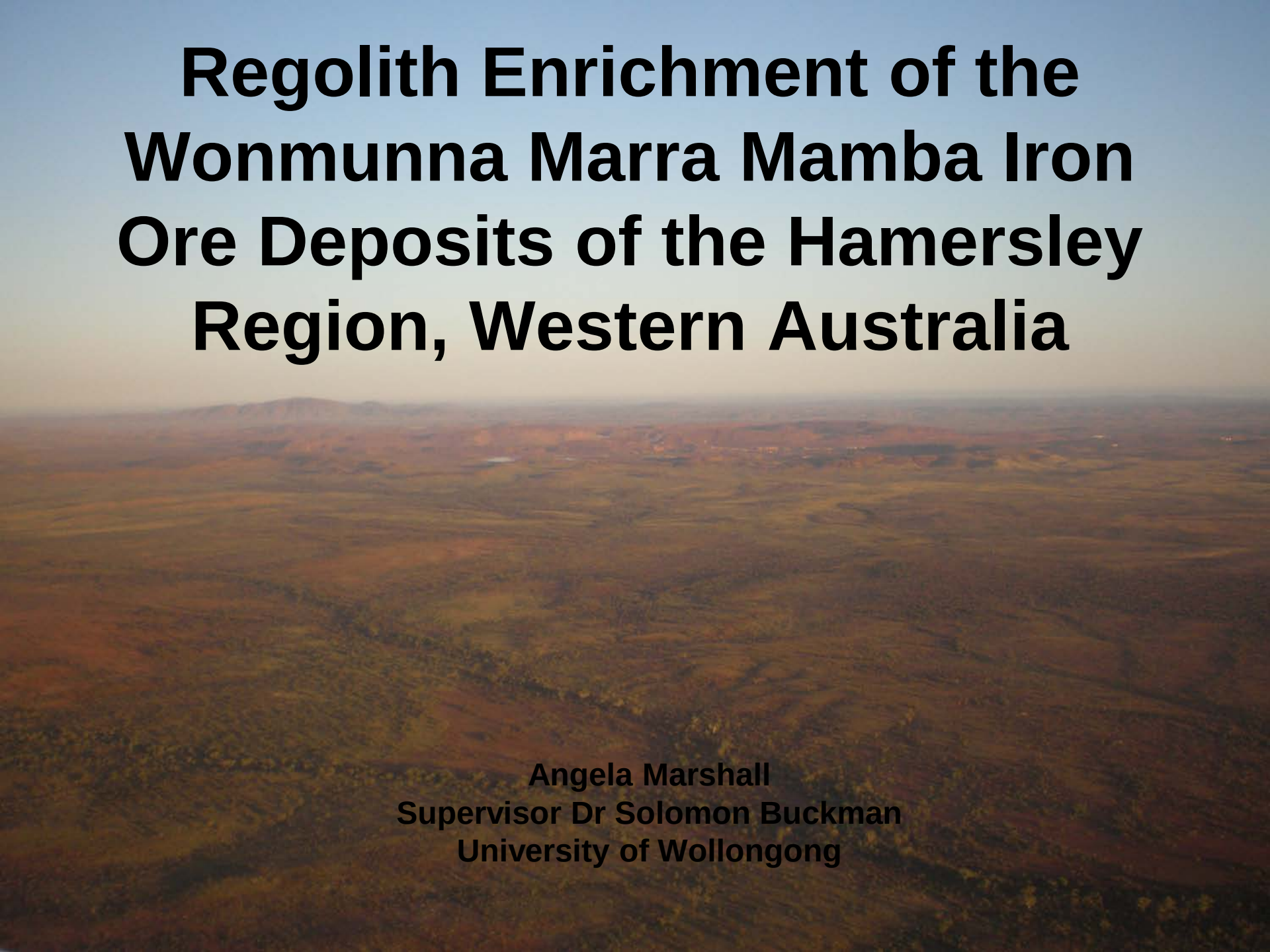
Regolith Enrichment of the Wonmunna Marra Mamba Iron Ore Deposits of the Hamersley Region, Western Australia

