A Geological Survey of Western Australia Newsletter

JANUARY 2019 NUMBER 89

# Fieldnotes

Government of Western Australia
Department of Mines, Industry Regulation and Safety

www.dmp.wa.gov.au/GSWA

## ROUND 18 EIS CO-FUNDED EXPLORATION DRILLING

### SUCCESSFUL APPLICANTS ANNOUNCED

*Pages 3 and 4*

Geological Survey of Western Australia

# What's inside

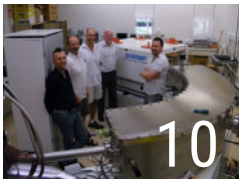
## FEATURES



## REGULARS







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## Fieldnotes

Fieldnotes is a free digital-only quarterly newsletter published by the Geological Survey of Western Australia (GSWA). The newsletter provides regular updates to the State's exploration industry and other geoscientists about GSWA's latest work, programs, products and services.

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- subscribing to the **GSWA eNewsletter** — there will be a Fieldnotes page with a link to the latest issue
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GSWA publishes a vast amount of pre-competitive geoscience information on the State, contributing to billions of dollars' worth of resources for exploration and development. To find more information about publications and maps we publish, go to our **website**.


**Cover image**: Newly drilled diamond core is extracted from a drill rod, near Kalgoorlie, Western Australia (Figure 1 from the article *Round 18 EIS Co-funded Exploration Drilling*)


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# Round 18 EIS Co-funded Exploration Drilling — successful applicants announced

EXPLORATION INCENTIVE SCHEME

The State Government continues to support the search for new resource discoveries across Western Australia. In late November 2018, the Minister for Mines and Petroleum, Bill Johnston, announced that 40 successful projects will benefit from the highly competitive Exploration Incentive Scheme (EIS) Co-funded Exploration Drilling program (Fig. 1, cover).

Applications for Round 18 co-funded drilling opened for six weeks in late August 2018. The round attracted 73 applications — an increase of about 16% on the previous round, indicating a rise in exploration activities in Western Australia. The successful 40 applicants (Fig. 2) were offered a total of $5.35 million for drilling projects in the 2019 calendar year.

Round 18 successful projects are widely distributed throughout Western Australia (Fig. 3) and include a range of commodities including lithium, tantalum, nickel, cobalt, gold, copper, base metals, potash, petroleum, rare earth elements and diamonds.

Successful applicants will be refunded up to 50% of their direct drilling costs — with caps of $150 000 for a multi-hole project, $200 000 for a single deep hole, and $30 000 for a prospector's project.

| *Map ID* | *Applicant Name* | *Drilling Project Title* | *Target Commodities* |
|---|---|---|---|
| 1 | Agnew Gold Mining Company | Agnew Strategic Stratigraphic Drilling Project | Au |
| 2 | Alt Resources | Bottle Creek Gold Project | Au |
| 3 | AngloGold Ashanti | Iceberg | Au |
| 4 | Ardea Resources Ltd | Mount Zephyr basal stratigraphy and gold potential | Au, Ni |
| 5 | Bellevue Gold Ltd | Bellevue Gold Project | Au |
| 6 | Buxton Resources Ltd | Merlin Prospect, Double Magic Project | Ni, Cu, Co, PGE |
| 7 | Canning Potash Pty Ltd | EM CP-05 | Potash |
| 8 | Comet Resources Ltd | Springdale | Ni, Co |
| 9 | Cygnus Gold | Burracoppin Project | Au–Ag–Cu–Pb–Zn |
| 10 | Dacian Gold Ltd | Cedar Island — a Wallaby-style greenfields target | Au |
| 11 | Darlot Mining Company Pty Ltd | Oval Flattening | Au |
| 12 | Encounter Resources | Aileron Prospect | Cu–Au |
| 13 | Finder Shale Pty Ltd | Helios Finder Shale | Oil and gas |
| 14 | Gold Road Resources Ltd | South Yamarna Seismic Line | Au |
| 15 | Golden State Mining | Cue | Au |
| 16 | GPM Resources Pty Ltd | Black Flag Fault | Au |
| 17 | Great Boulder Resources | Eastern Mafic Complex | Ni–Cu–Co–PGE |
| 18 | Greenmount Resources Ltd | Karlawinda Gold | Au, Ni |
| 19 | Hastings Technology Metals Ltd | Yangibana — T1 | REE |
| 20 | Independence Group | Woolly project | Cu, Zn, Pb, Ag, Au |
| 21 | Independence Group | Pike | Cu–Zn |
| 22 | IronRinger Pty Ltd | Tarraji | Ni–Cu–Au–Zn–Pb |
| 23 | Lithium Australia NL | Lepidolite Hill | Lithium |
| 24 | Moho Resources Ltd | Silver Swan North | Ni, Cu, Au |
| 25 | Northern Star Resources Ltd | Acra Project — Emu Fault | Au |
| 26 | Prenti Exploration Pty Ltd | Mad Gap | Diamonds |
| 27 | Red Metal Ltd | Madura Province — T8 Target Nullarbor | Au–Cu–Ni |
| 28 | Red Metal Ltd | Coompana Province Forrest Project | Au–Cu–Ni |
| 29 | Red Metal Ltd | Sharon Dam Project | Au–Cu–Ni |
| 30 | Redstone Resources Ltd | Prospectivity of the Tollu Group Volcanic Suite | Ni, Cu, Co, Au, Zn, Ag, Sn, W, Mo, REE |
| 31 | Rox Resources Ltd | Mt Tate | Ni |
| 32 | Sandstone Operations Pty Ltd | Two Mile Hill | Au |
| 33 | Serena Minerals Ltd | Coogee | Cu–Au |
| 34 | Silver Lake Resources | Lamprophyre intrusions — structural orientation at Ivy–Heathrow | Au |
| 35 | Sipa Exploration NL | Paterson North | Au, Cu |
| 36 | Squadron Resources Pty Ltd | Whalebone Hydrogeological Scouting | Potash |
| 37 | Technology Metals Australia Ltd | Gabanintha Layered Intrusion Stratigraphic Assessment | V, Ti, PGM, Au |
| 38 | Australian Livestock Suppliers Pty Ltd | Derry's Own North | Au |
| 39 | Rita Brooks | Mt Dockrell | Au |
| 40 | W Scott Wilson | Golden West | Au |

*Figure 2. List of successful applicants for Round 18*

# Co-funded Exploration Drilling program

Recent co-funded drilling successes include Bellevue Gold Limited's newly discovered gold lode north of Leinster and a significant copper–zinc drilling intercept at Fraser Range, northeast of Esperance by Independence Group (IGO).

Bellevue Gold Limited applied for co-funded drilling in Round 15 (under the name Draig Resources) to target a gold-rich lode that was interpreted to have been displaced by a fault beneath historical workings. In May 2018 the co-funded exploration diamond hole successfully intersected the lode, but extended drilling to a depth of 721 m unexpectedly located a second, unknown mineralized lode, which is now named the Viago Lode.

Bellevue Gold Limited reported to the Australian Securities Exchange that the Viago Lode is one of the highest grade recent gold discoveries globally with a maiden inferred resource of 800 000 t at 22 g per tonne — for 550 000 oz of contained gold. This new discovery is located beneath a mining centre that has been closed for 20 years, and is a testament to exploration at depth where mineralization was considered to be closed.

