SA Mineral System Drilling Program

Collaboration towards mapping mineral systems undercover

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This presentation...

1. The DISCOVERY challenge of cover
   How are we addressing that challenge…

2. South Australia Mineral System Drilling Program
3. More than just Geological Drilling…
4. Where to next?
1. The DISCOVERY challenge...
The covered minerals search space across 80% of South Australia!
Geoscience initiatives in support of improving mineral exploration in Australia
Addressing the discovery challenge...

- Pre-competitive surface geology mapping, geophysics, geochemistry, mineralogy, drilling...
Addressing the discovery challenge...

- Collaborative drilling...
- Stratigraphic drilling...

- What about using drilling for mapping and retrieving samples from undercover?

- Combine track-record of governments undertaking drilling but also providing geological maps...
We need to....

• Better understand and map geology in covered areas
• Map and test mineral systems under cover
• Retrieve samples from under cover for further analysis
• Develop a degree of confidence for geophysics
• Make drilling cheaper / faster
• Ensure that government regulation and data delivery keeps pace with these developments
2. SA Mineral Systems Drilling Program

Further understanding of 1590 Ma mineral systems

- $2.5m + $0.65m + in-kind = $8m
- 14 cored holes, 7868m, ~ 8 months
- Collaborative partners: GSSA with Deep Exploration Technologies CRC, Kingston Resources, Minotaur Exploration, service sector
A 1590 Ma crustal section for South Australia?
TRENDS:
Olympic Domain
Cu-Au-U
(Wallaroo Gp, Hiltaba granites)
Spencer Domain
Cu, Pb, Zn, Ag, Au ± Co, Ni
Archean Granite, schist, Moonabie/Pandurra
Cleve/Coulta Domain
Pb-Zn-Ag, to Ag-Pb Mn, Fe
Hutchison Gp schist dolomite marble.
Sleaford granites
Nuyts Domain
Au-Ag (± Cu, Mo, PGE)
St Peters Suite granites, abundant Hiltaba granite

Metal Occurrences of the Northern Eyre Peninsula
B. Nicolson, 2015
Mapping Mineral Systems Undercover

- Increase the size of the target
- Predict where you are within the mineral system
Key questions for mapping 1590Ma Mineral Systems in South Australia

1. Prospectivity of the Gawler Range Volcanics (GRV)?
2. Depth of cover? (what is cover here?)
3. What was the nature of mineralizing fluid-flow?
4. What are the characteristics of mineralisation trap sites?
MSDP05 – proof of concept

- Epithermal veining over ~30m within 160m wide alteration zone

Colloform-textured quartz-pyrite veins MSDP05 - 178.5m

1. Prospectivity of the Gawler Range Volcanics?
1. Prospectivity of the Gawler Range Volcanics?

- Investigator Resources Limited
2. Depth of Cover?

Gairdner Dolerite Ave. ~130 ppm Cu

Beda Basalt Ave. ~150 ppm Cu

GRV Basalt Ave. ~50 ppm Cu
2. Depth of Cover?

- **Base Adelaidean**
- **Base Roopena Basalt**
- **Base weakly reflective GRV**
- **Base GRV**

**Depth Estimates:**
- ~0.2 km
- ~1.3 km
- ~2 km
3. Mineralising Fluid Flow?

- Fluid-flow in NW-trending structure – Peltabinna area
- MSDP drillholes – brittle fracturing
- Alteration intensifies within volcaniclastic units which have clearly facilitated fluid-flow

*Importance of volcaniclastic units as well as structures*
4. Mineralisation trap characteristics?

**Mt Double** – Minotaur Exploration

- Mineral potential of trap sites – GRV margin, basement carbonates

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**Imiter, Morocco**

**Drillholes**

- Major Controlling Structure (e.g., Uno F. Buried/blind)
- Geochemical Anomalies But outbound of Major controlling structures
- Ag, Pb

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*Modified from Leistel and Qadrouci 1991*
4. Mineralisation trap characteristics?