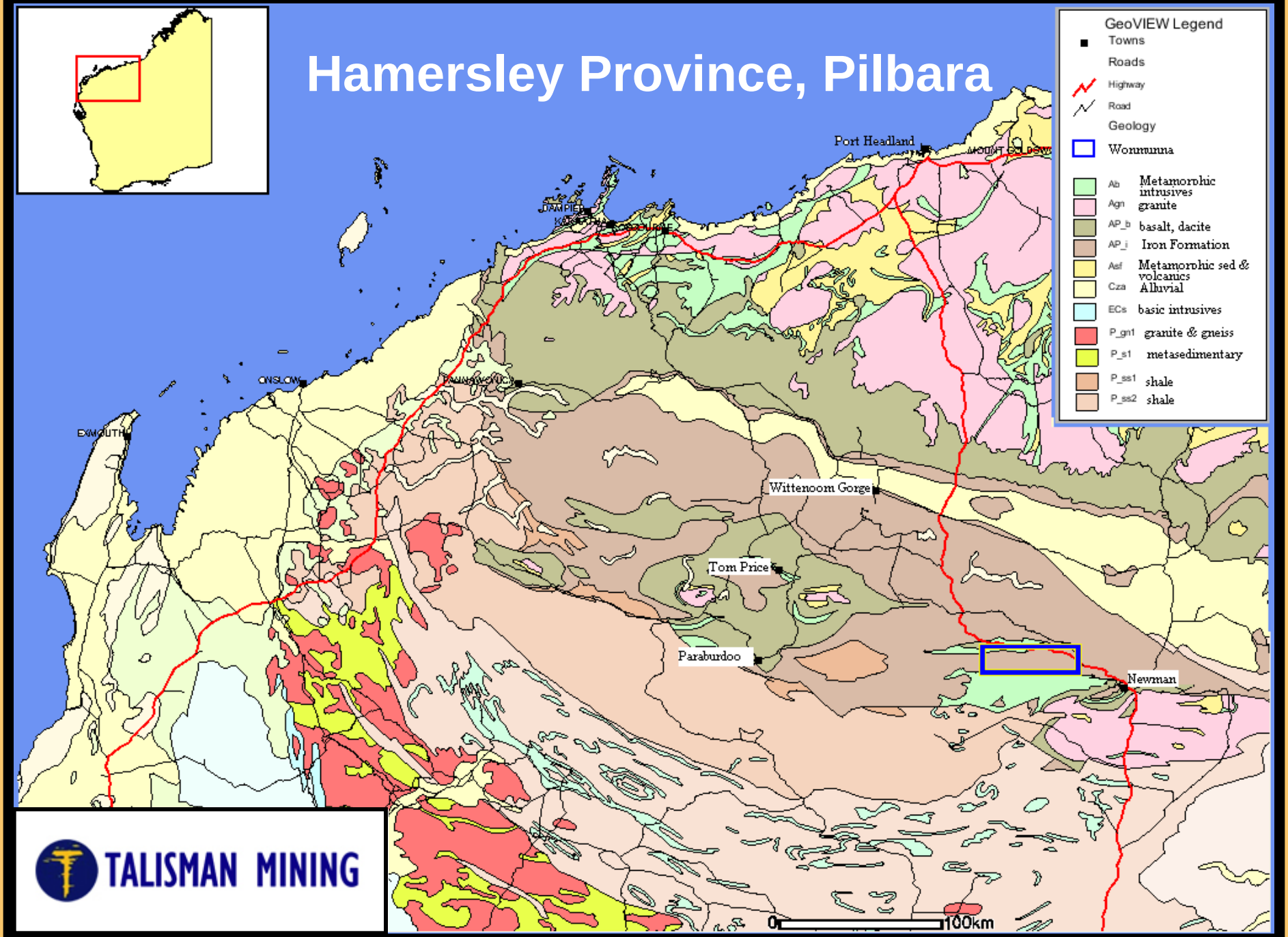


Angela Marshall
Supervisor Dr Solomon Buckman
University of Wollongong

Iron Ore

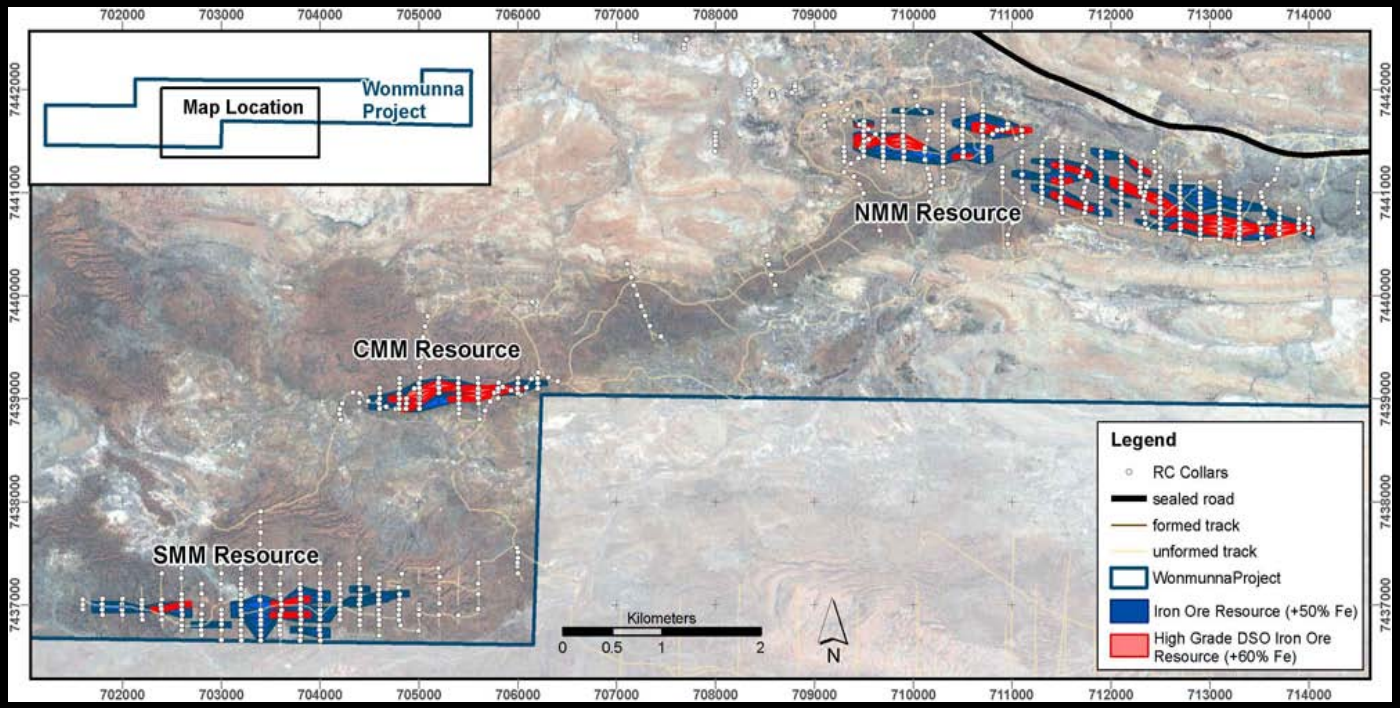
Aim

to describe the nature of the iron mineralisation at Wonmunna and determine the processes responsible for Fe-enrichment

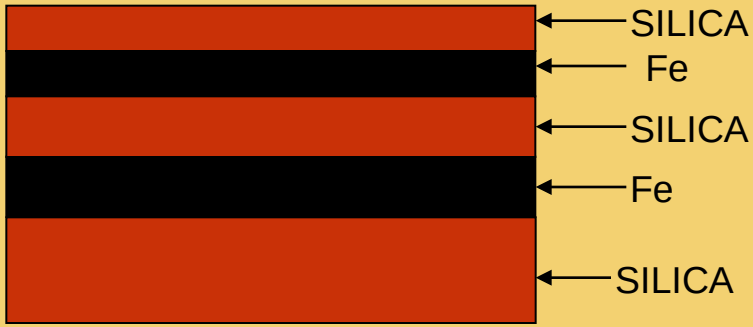

Hamersley Province, Pilbara
GeoVIEW Legend
Towns
Roads
Highway
Road
Geology
Woruumna
Ab Metamorphic intrusives
Agn granite
AP_b basalt, dacite
AP_i Iron Formation
Asf Metamorphic sed & volcanics
Cza Alluvial
ECs basic intrusives
P_gn1 granite & gneiss
P_s1 metasedimentary
P_ss1 shale
P_ss2 shale
Port Headland
DAMPIER
ONSLOW
EXMOUTH
Wittenoom Gorge
Tom Price
Paraburdoo
Newman
0
100km
TALISMAN MINING

