Snowy River : Concept to Development

AusIMM NZ Branch Annual Conference 2025
Future Horizons: Shaping the Next Generation Workforce in Mining and Resources
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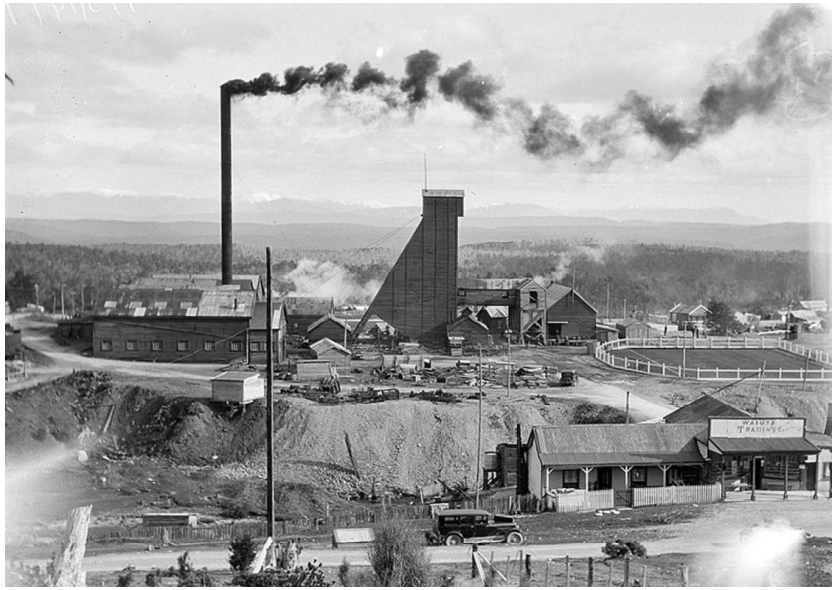
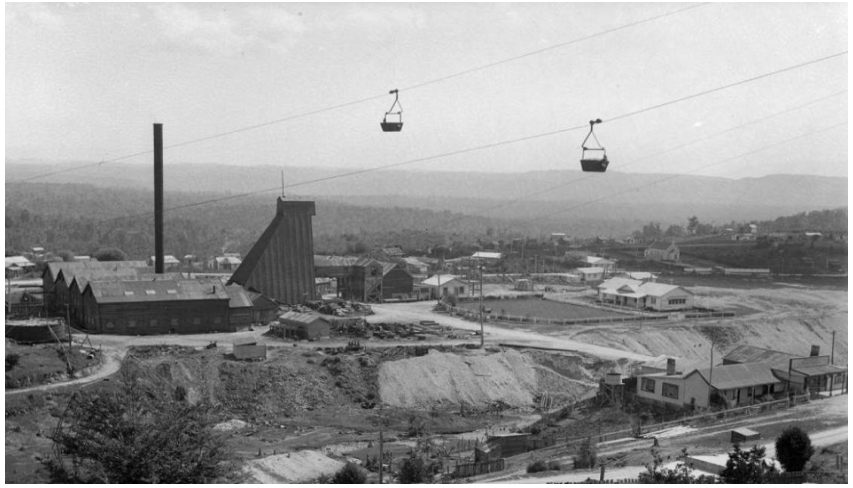
PITCH BLACK GROUP

Outline

- Location and Background
- History
- Test Work
- Process Design and Flowsheet Development
- Current Status



