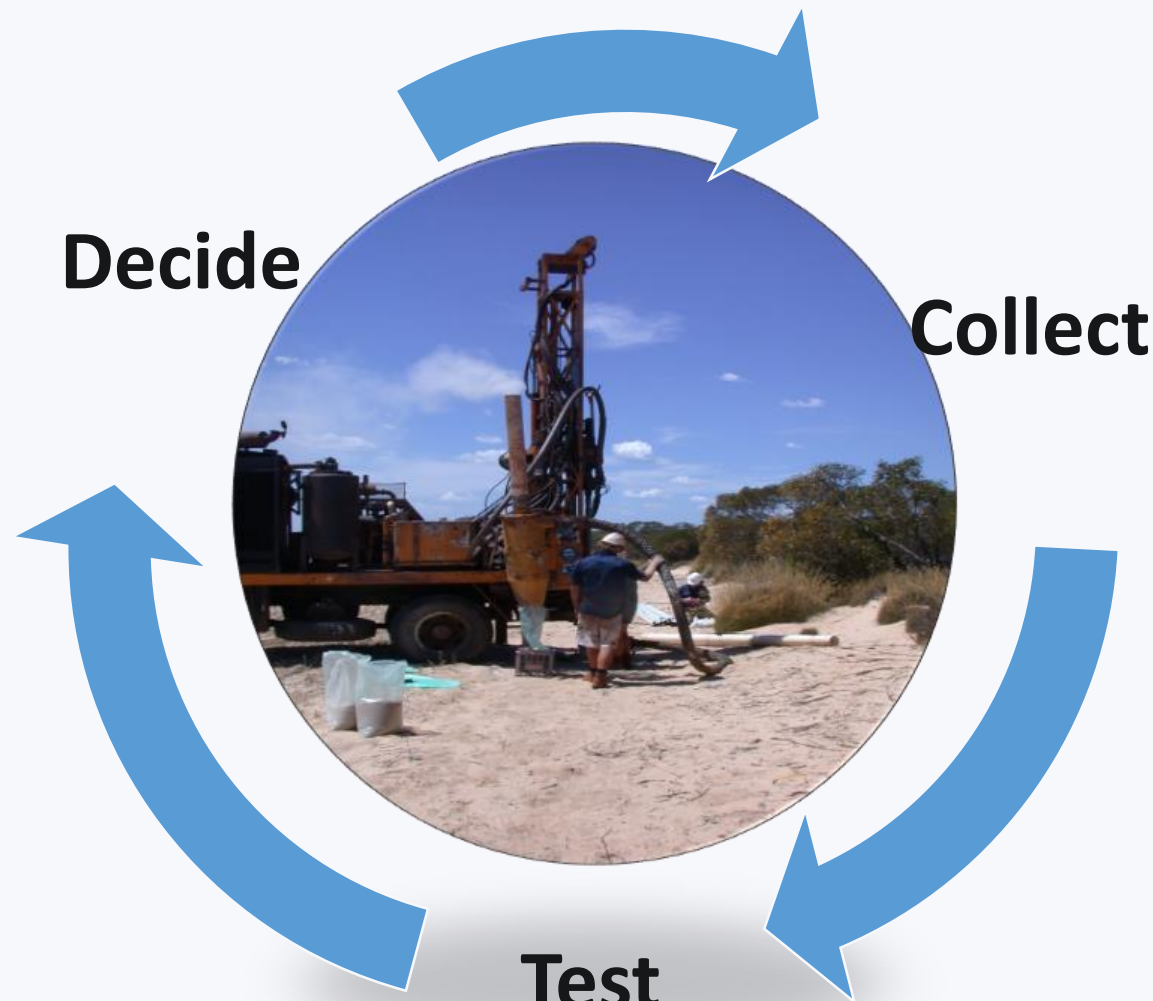
=

Decide

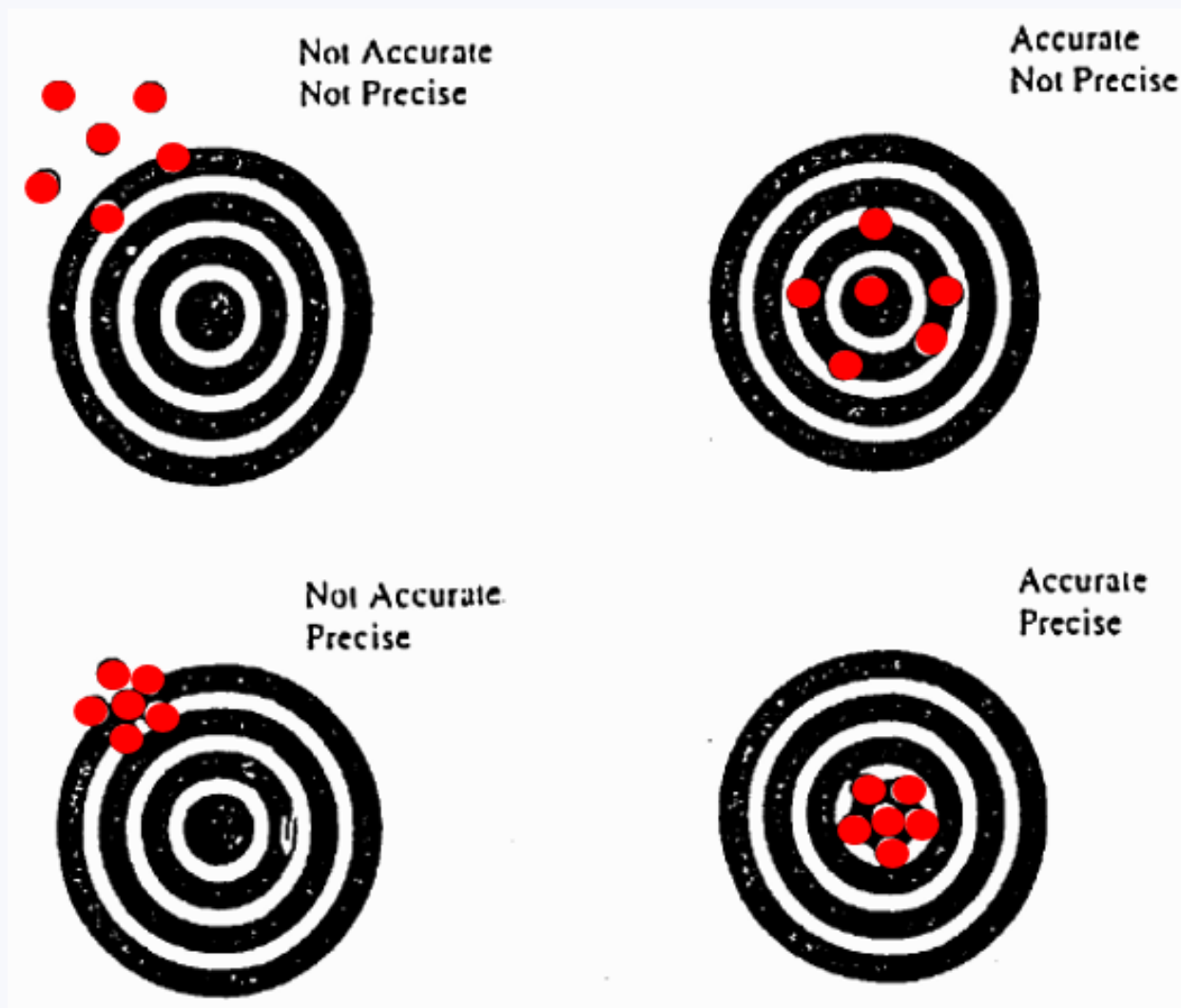
Collect

Test

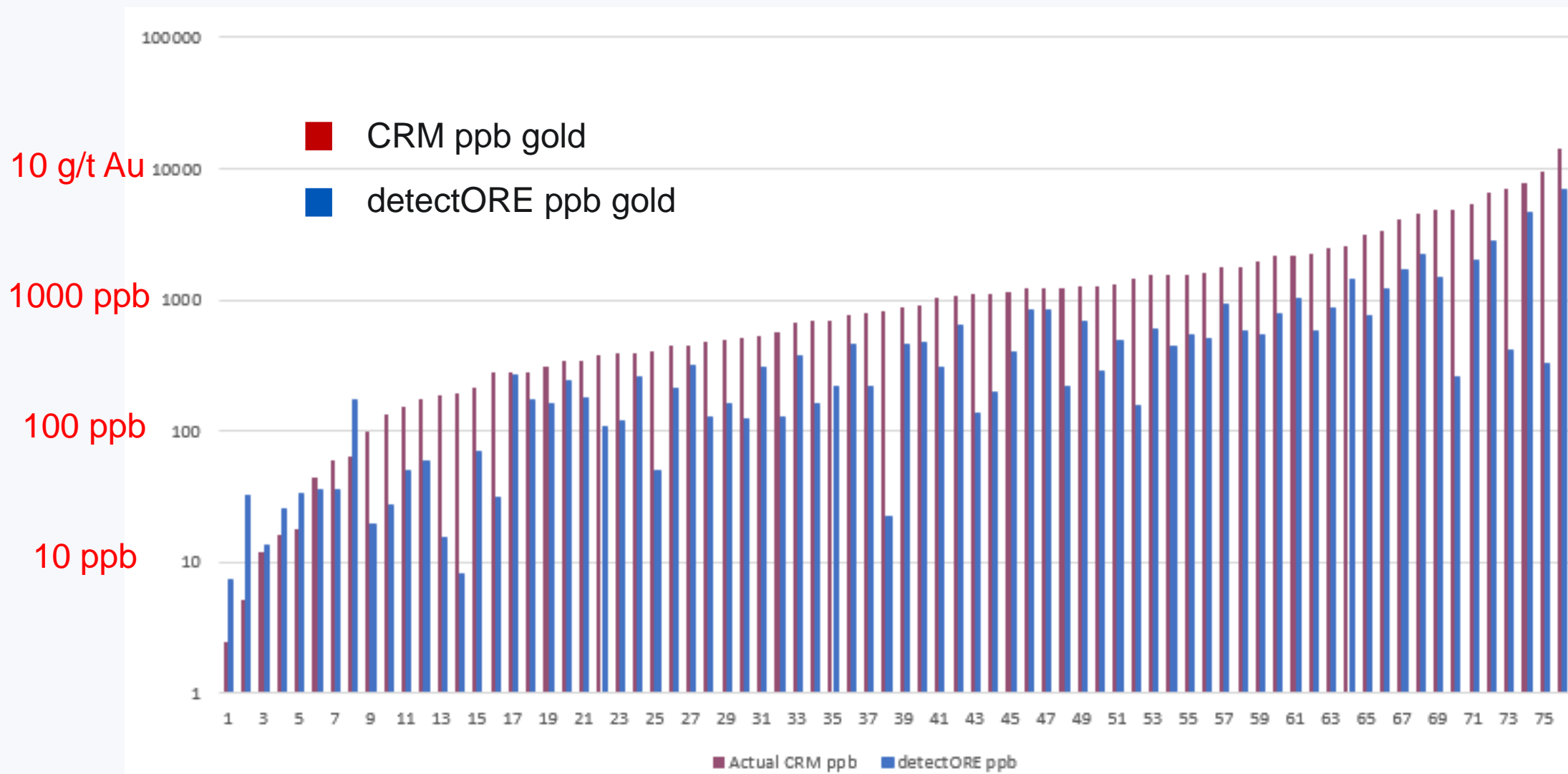
Bottle with "widget"



