

Fieldnotes



Government of Western Australia
Department of Mines and Petroleum

Geological Survey of
Western Australia



Visit our Home Page at www.dmp.wa.gov.au/GSWA

ISSN 1325-9377
ISSN 1834-2272

ISBN (PRINT) 978-1-74168-592-3
ISBN (PDF) 978-1-74168-591-6

Magnetotelluric surveys in Western Australia



The magnetotelluric (MT) method is a deep-penetrating, passive (natural-source), frequency-domain electromagnetic method that allows mapping of variations in electrical conductivity in the upper crust and mantle. Electrical variations in the crust may be caused by hydrothermal alteration or the presence of graphite, features which commonly mark the sites of major faults and shear zones. The MT method is relatively cheap compared to other traditional, deep-penetrating, active-source seismic techniques, and although of relatively low resolution, provides a rapid and inexpensive technique to image crustal architecture.

Over the past five years, a major statewide program of MT surveys has been undertaken (Fig. 1), some of which were complementary to active-source seismic lines, and others as an alternative to the more expensive active techniques. The results of these studies have provided a unique opportunity to test the validity of the MT method as well as provide insights into the crustal architecture of Western Australia's Archean cratons and Proterozoic orogenic belts. The most recently published MT results, funded by the Kimberley Science and Conservation Strategy (KSCS), image the Kimberley Basin and structures associated with the underlying Kimberley Craton, (GSWA Report 136), and the crustal architecture in the eastern part of the Capricorn Orogen, funded by the Exploration Incentive Scheme (GSWA Report 135).

During 2013–14, an MT survey was conducted across the Eucla Basin (Fig. 1). In 2014–15 one of the largest MT surveys conducted is taking place in the Capricorn Orogen, as part of the Science and Industry Endowment Fund (SIEF) project 'Distal footprints of giant ore systems: Capricorn Orogen case study', where more than 110 broadband stations will collect data along eight new traverses (Fig. 1).

A magnetotelluric survey across the Kimberley Craton (Report 136)

The Kimberley Craton is one of several crustal blocks that together form the Archean to Proterozoic North Australian Craton. The age, composition, and geological history of the Kimberley Craton are largely unknown because it is concealed by younger sedimentary basins. The Kimberley MT traverse

addresses this major information gap regarding the character of the concealed basement, with the aim of identifying and mapping major structures in the deep crust and upper mantle. Magnetotelluric soundings were collected at 155 locations throughout the Kimberley region. These provided two-dimensional (2D) conductivity models of the crust and uppermost lithospheric mantle beneath four regional transects and four local transects.

continued on page 3

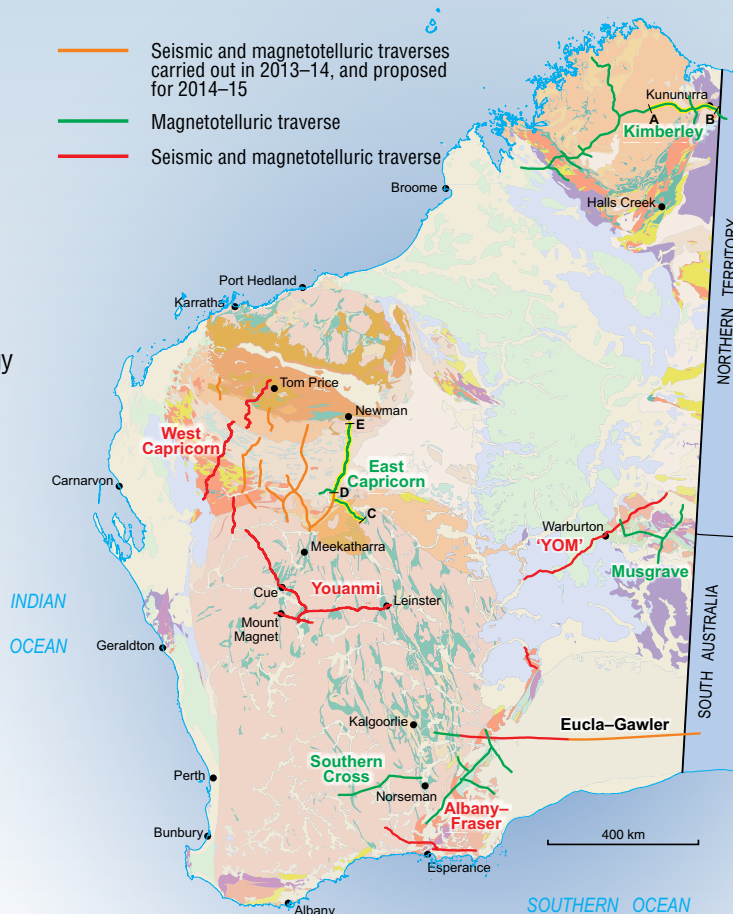


Figure 1. Location of MT surveys in Western Australia

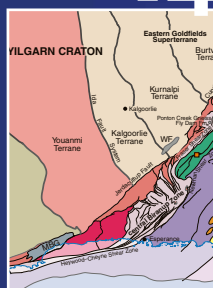
What's inside?

MT CRUSTAL SURVEYS	1, 3
TECHNOLOGY UPDATE	2
ALBANY-FRASER BASIN EVOLUTION	4
APPLICATION OF PASSIVE SEISMIC	5
BEDROCK GEOLOGY	6, 7
WEST TANAMI GIS UPDATE	8
YUINMERY VMS PROJECT	9
WHERE WE ARE WORKING	10
GEOPHYSICAL SURVEYS	11
PRODUCT RELEASES	12

PAGE 2



PAGE 4



PAGE 7



Viewing HyLogger drillcore images from your office

The HyLogger drillholes layer has been recently updated in GeoVIEW.WA to provide access to HyLogger data and images of drillcore. This allows not only viewing of mosaic and tray images of scanned drillcore via the internet, but also the download of the images and related TSG (The Spectral Geologist) data files for viewing and further analysis in the TSG software suite.

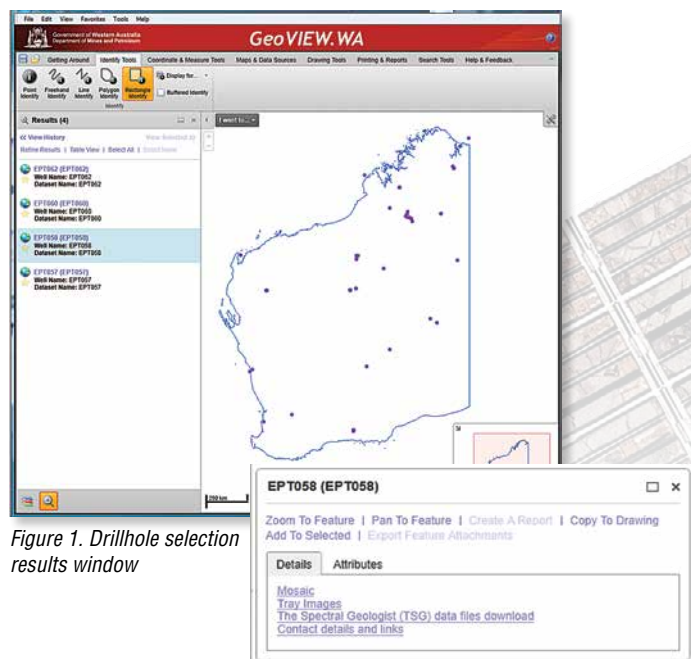


Figure 1. Drillhole selection results window

Figure 2. Pop-up window for selecting drillcore imagery

To view the scanned drillcore in GeoVIEW.WA, select the drillhole of interest in the map window via the identify tools button. The results window (Fig. 1) will display the selected point or points. To return more detailed information on the selected drillhole, click the blue hyperlinked text. This will open a new window that allows you to display the images and download the data (Fig. 2).