Blackwater Shaft and Waiuta Township, 1930



Aerial Ropeway from Prohibition Shaft to Snowy River Battery

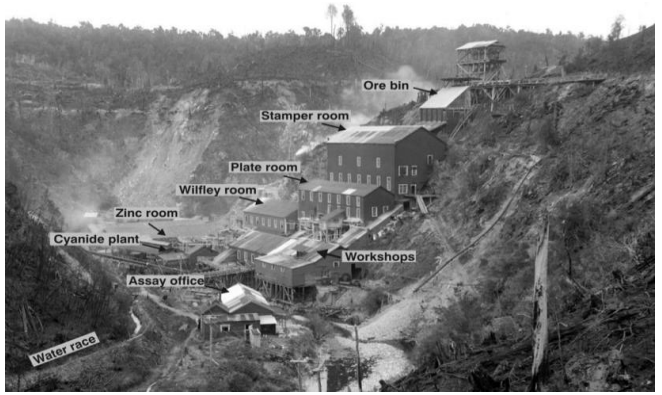
Location and Background

- SRGP on west coast of South Island near Ikamatua. Reefton is nearest largest city.
- Project targets the down-dip extension of the historic Blackwater Mine, centred on the high-grade Birthday Reef
- Blackwater project originally owned by Oceana Gold (PEA NI 43-101 in 2014)
- Federation Mining involvement commenced in July 2018, staged earn in agreement
- 100% ownership of asset in June 2024

History: Blackwater Mine

- Gold historically extracted from Birthday Reef between 1908 and 1951; two distinct processing phases
- Early Processing (Amalgamation-Cyanidation; 1908-1938)
  - Stamp mills followed by amalgamation of coarse free gold across mercury coated amalgamation plates
  - Amalgam plate tails split into coarse and fine fractions
  - Coarse fraction fed to Wilfley table for gravity gold recovery
    - Wilfley concentrate – amalgamation and roasting (Edwards Roaster) followed by cyanidation of calcine to recover refractory gold
    - Wilfley tails - cyanidation in vats
  - Fines, cyanidation in Pachuca tanks
  - Final tails thickener, blanket tables for fine gold recovery
  - Gold in solution precipitated onto zinc
  - 85-90% recovery

Snowy River Battery (1909)

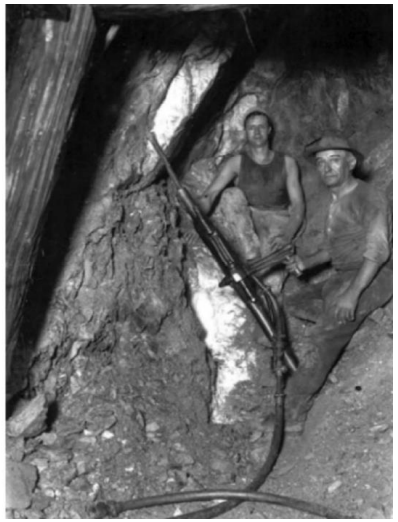


History: Blackwater Mine

- Prohibition Mill (Gravity-Flotation-Cyanidation; 1938-1951)
  - Constructed in 1937 and commissioned in 1938
  - Ore crushed and ground to 6.35mm in a ball mill, ball mill product discharged to blanket strakes for coarse gold recovery
    - Strake concentrate to amalgam drums.
    - Strake tails to classifier, coarse classifier underflow to tube mill. Overflow to secondary blanket strakes
    - Concentrate from secondary blanket strake to amalgam drum
    - Tube mill product (250µm) to ball mill discharge and primary blanket strakes
    - Tailings from secondary strakes to flotation
  - Flotation concentrate thickened, filtered, dried and subjected to roasting for arsenic and sulphur removal
    - Flotation tails; final tails
    - Roaster product subjected to cyanidation
  - Gold in solution recovered via Merrill-Crowe zinc dust precipitation
  - 92-96% recovery with 80% of gold recovered as free gold
  - 1.58 million tonnes of ore treated at 14.55 g/t Au

- Historic processing indicates presence of coarse free gold, fine free gold and sulphide associated gold with some sulphide associated gold possibly requiring liberation from sulphide matrix to enhance recovery

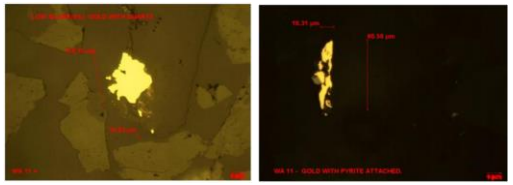
Prohibition Ball Mill, 1938



Blackwater Mine Birthday Reef

Mineralogy

- Historical processing identified mineralogical characteristics and guided current mineralogical and metallurgical assessments
- Mineralogy
  - Gold hosted in quartz veins, predominantly as native gold (70-80%) with remainder associated with sulphides.
  - Sulphide content low (<1%). Arsenopyrite and pyrite dominant sulphides with minor chalcopyrite and marcasite. Trace stibnite (antimony) and bismuth present.
  - Bi-modal free gold distribution
    - Fully liberated 100µm to 250µm angular particles or 25µm to 250µm, fully liberated flakes
    - Fine liberated gold, 20µm to 100µm
    - Gold not liberated intergrown with sulphides or encapsulated in quartz
- Mineralogy suggests:
  - High degree of gold liberation (coarse); propensity for high gravity gold recovery
  - Presence of coarse, fine and sulphide associated gold suggests combined gravity-flotation-leach approach required to maximise overall gold recovey
  - Low sulphide content, low mass yield