IGO's Fraser Range projects indicate that this is an emerging frontier for base metals following the copper–zinc discovery at their Andromeda project, enabled with the assistance of co-funded drilling in Round 16. The Andromeda discovery opens a new search space for base metals associated with metasedimentary rocks within the Albany–Fraser Orogen, and follows on from the investment in EIS pre-competitive data in the region with the acquisition of geophysical data, including aeromagnetic data and deep crustal seismic lines. Interestingly, the new discovery at Andromeda lies adjacent to a series of major crustal shear zones clearly identified in these datasets. IGO's Andromeda project is an addition to their Nova–Bollinger mine site which was also discovered using EIS co-funded drilling.

Another round of co-funded drilling (Round 19) will be undertaken for drilling between July 2019 and June 2020. The application process for Round 19 will open on Friday 22 February 2019 at the **GSWA Open Day**.

For more information, contact **Charlotte Hall**.

**GENERAL**

1 Agnew Gold Mining Company
2 Alt Resources
3 AngloGold Ashanti
4 Ardea Resources Ltd
5 Bellevue Gold Ltd
6 Buxton Resources Ltd
7 Canning Potash Pty Ltd
8 Comet Resources Ltd
9 Cygnus Gold
10 Dacian Gold Litd
11 Darlot Mining Company Pty Ltd
12 Encounter Resources
13 Finder Shale Pty Ltd
14 Gold Road Resources Ltd
15 Golden State Mining
16 GPM Resources Pty Ltd
17 Great Boulder Resources
18 Greenmount Resources Ltd
19 Hastings Technology Metals Ltd
20 Independence Group
21 Independence Group
22 IronRinger Pty Ltd
23 Lithium Australia NL
24 Moho Resources Ltd
25 Northern Star Resources Ltd
26 Prenti Exploration Pty Ltd
27 Red Metal Ltd
28 Red Metal Ltd
29 Red Metal Ltd
30 Redstone Resources Ltd
31 Rox Resources Ltd
32 Sandstone Operations Pty Ltd
33 Serena Minerals Ltd
34 Silver Lake Resources
35 Sipa Exploration NL
36 Squadron Resources Pty Ltd
37 Technology Metals Australia Ltd

**PROSPECTOR**

38 Australian Livestock Suppliers Pty Ltd
39 Rita Brooks
40 W Scott Wilson

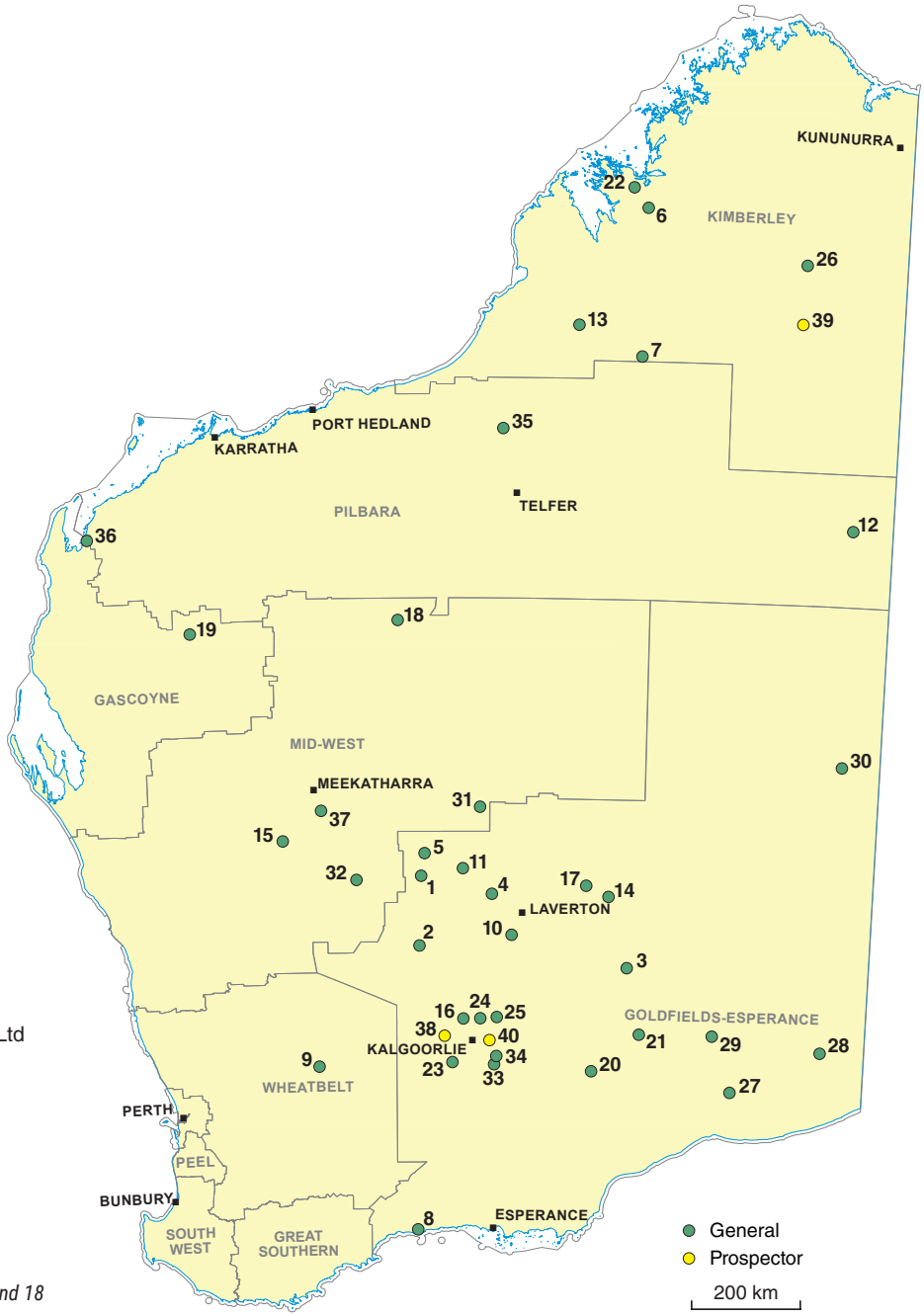



*Figure 3. Location of successful applicants for Round 18*

# Western Capricorn Orogen 2018 GIS — the last word

Basement rocks of the Gascoyne Province and the overlying sedimentary rocks of the Edmund and Collier Basins were first systematically mapped by the Geological Survey of Western Australia (GSWA) in the 1960s and 1970s. Products from this program included 1:250 000-scale maps and Explanatory Notes, and a number of early Reports. Systematic 1:100 000-scale field mapping began in 1996 and continued for two decades until completion in 2017. The project was supported by an extensive program of SHRIMP U–Pb zircon, monazite and xenotime geochronology, whole-rock and mineral isotope geochemistry, and whole-rock lithogeochemistry, significantly advancing our knowledge of the tectonic, depositional and mineralization history of the orogen. During those two decades, the province and basins have been covered by aeromagnetic and radiometric data at 400 m line spacing, 2.5 km spaced gravity, 5 km line spacing airborne electromagnetics, and Landsat TM and DEM-derived imagery, as well as crustal-scale geophysical data including seismic reflection and magnetotelluric data, and regional-scale passive seismic data. In total, the project has produced:

- over 44 first and second edition 1:100 000-scale printed maps
- Explanatory Notes for all lithostratigraphic units and events
- 30 GSWA Reports and Records and over 40 external journal publications outlining the protracted tectonic history of the orogen.

The Western Capricorn Orogen 2018 Geological Information Series (GIS) digital data package, is the most up-to-date compilation for the project, and is a one-stop-shop for all of this data. The geospatial information can be viewed and interrogated in different GIS platforms such as GeoMap.WA, ArcMap or QGIS, and all of the 'hard copy' GSWA maps, Records, Reports and Explanatory Notes can be retrieved as PDF files through search functionality in GeoMap.WA, or extracted directly from the data folders on the USB. The Western Capricorn 2018 GIS package will be the last update for the project.