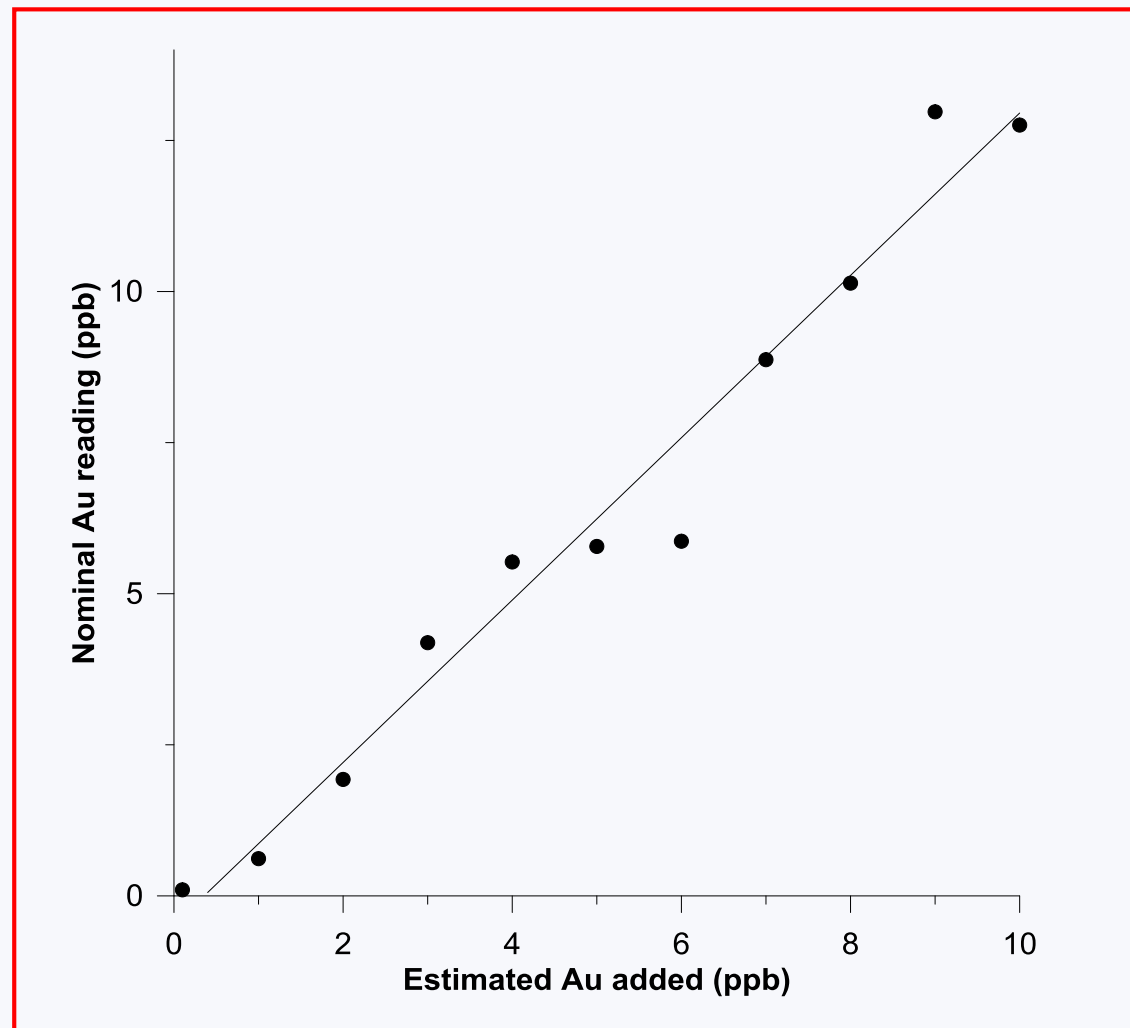
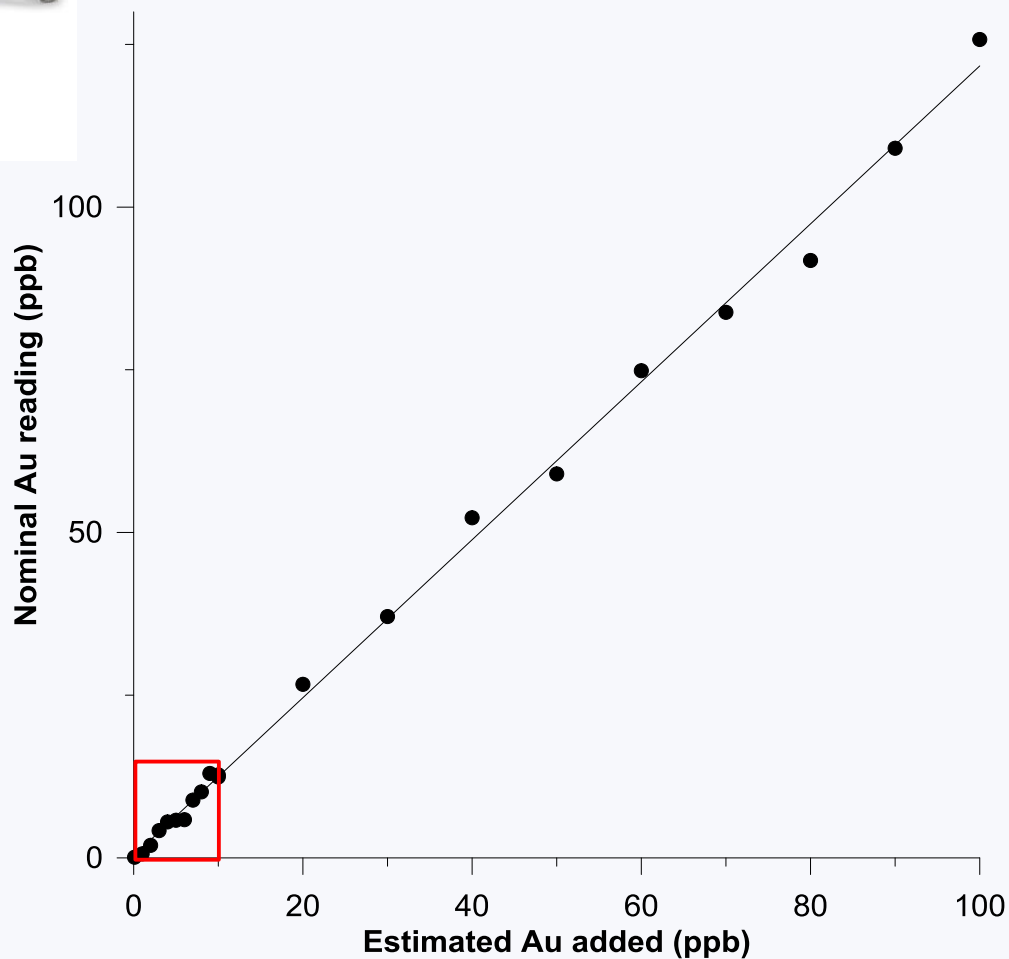
## Accuracy and precision