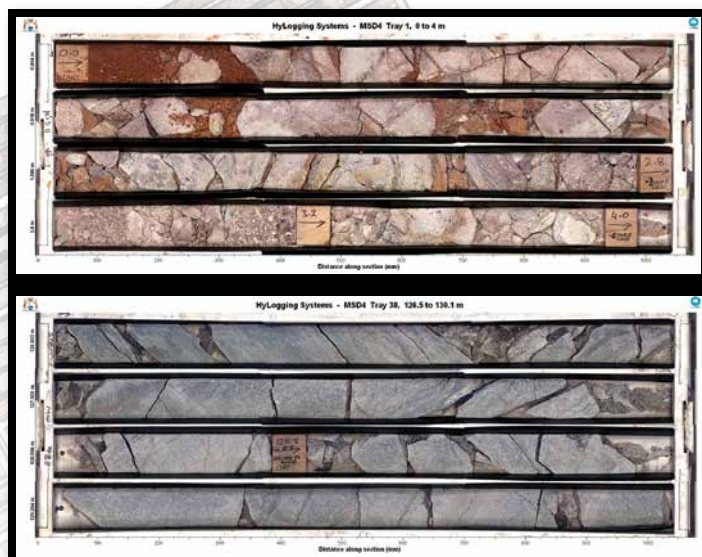


Figure 3. Example of a drillcore tray image for drillhole MSD4 (on the Mt PHILLIPS 1:250 000 map sheet)

HyLogger update

The HyLogger core scanner is a non-destructive rapid spectroscopic logging and imaging system that uses continuous visible and infrared spectroscopy and digital imaging to examine core.

HyLogger determines drillcore mineralogy

HyLogging is a highly automated method designed by CSIRO to determine drillcore mineralogy using rapid reflectance spectroscopy.

The GSWA HyLogger, installed in July 2009 at the Perth Core Library in Carlisle, is one of seven machines in Australia that together make up the AuScope National Virtual Core Library (NVCL) consortium. This is a Federal and State collaborative project that provides drillcore mineralogical and image data in a standard format.

Read more about the GSWA HyLogger at <www.dmp.wa.gov.au/hylogger>.

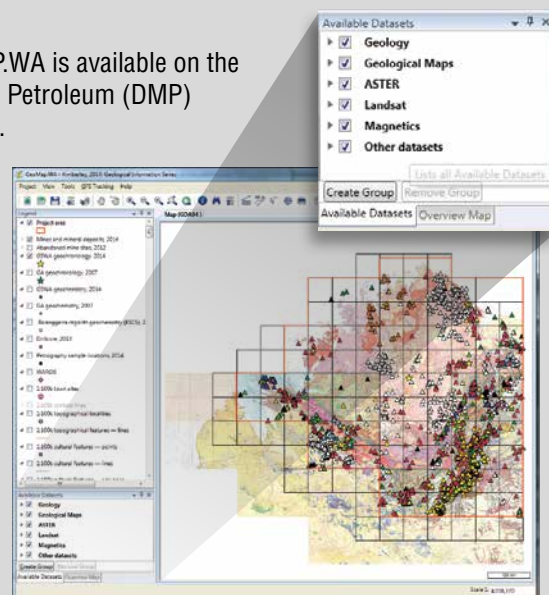
For more information, contact Lena Hancock (lina.hancock@dmp.wa.gov.au).

GSWA map viewing software updated

GeoMAP.WA

A new release of GeoMAP.WA is available on the Department of Mines and Petroleum (DMP) Data and Software centre.

This updated release provides added functionality, including the ability to group layers into related categories, which will significantly shorten the length of the table of contents and allow layers within groups to be quickly turned on or off.



Another enhancement is the ability, when connected to the internet, to add Web Map Services* (WMS) as an additional layer. One of the benefits of adding WMS is that it allows users to add DMP map services which can be viewed within GeoMap.WA prior to downloading data from the Data and Software Centre. For a list of the DMP WMS services and the latest release of GeoMap.WA, go to the Data and Software Centre <dmp.wa.gov.au/datacentre>.

* A web map service is a defined standard for broadcasting map images from a geospatial database.

continued from page 1

2D modelling reveals a near-surface conductive layer up to 5 km thick, interpreted as the volcanic and sedimentary rocks of the Kimberley and Speewah Basins, underlain by a resistive upper crust to depths of 15–35 km (Fig. 2). Several steeply dipping, less resistive features revealed in the upper crust correlate with the location of mapped faults in the central Kimberley Basin, and with major structural boundaries within the King Leopold and Halls Creek Orogens. These may reflect structural boundaries between discrete crustal blocks in the basement. Regionally, a conductive lower crust appears to be discontinuous at, or near, major inferred crustal block boundaries. Along the eastern margin of the Kimberley Basin, a northwesterly dipping resistive slab extending from the surface to at least 60 km depth (Fig. 2) is interpreted as ancient lithospheric material subducted during collisional orogenesis, probably associated with the Halls Creek Orogeny. Three-dimensional (3D) modelling of the data is being undertaken to address variable electric strike directions in the data.

For more information,
contact Julie Hollis (julie.hollis@dmp.wa.gov.au).

A magnetotelluric survey across the eastern part of the Capricorn Orogen (Report 135)

In 2010, a 581 km-long deep crustal seismic reflection survey across the western part of the Capricorn Orogen provided an unprecedented view of the deep crustal architecture of the West Australian Craton. However, due to extensive regolith cover, the major structures identified in the west have been difficult to project into the eastern part of the orogen. To view the electrical conductivity of the crust and attempt to identify the location and orientation of

the major crustal structures, two near-orthogonal MT traverses were conducted through the eastern part of the orogen (Fig. 1).

Since most data showed significant 3D MT responses that could not be modelled using standard 2D modelling methods, the data were processed using a 3D inversion algorithm, which produced more geologically plausible results. Distinct variations in mantle and crustal electrical conductivity are interpreted as a series of discrete tectonic blocks juxtaposed along crustal-scale faults or shear zones (Fig. 3). The broad-scale architecture of the eastern part of the orogen is fundamentally different from that in the west. The major structures in this survey dip towards the centre of the orogen, whereas in the western part, the major structures consistently dip to the south. This survey shows that the Yilgarn and Pilbara Cratons are resistive, and are separated by a large volume of conductive crust in the middle of the orogen that is interpreted to be Proterozoic crust analogous to the Glenburgh Terrane in the western part of the orogen. Therefore, the Pilbara and Yilgarn Cratons do not appear to be in direct contact with each other anywhere along the length of the orogen. The Marymia Inlier is most likely a para-autochthonous continental ribbon that was separated from the Eastern Goldfields Superterrane, possibly during rifting and deposition of the Yerrida Basin at c. 2170 Ma.

Download Reports 135 and 136 from
<www.dmp.wa.gov.au/gswapublications>.

For more information,
contact Simon Johnson (simonpaul.johnson@dmp.wa.gov.au).

Figure 2. 2D resistivity model for the eastern line of the Kimberley MT survey, the location of which (A–B) is shown in Figure 1. The dashed white lines mark steeply dipping features observed in the upper crust, the red dashed line marks the approximate crust–mantle boundary, and the black dashed lines mark possible variations in the mantle.