More information can be accessed on the Department of Mines, Industry Regulation and Safety **website**.

For more information, contact **Simon Johnson**.

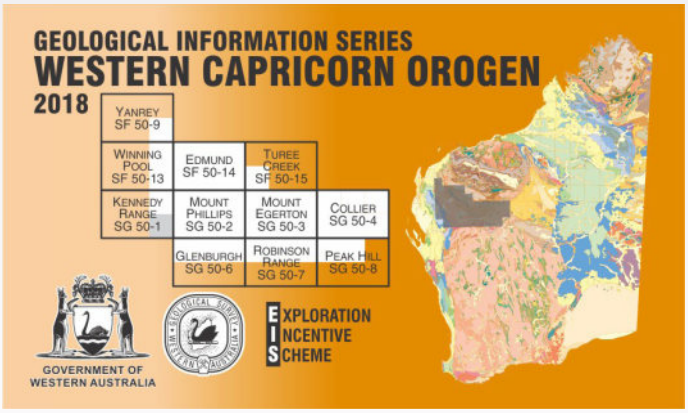



*Figure 1. Cover of product*

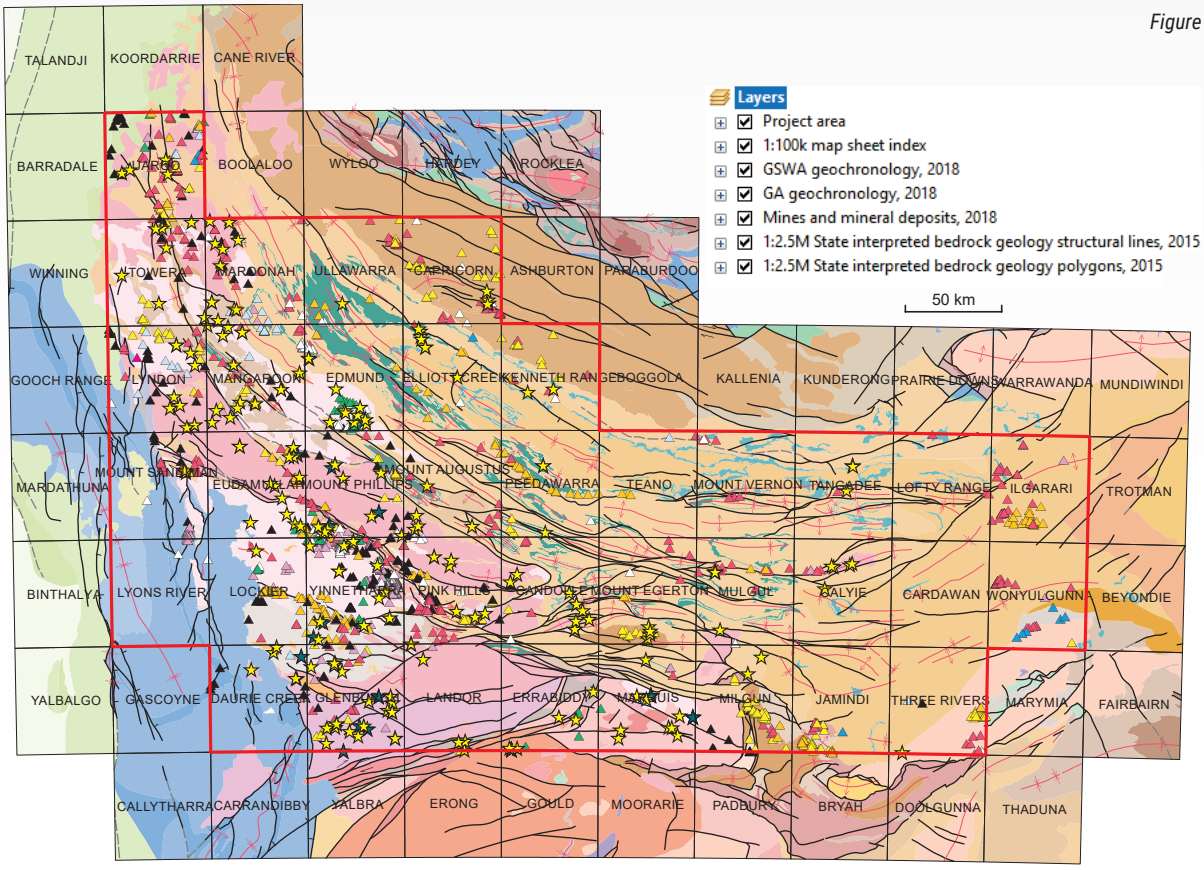



*Figure 2. Screen shot of the digital data package when opened in GeoMap.WA.*

# MRIWA PROJECT No. 462 Multi-scaled near surface exploration using ultrafine soils

GSWA Report 190 presents the results of the Minerals Research Institute of Western Australia (MRIWA) Project M462 'Multi-scaled near surface exploration using ultrafine soils' carried out by the researchers at CSIRO Mineral. The Geological Survey of Western Australia is releasing the report to ensure a wider distribution for the results of the Ultrafine+ method that demonstrates the geochemical analysis of <2 µm particle size fraction of soils and sediments, and its application for mineral system signatures. The M462 Project was conceived to develop and test a new analytical workflow to separate the <2 µm soil and sediment fractions for multi-element analysis along with other, commonly not utilized physico-chemical parameters that should aid exploration. The project delivered the method, workflow, and commercialized platform (UltraFine+ certified trademark pending); and demonstrated success in experiments, orientation field surveys and new regional geochemical map products for Western Australia. This report condenses the two-year effort into two journal-style papers:

- Part 1 Method optimization report — refining fine fraction soil extraction and analysis for mineral exploration by Noble, RRP, Lau, IC, Anand, RR and Pinchand, GT
- Part 2 Site studies and regional maps application of ultrafine fraction soil extraction and analysis for mineral exploration by Noble, RRP, Morris, PA, Anand, RR, Lau, IC and Pinchand, GT.

Additional data products and the public data release for the regional maps are linked in an Appendices for cloud data delivery to sponsors; the data and Report are hosted in the Department of Mines, Industry Regulation and Safety (DMIRS) eBookshop and GeoVIEW.WA for public release.

Greenfields exploration in Australia is in decline, and the technical challenge of exploring in deeply weathered and covered regions has not been fully addressed; yet exploration success in these areas is critical to the future economy. Commonly, soil sampling is paired with acid digestion and multi-element measurement. This established approach has not changed significantly over the past 30 years: that is, digest the <250 µm soil fraction and analyse the solution for elemental concentrations. In transported cover, the mobile element signature is contained in the smallest size fractions, so we tested the clay size fraction (<2 µm) as an improved sample medium for mineral exploration.