	Fe cut-off	Million Tonnes	Fe %	SiO 2 %	Al 2 O 3 %	P %	LOI %
NMM Resource	50%	47.2	55.9	6.9	3.7	0.07	8.9
NMM DSO Resource	60%	6.2	61.4	3.0	1.8	0.07	7.2
CMM Resource	50%	15.2	56.8	5.7	3.3	0.10	9.5
CMM DSO Resource	60%	2.4	61.2	3.3	1.7	0.10	7.4
SMM Resource	50%	15.9	55.3	6.7	3.8	0.07	9.7
SMM DSO Resource	60%	1.4	61.2	2.9	1.6	0.06	7.6
Total Resources	50%	78.3	56.0	6.6	3.6	0.08	9.2
Total DSO Resources	60%	10.0	61.3	3.1	1.7	0.08	7.3

Wonmunna



Banded Iron Formation (BIF)



Ore Types

Martite-goethite ore

Microplaty-hematite ore

Enrichment Processes

Hypogene Model

1. warm, reduced fluids leach silica
2. Oxidisation (hot meteoric oxidising fluids)
3. Microplaty hematite formed in carbonate matrix
4. Late stage supergene leaching

→ Taylor et al., (2001)

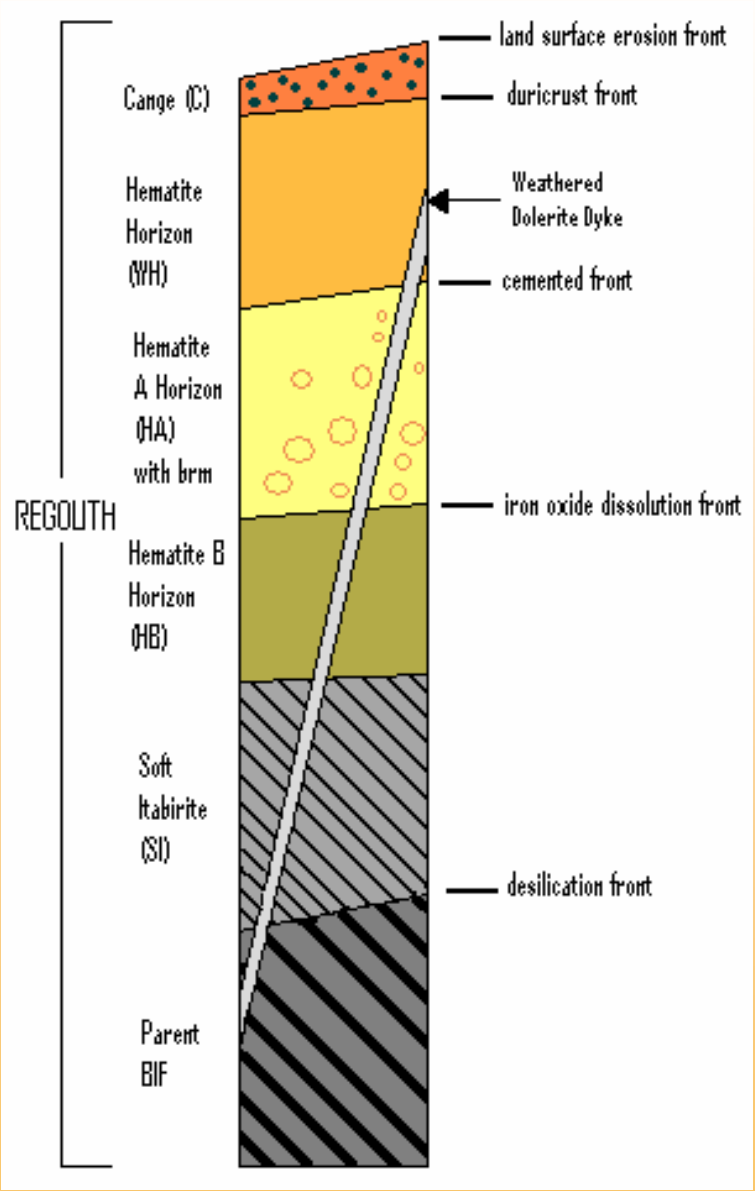
Supergene – Metamorphic Model

1. Supergene processes for martite-goethite ore
2. Burial metamorphism upgrades this to microplaty-hematite ore

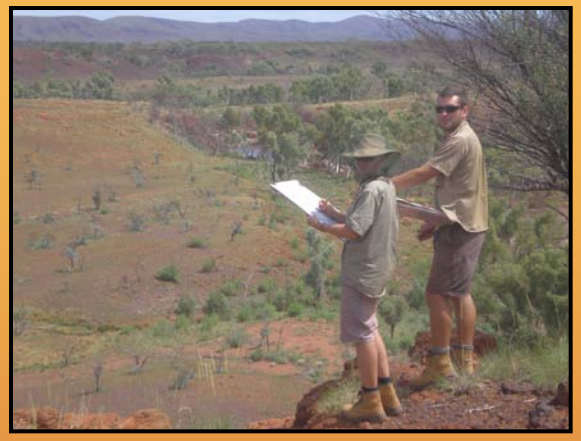
→ Morris (1985)