# detectORE testing with Certified Reference Materials



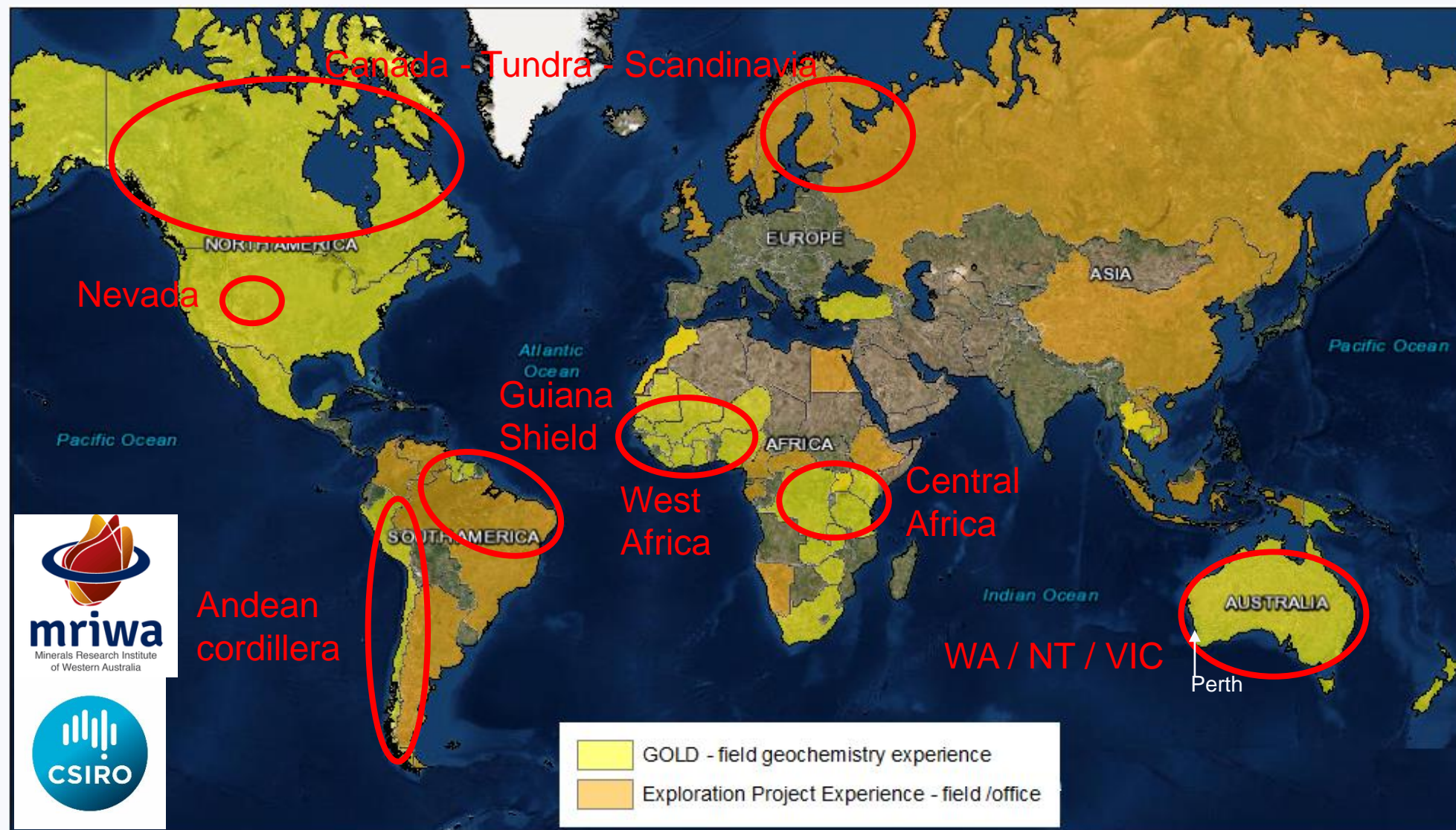
# Calibration curves 1-100 ppb gold standards read with pXRF (using detectORE procedure) – pre-2018 data





# Global R&D trial areas – working with industry

Proudly supported by:



GOLD FIELDS



NEWCREST MINING LIMITED



NOVO RESOURCES CORP



BARRICK

centerraGOLD



Perseus MINING LIMITED



exore RESOURCES



JERRITT CANYON GOLD



Bellevue GOLD LIMITED

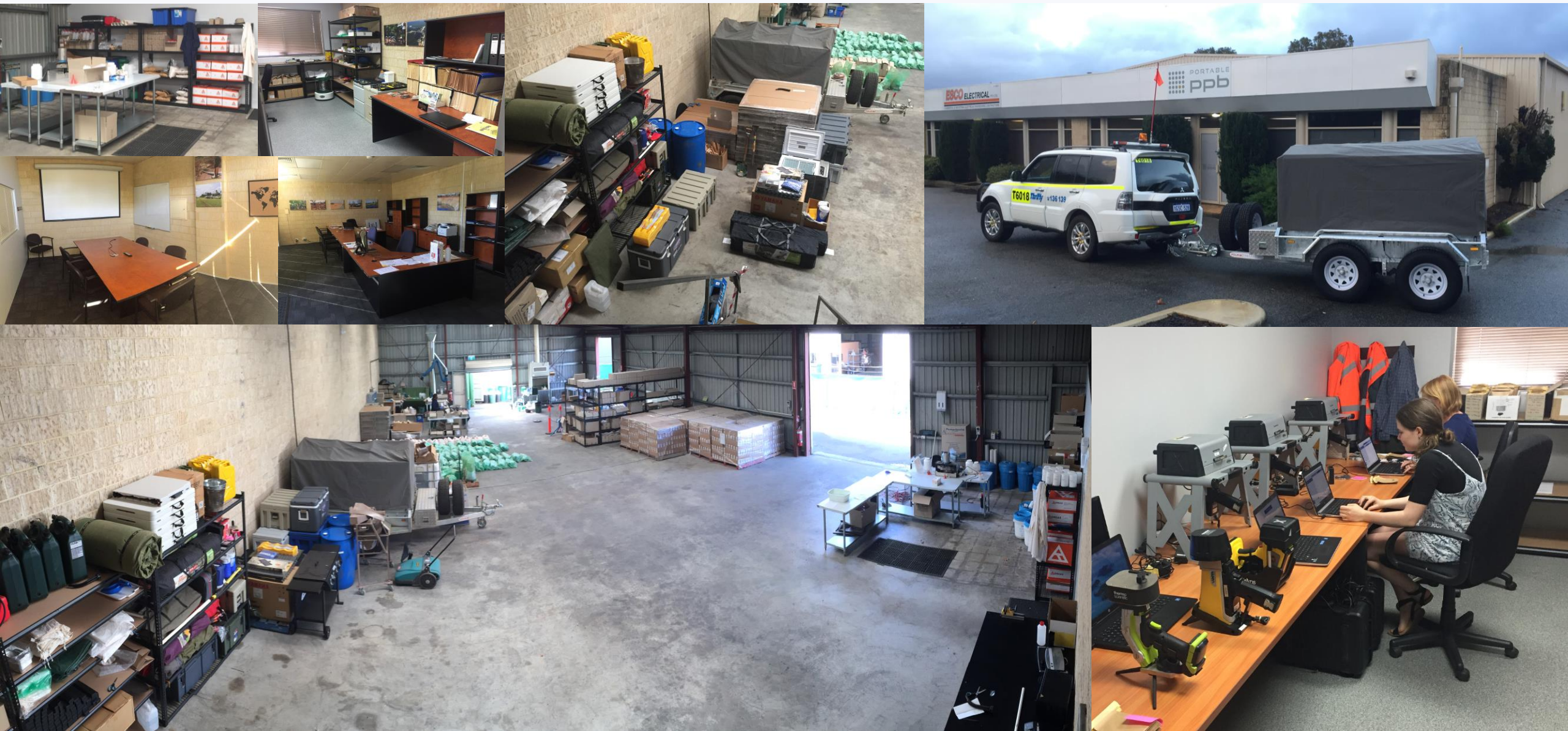


OLYMPUS





## Established R&D capacity – lab and field





## Extensive test work and field trials to date

- **Drill samples** – RC / AC / AUGER
  - Weathered, un-weathered + overburden
- **Regolith materials:** Soil / Drainage / Laterite / Lag / Calcrete
- **Mineralization styles:** Orogenic / Porphyry / Epithermal / Carlin