Metallurgy

- Numerous metallurgical test work campaigns have been completed, to characterise ore and determine metallurgical performance
- Campaign 1 - 2003
  - 1.4kg sample of Birthday Reef, 58g/t
  - Gravity-flotation
  - 97% recovery (87% gravity, 10% flotation)
- Campaign 2 to 5 – 2010 to 2013
  - C2: 12kg of quartz sample, averaged 13.8 g/t, ground to P_{80} of 150µm and achieved 98.6% combined gravity-flotation recovery (gravity >80%)
  - C3: Sample from Prohibition waste dump adjacent to Joker Bin and Blackwater Lower Adit.
    - 50:50 mix tested using gravity-flotation regime
    - Gravity recovered >80% Au into a 1% mass
    - Flotation of gravity tails recovered 65% of remaining gold
    - Bottle roll leach tests on gravity concentrate recovered 99.8% Au
    - Bottle roll leach tests on flotation concentrate recovered 98.3% Au
    - Overall, Au recovery ~95%
  - C4: Ore sorting
    - Birthday reef, optical sensor using laser
    - 96-99% quartz recovery into 50% of the mass

Gravity Tails Flotation

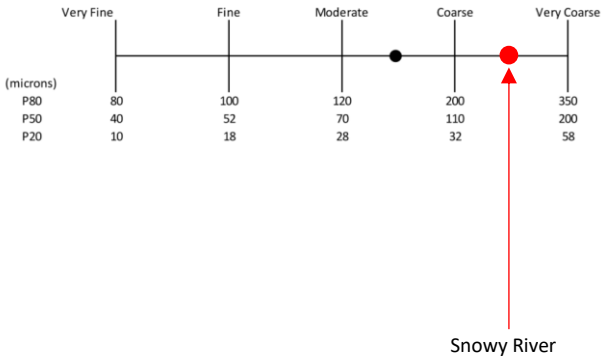
Ore Sorting (+53 -75mm Fraction)

Metallurgy

- Campaign 2 to 5 – 2010 to 2013
  - C5: Sample from Prohibition waste dump / 250kg of core sample.
    - Quartz reef is moderately hard with a Bond Ball Mill Work Index (BBWi) of 17.7 kWh/t. Reef is very abrasive with an Abrasion Index (Ai) of 0.757 g/rev.
    - Gravity Test work gravity recovery consistently exceeding 80%.
    - Sequential three-stage GRG test returned a cumulative GRG value of 96.7%, with 91.9% of the gravity gold liberated at 850µm and 94.8% at P50 of 75µm. Liberation analysis indicated that ~80% of gold is hosted in the >106 µm size fraction.
    - Flotation tests on gravity tails at P_{100} grind sizes of 150 µm and 106 µm achieved gold stage recoveries of 60% and 90% respectively. Regrind to a P_{80} of 106µm improved gold stage recovery to 97.9%. Flotation mass yield is consistently low at approximately 3% whilst flotation kinetics are consistently fast, with flotation complete after 8 minutes. Combined gravity-flotation circuit recovery consistently exceeds 98%.
    - Cyanide leaching tests on flotation and gravity concentrates consistently demonstrated high recoveries, with finer grinding improving leach extraction. At P_{100} grind size of 106 µm, gold recovery of up to 99.9% was achieved following 6 hours of leaching with 1% NaCN solution in an oxygenated environment. Tests conducted using alternative oxidants and modified pH conditions showed no adverse impacts attributed to the presence of arsenic and stibnite, confirming that the flotation concentrates were non-refractory.
  - A combined gravity, flotation, intensive leach circuit consistently yields an overall gold recovery between 95.6% and 96.5%.