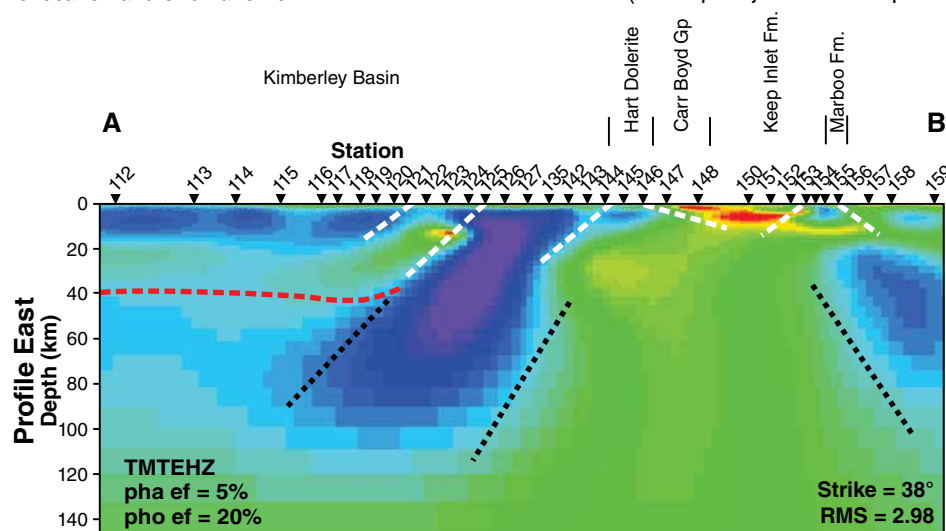
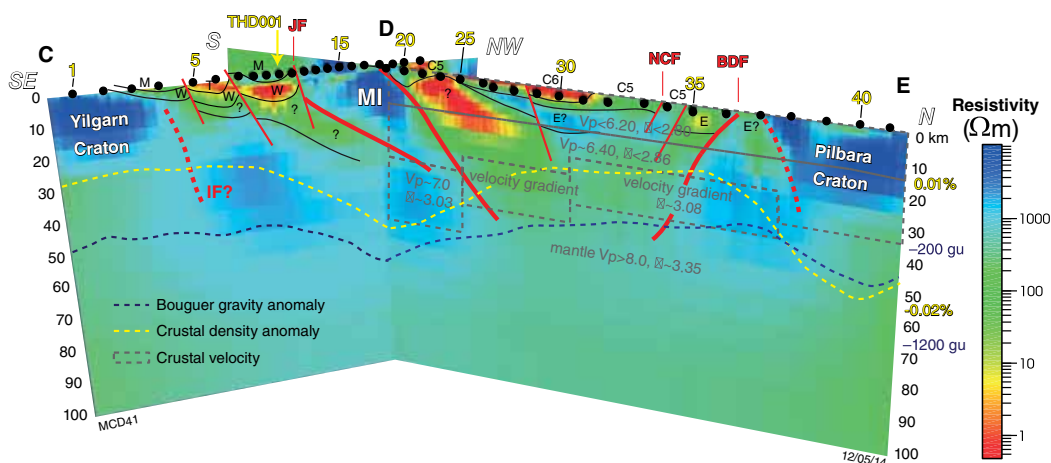


Figure 3. 3D resistivity model of the East Capricorn MT survey, the location of which (C–D–E) is shown in Figure 1. Constraints from previous geophysical surveys including crustal velocity, crustal density and Bouguer gravity anomaly are overlain. Abbreviations: C5 – Collier Group depositional package 5; C6 – Collier Group depositional package 6; E – Edmund Group; M – Mooloogool Group; MI – Marymia Inlier; T – Tooloo Group; W – Windplain Group; NCF – Neds Creek Fault; BDF – Baring Downs Fault; JF – Jenkin Fault.



Tectonic links between basin formation and magmatism

Preserved in the Albany–Fraser Orogen are the remnants of two, regionally extensive Proterozoic basin systems: the 1815–1600 Ma Barren Basin and the 1600–1305 Ma Arid Basin. An extensive U–Pb zircon geochronology dataset, coupled with Lu–Hf isotope analysis, was used in conjunction with basin analysis to interpret the provenance and tectonic evolution of these basin systems (GSWA Report 133). The Barren Basin is dominated by Neoarchean zircon-bearing detritus from the Yilgarn Craton, and

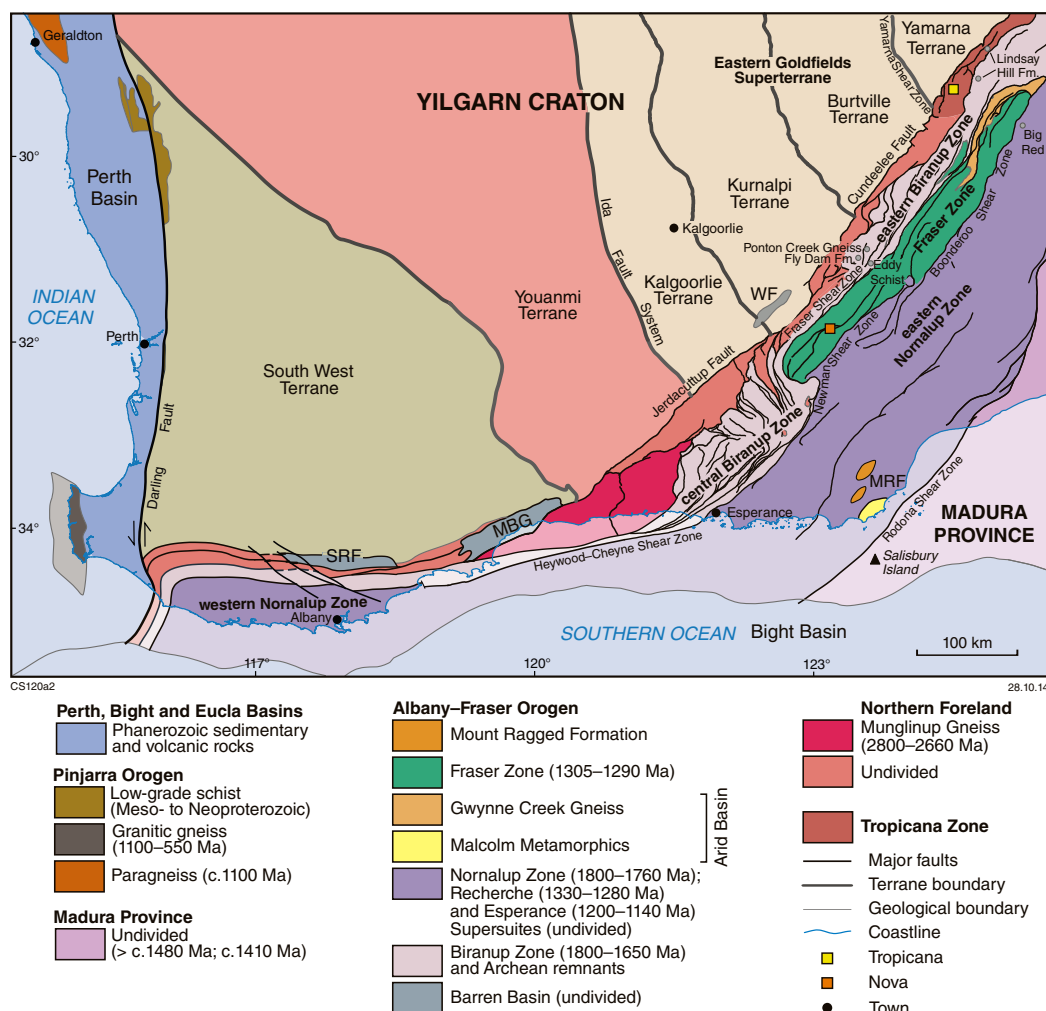


Figure 1. Simplified, pre-Mesozoic interpreted bedrock geology of the Albany–Fraser Orogen and tectonic subdivisions of the Yilgarn Craton. Abbreviations used: SRF=Stirling Range Formation; MBG=Mount Barren Group; WF=Woodline Formation; MRF=Mount Ragged Formation.

Paleoproterozoic zircon-bearing detritus from coeval magmatic events within the orogen dated at 1815–1800 Ma (Salmon Gums Event), 1780–1760 Ma (Ngadju Event), and 1710–1650 Ma (Biranup Orogeny). The abundance of locally derived sediment deposited onto a reworked Archean Yilgarn Craton substrate indicates a predominantly extensional tectonic setting, consistent with a broad continental rift basin, or alternatively, a long-lived back-arc basin system along the craton margin. The relatively quiescent period from c.1600 to 1455 Ma indicates a change from active, rift-related extension, to a proto-oceanic rift, through to a passive-margin and adjoining marginal basin, marking the initiation of the Arid Basin.