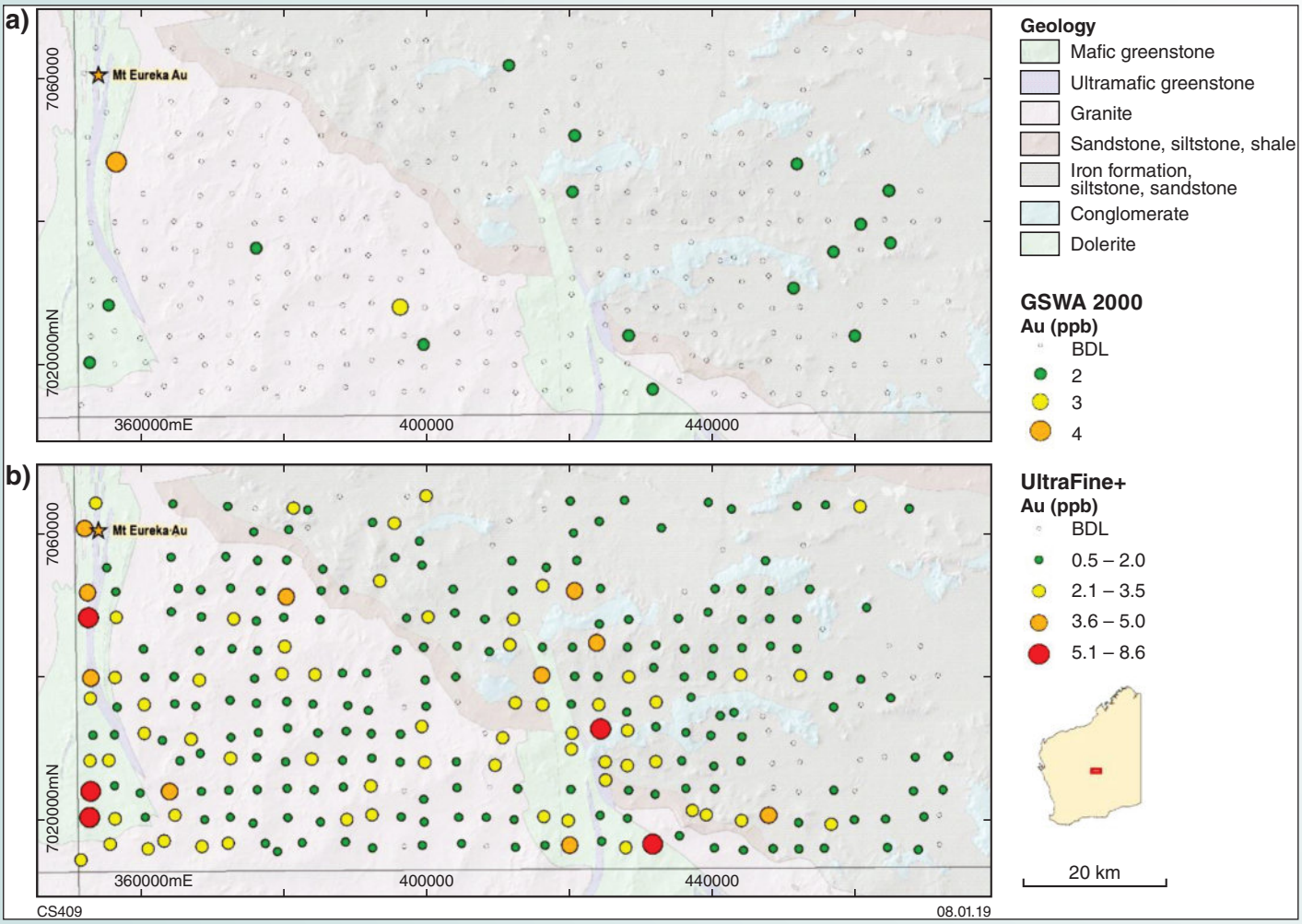



*Figure 1. Gold (ppb) in soils in the Kingston 1:250 0000 Geological Series map sheet: a) original GSWA data with only a few detectable Au values; b) the new results of the Ultrafine+ method developed in this MRIWA project using the same samples, clearly showing the vast improvement in Au information. Mt Eureka is the only known small Au deposit in the region (mined in the 1930s). Geology is generalized and based on the data from GSWA (2014)*

# zing the value of regolith samples

A series of experiments was conducted to demonstrate the value of using <2 µm fractions for exploration geochemistry. Twenty-seven bulk reference soils were collected in the vicinity of known mineral deposits (including background areas) that reflect the common soil types of Western Australia. By analysing fine fractions (<2 µm) we produced reproducible, reliable results, with higher concentrations than from the <250 µm fraction (average increase of 100–250%). Key benefits were the reduction of nugget effects (in Au) and the challenges with detection limits in materials that are dominated by quartz sand. Testing submicron fractions showed that although <0.2 µm fraction was slightly different to the <2 µm and <0.75 µm fractions, there was not significant additional value. The <2 µm fraction represents the most effective and cost efficient sample medium to use. The overall method development showed that ultrasonics were not required, a dispersant was critical for solid recovery and that Na-hexametaphosphate (technical or laboratory grade) was the most effective dispersant. The developed method proved the use of a small weight for analysis was effective (0.2 g) and microwave assisted aqua regia was the best analytical method for Au detection. Our research shows obvious benefits in using fine fractions for Au. Copper and Zn were consistently and abundantly extracted from the fine particle size fraction.

The UltraFine+ workflow was applied to a number of small orientation site studies in Western Australia, and reprocessed archived regional soil samples from GSWA to test the method to improve exploration targeting. The orientation program involved ~200 samples from the Leonora and Sir Samuel 1:250 000 Geological Series map sheets, an area that hosts known major Au and base metal deposits. We then applied this approach to the Kingston 1:250 000 Geological Series map sheet area, analysing a further 300 samples in a region on the Yilgarn Craton margins that is essentially greenfields. There has been little exploration in the region, and the original geochemical survey data was heavily censored due to the dominance of transported regolith dominated by quartz-rich sand. Of most relevance, the study revealed a marked decrease in censored results for Au (~67% to 10% below detection limit) using historic samples, and re-assaying them enabled us to produce a new geochemistry map of the Kingston 1:250 000 Geological Series map sheet (Fig. 1).

Download a free PDF of **Report 190 MRIWA Report no. 462: Multi-scaled near surface exploration using ultrafine soils** by R Noble, I Lau, R Anand and T Pinchand from the DMIRS eBookshop.

For more information, contact **Catherine Spaggiari**.

EXPLORATION INCENTIVE SCHEME

mriwa Minerals Research Institute of Western Australia

CSIRO

*Ferricrete capped mesas, south of Halls Creek, Western Australia*

# GSWA joins MinEx CRC as a participant in the National Drilling Initiative

The $218 million **Mineral Exploration Co-operative Research Centre (MinEx CRC)** was announced in March 2018. The Centre was launched in Perth on 12 October and in Adelaide at the Australian Geoscience Council Conference on 15 October 2018 (Fig. 1).

The Geological Survey of Western Australia (GSWA) supported the MinEx CRC bid and has signed up as a participant in the National Drilling Initiative (NDI), a world-first collaboration of Government Geological Surveys and researchers that will undertake drilling in unexposed, underexplored areas of potential mineral wealth across Australia.

Mineral discovery rates in Australia are declining, and the perception that Australia is a mature exploration destination could result in less investment in exploration. This would result in fewer future mines, less mine construction and reduced royalty income for Western Australia. MinEx CRC is an incorporated co-operative research centre, a funding model that provides up to 10 years of funding for linking researchers with industry to focus on research and development that leads towards use of new equipment and technologies and their commercialization. MinEx CRC's purpose is to create new opportunities and search spaces for mineral discovery by delivering:

- more productive, safer and environmentally friendly drilling methods
- new technologies for collecting and delivering data while drilling
- exploration data on never-before sampled rocks that are prospective for minerals but are hidden beneath either regolith or sedimentary basin cover, or both.

The successful bid secured $50 million in Federal Government funding through the Department of Industry, Innovation and Science, as part of the 19th selection round for the CRC Program. MinEx CRC will be dual-headquartered in Western Australia and South Australia with the CEO based at the Australian Resources Research Centre (ARRC) in Bentley, and the Chief Scientist at the University of South Australia.

