COWAL GOLD MINE: *NEW INSIGHTS & ONGOING RESEARCH*

Evolution

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Acknowledgement of country

Evolution would like to acknowledge the traditional custodians of the land on which we meet today, the Wiradjuri people, and pay our respects to Elders past, present and future.

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OVERVIEW

Geology and mineralisation of GRE46Volcanic Facies Architecture



LOCATION

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GEOLOGICAL SETTING

- Cowal Igneous Complex hosts a variety of mineralization styles.
- Two most prevalent types are:
- Low sulfidation epithermal: E42, GRE46, E41
- Calc-alkalic porphyry : Marsden, E39, E43







COWAL GOLD MINE

Cowal Gold Mine MROR December 2021¹ Ore Reserve: 138Mt at 1.03g/t Au for 4.6Moz Mineral Resource: 305Mt at 0.98g/t Au for 9.6Moz

> E42 Reserve 2.7Moz Resource 4.3Moz

E46 Reserve 0.21 Moz Resource 0.38 Moz

Galway Regal E46 Open pit Reserve 0.15Moz Resource 0.62Moz

> GRE46 UG Reserve I.IMoz Resource 2.8Moz

E41 Reserve 0.49Moz Resource 1.5Moz

Marsden (15km SW) Reserve 817koz, 371kt Cu Resource 1.0Moz, 560kt Cu





COWAL GEOLOGY

 Geology of E42 and Southern GRE46 corridor

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Barker & Milojkovic, 2019



- Preferential mineralization of lithological units due to contrasting brittleness creating fluid pathways (Dalwhinnie, Lava)
- Rheological contrasts such as Diorite-Volcaniclastic contacts
- Undulations and overhangs of Diorite Intrusion creating fluid traps
- Proximity to interpreted fluid conduits (Galway and Manna shear zones)





Galway shear mineralisation:







Dalwhinnie Mineralisation:







- Dalwhinnie and Galway decrease in grade to the North
- The Bulk of the Mineralisation is hosted within the large, brittle Trachyandesite Lava body.
- Manna and Ardberg shears are interpreted to is the interpreted to increase fluid flow to the Trachyandesite lava in the Northern half of the deposit.







Steeply dipping multistage veins/'QSBs' qz-cb-py-cp-gn



COLLABORATIVE 3D MODELS

Leapfrog Geo + Central

- 3D visualization
- Implicit modelling of complex geometries
- Integrating data & software
- Cloud-based, shared geological models





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GOLD MINERALISATION LATE OFFSETS





Milojkovic & Browne, 2019

VOLCANIC FACIES ARCHITECTURE - BACKGROUND



Radford 2020

AIMS AND MOTIVATIONS

- <u>The Issues:</u>
 - Below Diorite, heading east, down stratigraphy;
 - No obvious marker beds (monotonous fine sediments)
 - Less diamond drilling
 - <u>More deformation (folding, thrusts, faults/shears)</u>
 - Ambiguity in extrapolating E42 stratigraphy to GRE46
 - Even further east of GRE46, drill density decreases, more uncertainty

• The Aims:

- Delineate volcanic facies at <u>GRE46</u> initially. Go further afield if possible
- Interpret eruption and transport processes, paleo-environment
- Volcano-magmatic evolution of Cowal Complex; implications for
 - Ore Deposits, Metallogeny and Intrusions
 - Junee-Narromine Belt / Macquarie Arc where appropriate

WORK COMPLETED, LOOKING NE



Cowal Igneous Complex = 40 x 16km (southern half dominantly intrusions)

Logging Coverage = 20 x 10km

= Graphic Logging

April – October 2021

- 26.9km of Graphic Logging
 - Logged blind. Independent
 validation of Geology Map
- **1072** specimen photographs

1250

2500

- 852 core samples
- **55** standard thin sections from GSNSW

Plunge +32 Azimuth 030

5000

3750

DETAILED GRAPHIC LOGGING, 1:500 SCALE



COMPOSITE CROSS SECTION – LOOKING NE



STRATIGRAPHIC COLUMNS





Structural Domain of Open Folds

- Dominantly effusive basalt and andesite
- Estimated 600m thickness but shortening not quantified
- Open folds due to mechanical strength of thick effusive sequence? Or perhaps due to Granodiorite?





Structural Domain of Thrusts

- Coherent Pyroxene Basalt Substrate, locally reworked
- Quiescence (mud), effusive basalt, then local scoria cones
- Thrusts best developed in this domain due to mud and fine sand?



Coherent Pyroxene Basalt with alteration induced pseudo-breccia textures



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- Coherent Pyroxene Basalt Substrate, locally reworked
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Hematitic mudstone matrix fluidal amygdaloidal basalt breccia; peperite



'Gold Corridor' Stratigraphy

- Below E42 mine stratigraphy, massive to laminated fine sands with local coarse polymict breccias
- Mine succession of conglomerate, trachyandesite and fiamme breccias
- Diorite may have preserved stratigraphy better than in 'thrusts' domain?



Massive to laminated fine dark (mafic) sand. Monotonous, ubiquitous facies below the mine stratigraphy. <u>Correlations difficult: lack of marker beds, complexed further by deformation.</u>



'Gold Corridor' Stratigraphy

- At base, massive to laminated fine sands with local coarse polymict breccias
- Mine succession of conglomerate, trachyandesite and fiamme breccias
- Diorite may have preserved stratigraphy better than in 'thrusts' domain?



Coarse, poorly sorted, and esitic polymict clast supported breccia-conglomerates, with rare pumice lithics

W-E Cross Section to the North

- Thinner leading edge of Diorite
- Thrusts as opposed to folding in Reflector Hanging Wall
- East vergent parasitic folds
 - Thick basalt: 5-10km
 - Coarse breccias: 50-100m
 - Fine Sediments: 5-10m

NW-SE Cross Section to the South

- Fold in Diorite in Reflector Hanging Wall
- East vergent parasitic folds
 - Thick basalt: 5-10km
 - Coarse breccias: 50-100m
 - Fine Sediments: 5-10m





PRELIMINARY STRUCTURAL FRAMEWORK



VOLCANIC FACIES – GOING FORWARD

- Apply recent stratigraphic and structural framework to ongoing Leapfrog Modelling
- Validation of stratigraphic framework through
 - Thin Section Analyses (confirming / identifying components and facies)
 - XRF Whole Rock Geochemistry
 - Utilise company 4A digest geochemistry database
- Interpretation of eruption and transport processes through the succession
- Zircon U-Pb dating of targeted coherent facies (particularly the trachyandesite)















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