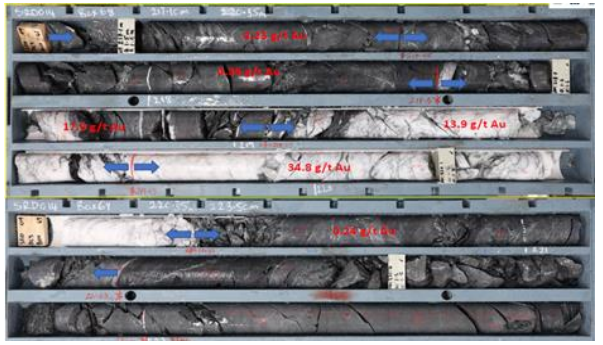
Gravity Tails Flotation

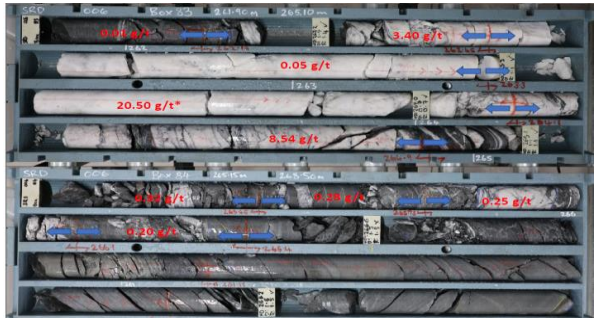
Figure 3 – AMIRA Gold Grain Size Classification



Metallurgy

- Verification Test Work
  - Aimed at verifying historic test results and generating additional data required.
    - Comminution, GRG, Leach Optimisation, Cyanide Destruction, Rheology, Settling and Filtration
    - Minimal sample mass (60kg quartz from 4 drill holes)
    - Proxy approach (low mass yield 1%)
  - Pertinent outcomes:
    - Head assay 14.2 g/t, S^{2-} (0.44%), As (1,250 ppm)
    - BBWI 17.1 kWh/t
    - GRG 91% (Modelling ~80% recovery). Gravity-amalgam 84%
    - Leach kinetics fast (60% in 2hrs, 96% after 8 hrs at 75µm at 0.05% NaCN). No impact from deleterious elements (As, Sb)
    - Flotation (10 min at 75µm yielded 93% stage recovery, overall recovery 99%)
    - CNp 0.8 mg/L using Air/SO2 at 5.0 gSO_2/gCN_{WAD}
  - Flowsheet verification test work
    - Original – 82% gravity, 98.3% gravity + float, 89% overall
    - Extended – 93% overall (passivation)
    - Additional optimization test work recommended