The CRC has strong industry and research backing, with 34 companies and Government geoscience organizations committing $165 million (cash and in-kind) to the CRC over the next 10 years. These companies include BHP Billiton, South32, Anglo American and Barrick, together with Geoscience Australia (GA) and State Geological Surveys, including GSWA, as well as the Minerals Research Institute of Western Australia (MRIWA).

Research organizations supporting the CRC include CSIRO, Curtin University, the University of Adelaide, the University of South Australia, The University of Western Australia, and the University of Newcastle.

The outcomes from the CRC will also develop the high-value Mining Equipment, Technology and Services (METS) sector. The NDI provides the opportunity for METS suppliers to access world-class technology developed in a collaborative R&D environment.

Part of MinEx CRC's focus will be to extend the capability of Coiled Tubing (CT) drilling (Fig. 2), developed by the now completed Deep Exploration Technologies CRC, so that it can drill deeper, is steerable and delivers the highest quality sampling. CT technology for deep rock exploration promises drilling at one-fifth the cost of conventional diamond drilling and has the potential to drive a revolution in mineral exploration. Basement drill targets beneath cover can be interpreted from regional-scale geophysical


*Figure 1. Launch of MinEx CRC at ARRC in Perth, 12 October 2018: Left-to-right: John Emerson (Board Member), Erica Smyth (Board Member), Chris Pigram (Chairman), Stephen Price MLC (Member for Forrestfield), Linda Kristjanson (Board Member), Peter Rossdeutscher (Board Member) and Andrew Bailey (CEO). Photo courtesy MinEx CRC*

data mostly acquired by Western Australia's Exploration Incentive Scheme (EIS), from known geology, reinterpretation of exploration reports in the Department of Mines, Industry Regulation and Safety's (DMIRS) WAMEX database, and by revaluation of drillcore held in GSWA's core libraries.

DMIRS, through GSWA, will contribute $350 000 a year over the 10 years of MinEx CRC from the EIS, for a total of $3.5 million as part of the NDI (MinEx CRC Program 3). In-kind support will consist mostly of the acquisition of targeted geophysical surveys up to a value of $6 million over the life of the CRC. MRIWA is contributing $1 million to Programs 1 and 2 of MinEx CRC, bringing the total contribution from Western Australia to $4.5 million. GA is contributing $10 million, the Geological Survey of NSW $4.4 million and the Geological Survey of South Australia $5 million as part of the NDI.

MinEx CRC participation is an integral part of GSWA's ongoing plans for EIS through Program 1 Innovative Drilling – Stratigraphic and mineral potential drilling using new technologies, and Program 3 Encouraging exploration through cover. The full $3.5 million EIS contribution will be invested in drilling programs in Western Australia and will leverage an equivalent amount of research at CSIRO and participating universities aimed around those drilling programs. Research programs include:

- maximizing the value of data and drilling through cover
- geological architecture and evolution
- targeting mineral systems in covered terranes.

In Western Australia, GSWA will concentrate its NDI drilling programs in a region defined as 'The Gap' on the eastern margin of the Pilbara Craton (the Paterson Orogen, hosting the Cu–Au deposits including Telfer), and across the Canning Basin to the border region with the Northern Territory. This will follow the line of the recent GA/GSWA-funded Kidson deep seismic reflection survey. The aim is to reduce risk for mineral explorers in a greenfields setting in remote country in the Paterson, Tanami and Arunta Orogens (Fig. 3).

For more information, contact **Ian Tyler** or **Catherine Spaggiari**.

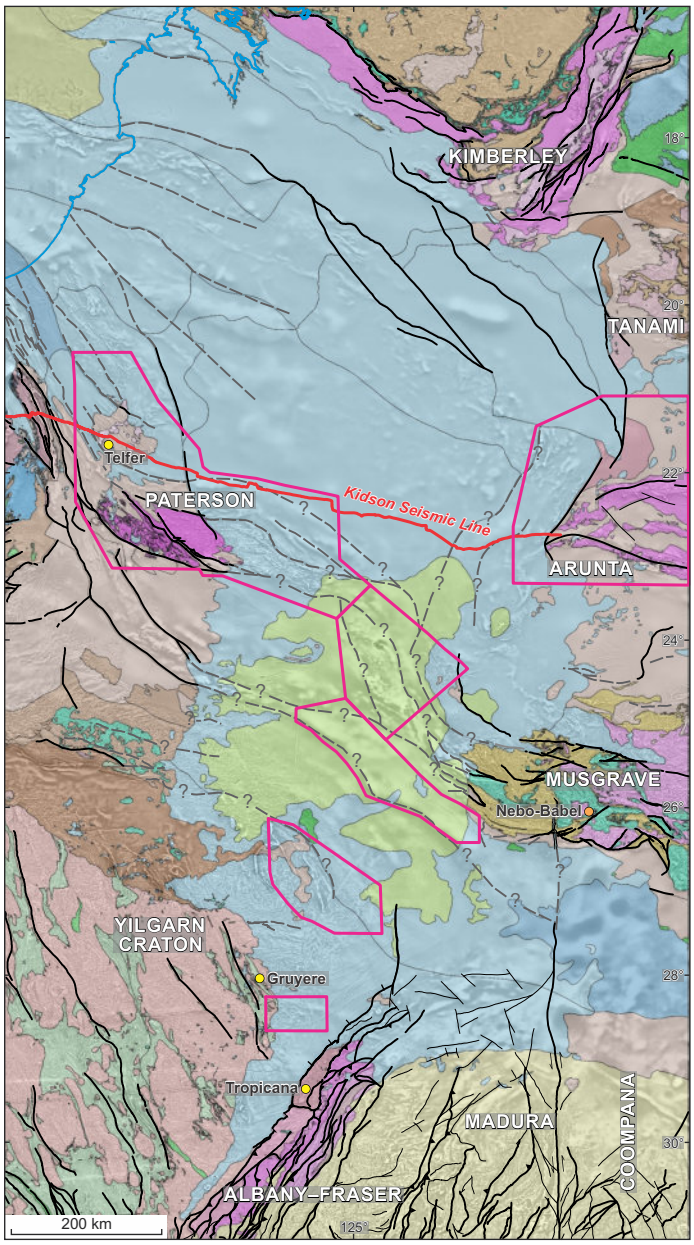



*Figure 3. 'The Gap'. MinEx CRC NDI priority areas in Western Australia. Background is Western Australian tectonic units over 1VD magnetic image*

*Figure 2. The RoXplorer coiled tube (CT) drill rig. Photo courtesy DET CRC*

EXPLORATION INCENTIVE SCHEME

MinEx CRC

# Celebrating SHRIMP geochronology in Western Australia

The Sensitive High Resolution Ion MicroProbe (SHRIMP) is a large instrument used to determine the ages of rocks and geological events, by measuring minute quantities of uranium and lead in tiny crystals of zircon and other minerals. Building on previous collaborations between Geological Survey of Western Australia (GSWA) Director Alec Trendall and Curtin University Professor John de Laeter, a consortium comprising GSWA, Curtin University, and The University of Western Australia was formed in 1993 to purchase the first commercial SHRIMP II instrument, with assistance from the Australian Research Council.

Initially designed and constructed in the 1970s in the Research School of Earth Sciences at the Australian National University in Canberra, the SHRIMP is a true Australian success story that revolutionized geochronology in Western Australia. GSWA has been a major user of the SHRIMP since 1993, so far publishing more than 1550 reports in its Geochronology Record Series. The Western Australian SHRIMP has also provided geochronology and isotope geochemistry data of fundamental importance to the wider Australian and international geoscience community. Its impact is indicated by almost 900 scientific publications and 88 000 journal citations on diverse topics that include Earth, lunar and planetary sciences, adding the time dimension to 3D plate tectonic reconstructions, and understanding the formation of mineral deposits in Western Australia and around the world.