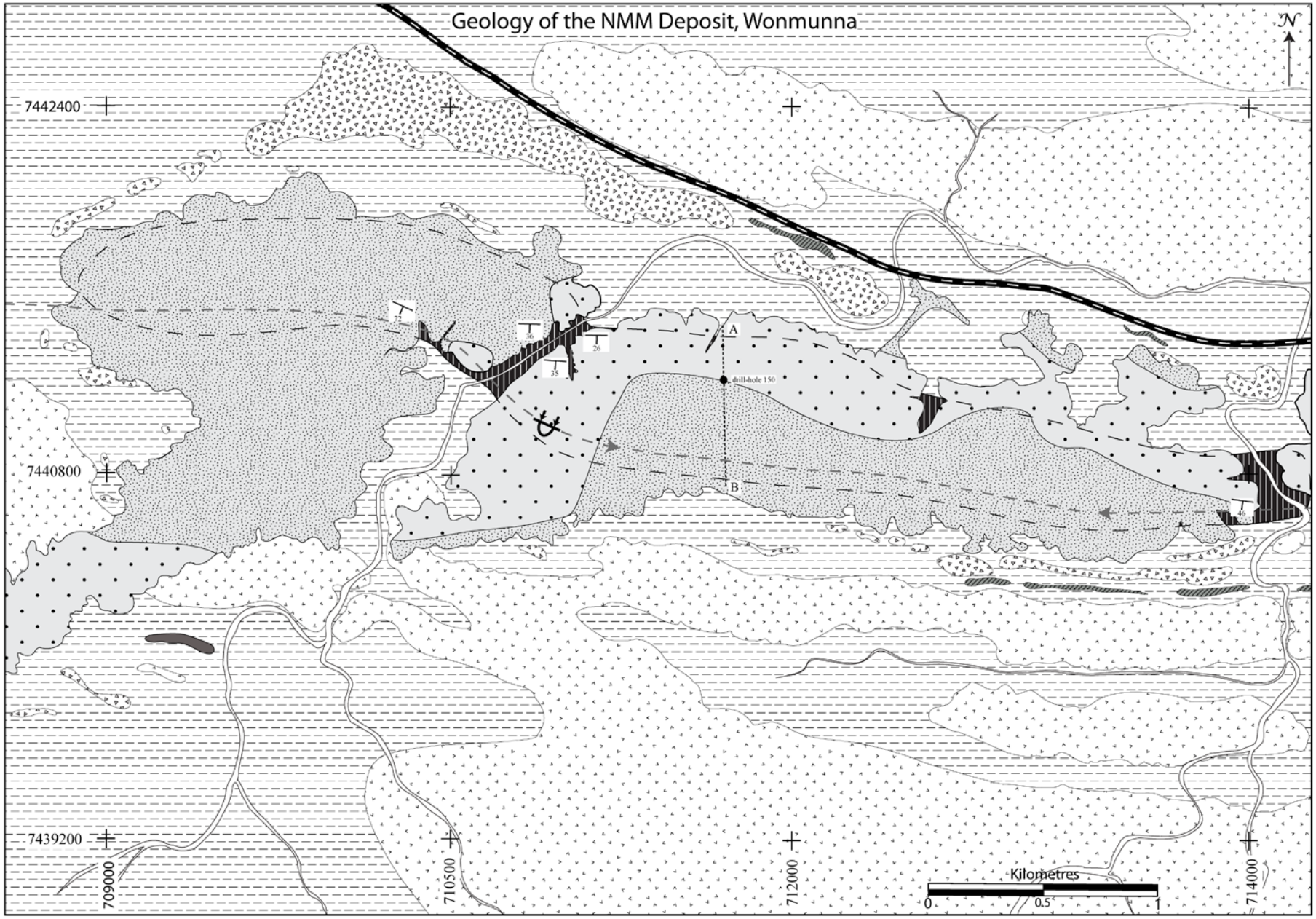
Regolith Processes

→Ramanaidou (2009)