Cross checking detectORE™ with high quality traditional laboratory assays



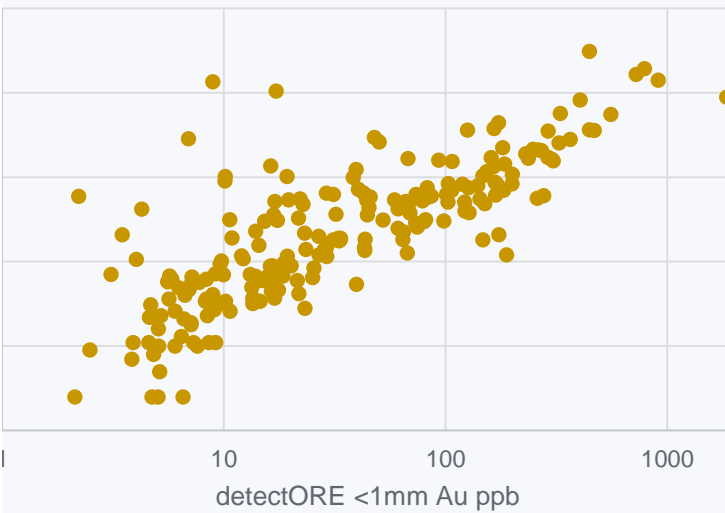
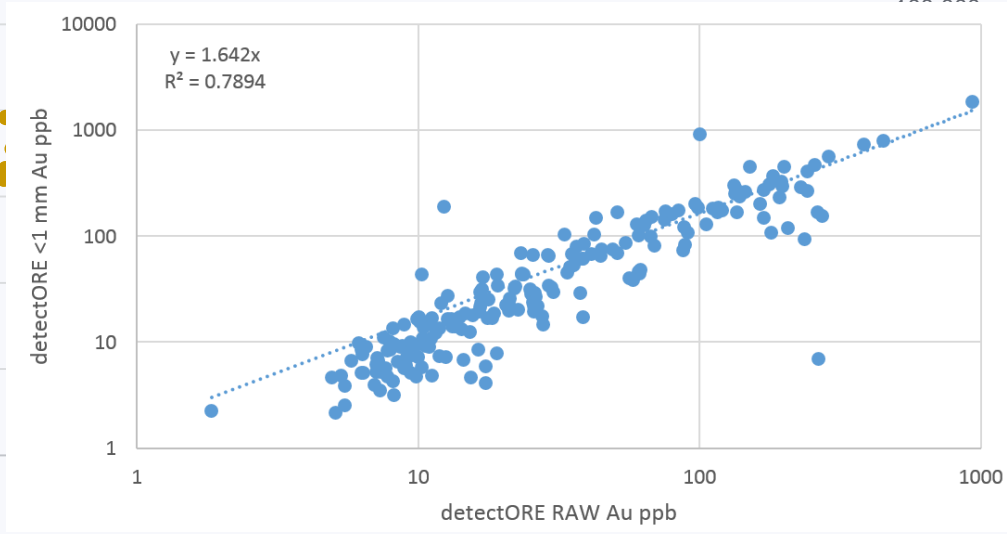
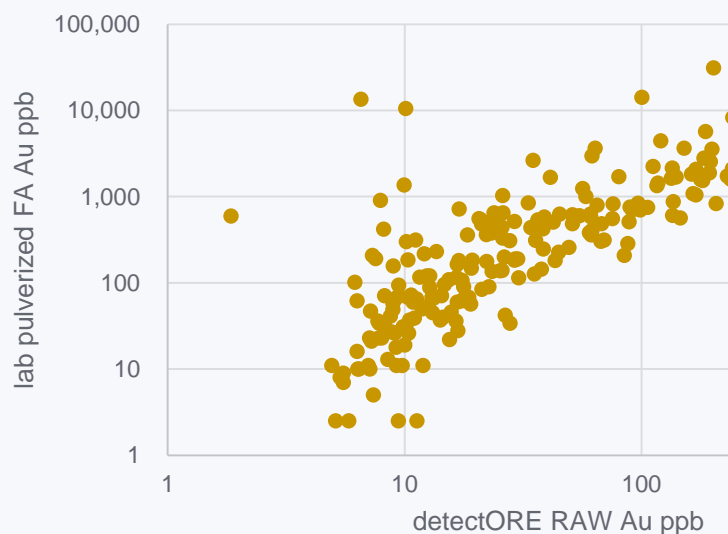
# Practical drill sample preparation ...



“raw” RC



“<1mm” RC



Note: These RC samples were sourced from an orogenic gold deposit containing abundant coarse gold



## Field trial by CSIRO – Western Australia – 2018 data

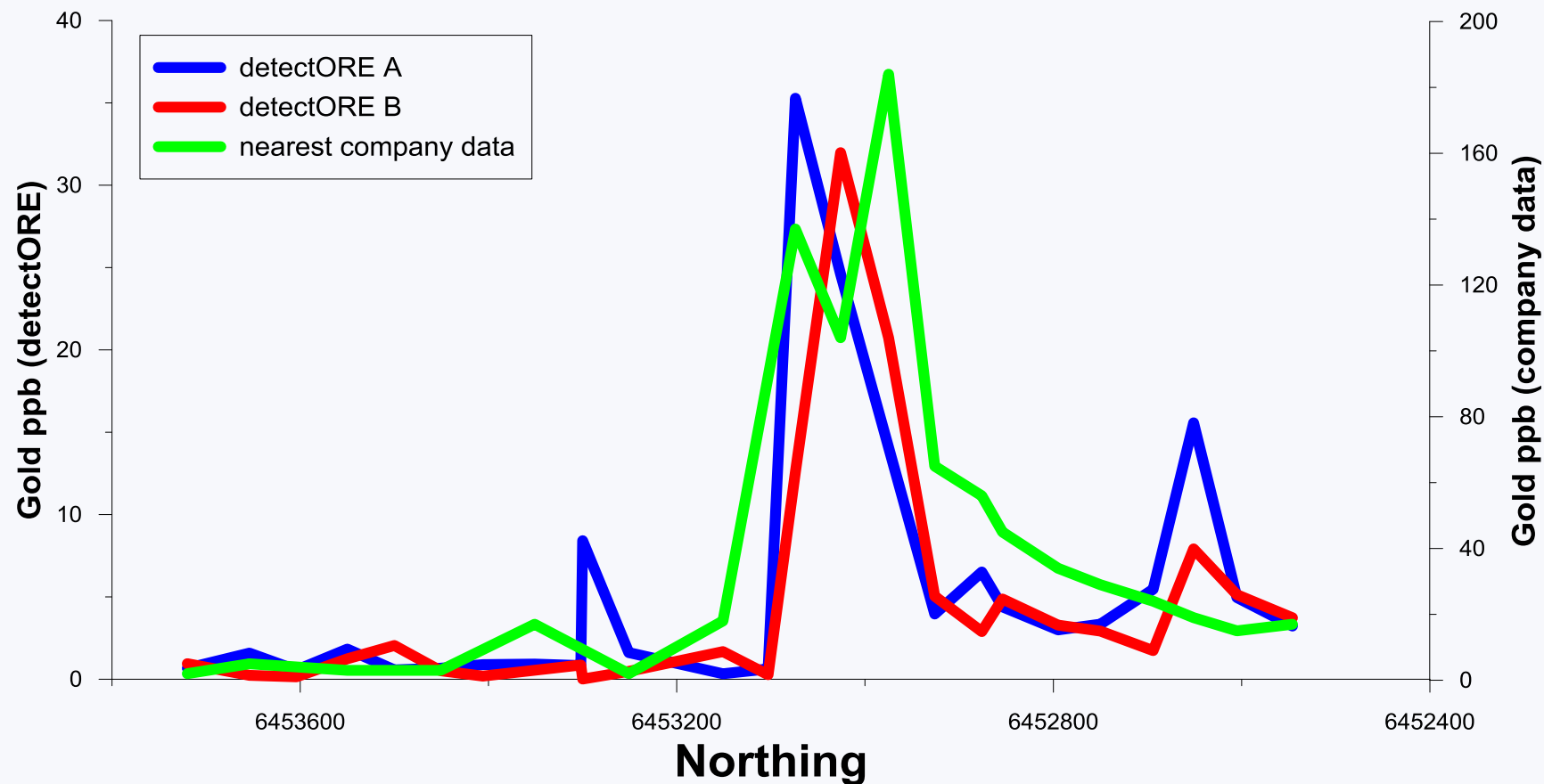


Soil sampling directly over auger GOLD anomaly and out into background to collect high level to back ground suite of samples.  
Soils sieved in field to <2mm



detectORE bottles with “widgets” loaded in the field for on-site gold concentration determinations with pXRF within 24 hours

# Field Trial Results – 2018 data



Green = auger

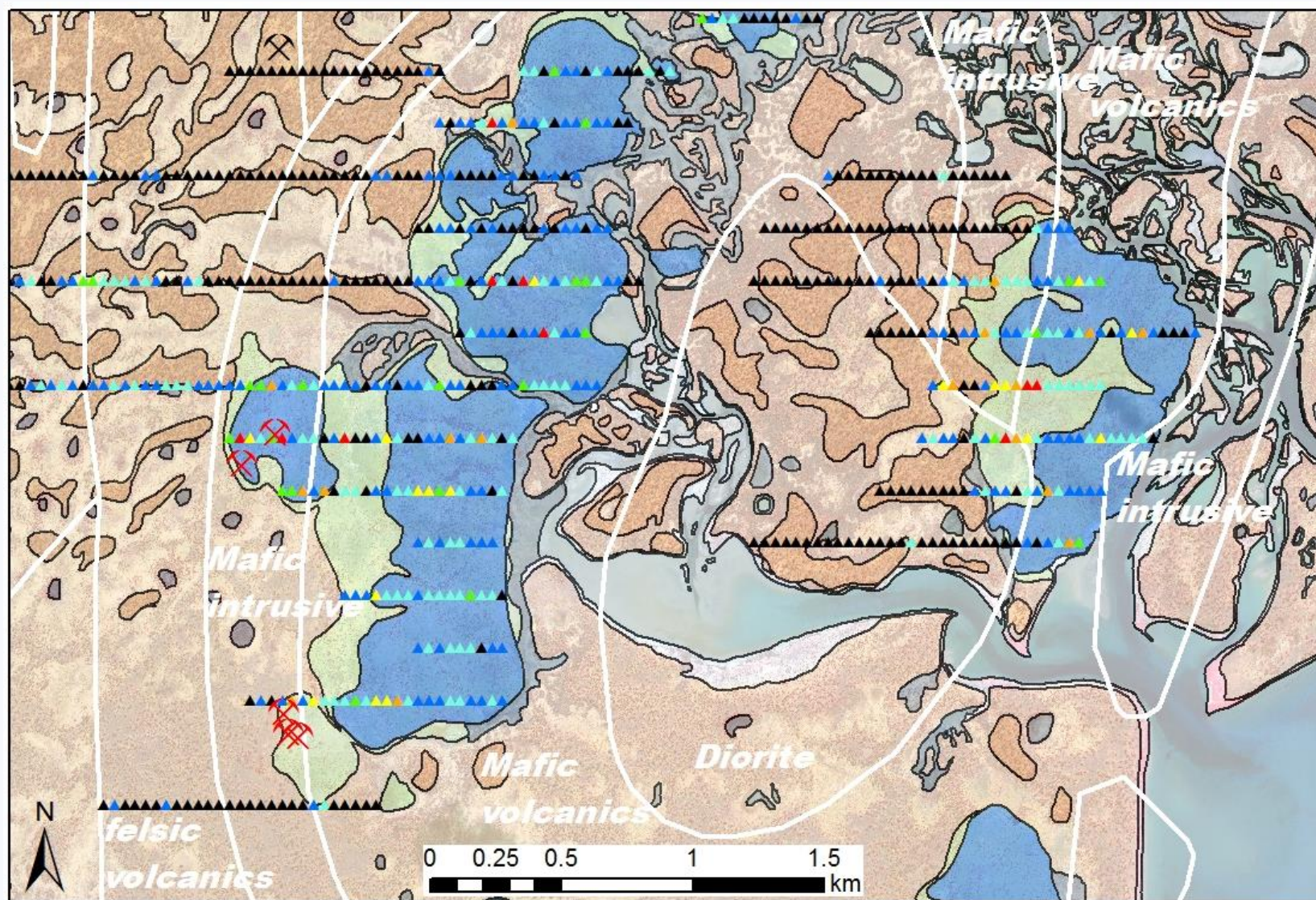
Red & blue = detectORE soil

Green – transport samples & possibly wait weeks, sometimes months, for results

Red / blue – results achieved within 24hrs from field camp using pXRF (operating detectORE process)