In contrast to the Barren Basin, the Arid Basin is dominated by 1455–1375 Ma detritus that does not correspond to any known source within the Albany–Fraser Orogen, signifying an external, but proximal, new source interpreted to be an oceanic magmatic arc — the c. 1410 Ma Loongana arc — within the Madura Province to the east of the Albany–Fraser Orogen. Closure of the marginal basin via east-dipping subduction led to accretion

of the Loongana oceanic arc at c. 1330 Ma, and dispersal of the detritus into a foreland basin system, marking a second phase of the Arid Basin. Detritus sourced from the Paleoproterozoic Biranup and Nornalup Zones, which constitutes the second-most abundant age component in the Arid Basin, was mixed with the younger foreland basin sediments.

The two basin systems reflect a distinct change in tectonic regime from Paleoproterozoic rifting of the Yilgarn Craton, to the formation of a marginal basin that was subsequently closed during the Mesoproterozoic. The extensional structures produced during basin formation were inverted during orogen-wide, craton-vergent thrusting, which dominates the present-day crustal architecture.

Download Report 133 from
<www.dmp.wa.gov.au/gswapublications>.

For more information contact,
Catherine Spaggiari (catherine.spaggiari@dmp.wa.gov.au).

Estimating the thickness of cover from passive seismic data

Information on the thickness of cover (i.e. sedimentary rocks or regolith), particularly in greenfields areas, is essential as future exploration for mineral deposits expands into areas where mineralization is suspected but unproven. However, in greenfields areas, information on cover thickness from traditional sources, such as drilling or reflection seismic, are either unevenly distributed or non-existent. An alternative to these costly and time-consuming approaches, is passive seismic, which involves the measurement of ambient (natural) sound waves in the subsurface, as opposed to reflection seismic that measures sound waves generated by a controlled source, such as a hammer blow or vibration.

Over the past year and a half, the Geological Survey of Western Australia (GSWA) has tested the application of a single-station passive seismic system to estimate the thickness of cover, comprising both regolith and Phanerozoic sedimentary rocks. GSWA Record 2014/9 describes the passive seismic methodology of the single-station approach and reports on data interpretations from three trials in the southern Gunbarrel and central Eucla Basins, and over the Yilgarn Craton. Analysis of passive seismic data from both the Gunbarrel and Eucla Basins provided estimates of cover thicknesses that were consistent with drilling data. In the

Gunbarrel Basin, passive seismic was used to estimate the thickness of cover units ranging from 5 m-thick Quaternary sandplain deposits through to >700 m-thick Cenozoic to Permo-Carboniferous sedimentary rocks overlying crystalline basement. In the Eucla Basin, passive seismic data provided thickness estimates of between 200 and 400 m for a succession of carbonate and clastic sedimentary rocks overlying crystalline basement. In the Boorabbin area of the eastern Yilgarn Craton, passive seismic was used to estimate the thickness of unconsolidated sand as part of a GSWA sand resource study.



These surveys have shown that the single-station passive seismic is a rapid, non-invasive and low-cost technique, which provides an alternative to conventional methods of estimating cover thickness, and subsequently can substantially reduce costs and improve efficiency in exploration.

Download Record 2014/9 from www.dmp.wa.gov.au/gswapublications.

For more information, contact Andreas Scheib (andreas.scheib@dmp.wa.gov.au).

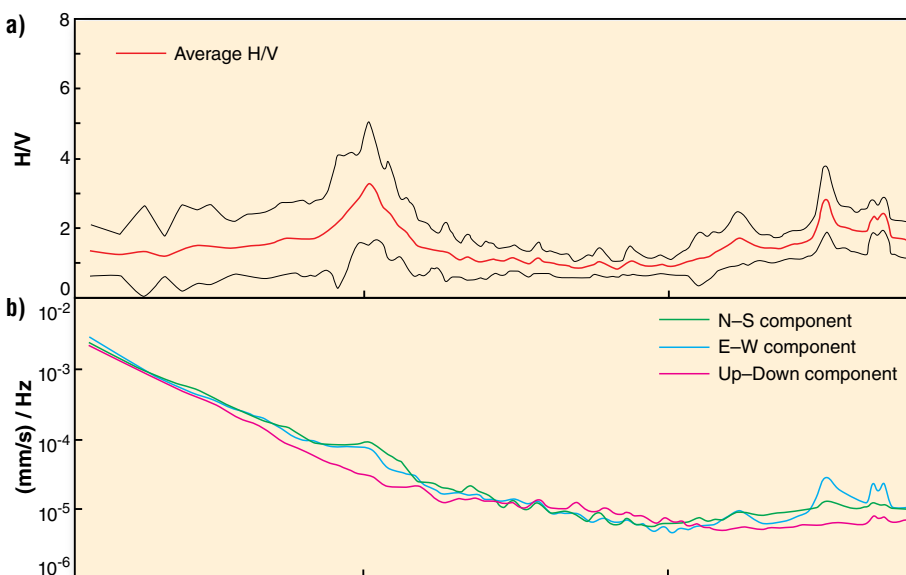
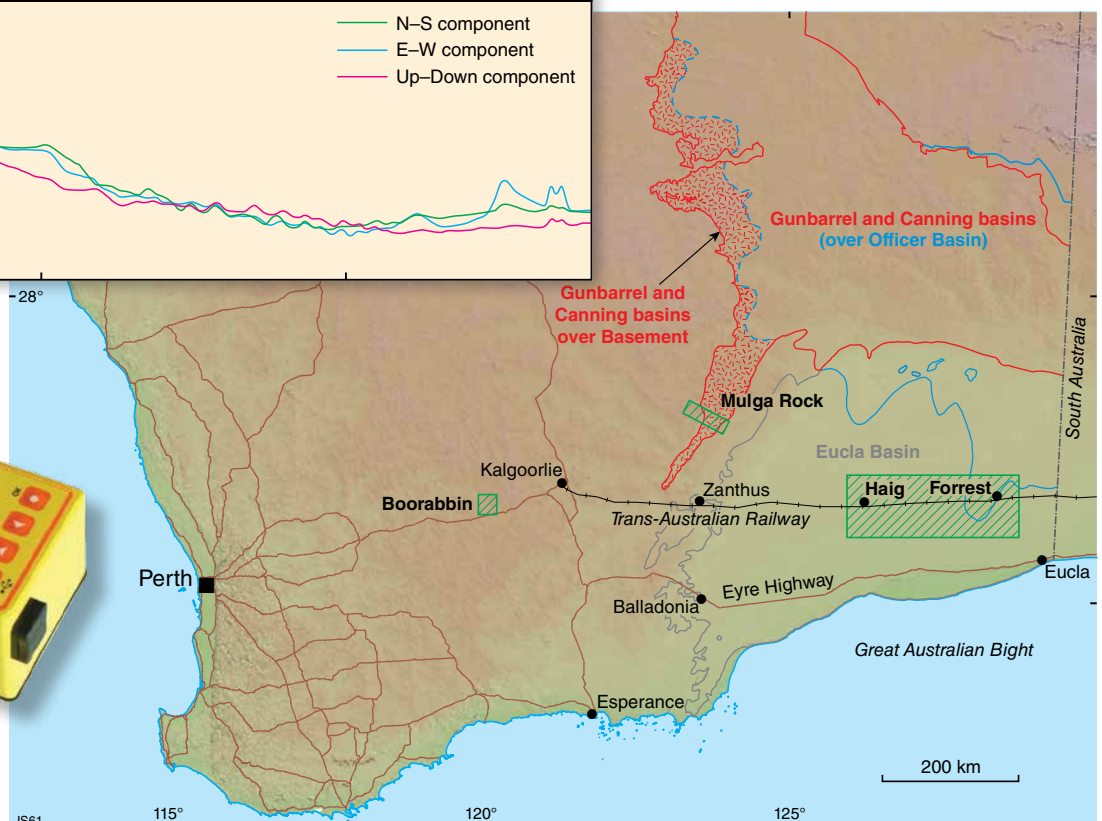


Figure 2. Example of horizontal to vertical (H/V) spectral a) ratio and corresponding b) Fourier plot



Figure 3. Tromino, the single-station passive seismic system

Figure 1. Map of the three trial areas: at Mulga Rock in the southern Gunbarrel Basin, in the central Eucla Basin, and near Boorabbin



A new 1:500 000 interpreted bedrock geology of WA



A seamless interpreted bedrock geology digital map at 1:500 000 scale forms the base for all Geological Survey of Western Australia (GSWA) statewide map and spatial products. A 1:500 000 digital bedrock geology layer was first developed in 2001, and a revision was released in 2008. A complete reinterpretation and update have now been completed, based on GSWA mapping since 2000 and recent advances in the understanding of the geology of Western Australia. As well, the most recent geophysical datasets have been extensively improved and updated as part of the Exploration Incentive Scheme (EIS).

The 1:500 000 interpreted bedrock geology is a set of intelligent spatial layers, rather than a single map, comprising:

- interpreted bedrock geology (polygons)
- Cenozoic bedrock geology (polygons), for areas of significant, thick Cenozoic deposits
- interpreted bedrock geology structures (lines), e.g. faults and folds.

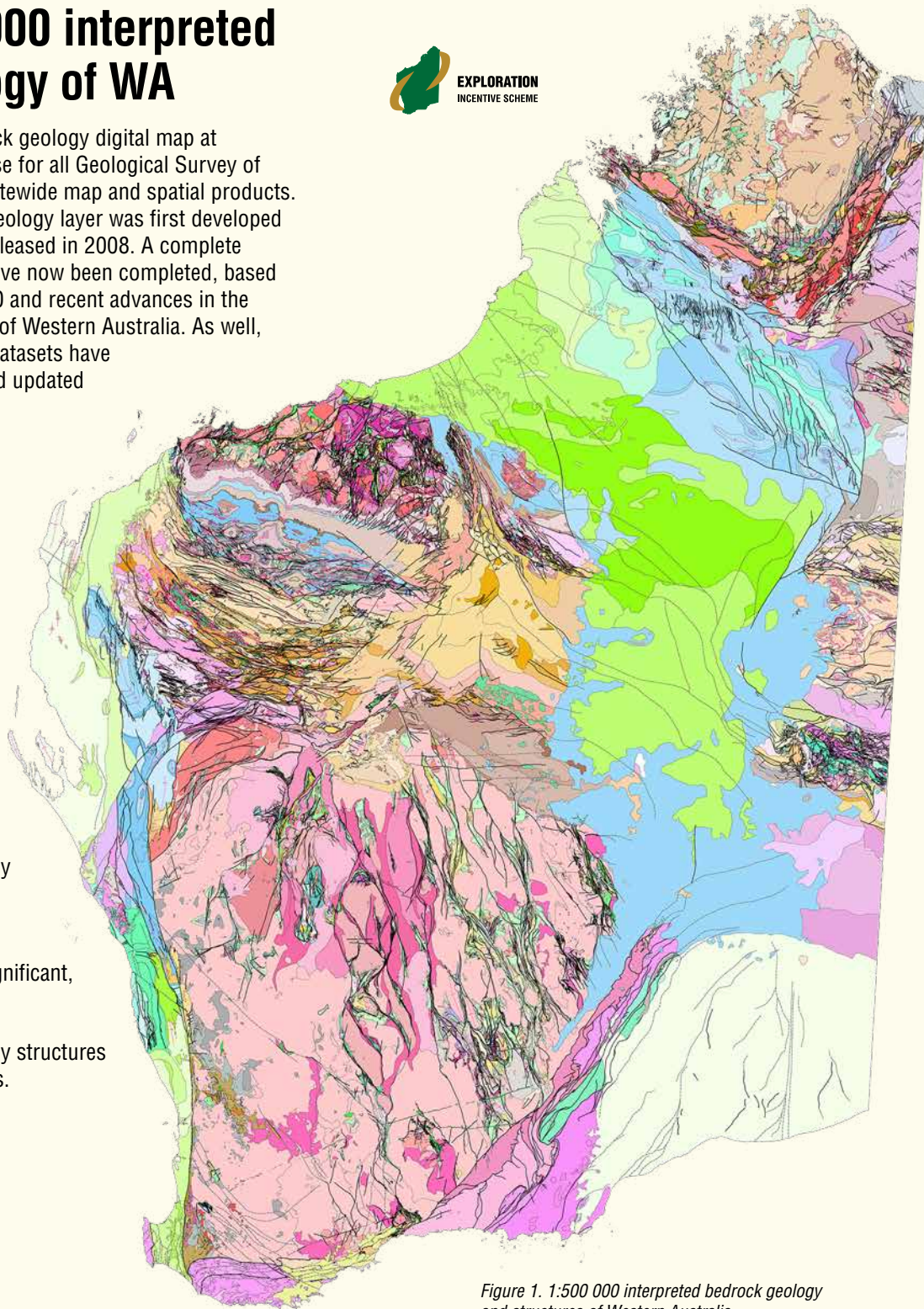


Figure 1. 1:500 000 interpreted bedrock geology and structures of Western Australia

There are 1140 bedrock units, and a further seven Cenozoic units. The Cenozoic units are singled out as a separate layer so that users can, for example, turn off paleovalley deposits crossing Archean cratons. The layered approach has also allowed the extension of bedrock geology under regions such as the Officer and Canning Basins (rather than stopping at the edge of thick cover), where geological and geophysical information permits such interpretations.

The 1:500 000 interpreted bedrock geology layers aim to illustrate the regional geological framework of Western Australia in as much detail as possible at this scale, rather than being

simply a standalone map. If printed at the intended scale, the map would be more than 5 m high, about 4.5 m wide, and have a reference measuring at least 4 by 4 m. A preliminary printed map was displayed at the Petroleum and Geothermal Open Day in Fremantle in early September (Fig. 2), and even at 3 m height was still overly detailed in some areas.

Each component polygon has a set of attributes such as lithology, stratigraphic relationships (including parent and child units), tectonic unit and setting, and maximum and minimum age. Attributes such as fault or fold type are similarly attached to structural lines. The lookup table for the main interpreted

bedrock geology layer is coarsely sorted using tectonic subdivisions first and then age, providing the digital equivalent of a map legend. Further layers are in preparation for tectonic

subdivisions, for areas with marked tectonic overprints (mostly, but not exclusively, fold belts) and linear igneous rocks (primarily dykes). Again, these will be intelligent layers with attributes such as name, age and association linked to the polygons or lines.



Figure 2. Director General, Richard Sellers, GSWA's Executive Director, Rick Rogerson, and General Manager of DMP Communications and Marketing, Laura Lewis, discuss the new interpreted bedrock geology map at the Petroleum and Geothermal Open Day held on 11 September 2014.

The 1:500 000 scale layers and associated lookup tables are available as a download from the Data and Software Centre. The new map is available on GeoVIEW.WA from 31 October 2014. The geology is valid at its intended 1:500 000 scale, but not at scales such as 1:250 000 or 1:100 000. The polygons can be filtered and dissolved ('rolled-up') to simplify geological divisions in Western Australia. Spatial layers at 1:2 500 000 scale, including geological polygons, structures and tectonic divisions, are the next target, and will culminate in a new, completely revised, State Geological Map — the first since 1998, and the first compiled entirely digitally.

For more information, contact Roger Hocking (roger.hocking@dmp.wa.gov.au).



Figure 3. Revised geological interpretation of the central Yilgarn on the new 1:500 000 interpreted bedrock geology map. Semi-transparent polygons are Cenozoic features, such as paleodrainage channels, overlain on the Archean bedrock.

West Tanami GIS update includes new maps



The West Tanami 2014 Geological Information Series was released in July 2014. This updated digital package is a comprehensive geoscience dataset that includes information covering seven 1:100 000 geological series map sheets. Full data are provided for five of these maps: BALWINA, KEARNEY, LEWIS, SLATEY CREEK, and WATTS; partial data are provided for WOLFE CREEK and STURT CREEK. Of these seven, BALWINA and SLATEY CREEK are new maps, and WATTS is a second edition, all released since the 2013 package. The new maps use the reinterpretation of the regolith geology of the West Tanami published in the West Tanami 2013 update. Other new features in this update include imagery now supplied as JPEG 2000 (JP2).

The package includes a large range of geoscience datasets including:

- 1:100 000 surface geology, interpreted bedrock geology, diagrammatic sections (PDF), and a geology mosaic image
- 1:250 000 geology mosaic image
- 1:500 000 interpreted bedrock geology and tectonic units
- 1:1 000 000 geology (Geoscience Australia)
- 1:2 500 000 geology
- petrography
- GSWA field observation sites and information (WAROX)
- geochemistry
- geochronology
- index to GSWA products and selected full GSWA publications, including maps (PDF)
- geophysics images and index to geophysical surveys (MAGIX)
- magnetotelluric stations and seismic lines
- mineralization and exploration data (EXACT and WAMEX); mining tenements (TENGRAPH); mines and mineral deposits (MINEDEX)
- petroleum and minerals exploration drillcores (WAPIMS)
- topography
- remotely sensed information

For more information,
contact Julie Hollis (julie.hollis@dmp.wa.gov.au).

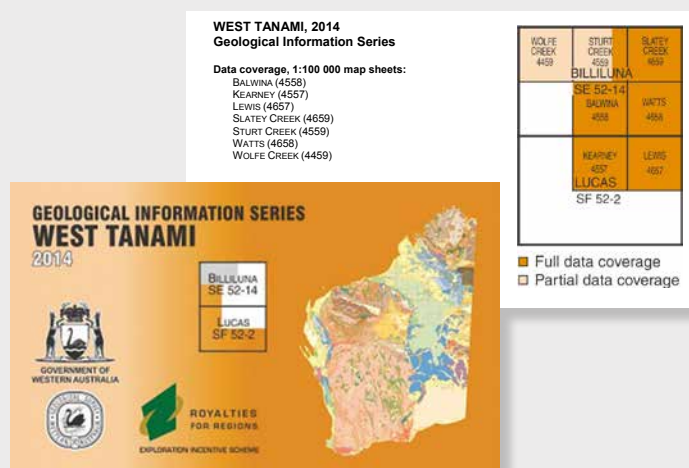
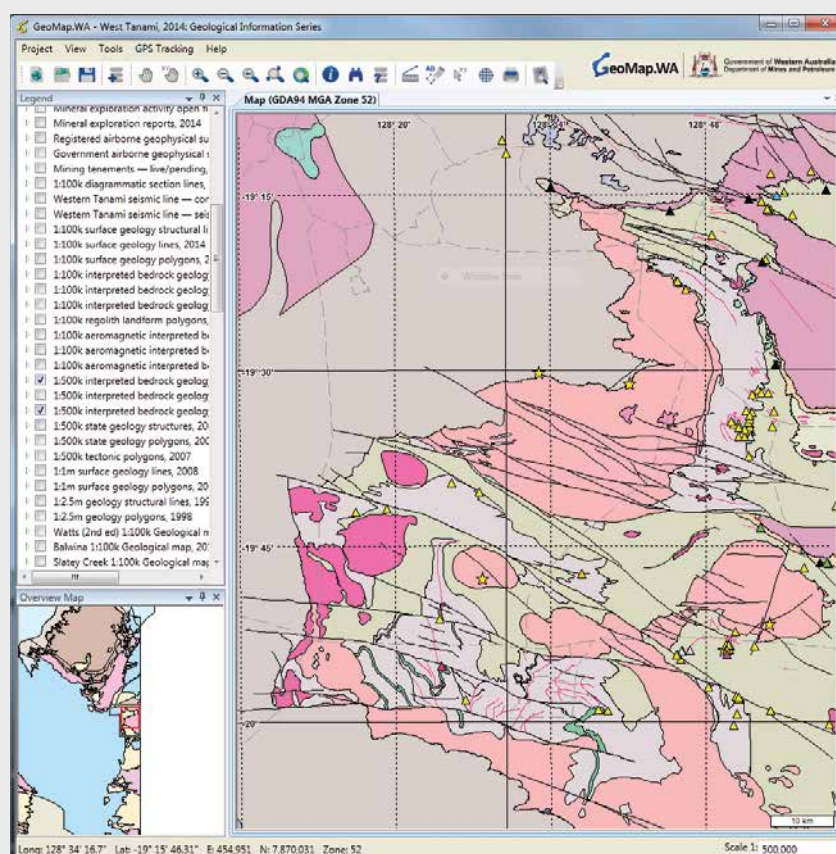


Figure 1. GeoMap.WA screen shot showing West Tanami 1:500 000 interpreted bedrock geology and structures, overlain by mines and mineral deposits (MINEDEX) and geochronology datasets



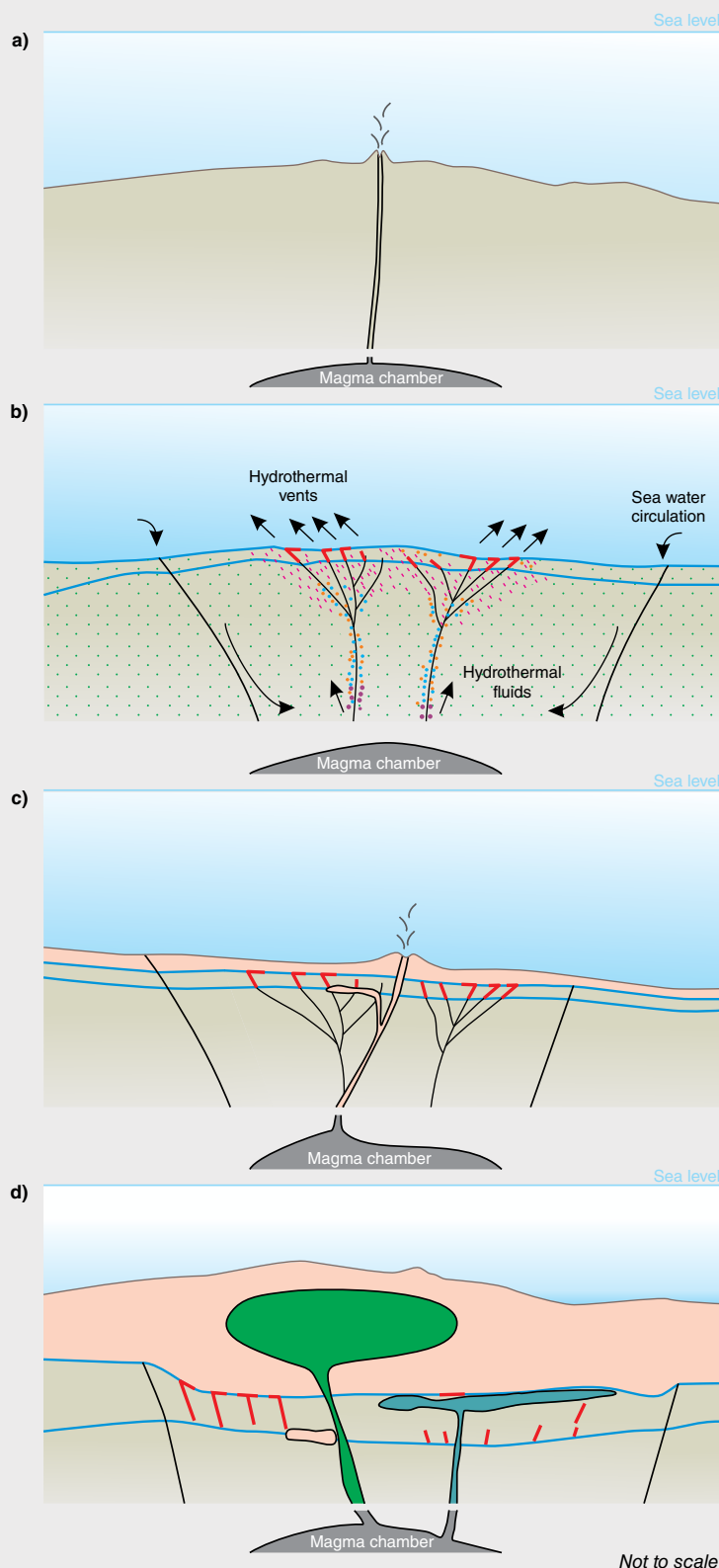
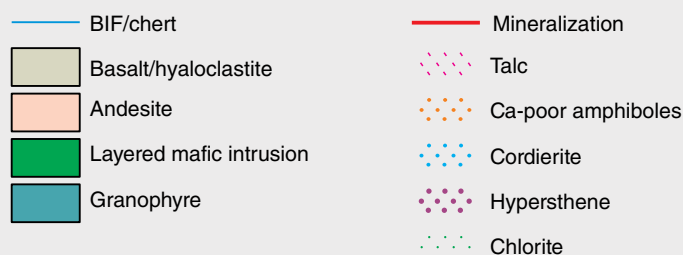
Yuinmery VMS prospects: mineralization, metasomatism and geology

The Yuinmery volcanogenic massive sulfide (VMS) project includes the Just Desserts deposit (where Empire Resources Ltd has reported a resource of 1.07 Mt at 1.82% Cu and 0.78 g/t Au) and several other prospects in the Archean Youanmi Terrane. The mineralization was formed in a subaqueous environment during periods of volcanic quiescence marked by the presence of chemical sedimentary rocks or exhalites and changes in the composition of the volcanic rocks. The Just Desserts, Trajan, and C Zone mineralization is hosted by calc-alkaline basalt, basaltic hyaloclastite, and banded iron-formation (BIF), which are overlain by calc-alkaline andesite. Trace element geochemistry is consistent with the eruption of the volcanic rocks in an oceanic arc-rift setting.

Textures indicate that at least some of the sulfides were deposited on the sea floor around hydrothermal vents while the chemical sedimentary rocks were still in a plastic state. Mineralization infilling the matrix of hyaloclastites and within fractures in chert may have formed in the substrate beneath the sea floor.

Talc is the dominant alteration mineral proximal to mineralization whilst chlorite is abundant more distally. Localized patches of hypersthene, Ca-poor amphiboles (anthophyllite and cummingtonite) and cordierite are interpreted to have formed along fluid pathways by extremely hot hydrothermal fluids heated by underlying magma. The Yuinmery prospects are very different from the Golden Grove deposits, which are hosted by felsic volcanics in a continental arc setting and have chlorite and white mica as the dominant alteration minerals.

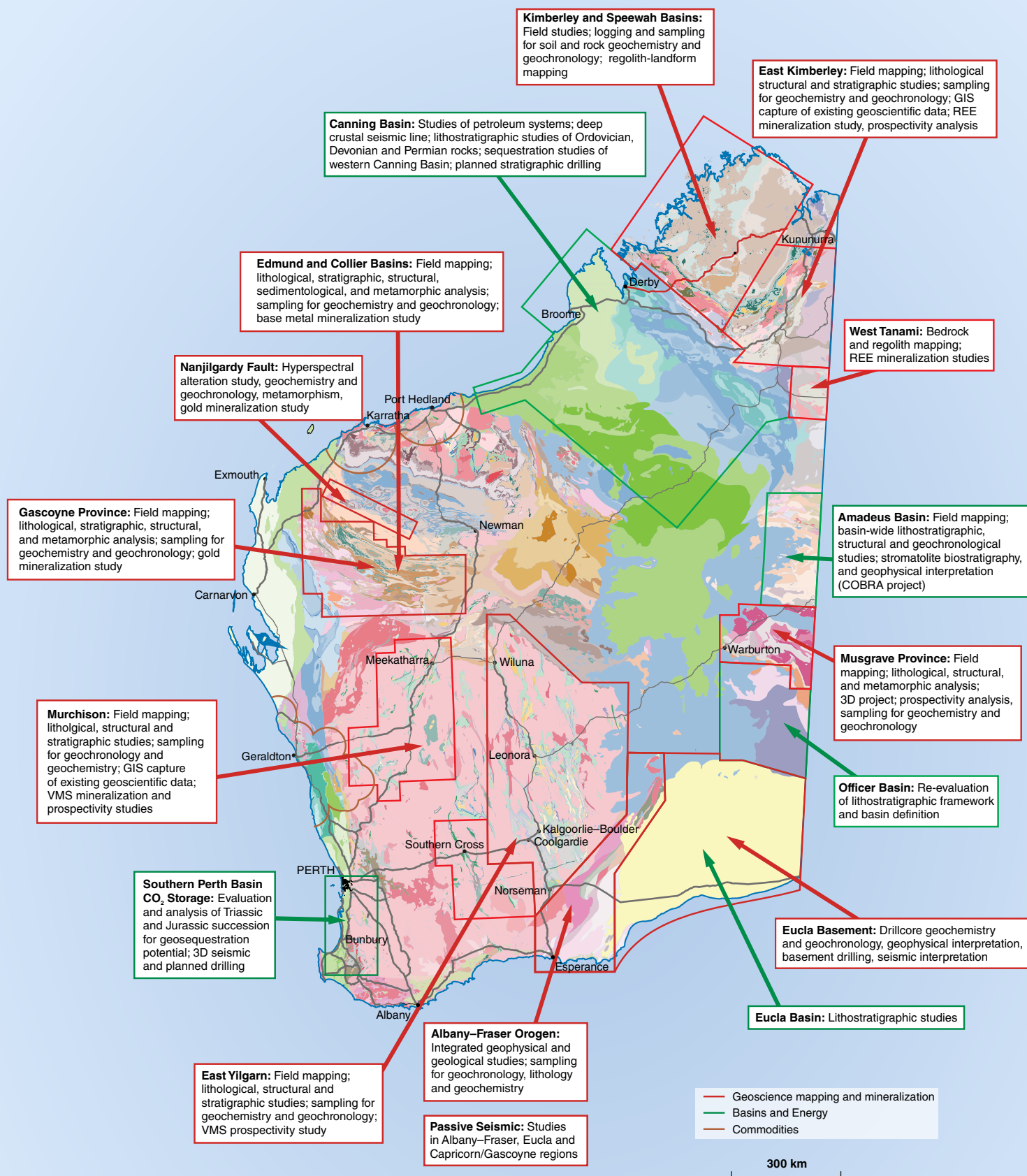
The HyLogger Spectral Scanner proved useful for studying the alteration assemblages and a portable HyLogger could be used on drillcore and cuttings in the field as an exploration tool to identify talc and Ca-poor amphiboles that could indicate proximity to mineralization. Trace element geochemistry indicative of an oceanic arc setting and a change in volcanic composition are important regional vectors to mineralization of the Yuinmery type.



Download Report 131 from
www.dmp.wa.gov.au/gswapublications.

For more information,
 contact Lee Hassan (lee.hassan@dmp.wa.gov.au).