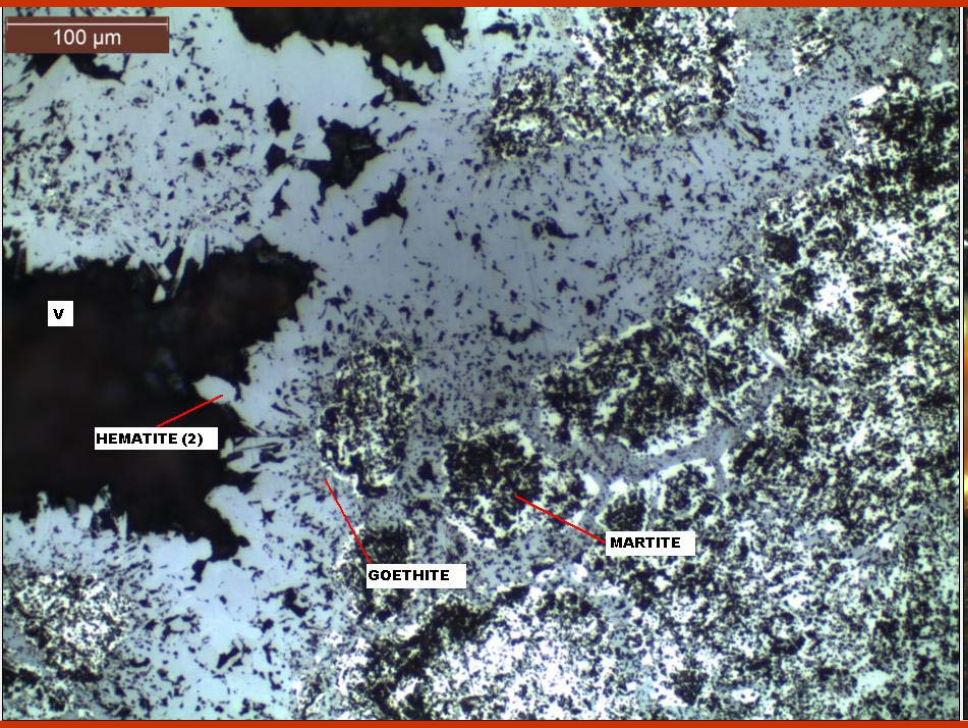


Field work and mapping

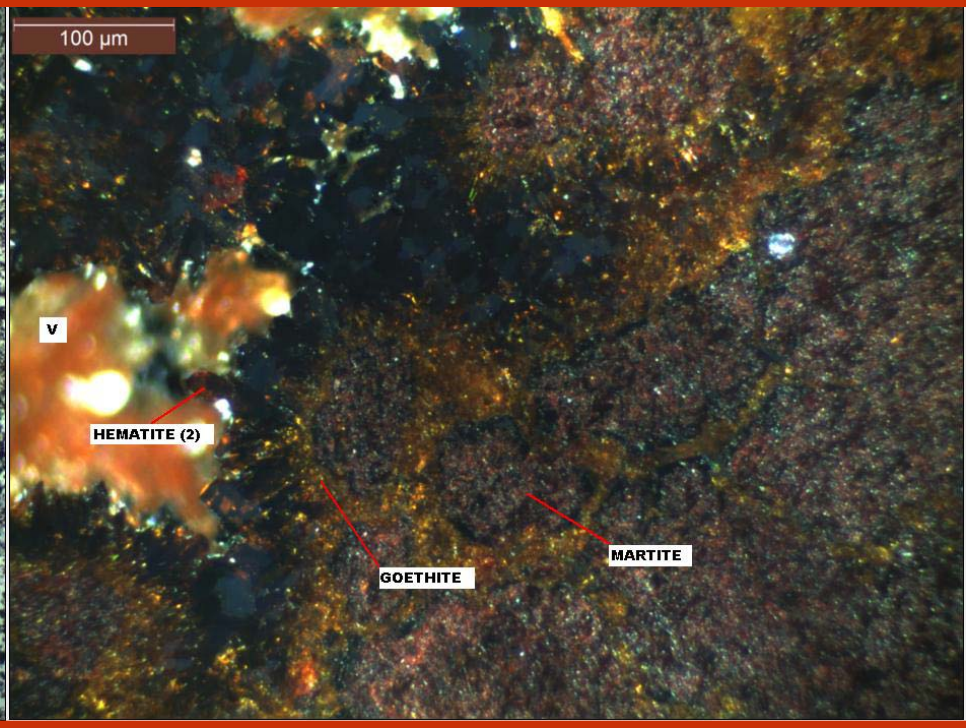



Geology of the NMM Deposit, Wonmunna
N
7442400
7440800
7439200
709000
710500
712000
714000
drill-hole 150
A
B
Kilometres
0
0.5
1