# Field Trial, Western Australia, NE Goldfields – 2019



## Interpreted regolith

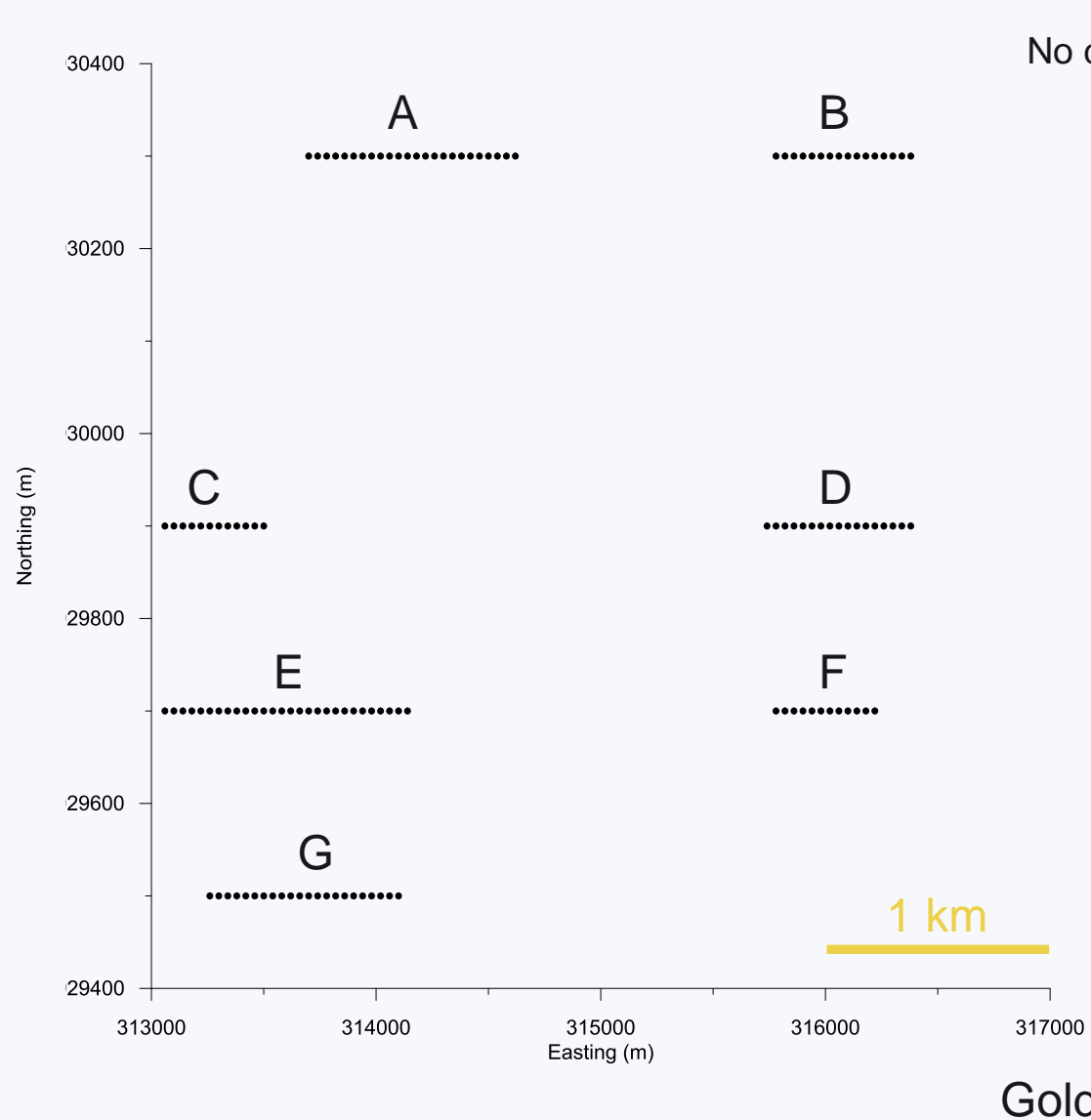
- Eo2 - Low hills with lithosols and frequent outcrop
- Ep3 - erosional plains. Lithosol and proximal colluvium
- Dwp3 - aeolian sand plans over plainated saprolite
- Dw2 - Thicker aeolian sand plains and low dunes
- Dd1. Small lakes / clay pans / playas
- Dd1s. Salt lake shore with thin cover over bedrock
- Dd2. Salt lake system

## Original lab soil results

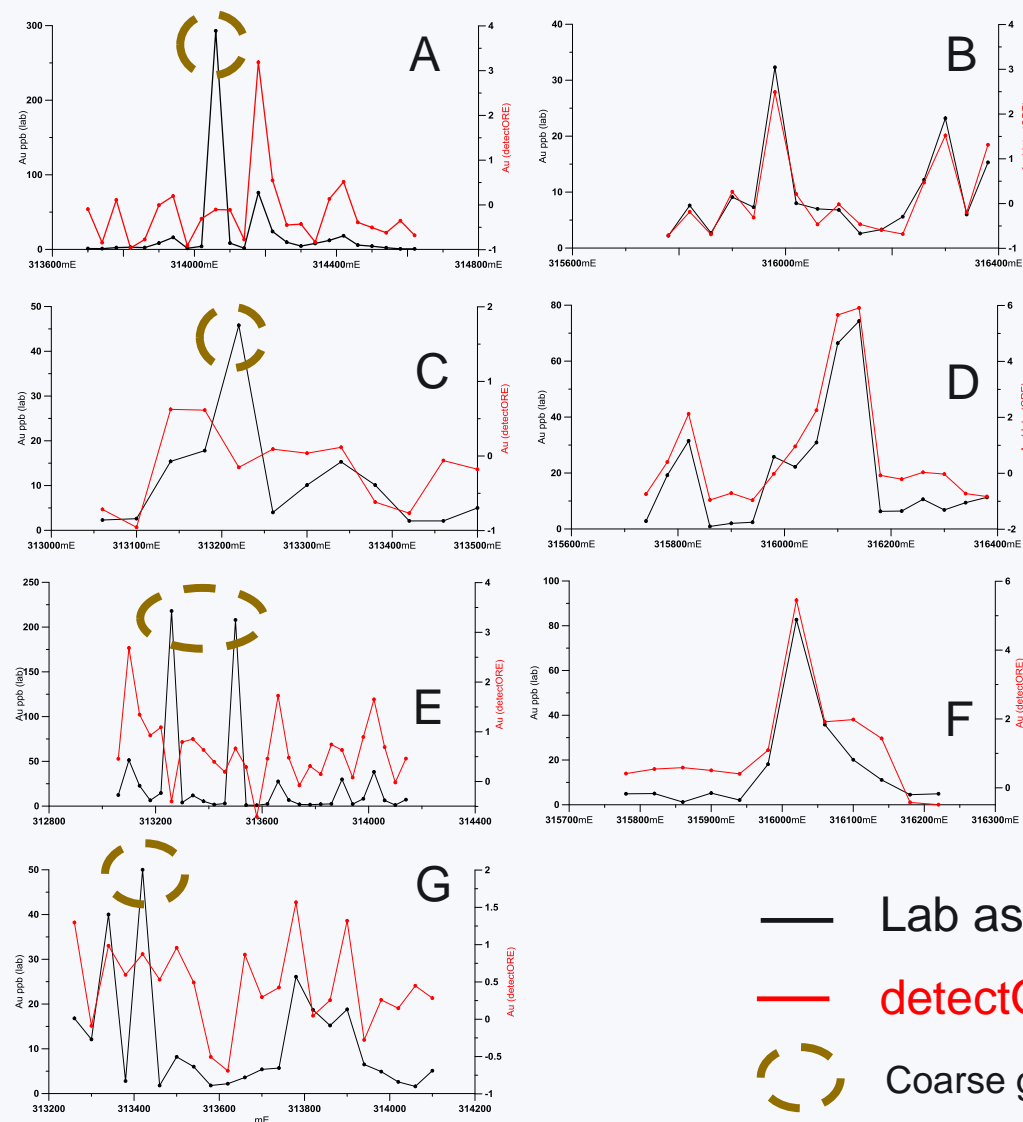
### Au (BLEG) - ppb

- 0.1 - 2.0
- 2.1 - 5.0
- 5.1 - 12.0
- 12.1 - 18.7
- 18.8 - 28.3
- 28.4 - 51.2
- 51.3 - 307.0