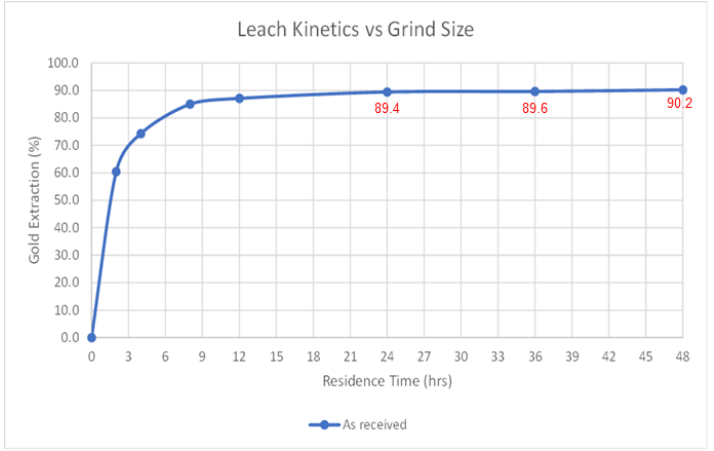


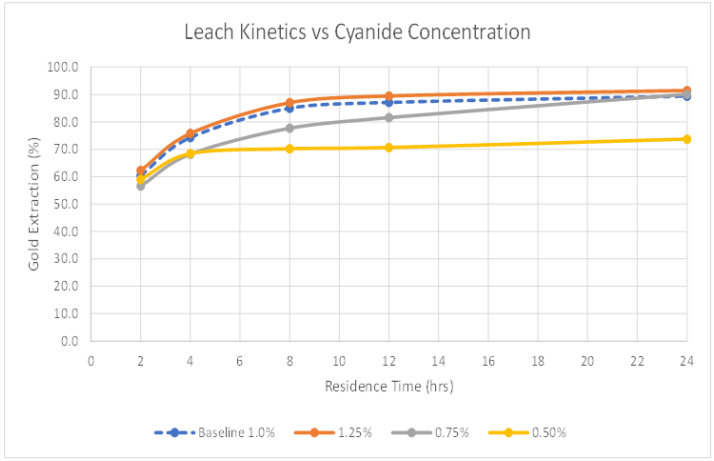


Sample	Assay Head	Calc. Head	Grav. Rec	Grav + Float Rec.	Float Res. Grade	Leach Head Grade	Leach Au Recovery (%)			Leach Res. Grade	Overall Au
	Au (g/t)	Au (g/t)	%	%	Au (g/t)	Au (g/t)	8	12	24	Au (g/t)	%
Original	10.7	10.2	81.7	98.3	0.18	44.0	24.7	32.1	44.6	24.4	89.1
Re-Leach							-	-	70.4	13.1	93.4

Metallurgy

- Optimisation Test Work
  - Aimed at refining verification test work results.
    - Bulk sample from development ore stockpile (310kg Quartz, 200 kg Greywacke)
  - Pertinent outcomes:
    - Head assay 8.4 g/t (Photon), S^{2-} (0.24%), As (1,720 ppm)
    - SFA 10.9 g/t; Avg (30) Photon samples 10.1 g/t
    - BBWI 18.7 kWh/t; Axb 64 (low competency); ta ~0.63 (less fines, impact breakage)
    - GRG 95%. Gravity-amalgam 83%
    - Rougher flotation (10 min at 75µm yielded overall recovery to concentrate >98%)
    - Baseline leach (P_{80} 75µm, 24 hrs, 45% w/w, pH 10.5, oxygen >15 ppm, [NaCN] 1.0%). Leach recovery 89.4%; Overall recovery 94%
    - Leach optimization
      - No benefit – regrind, oxygen, pre-aeration, leach accelerant
      - [NaCN] – most pronounced impact, below 0.75% leach adversely affected
      - Alkalinity (pH 10.5) and slurry density (50% w/w) improved stage recovery
    - CNp discharge limits not met (~187 mg/L; 96% efficiency)
    - “Flipped” flowsheet
    - Diagnostic test work – 30% CN soluble, 34% Arsenopyrite, 20% Sulphides, 16% Silicates
  - Flowsheet verification test work
    - Under identified optimum conditions; 95.2% overall gold recovery