Petrography

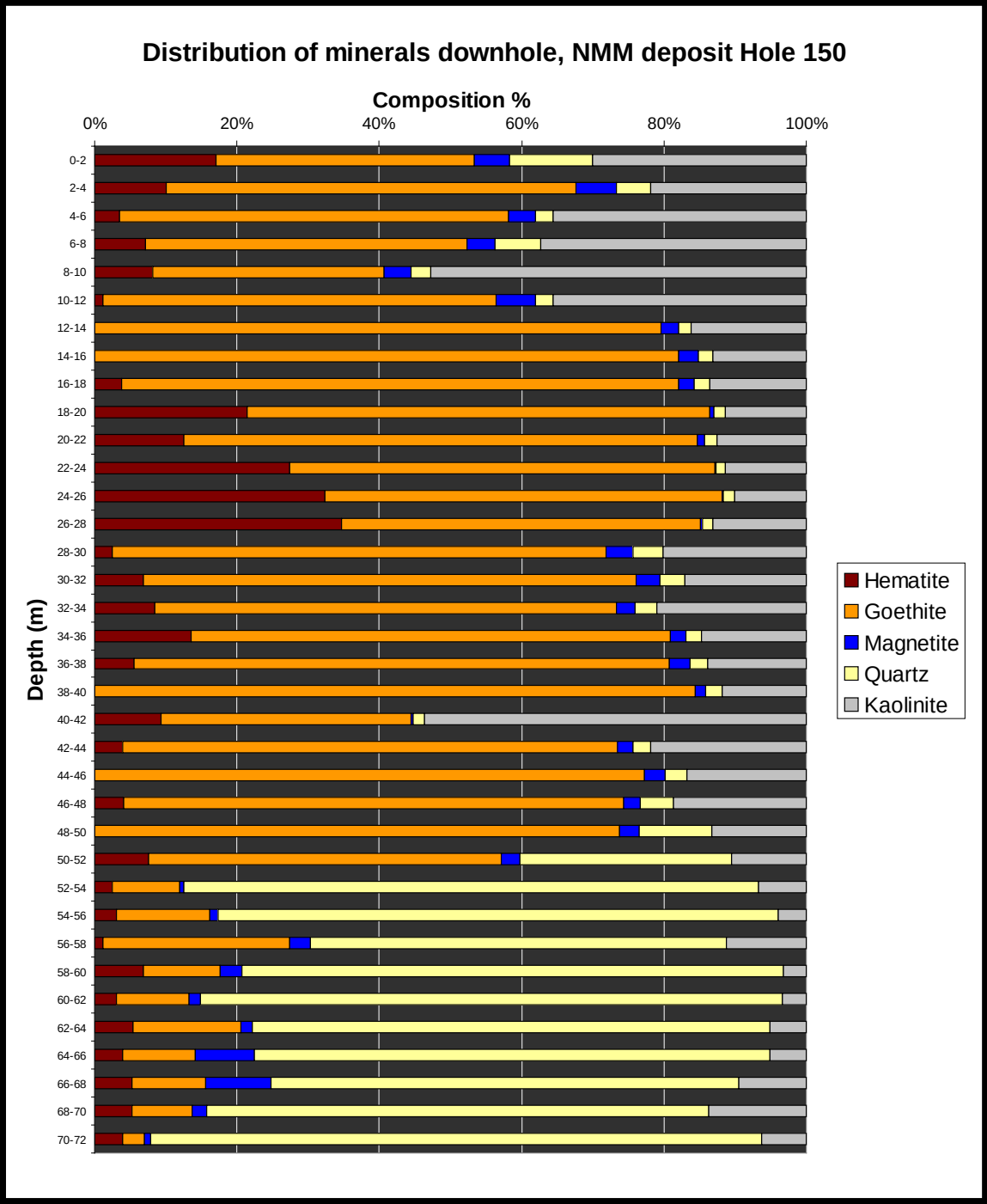


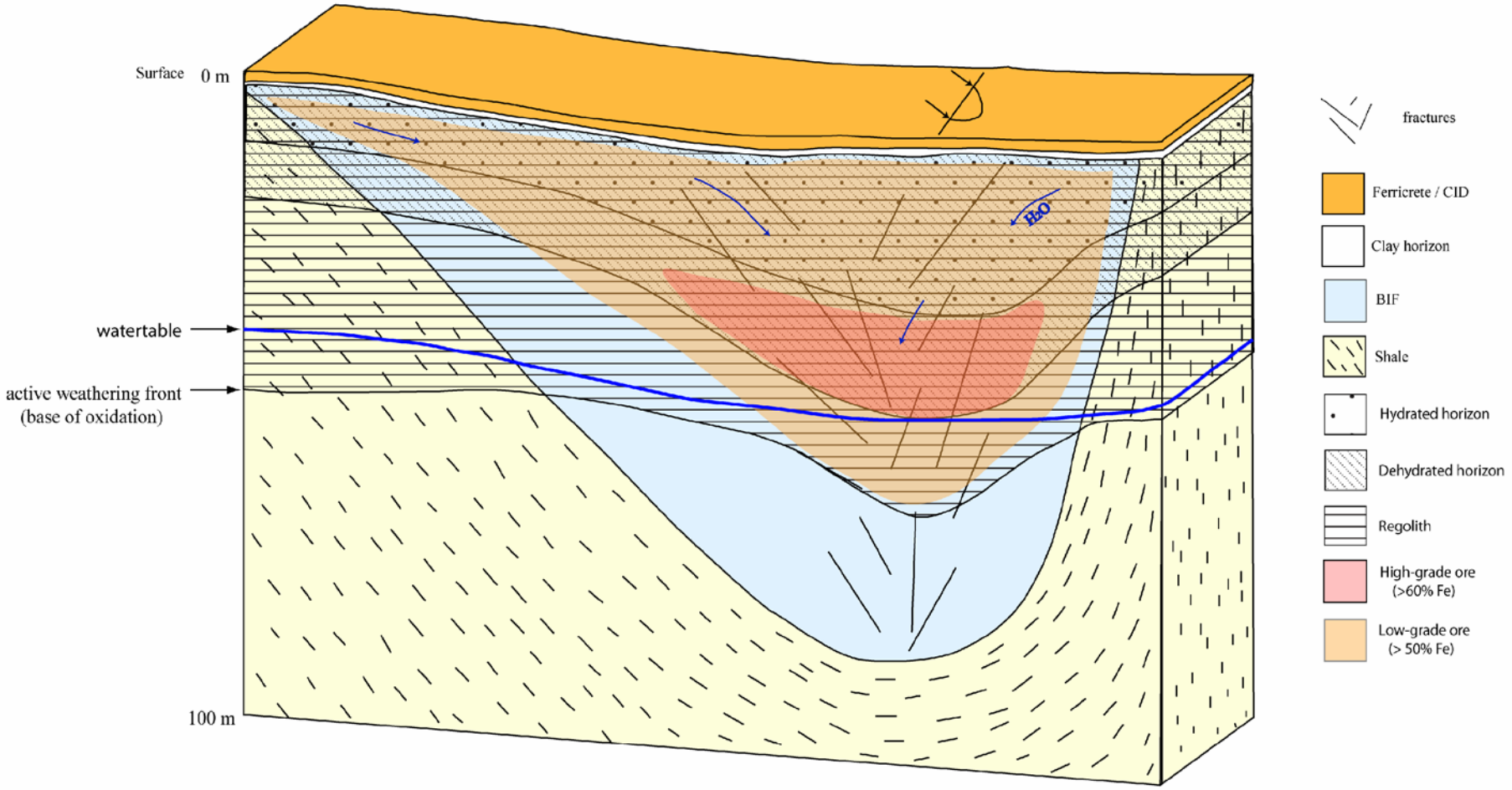
10 x, plane polarized light



10 x, crossed polarized light

Mineralogy XRD




Surface
0 m
watertable
active weathering front
(base of oxidation)
100 m
H2O
fractures
Ferricrete / CID
Clay horizon
BIF
Shale
Hydrated horizon
Dehydrated horizon
Regolith
High-grade ore
(>60% Fe)
Low-grade ore
(> 50% Fe)

Conclusion

- **Relationship with the current surface and regolith development.**
- **Microplaty hematite in the Marra Mamba Iron Formation at Wonmunna**
- **Regolith enrichment model for Wonmunna: oxidation, leaching, goethitisation → dehydration of goethite → mpl-H**
- **Implications for exploration models**