In December 2018, an anniversary symposium was held at Curtin University to celebrate SHRIMP's 25th year of continuous operation, and to acknowledge the profound impact of the SHRIMP in understanding the geology of Western Australia. The event included 23 presentations by 18 researchers, showcasing the building of SHRIMP, personal reflections of the early days, the impact of the SHRIMP, and our challenges and opportunities for the future. The event culminated in a reception, complete with a scale model of the SHRIMP made of birthday cake!

For more information, contact **Michael Wingate**.

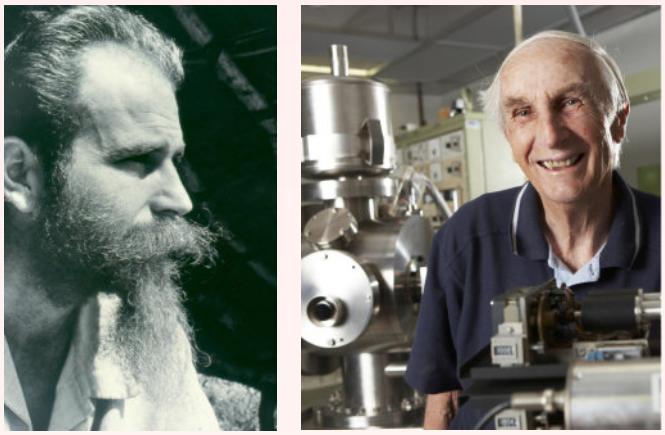


*Figure 1. (left) Dr Alec Trendall, GSWA Director from 1980 to 1986; (right) Curtin University Professor John de Laeter*


*Figure 2. Some of the current geochronologists with the SHRIMP*

John de Laeter Centre

AuScope

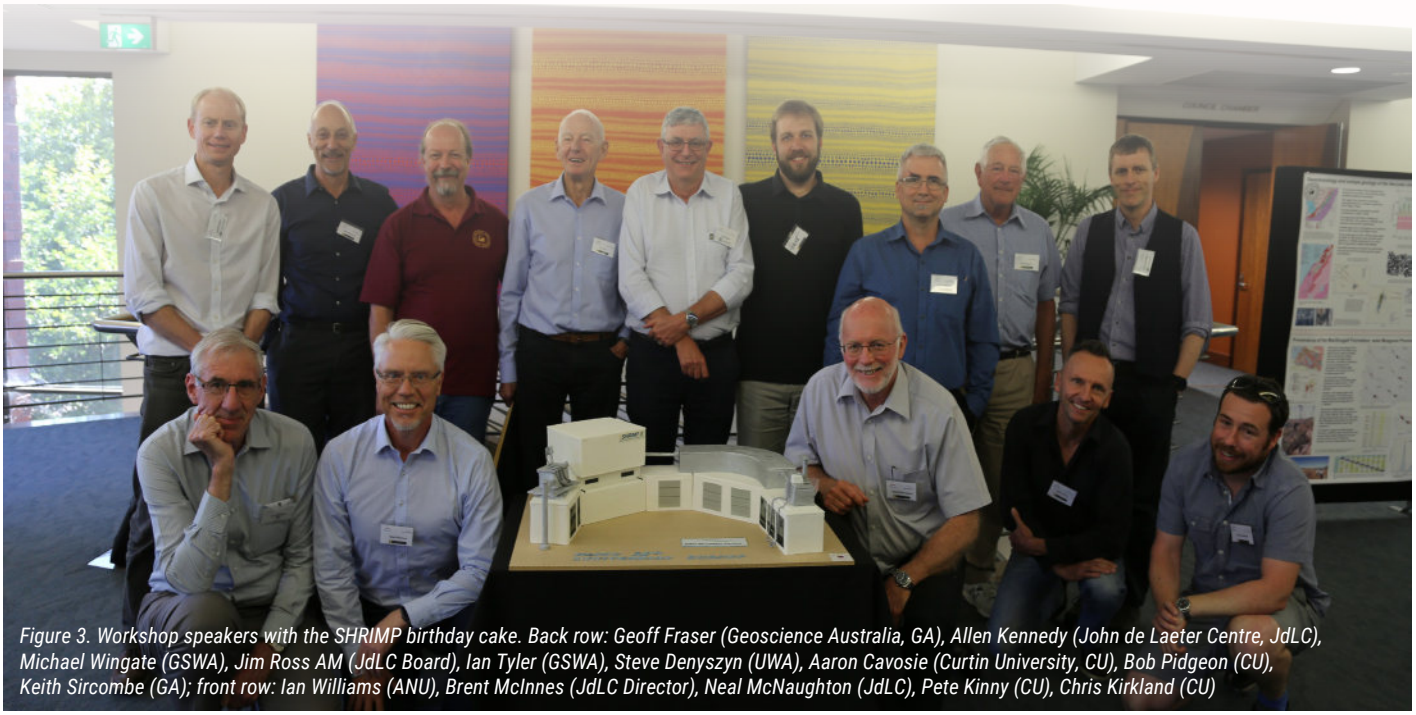


*Figure 3. Workshop speakers with the SHRIMP birthday cake. Back row: Geoff Fraser (Geoscience Australia, GA), Allen Kennedy (John de Laeter Centre, JdLC), Michael Wingate (GSWA), Jim Ross AM (JdLC Board), Ian Tyler (GSWA), Steve Denyszyn (UWA), Aaron Cavosie (Curtin University, CU), Bob Pidgeon (CU), Keith Sircombe (GA); front row: Ian Williams (ANU), Brent McInnes (JdLC Director), Neal McNaughton (JdLC), Pete Kinny (CU), Chris Kirkland (CU)*

# GSWA in the Goldfields

Kalgoorlie was the location of GSWA in the Goldfields held on 15 November 2018, an annual event where Department of Mines, Industry Regulation and Safety (DMIRS) staff interact directly with the geological industry and community in Kalgoorlie through activities, work programs and results specifically relevant to the Goldfields region. The half-day event featured several presentations of stratigraphic drillcore at the Joe Lord Core Library. A group of about 30 people, representing several companies as well as other interested members of the local public, attended the core library presentations. DMIRS also greatly appreciated David Nixon's (Gold Fields St Ives) time and expertise as he enthusiastically guided the attendees through recently acquired Exploration Incentive Scheme (EIS) co-funded core from the Invincible deposit near Kambalda.

At the same time as the core library core viewing, other participants were undertaking training in the department's databases and online systems.

GSWA in the Goldfields continued into the evening with presentations by the Raglan Drilling Geology Lecture Series at the Hannans Club, an informative series that always draws an appreciative crowd.

Ian Tyler (Director, Geoscience) delivered a short introduction, mentioning the ongoing continuation of the highly successful EIS, and was followed by talks by Klaus Gessner and Hugh Smithies. Klaus Gessner's topic was 'The Eastern Goldfields High-Resolution Seismic Survey: what, where, when and why…'. Klaus, the manager of the Lithospheric Architecture Branch within the Geological Survey of Western Australia (GSWA), outlined the details for an upcoming program of geophysical data acquisition over the region, including the 2019 Eastern Goldfields High-Resolution Seismic Survey, which will deliver ~250 km of high-resolution seismic data along six east–west traverses broadly between Ora Banda and Kambalda. The high-resolution seismic acquisition is planned for February to April 2019 and will be accompanied by magnetotelluric and passive seismic surveys that have already commenced and will continue over the next 18 months.