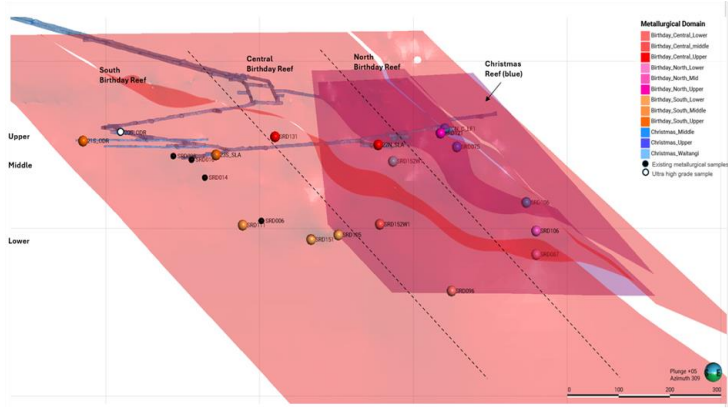


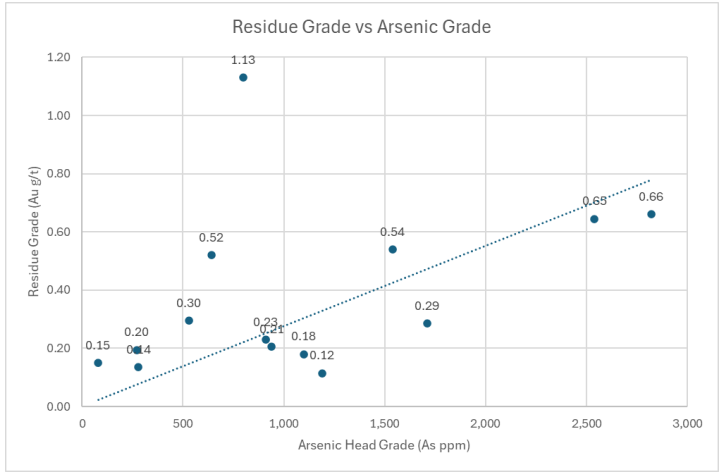
UNIT PROCESS OPTIMUM

Circuit	Gravity	Flotation	Leach	AW/EL/EW	Overall
Slurry	80%	92.3%	91.5%	97.8%	96.5%

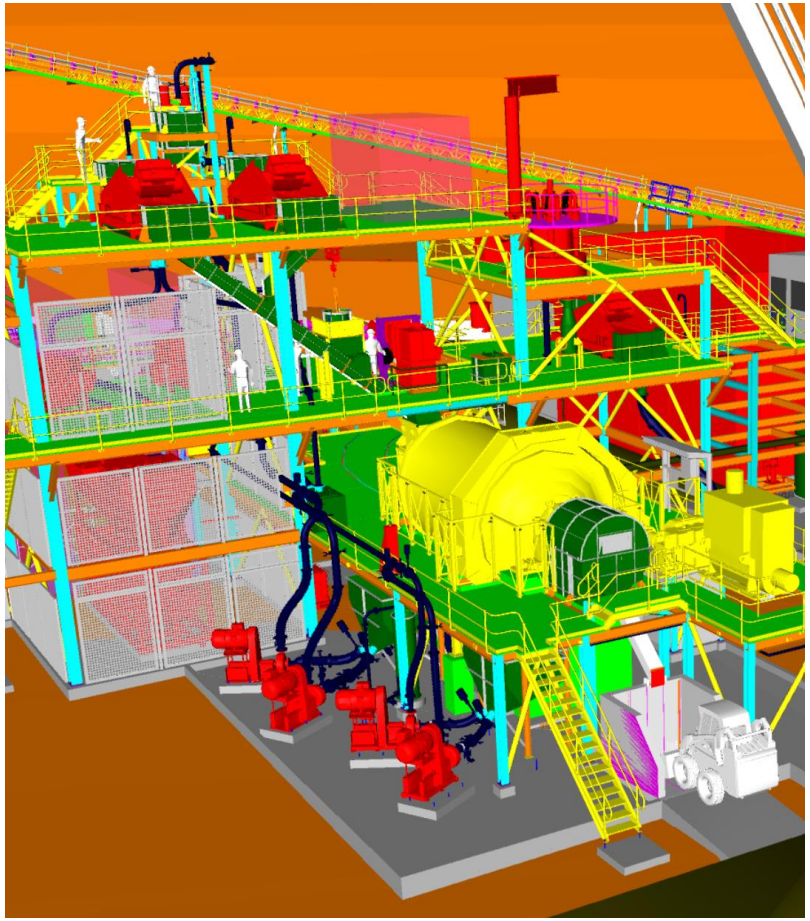
Metallurgy

- Variability Test Work
  - Aimed defining metallurgical performance of base case ‘flipped’ flowsheet and understanding impact of variability on circuit performance.
    - 15 samples selected; varying Au, As, S, Sb and Bi grades to understand impact on metallurgical response
  - Pertinent outcomes:
    - Photon Head assay range 1.3g/t to 27.8 g/t with average 7.365 g/t. SFA average 7.51 g/t.
    - SFA indicates bi-modal Au distribution (40% +75µm, 60% -75µm)
    - BLEG yields overall gold recovery of 96.8%
    - Head grade vs gravity recovery correlation – 72% at 6.8 g/t
    - Residue grade impacted by arsenic head grade (±1,200 ppm)
    - Although stibnite is present, no adverse impacts on metallurgy
    - Additional liberation, via finer grinding to a threshold of approximately 75µm, improves gold liberation and recovery, following which an adverse impact on gravity recovery is evidenced
    - CNp discharge limits consistently met (~0.57 mg/L; 99% efficiency)
    - “Flipped” flowsheet gravity-tails leach yields 96.5% overall recovery (24 hrs)
    - Mini diagnostic assessment – 73% Sulphides, 24% Silicates