# Pre-field Trial, Western Australia, NE Goldfields – 2019



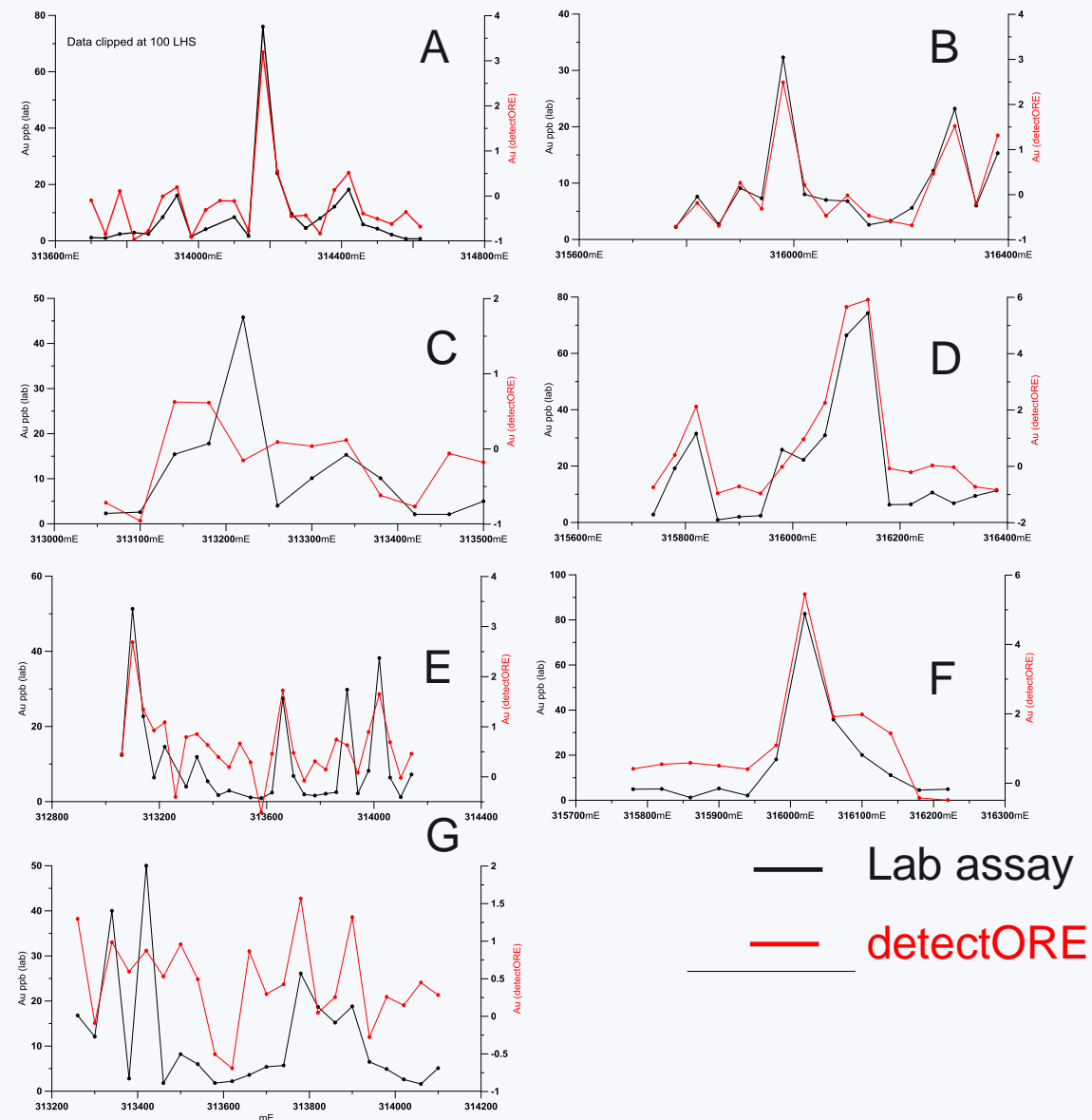
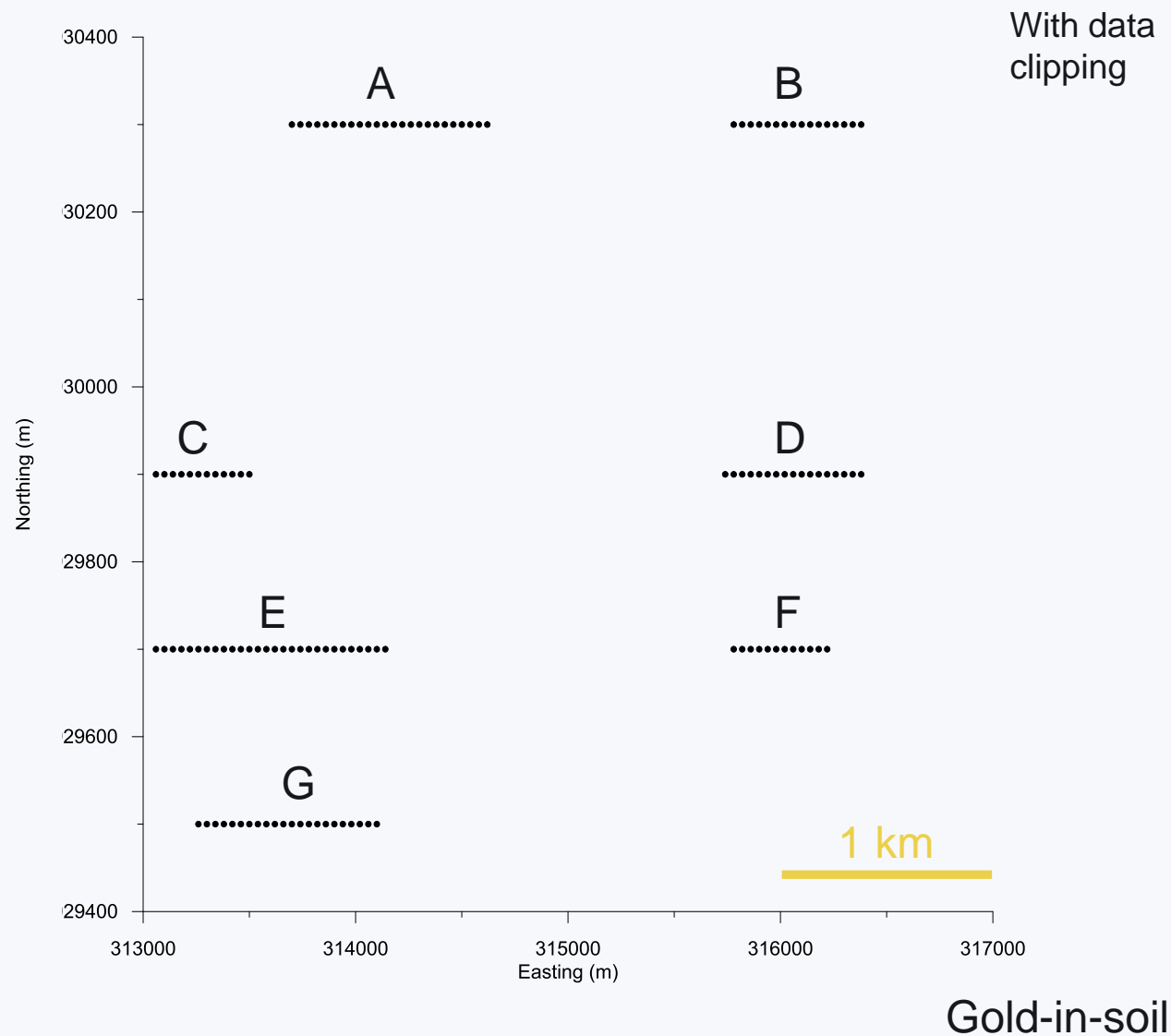
No data clipping



— Lab assay  
— detectORE  
○ Coarse gold?



