FIELD PORTABLE XRF ANALYSERS

GEOS Mining
"The Consultants Experience"
2007 – 2009

JUSTIFICATION

Why?

- 'The Promise'
- The concept

Results <u>can</u>, at best, <u>approach</u> laboratory analyses

Portable. Rapid results.

Efficiency Cost Saving

- Quicker and larger areal coverag
- Enabling modification/adaption of the ongoing work program
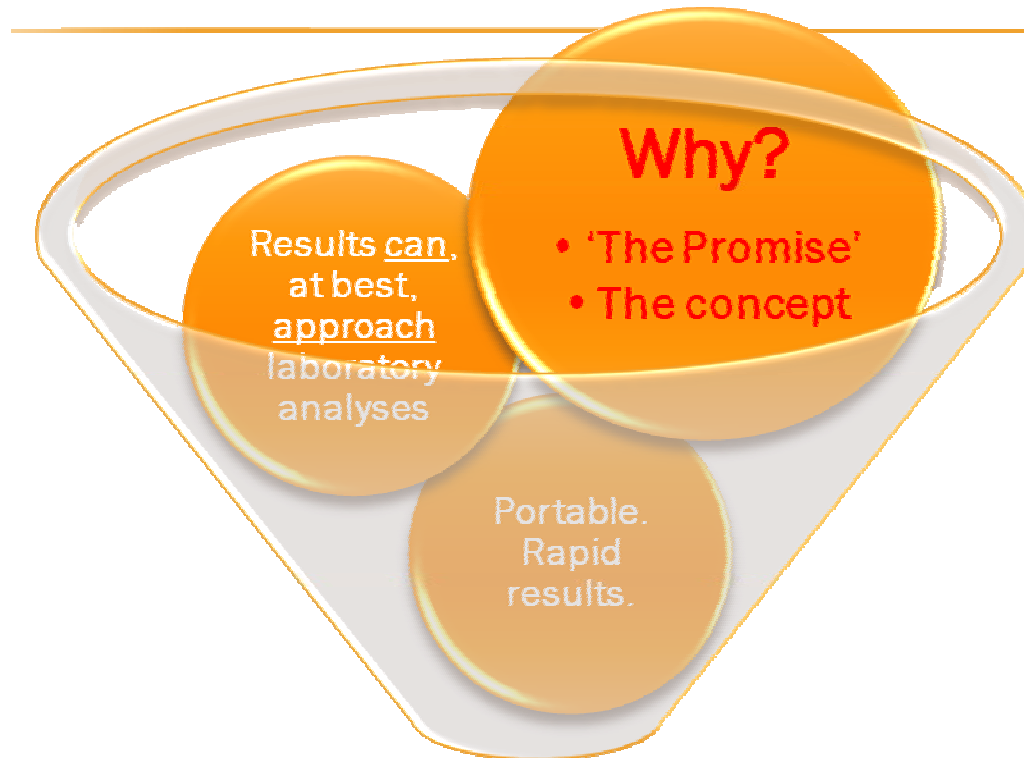
Niton XRF analyser (Niton Mining Brochure)

GEOS MINING
MINERALS CONSULTANTS

Suite 301,
66 Alfred Street,
Milsons Point NSW 2061
Australia

T 61 2 9929 6868
F 61 2 9923 1112
E info@mineralgeos.com
www.mineralgeos.com

MINERALS EXPLORATION | INDUSTRIAL MINERALS | ENERGY RESOURCES | TENEMENTS MANAGEMENT

A quoted ... "Element Range of Detection:
Potassium (K) through to Uranium (U)" ..."detection limits down to ten parts-per-million (ppm)"

Typical 'experienced' target elements & 'practical' detection limits:

Element	Detection Limit Range (ppm) *
Cu, Pb, Zn	10 - 100
Ag	50 - 150
As	10 - 100
Co	10 - 100
Cr	20 - 100
Mo	10 - 100
Ni	10 - 100
Sn	50 - 150
U	20 - 100
W	50 - 100