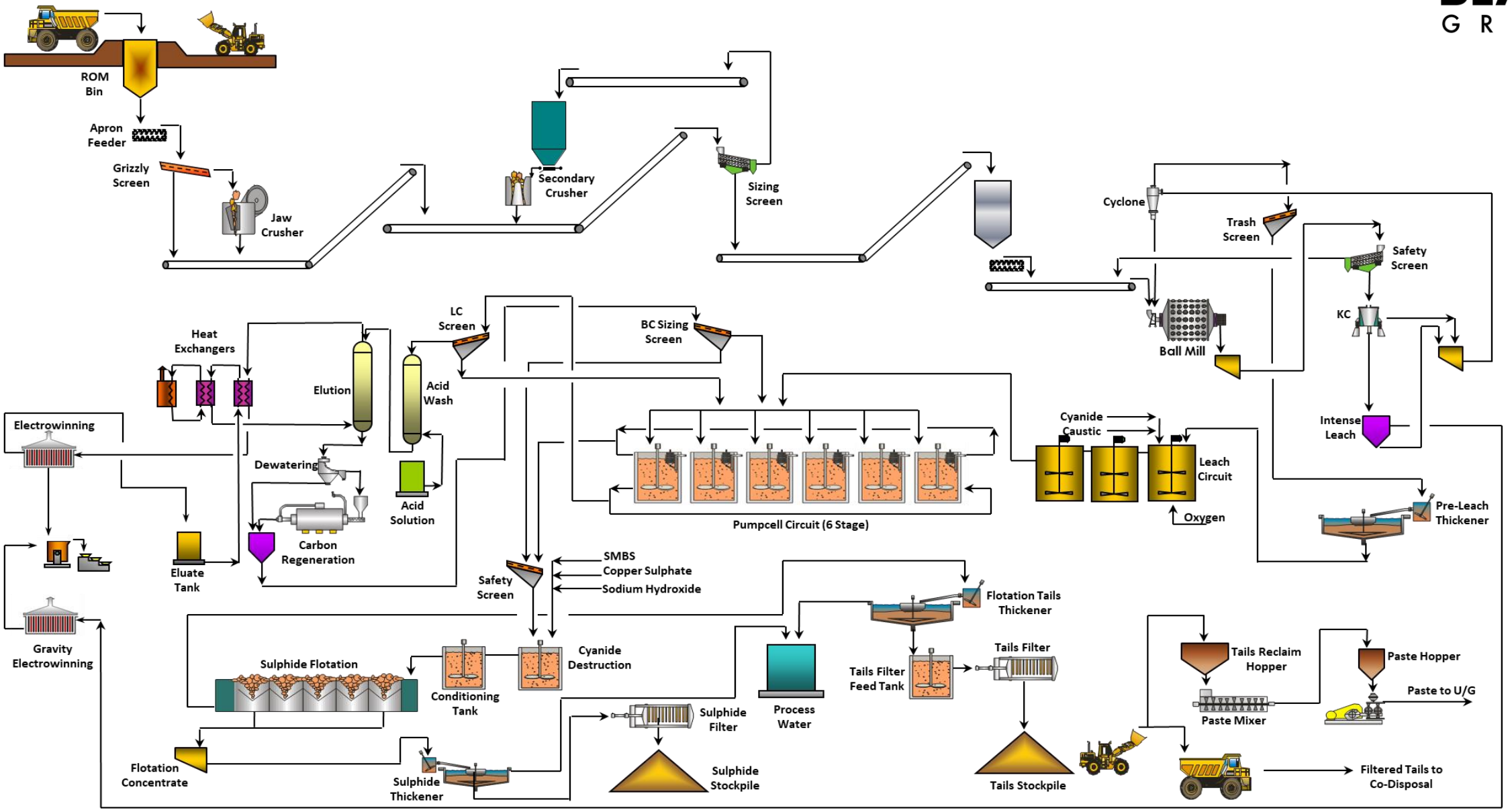


Flowsheet