# Pre-field Trial, Western Australia, NE Goldfields – 2019

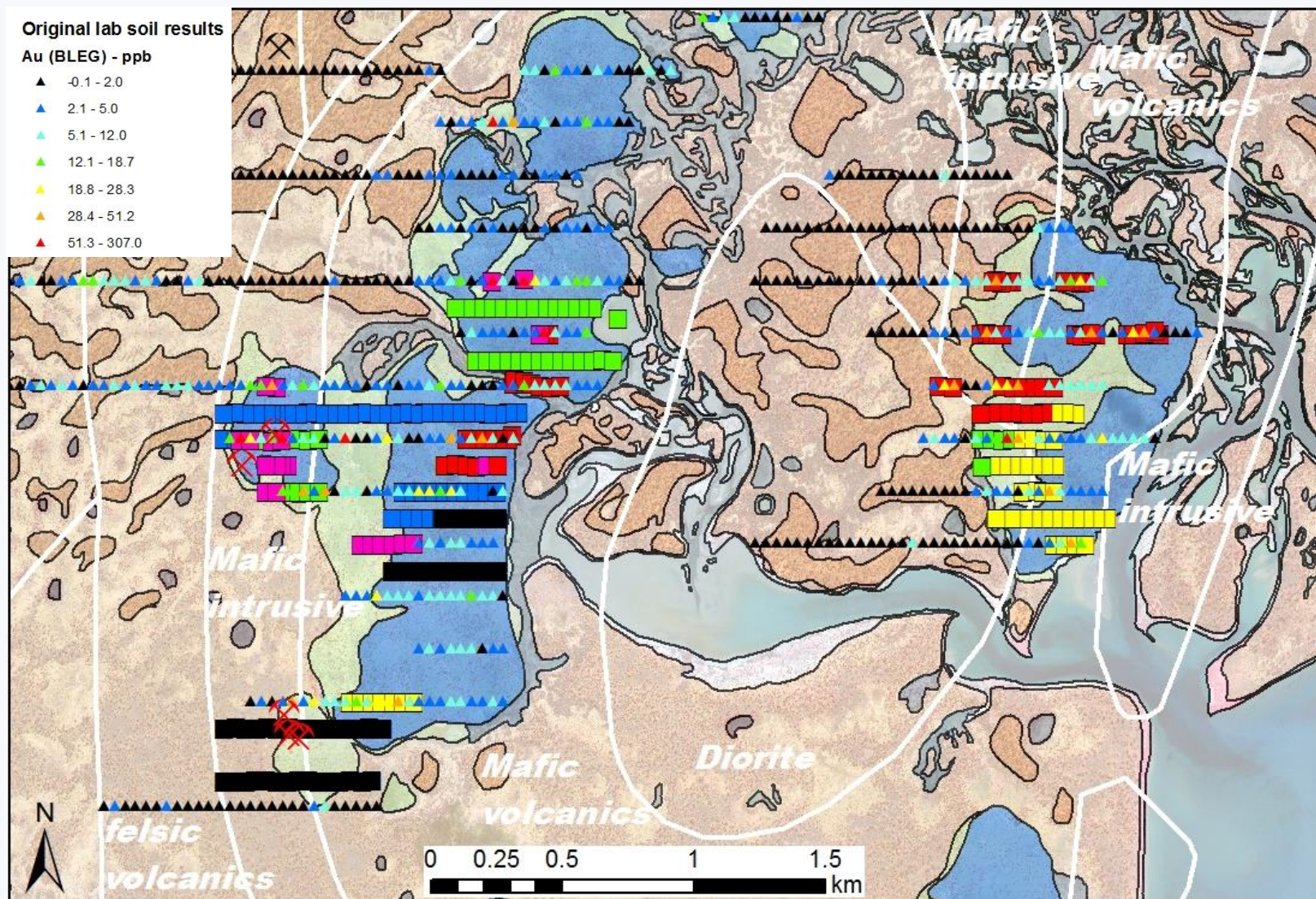


## Field Trial, Western Australia, NE Goldfields – 2019





# Field sampling days relative to lab gold-in-soil results



6 days of field sampling

Sampling focused over favourable regolith

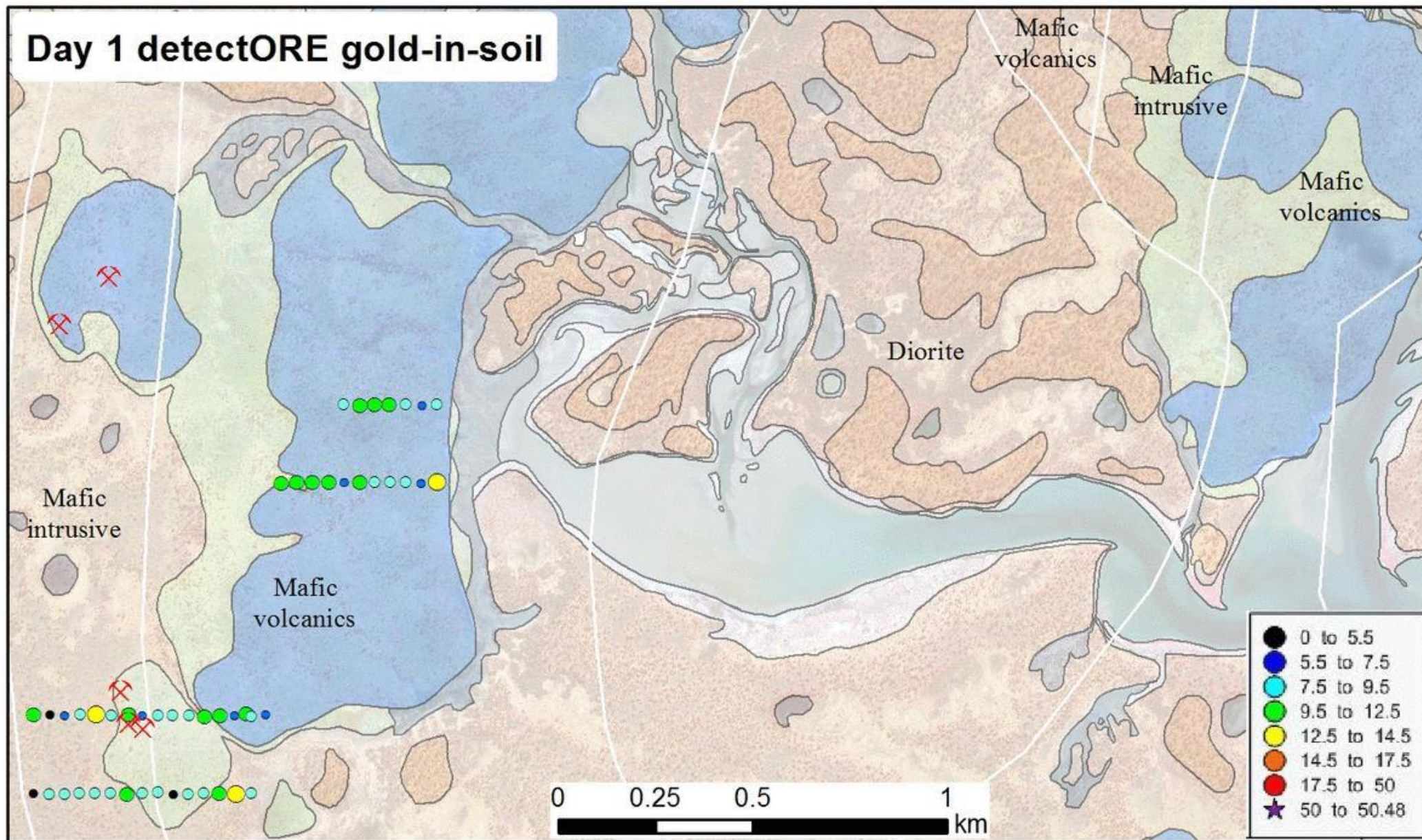
ALL results within 24 hours

## Days

- Day 1
- Day 2
- Day 3
- Day 4
- Day 5
- Day 6



# Field results – daily gold assay information



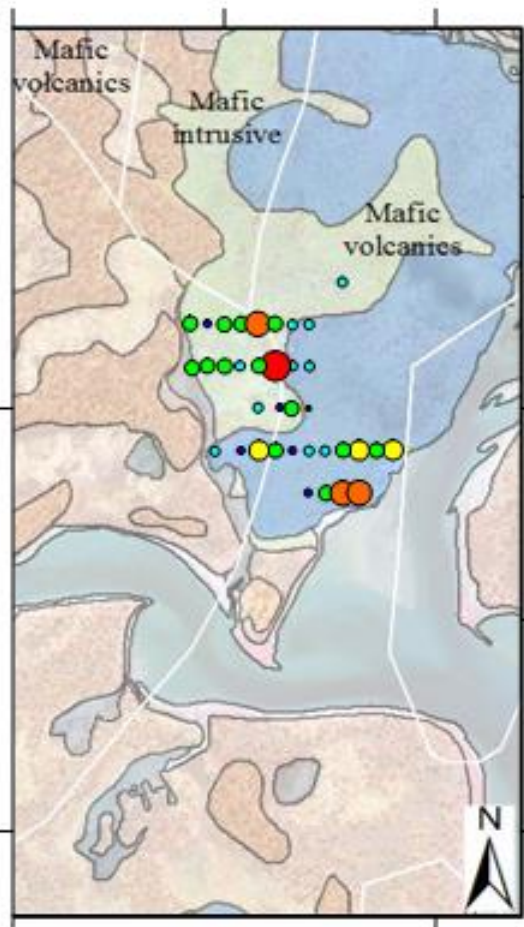


# Field Trial – Western Australia, NE Goldfields

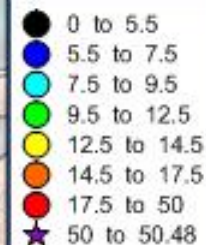
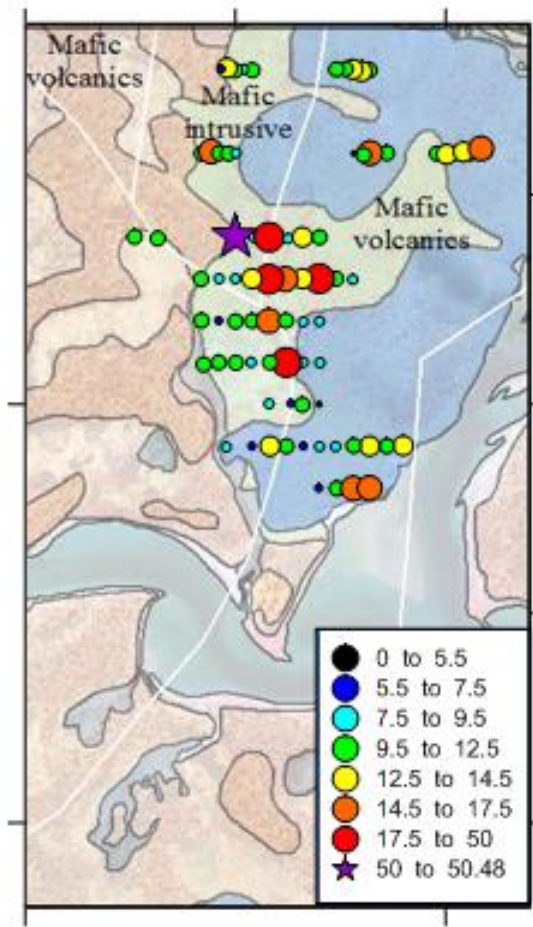
Tuesday