Hugh Smithies, the manager of the 4D Geodynamics Branch within GSWA, spoke on the topic, 'A new look at lamprophyres and sanukitoids, and their relationship to the Black Flag Group and gold prospectivity'. He outlined new geochemical data arising from GSWA's ongoing greenstone geochemical barcoding program that demonstrates the very unusual and distinctive geochemical characteristics of the Black Flag Group and links these to hydrous melts of mantle origin.

The Hannans Club talks — as always perfectly organized by Alicia Verbeeten — were very well received and attended with mandatory beer and delicious pizza on the menu.

Make sure to remember the date of GSWA in the Goldfields for 2019 — Thursday 28 November.

For more information, contact **Hugh Smithies.**

*Figure 1. Hugh Smithies outlines the drillcores on display at Kalgoorlie Open Day 2018*


*Figure 2. David Nixon has a captive audience as he unveils recent EIS core from Gold Fields (St Ives) Invincible deposit*

# QGIS formatted data now in digital packages

QGIS is a free and open-source Geographic Information System. The Department of Mines, Industry Regulation and Safety (DMIRS) has implemented the introduction of QGIS-formatted data into Geological Survey of Western Australia (GSWA) digital packages. This is due to the demand from the QGIS user community and increased availability of the popular open-source QGIS platform. A QGIS project file (*.qgs) will be included in the ArcMap folder, and QGIS layer files (*.qlr) are included in the shapefiles and overview folders. QGIS projects will include an overview window and the layers contained in GeoMap.WA with equivalent polygon, line, and point with symbology similar to that already implemented within GeoMap.WA. This means more users can experience a GIS product that views, creates and uses GSWA data, with the same look and feel as all other GSWA project desktops.

The symbolization process has been largely automated, and can therefore be replicated relatively easily in minimal time frames. Over time, additional functionality can be implemented for querying and displaying data.

QGIS supports many other GIS formats including existing shapefiles, and jp2 formats provided as part of GSWA digital packages. QGIS will also support many other GIS formats including ESRI file geodatabases.

QGIS is a user-friendly GIS platform that has a similar look and feel to the ESRI ArcGIS desktop software. Users can download and install plugins to improve functionality, and can create their own capabilities using Python (general-purpose programming language).

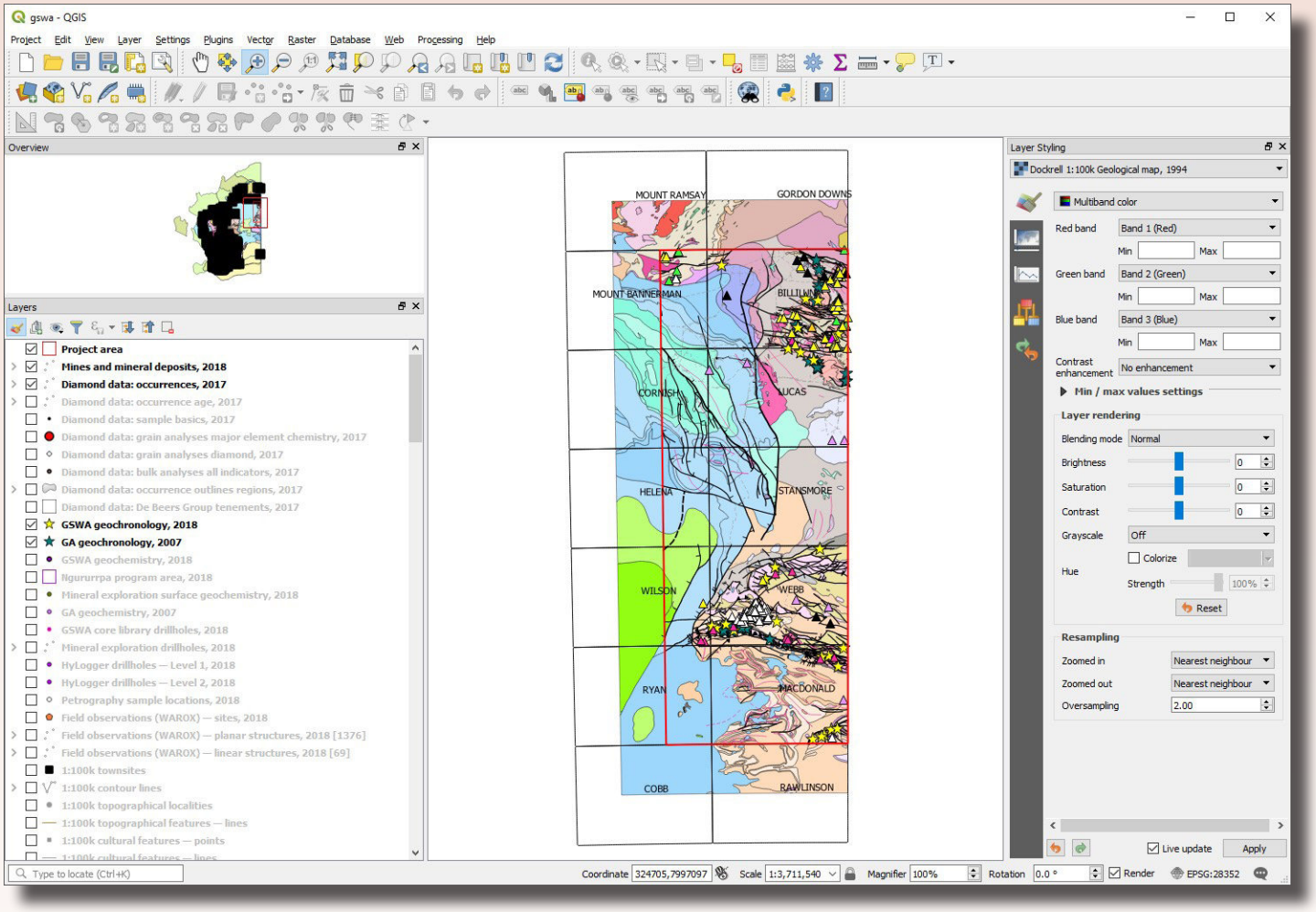



*Figure 1. The QGIS desktop environment for the Tanami–Arunta GIS update*

The open-source GIS platform can operate on multiple platforms; for the first time GIS users have the opportunity to use GSWA digital products on Android, BSD, Linux, MAC or Windows.

For more information, contact **Daniel Then** or visit **QGIS website**.