(*..Soils.. powders, fine grained homogenous materials)
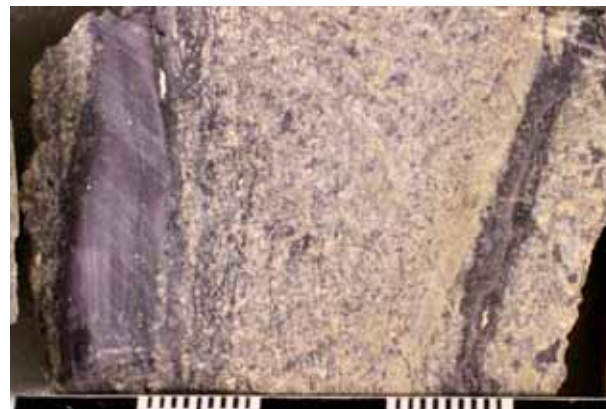
APPLICATION

- **In situ Geochemical surveys**
  - **Soil**
    - **"Termitus"**

- **Mineralisation discrimination**
  - **Drill core**
  - **Rock samples**
  - **Drill chip**
  - **Vein sets**

Termite mound survey

F-U-Mo veins

Vein gossan

"THE EXPERIENCE"

GEOS MINING
MINERALS CONSULTANTS

Suite 301,
66 Alfred Street,
Milsons Point NSW 2061
Australia

T 61 2 9929 6868
F 61 2 9923 1112
E info@mineralgeos.com
www.mineralgeos.com

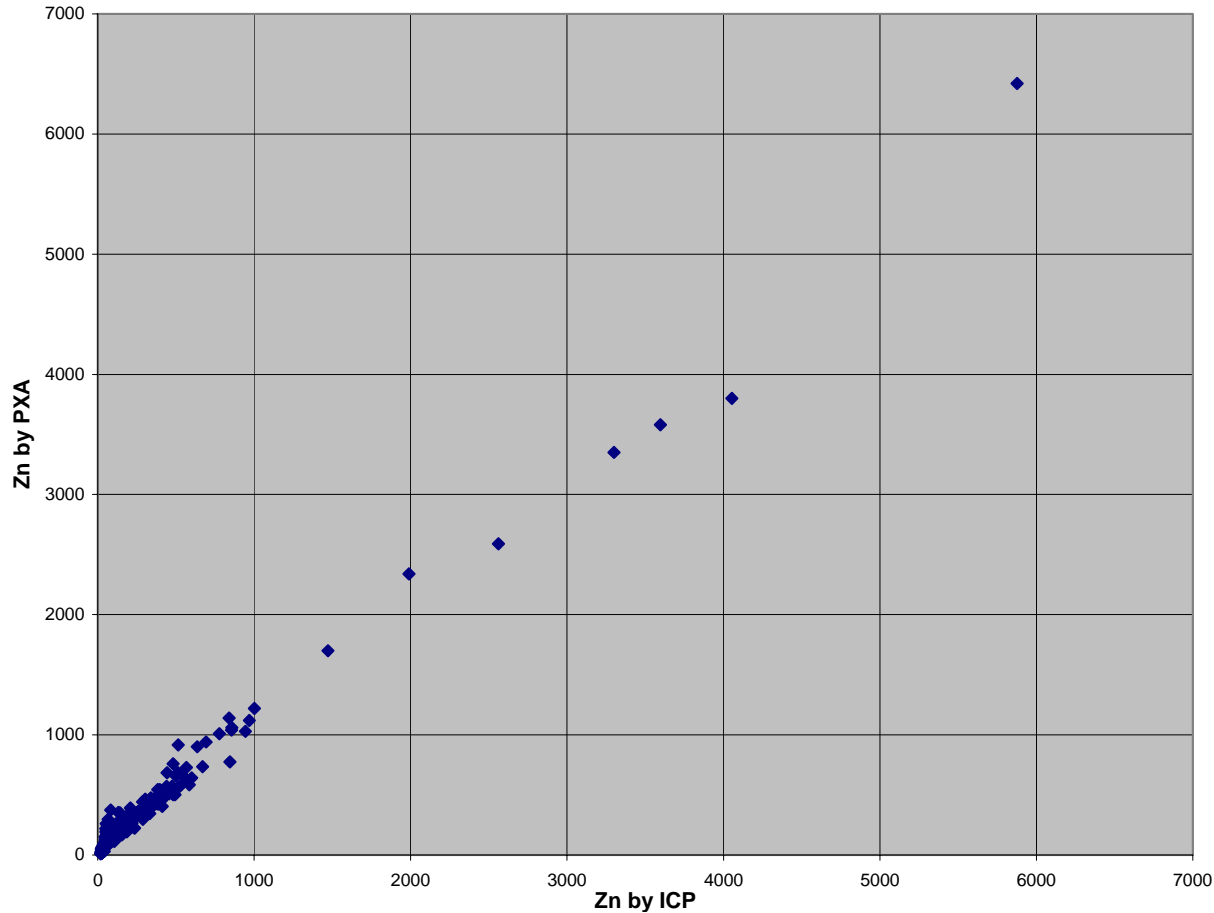MINERALS EXPLORATION | INDUSTRIAL MINERALS | ENERGY RESOURCES | TENEMENTS MANAGEMENT