Wednesday



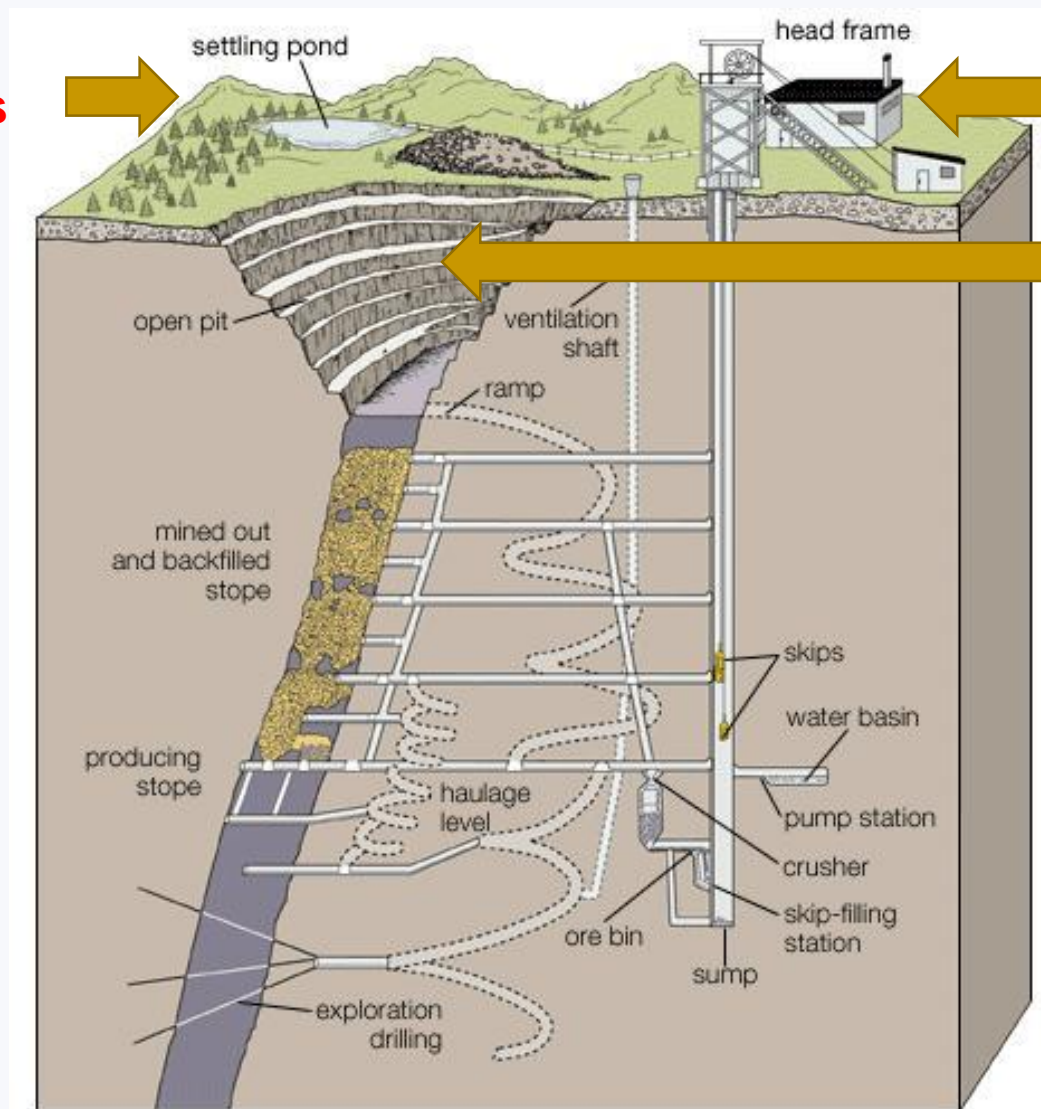
Thursday



# detectORE applications throughout the gold industry

## Exploration: brownfields & greenfields

- Drill samples
- Soils
- Trench
- Drainage



## Process plant monitoring

- CIL Au grade?
- Tailings grade?

## Grade control drilling

### detectORE advantages:

- **Low capital and operating costs** compared with traditional assay methods
  - Fire Assays require very skilled staff and has high running costs
  - ICPMS uses expensive equipment & skilled operators
- **Larger sample (250g)** – more representative
- **Easier to scale up** and be run by technicians than traditional Au analyses

## Done



Patented  
MVP

## On-going

Global Test Work

*Traction*

*Validation*

*Engagement*

## Advancing



Productisation/SOP  
GLOBAL Scaling up

- Gold exploration can be very slow
- Waiting for assays is very expensive
- Infield analysis enables reactive sampling – immediate follow-up
- detectORE enables low level gold determinations using off-the-shelf pXRF
- Extensive trials being undertaken drawing on samples from around the world
- Working with Industry to test samples and undertake field trials
- Working to deliver a simple, safe, reliable and robust system
- Sponsors will have earliest access to the technology
- Working towards release by end of 2020

**detectORE™ Explore Smarter – Discover Faster**



# For more details contact...

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[www.portableppb.com](http://www.portableppb.com)

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## detectORE R&D Sponsor program – what is it?

- Opportunity for companies to work with us to accelerate the test work
- Sponsors receive immediate and longer term benefits for doing this
- Limited number of companies can get involved
- Rewarding those who get on-board and support us during the R&D
- Possibility to upgrade sponsor status by contributing more, provided that there is an opening at the higher level
- Three sponsor levels
  - Bronze – \$30,000 (limited to 6)
  - Silver – \$50,000 (limited to 8)
  - Gold – \$100,000 (limited to 5)



# detectORE Mining/ Exploration R&D Sponsor program

	Bronze	Silver	Gold
Advanced access to technology	✓	✓	✓
Direct access to detectORE principals to discuss product development and priorities	✓	✓	✓
Notification of new case studies and product releases	✓	✓	✓
Priority Access before full commercial release	✓	✓	✓
Orientation surveys – advice & design	✓	✓	✓
Express supply of detectORE CRMs	✓	✓	✓
Guaranteed supply of consumables for 12 months after release <sup>1</sup>	✓	✓	✓
Advanced access to any new elements or techniques (Assistors if assisted with the newest product)	✓	✓	✓
Earliest supply of SOPS in French / Spanish	✓	✓	✓
Orientation surveys – advice, design, <i>interpretation</i> <sup>2</sup>		✓	✓
In-house train-the –trainer workshop training <sup>3</sup>		✓	✓
Guaranteed supply of consumables after commercial release for 24 months <sup>4</sup>		✓	✓
Highest priority product support (<4hrs during normal business hours)		✓	✓
Guaranteed places (up to 10 days before) for 3 people at detectORE industry training sessions <sup>5</sup>		✓	✓
Highest Priority access to product after commercial release		✓	✓
Orientation surveys –free field supervision of up to 10 days / year <sup>6</sup>			✓
SOPS – specify one other language required at no charge			✓
Earliest access to any enhanced technology			✓
Highest priority analysis turnaround <sup>8</sup>			✓
On declared commercialisation receive FREE widgets <sup>9</sup>	✓	✓	✓
Early mover sign-on commitment rewards <sup>10</sup>		✓	✓
Ability to move to a higher tier (*or negotiate further benefits) by contributing additional funds <sup>11</sup>	✓	✓	✓*
On commercialisation receive a 10% discount on widget purchase costs for the next 10 years. <sup>12</sup>	✓	✓	✓

## detectORE™ R&D Partner Company Sponsor Levels

<sup>1</sup> Limited to 5,000 units / year with dispatch from central supplies within 5 business days for 2 years

<sup>2</sup> Planning and Interpretation time charges covered, but limited to 7 man days/ year.

<sup>3</sup> Train-the-trainer course costs limited to out of pocket expenses

<sup>4</sup> Limited to 5000 units / year dispatched from central warehouse within 3 business days of urgent order receipt for a period of 24 months after declared commercial release date (to be posted on website)

<sup>5</sup> Expenses associated with training to be at client charge

<sup>6</sup> Supervision time charges covered, limited to 10 man days/ year, but travel / expenses at sponsor costs. Additional days at prescribed day rates.

<sup>7</sup> Limited to 30 months after product release, thereafter based on client volume

<sup>8</sup> Gold sponsor XRF spectral will be assigned highest priority for post processing and checking through company software and manual routines for a period of 18 months on start-up and thereafter based on on-going product volume

<sup>9</sup> Upon commercialisation the following number of units ("widgets") will be made available to sponsors free of charge ex-Perth for a period of 3 years (Freight and any import duty at sponsors own cost). Bronze 1000; Silver Sponsors 2500 widgets; Gold Sponsors 5000 widgets.

<sup>10</sup> Be among the first sponsors and besides assisting with the early trials, receive a further 2500 units for Silver or 5000 as Gold Sponsors upon declared commercialisation over and above standard tier level rewards.

<sup>11</sup> Enter at one level and like what you see and want more of it? Then contribute more R&D funds and provided that there is a vacant slot in our limited Sponsor Program, you receive all the benefits of the higher tier. For the avoidance of doubt, the free units are not cumulative, i.e. move from Bronze to Silver you receive 2500 units, not 1000+2500.

<sup>12</sup> The 10% discount will be over and above any other promotions or discounts on at any one time – i.e. pricing that would be available to non R&D Sponsors. The 10% discount is capped to a total discount value of 2x Sponsorship money provided to PPPB, i.e. a total cash saving of \$60,000, \$100,000 or \$200,000 for Bronze, Silver and Gold sponsors respectively.

All sponsors must agree to make outcomes of the orientation / trial data available for PPPB to use to assist with informing others about the R&D. Project co-ordinates etc. will be removed to disguise the precise location, companies name can be removed (etc).

We are seeking a spread of trial sample materials in different geologic and regolith terrains and what sponsors offer will determine who will be able to join the Sponsor Program.

Bronze \$30,000 + GST (limited to 6)

Silver \$50,000 + GST (limited to 8)

Gold \$100,000 + GST (limited to 5)

Exclusive – open to discuss possible exclusivity options

\$= AUD for Australian domiciled businesses (with an ABN) \$=USD for offshore businesses (no ABN) –