**MSDP11** – magnetite-rich, magnesian skarn
Alteration associated with Hutchison Gr metacarbonate

![Image of mineral samples showing serpentine, magnetite, and talc]
Mineral Systems Drilling Program

Want to know more?

- MSDP webpage - video series
- Core now available for inspection!
- Core display - MSDP05, MSDP10, MSDP11, MSDP12

minerals.statedevelopment.sa.gov.au/msdp
3. More than just a geological drilling program…

- 320% leverage of initial $2.5M government investment into drilling program
- >100 South Australian-based suppliers utilised in MSDP
- Major part of the greater DET CRC Program that has created 265 FTE years of employment in South Australia
- Expenditure into regional South Australia
- Engagement with traditional owners
- New technologies and workflows….
DET CRC – cheaper, faster drilling, rapid data collection

Challenge - collecting sufficient data in covered terranes

MSDP – support the pull through of technology
South Australian Drill Core Reference Library

minerals.statedevelopment.sa.gov.au/geoscience/drill_core_reference_library
South Australian Drill Core Reference Library operations

Nelson Discovery Hall  Woodall Laboratory  Holloway Geoscience Theatre
Now at the South Australia Drill Core Reference Library...

- Minalyze CS
- Reflex – IQ logger
- Gold Sniffer
- Reflex Press
- oXRF
- Olympus Vanta
- Corescan / Hylogger
- Gold Sniffer
New: South Australian Resources Information Gateway

https://map.sarig.sa.gov.au
4. Where to from here?

National Drilling Initiative (NDI)

- MSDP set the scene with concept and CT Drilling Rig trials
- The next major step change for Australian pre-competitive geoscience?
MinEx CRC: Research Activities

Area of Research
- Australian National Drilling Initiative (NDI)
- Drilling for Definition of Mineral Deposits
- Optimising Conventional Drilling

Partners
- Geoscience Australia State Surveys Research Organisations
- Industry Partners Research Organisations

CRC Activities
- Data compilation for the NDI
- Depth of cover and interfaces
- Basement mapping with drill rig
- Geochemical background
- Corridor 3D seismic surveys
- Petrophysical vectoring
- Auto 3D geology modelling
- Turbocoring
- Coiled tubing drilling (CTD) for definition of mineral deposits
- Trialling CTD in Chile
- Composites for CTD
- Petrophysical logging for CTD
- Real-time downhole assay
- Borehole seismic inversion
- Drilling automation
- Rock properties from drilling data
- Reverse circulation (RC) drilling

Significant greenfields CT drilling in NDI pulls through existing technology and provides ideal platform for development of CT for brownfield and drill-out operations.
Task 1: Drilling and resampling program to identify and map key aspects of the mineral systems under cover

10 x 10 km pattern with depth to basement 1000 m

416 holes
203,200 m
$10.2M @ $50/m
41,600 km²
3. Where to from here?

National Drilling Initiative (NDI)

• Geological surveys access ‘new hammer’ for mapping under cover
• Step-change in geological survey work required to write the prospectus for exploration under cover
• Leveraged cash from CRC Program to support analysis of NDI and related data
• Experience gained by, and success of, previous collaborative drilling programmes such as SA MSDP

E.g. Eastern Gawler (Olympic Domain)
National Drilling Initiative (NDI)

Key Components:

1. Upgrade data associated with legacy drill holes in core libraries
   - emphasis on ‘real time’ and non-destructive analysis

2. New Drilling and characterisation in new frontiers

3. National data compilation and value-add information and knowledge
To find out more....

GEOLOGICAL SURVEY OF South Australia

DISCOVERY DAY

DISCOVER
New Data
New Insights
New Opportunities

PACE
Copper

SOUTH AUSTRALIA

Government of South Australia

ADELAIDE CONVENTION CENTRE
Thursday • 7 December • 2017
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