Soil survey FP XRF vs. laboratory ICP assay (ppm)

Zinc pxa vs lab ICP

Good Correlation due to:

• Fairly homogenous fine grained soil

• Relative low detection capability for Zn by FP XRF

• Low error for XRF Zn

TYPICAL ISSUES

- Generally high detection limits
- No direct analysis for gold
- Spot readings
  - Often unrepresentative, rock/core/chip
  - Ground homogenised materials ideal
- Permit users to become analysts
  - Without training OR understanding
- Great risk of errors

Great need for Pre survey planning
- WHAT ,WHAT, WHAT AND WHAT??

- ✕ **Masking of level soil anomalies**
  - ✚ e.g. Cu error consistently >120 ppm masking low level Cu anomalism
  - ✚ Recommend at least 10% of survey stations/points sampled chemical analysis

- ✕ **Contamination**
  - ✚ Cover instrument window with thin plastic (cling film)
    - ✕ Beware !!! - Anomalous Zn – due to green plastic cover
  - ✚ Plastic bagged samples analysed through plastic
  - ✚ Daily calibration of instrument

- ✕ **"Spike" readings**
  - ✚ High values not reproduced in readings taken close to or at the original site
  - ✚ Probably caused by
    - ✕ Small rock/mineral fragments in soil surveys
    - ✕ Imperfect PF XRF window fit to sample
    - ✕ High moisture
  - ✚ Take repeat readings, record them as such

- **High nugget effect from core or rock samples**
  - Operator bias
  - One 'spot" reading on core not representative of one metre
  - Procedures to <u>randomize readings</u>
    - multiple/repeat readings

- **Erroneous results**
  - Unusual matrices
  - Weathering effects on rock surfaces
  - Instrument introduced errors
    - Bad fit (instrument vs. operator ?)
    - Low battery
    - Over heating

- **Data not validated by laboratory analysis**
  - MUST be regarded as <u>indicative</u> ONLY
  - MUST be clearly recorded as such