# Airborne gravity program: 20 December 2018 update

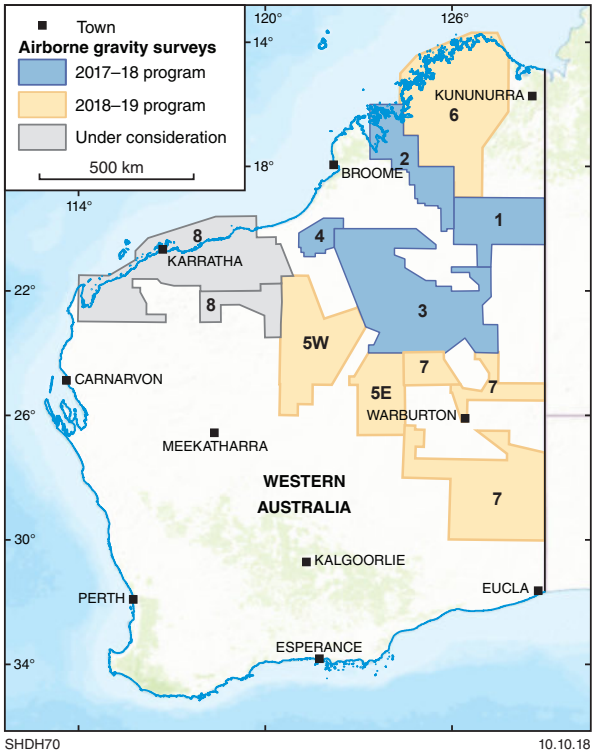
## Data downloads

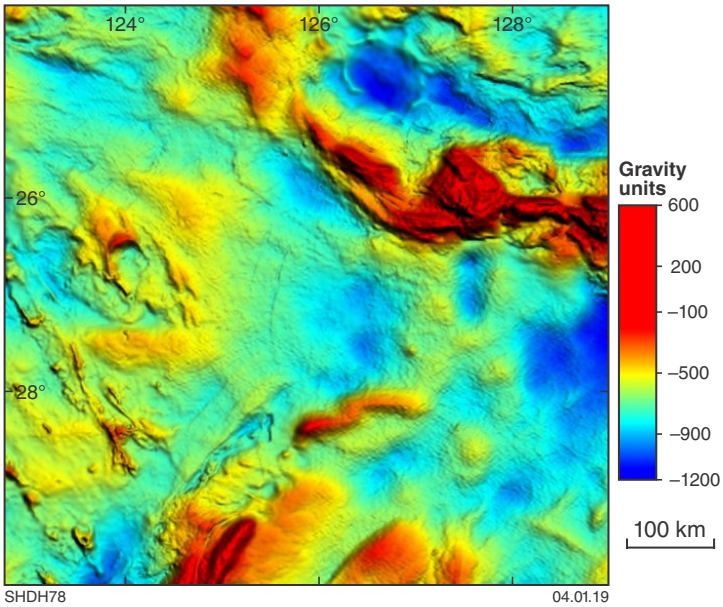
Data downloads from **GeoVIEW.WA**. Search by registration number in 'Government Airborne Surveys' layer.

**Subscribe to the GSWA eNewsletter** for data release alerts.

**Download survey outline shapefiles**.

For more information, contact **David Howard**.




*Compilation of grids of preliminary data from Little Sandy Desert East and the Warburton – Great Victoria Desert surveys merged with surrounding data from the gravity anomaly grid of Western Australia (2017 — version 1)*

***All surveys at 2.5 km line spacing***

| ID | Area/Name | Line dirn. | Size (km) | Status | Start | End | Release |
|---|---|---|---|---|---|---|---|
| 3 | Kidson 2017 | N-S | 70 000 | Processing | 21-07-17 | 03-05-18 | (Feb-19) |
| 4 | Extension area | E-W | 5 500 | Processing | | | (Feb-19) |
| 5 | Little Sandy Desert 2018 | N-S | 52 000 | Processing | 23-04-18 | 01-09-18 | (Feb-19) |
| 6 | Kimberley Basin 2018 | N-S | 61 000 | Processing | 04-06-18 | 14-07-18 | (Feb-19) |
| 7 | Warburton – Great Victoria Desert 2018 | E-W<br>N-S | 62 000 | Processing | 14-07-18 | 14-10-19 | (Feb-19) |
| Preliminary Bouguer anomaly grids and images for all surveys are available via GeoVIEW.WA. Registration numbers: Kidson 71234; Little Sandy Desert 71316; Kimberley Basin 71317; Warburton – Great Victoria Desert 71318 | | | | | | | |
| 8 | Pilbara — under consideration | E-W<br>N-S | 58 000<br>11 000 | Tender assessment | AusTender no. GA2018/2320<br>Closed 25 Sep 2018 | | |

Dates in parentheses are estimates

# Product releases

## • REPORTS •

Report 184 Regional seismic interpretation and structure of the southern Perth Basin *by Thomas, CM*

Report 188 Petroleum geochemistry and petroleum systems of the Perth Basin *by Ghori, KAR*

## • RECORDS •

Record 2018/11 The Cryogenian Aralka Formation, Amadeus Basin: a basinwide biostratigraphic correlation *by Allen, HJ, Grey, K, Haines, PW, Edgoose, CJ and Normington, VJ*

Record 2018/13 (U–Th)/He dating of ferruginous duricrust, Boddington gold mine, Western Australia *by Wells, MA, Danisik, M and McInnes, BIA*

Record 2018/15 A new look at lamprophyres and sanukitoids, and their relationship to the Black Flag Group and gold prospectivity *by Smithies, RH, Lu, Y, Kirkland, CL, Cassidy, KF, Champion, DC, Sapkota, J, De Paoli, M and Burley, L*

## • OTHER PUBLICATIONS •

Calendar 2019: Geological Survey of Western Australia *by Riganti, A, Goss, SC and White, SR*

Fieldnotes: a Geological Survey of Western Australia newsletter October 2018 number 88

Stromatolite assemblage including Eleonora boondawarica and Acaciella savoryensis from mineral drillhole 07THD003 (via GeoVIEW.WA)

Understanding the Meckering earthquake, Western Australia, 14 October 1968 *by Johnston, JF and White, SR*


## • DATA PACKAGES •

Kimberley, 2018

Murchison, 2018

Western Capricorn Orogen, 2018

Tanami–Arunta, 2018

GEOLOGICAL SURVEY

# OPEN DAY 2019

## Friday 22 February 2019

**8.30 am – 4.30 pm**

Followed by a Sundowner

**Esplanade Hotel, Fremantle**

Cnr Marine Tce & Essex St

This is a great opportunity to hear presentations on the latest results from GSWA's geoscience programs, including collaborative work with CSIRO, Geoscience Australia, Curtin University and the Centre for Exploration Targeting (CET).

Activities and results of the Exploration Incentive Scheme will be outlined including the launch of Round 19 of the Government Co-funded Exploration Drilling program.

Throughout the day there will be geological presentations, an extensive poster display, and demonstrations of online systems and technology innovations.

**Register online at**

**www.dmp.wa.gov.au/gswa2019**

For further information, call **(08) 9222 3634**

Government of **Western Australia**
Department of **Mines, Industry Regulation and Safety**

## FREE DATABASE AND ONLNE SYSTEMS TRAINING — DATES FOR 2019

Learn how to access geoscience data online and understand the department's systems at these FREE training sessions.

Topics include:

- navigating the department's website
- searching for geoscience publications using the **eBookshop**
- finding digital datasets using the **Data and Software Centre**
- searching for open-file mineral exploration reports using **WAMEX**
- searching the **mineral drillholes** and **geochemistry databases**
- using the interactive map viewers, **GeoVIEW.WA** and **TENGRAPH Web**
- **GeoMap.WA**, a standalone GIS viewer for Windows

A desktop computer will be available for each participant.

### PERTH SESSIONS

The Perth training has been divided into separate sessions: one for **advanced** (morning), and one for **beginners** (afternoon).

- **Thursday 14 March**
- **Thursday 25 July**
- **Thursday 21 November**

### KALGOORLIE

The Kalgoorlie training is open to **anyone** (full day).

- **Thursday 28 March**
- **Thursday 28 November (on the same day as GSWA Kalgoorlie Open Day)**

### Register

When you **register** online, include your details (name, company name, telephone number), with the name, location and date of the training you wish to attend. For the Perth sessions, please indicate whether you wish to attend the advanced (morning) or beginners (afternoon) training.

The Geological Survey of Western Australia (GSWA) has released almost 6500 geological products including books, maps and data packages. These can be found on our **website**.

Maps, USB data packages, and selected premium publications are available to purchase as hard copies via the online cart on the **eBookshop**. Alternatively, these products can be purchased from the Information Centre, First Floor, Mineral House, 100 Plain Street, East Perth, WA 6004, Australia, Phone: +61 8 9222 3459; Fax: +61 8 9222 3444.

Records, Reports, Bulletins and non-series books cannot be purchased in hard copy but are all available as PDFs to view, and as a free download.