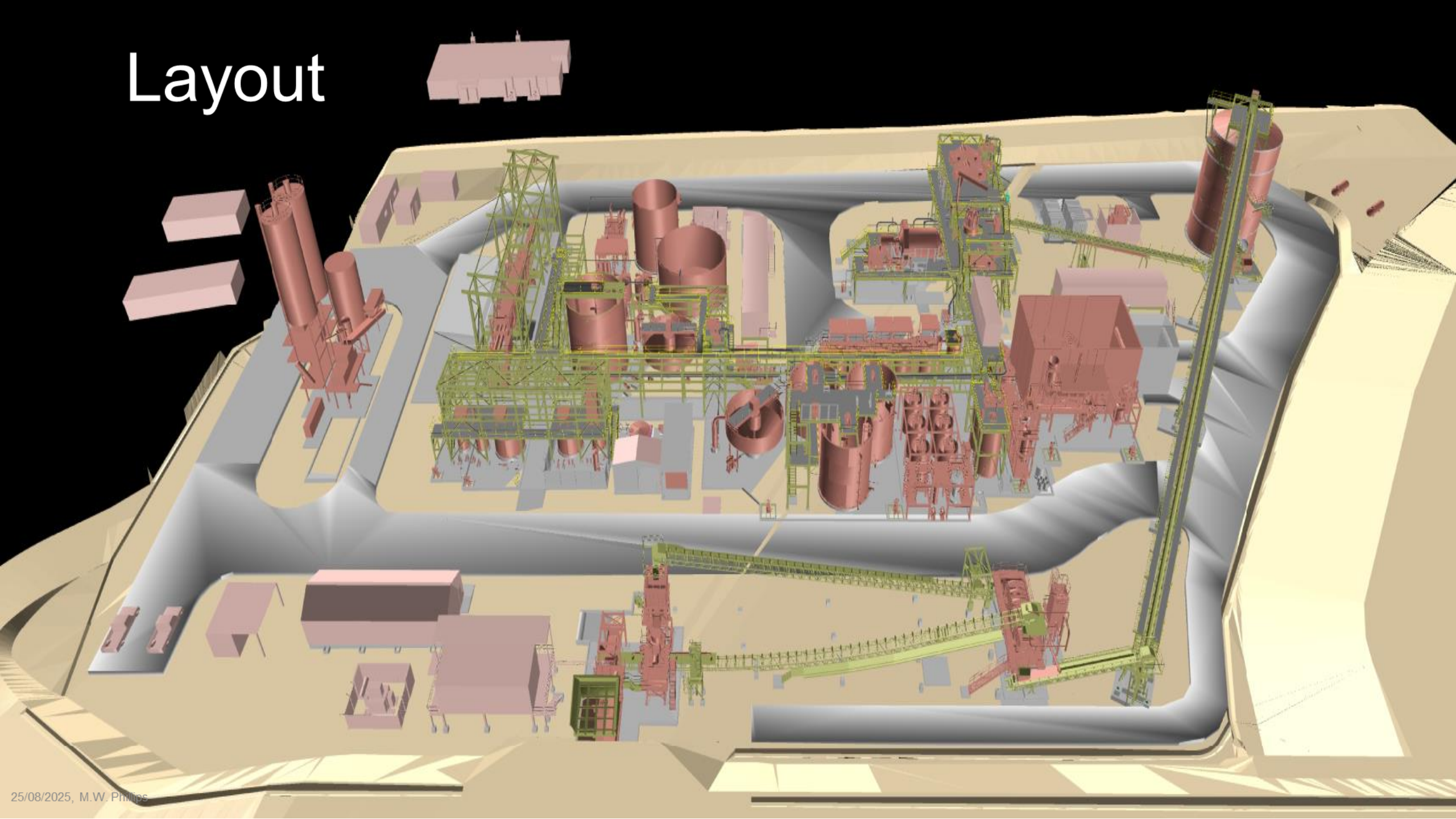


- