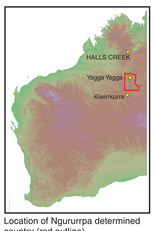
NGURURRPA
REGOLITH GEOCHEMISTRY

Introduction

The Ngururrpa area is located approximately 250 km south of Halls Creek in the Great Sandy Desert (inset; Fig. 1). Following an approach from the traditional owners (Parna Ngururrpa) to carry out gravity capture and regolith chemistry on their country, an on-country heritage assessment in 2013 was followed by gravity measurements at 4964 stations (2.5 km grid) in May–June 2014, and regolith samples were collected from 637 sites in September 2014 (Fig. 1).



Location of Ngururrpa determined country (red outline).

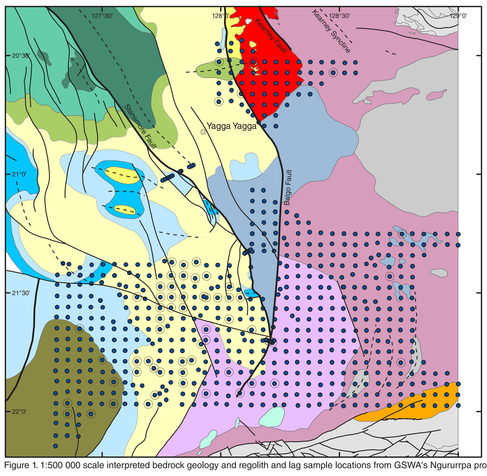


Figure 1. 1:500 000 scale interpreted bedrock geology and regolith and lag sample locations from GSWA's Ngururrpa program.

Regional geology

The Ngururrpa area is composed of sedimentary rocks of the Proterozoic to Paleozoic Murraba Basin, and Paleozoic – Mesozoic Canning Basin (Fig. 1). Murraba Basin rocks unconformably overlie rocks of the Granites–Tanami Orogen to the north and the Arunta Orogen to the south. More than 85% of the Ngururrpa is covered by regolith, much of which is sandplain (Fig. 2a).

Apart from the limited amount of outcrop, understanding bedrock stratigraphy and mineralization potential is complicated by the limited range in lithology (most rocks are quartz-rich siliciclastic rocks), the lack of distinctive marker horizons, and lateral facies changes. Although the majority of regolith is transported, the small amount of drilling data available (mainly related to petroleum exploration), the presence of ferruginous lag, duricrust patches and Fe-rich sheetwash, and passive seismic data captured during the regolith sampling program indicate that in some areas regolith forms a thin veneer only a few metres thick over bedrock.

Sampling and analysis of regolith

Regolith was sampled at a maximum of 90 cm depth using a power auger (Fig. 2b)

At 63 sampling sites, ferruginous lag was collected, and analysed by a combination of x-ray fluorescence (XRF) spectrometry, inductively coupled plasma (ICP) spectrometry, and Pb collection fire assay+ICP.

Approximately 3 kg of each regolith sample was dry screened to isolate the < 50 µm fraction, and analysed for 63 elements by ICP following regia digestion.

Quality control was maintained by analysis of

- 90 sample duplicates (i.e. a second analysis of the < 50 µm fraction)
- reference materials (approximately 10% of all analyses) and analytical blanks

Site duplicates (i.e. analysis of a second regolith sample collected at the site) were analysed from 51 sites

Geochemical data are available from **www.dmp.wa.gov.au/geochem** or **GeoVIEW.WA**

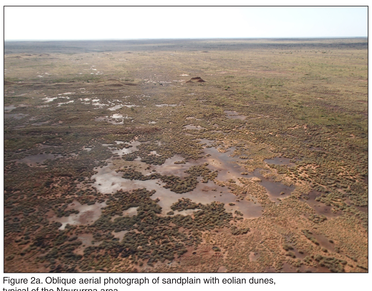


Figure 2a. Oblique aerial photograph of sandplain with eolian dunes, typical of the Ngururrpa area.

Figure 2b. Augering to collect regolith sample.

Gold

Of the 637 samples, 195 (31%) returned values of < 1 ppb in the < 50 µm fraction of regolith (Fig. 3a). The maximum concentration of Au is 63 ppb in 221058 (Fig. 3b), colluvium from the Redcliff Pound Group in the northeast of the program area. Two other samples with elevated Au concentrations are from sandplain overlying the Liveringa Group – 220709 (16 ppb Au) and 221169 (10 ppb). Of the 12 samples with > 13 ppb Au, seven are from either the Redcliff Pound Group or Hidden Basin beds. There is no clear relationship between Au concentration and regolith type.

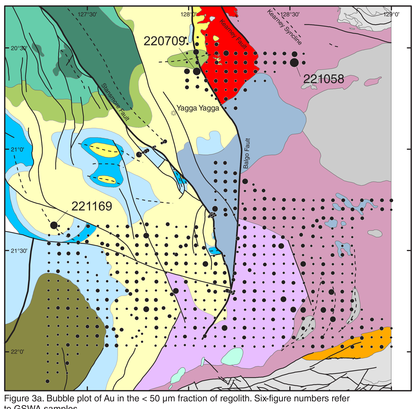


Figure 3a. Bubble plot of Au in the < 50 µm fraction of regolith. Six-figure numbers refer to GSWA samples.

Iron

The distribution of Fe_2O_3 (Fig. 5a) illustrates the combined influence of lithology and regolith type. A box and whisker plot (Fig. 5b) shows that regolith from the Liveringa Group has one of the higher median values for Fe_2O_3 and the widest range (including some of the highest values) for Fe_2O_3. In terms of regolith type, sheetwash has the highest median value and widest range for Fe_2O_3 (Fig. 5c), and the Liveringa Group has the highest proportion of sheetwash deposits of all bedrock types, most of which have been classified as ferruginous sheetwash (*Wf*). Field observations indicate that ferruginous duricrust, and ferruginized rock fragments are more common over the Liveringa Group than other lithological units, and the majority of lag samples collected are from this unit (Fig.1).

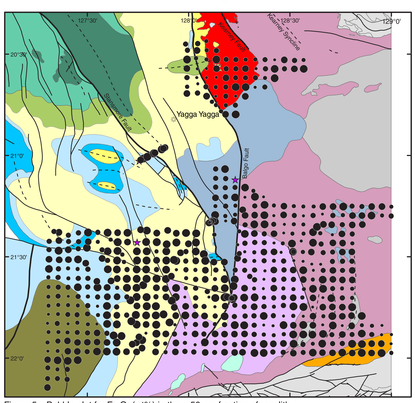


Figure 5a. Bubble plot for Fe_2O_3 (wt%) in the < 50 µm fraction of regolith.

Strontium

In some cases, there is a strong control on regolith chemistry from regolith itself, with little influence from bedrock. Fifty six regolith samples have anomalous concentrations of Sr (i.e. > 42.6 ppm), and of these, 37 have extreme values (> 64.7 ppm; Fig. 4a). Thirty six of the samples with anomalous Sr contents are from lacustrine areas or areas of groundwater calcrete most of which are located over the western part of the Murraba Basin (Fig. 4b). The distribution of high-Sr samples shows some correlation with paleochannels interpreted from regolith mapping [see adjoining poster].

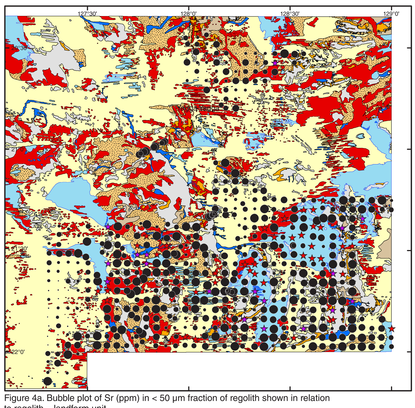


Figure 4a. Bubble plot of Sr (ppm) in < 50 µm fraction of regolith shown in relation to regolith – landform unit.

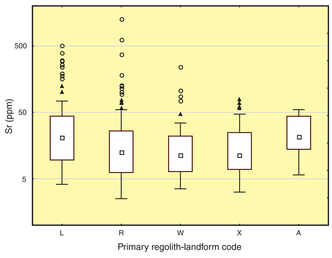


Figure 4b. Box and whisker plot of Sr (ppm) in the < 50 µm fraction of regolith according to regolith-landform unit.
L = lacustrine
R = residual or relict
W = sheetwash
X = exposed (regolith in areas of outcrop)
A = fluvial or alluvial
▲ Outlier value ◇ Extreme value
▫ Median value

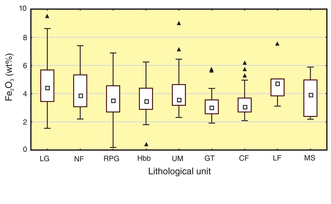


Figure 5b. Box and whisker plot for Fe_2O_3 (wt%) in the < 50 µm fraction of regolith according to selected lithological units.
LG = Liveringa Group
NF = Noonkanbah Formation.
RPG = Undivided Murraba Basin (incl. Redcliff Pound Group)
HBb = Hidden Basin beds
UM = undivided Mesozoic siliciclastic units
GT = Granites–Tanami
CF = Callawa Formation
LF = Lucas Formation
MS = Munyu Sandstone
▲ Outlier value ◇ Extreme value
▫ Median value

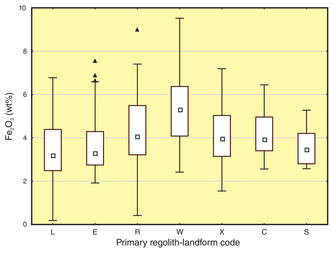
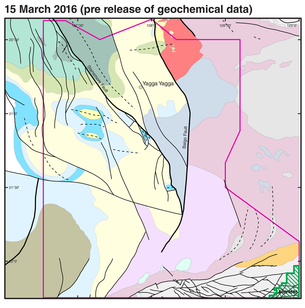


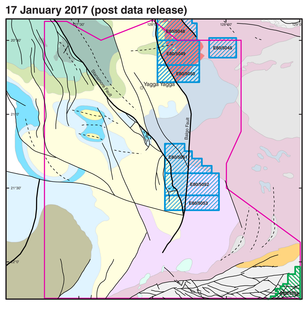
Figure 5c. Box and whisker plot for Fe_2O_3 (wt%) in the < 50 µm fraction of regolith according to regolith-landform unit.
L = lacustrine
R = residual or relict
W = sheetwash
X = exposed (regolith in areas of outcrop)
A = fluvial or alluvial
E = eolian
C = colluvial
S = sandplain
▲ Outlier value
▫ Median value

How is mineral exploration affected by GSWA's regolith geochemistry?

15 March 2016 (pre release of geochemical data)



17 January 2017 (post data release)



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