CONCLUSIONS

GEOS MINING MINERALS CONSULTANTS

Suite 301,
68 Alfred Street,
Milsons Point NSW 2061
Australia

T 61 2 9929 6868
F 61 2 9923 1112
E info@mineralgeos.com
www.mineralgeos.com

MINERALS EXPLORATION | INDUSTRIAL MINERALS | ENERGY RESOURCES | TENEMENTS MANAGEMENT
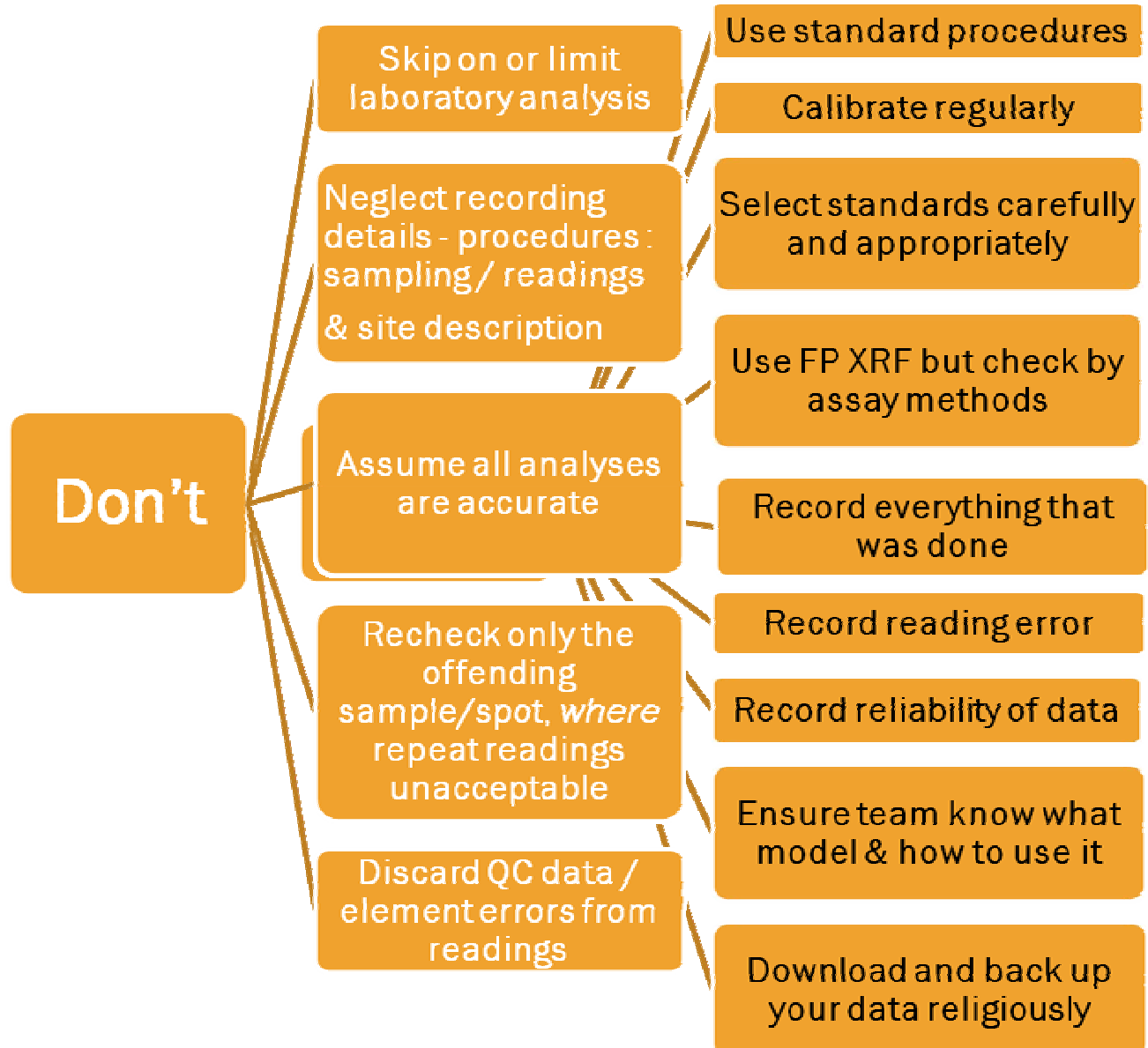
Poor methodology and hence data will lead to poor choices

Quality control of the data is critical

Pre-program setup of FP XRF is crucial

- Includes understanding limits of methodology and instrument
- Style and type of target mineralisation (including pathfinder elements)
- Materials to be tested
- Likely errors that will be encountered / introduced

Don't
- Skip on or limit laboratory analysis
- Neglect recording details - procedures : sampling / readings & site description
- Assume all analyses are accurate
- Recheck only the offending sample/spot, *where* repeat readings unacceptable
- Discard QC data / element errors from readings

- Use standard procedures
- Calibrate regularly
- Select standards carefully and appropriately
- Use FP XRF but check by assay methods
- Record everything that was done
- Record reading error
- Record reliability of data
- Ensure team know what model & how to use it
- Download and back up your data religiously

FIELD GEOLOGIST QUOTE

"....TO GET THE MOST OUT OF (FP XRF), IT IS ALL ABOUT CONSISTENCY, CONSISTENCY, CONSISTENCY!"

GEOS MINING MINERALS CONSULTANTS

MINERALS EXPLORATION | INDUSTRIAL MINERALS | ENERGY RESOURCES | TENEMENTS MANAGEMENT