Where we are working



GSWA regional geophysics surveys: 8 September 2014 update

Data downloads

Final data releases from the Geophysical Archive Data Delivery System are at <www.ga.gov.au/gadds>.

Preliminary and final grids and images from the GSWA website are available from <www.dmp.wa.gov.au/geophysics>.

Subscribe to the GSWA eNewsletter for alerts of preliminary and final data release dates.

Survey outline shapefiles are available online at <www.dmp.wa.gov.au/geophysics>.

Airborne mag/spec surveys

- Goldfields 100 m program (completed)
- Yalgoo–Singleton 100 m (proposed)

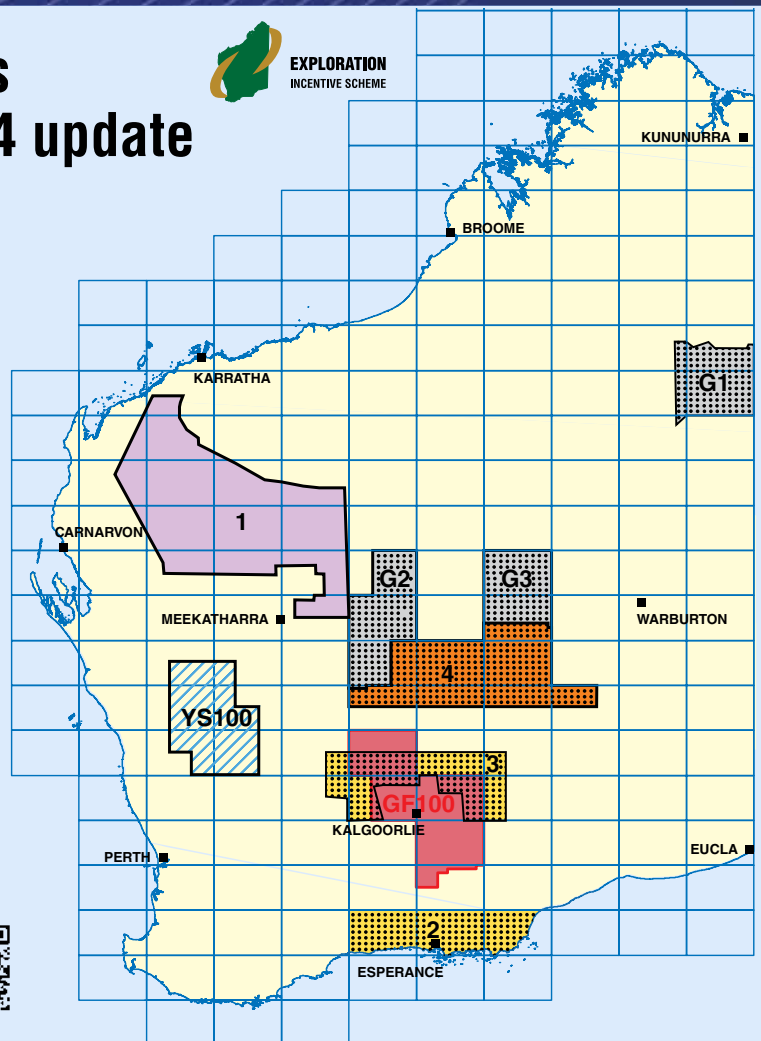
Airborne EM surveys

- Capricorn 2013 AEM (completed)

Ground gravity surveys

- Recently completed
- In progress
- Under consideration

For more information, contact
David Howard (david.howard@dmp.wa.gov.au).



Airborne magnetic and radiometric surveys

ID	Area/Name	Configuration	Line-km	Contractor	Acquisition Start	Acquisition End	Current Status	Release Status ¹ & Date
GF100	Eastern Goldfields 100 m program	100 m E-W	720 000	Various	2012	2014	Released	Jun/13 to Jun/14
YS100	Yalgoo–Singleton 100 m program	100 m E-W	Area under consideration for surveys in 2014–16					

Airborne EM surveys

ID	Area/Name	Configuration	Line-km	Contractor	Acquisition Start	Acquisition End	Current Status	Release Status ¹ & Date
1	Capricorn 2013 (TEMPEST)	5 000 m; N/S (E/W in part)	30 000	CGG	Oct-13	Jan-14	Released	19-Jun-14

Ground gravity surveys

ID	Area/Name	Configuration	Stations	Contractor	Acquisition Start	Acquisition End	Current Status	Release Status ¹ & Date
2	Esperance 2013	2.5 km grid, 1 km roads	7 891	Atlas	Jul-13	Sep-13	Released	24 Oct-13
3	Goldfields 2013	2.5 km grid	8 115	Atlas	Nov-13	Dec-13	Released	20-Feb-14
4	Sir Samuel–Throssel 2014	2.5 km grid	11 600	IMT	Jun-14	Sep-14	Processing	Dec-14*
Gx	Potential areas under consideration for ground gravity surveys in 2014 and 2015							

Notes

* Asterisk indicates an estimated date (month/year) based on latest information available. Subscribe to the newsletter for release alerts.

1. Release Status: F = final; P = preliminary. (Preliminary releases of partially processed or unchecked data are made on a case-by-case basis.)

Colour legend

 Final data released	 Prelim release or Final release date set	 In progress	 Under consideration
---	---	---	---

Information current at: 8 September 2014

Product releases

Any prices include GST

ISSN 1325-9377 ISBN (PRINT) 978-1-74168-592-3
ISSN 1834-2272 ISBN (PDF) 978-1-74168-591-6

RECORDS

Record 2014/9 The application of passive seismic to estimate cover thickness in greenfields areas of Western Australia — method, data interpretation and recommendations
by AJ Scheib

Record 2014/10 Geological setting of mineral deposits in the eastern Yilgarn Craton — a field guide
by S Wyche

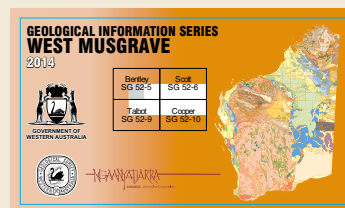
Record 2014/11 Geology of the Boord Ridges and Gordon Hills: key stratigraphic section in the western Amadeus Basin, Western Australia
by PW Haines and HJ Allen

REPORT

Report 140 Regional Structural and stratigraphic study of the Canning Basin, Western Australia
by M Parra-Garcia, G Sanchez, MC Dentith and AD George

GEOLOGICAL INFORMATION PACKAGES (\$55 incl GST)

West Musgrave, 2014: Geological Information Series
Kimberley, 2014: Geological Information Series



NON-SERIES DIGITAL PRODUCT

Western Australia petroleum acreage release, September 2014



Record 2014/10
Geological setting of mineral deposits in the eastern Yilgarn Craton — a field guide *by S Wyche*

Bulletin with eight accompanying plates, maps

A compilation of more than 50 years of research on the geology of these remarkable reef complexes

Printed publications are available free as PDF files on our website at <www.dmp.wa.gov.au/GSWApublications>. GIS files (ESRI and MAPINFO formats) for all maps published since 1991 are available as a free download from the Data and Software Centre. Further details of geological publications and maps produced by the Geological Survey of Western Australia can be obtained at <www.dmp.wa.gov.au/GSWA>.

Hardcopy publications including products on CD, DVD, and USB are available from the Information Centre, First Floor, Mineral House, 100 Plain St, East Perth, WA 6004, AUSTRALIA Phone: +61 8 9222 3459; Fax: +61 8 9222 3444, or can be purchased online from the bookshop at <www.dmp.wa.gov.au/ebookshop>.

Products were produced using information from various sources. The Department of Mines and Petroleum (DMP) and the State cannot guarantee the accuracy, currency or completeness of the information. DMP and the State accept no responsibility and disclaim all liability for any loss, damage or costs incurred as a result of any use of or reliance whether wholly or in part upon the information provided in this publication or incorporated into it by reference.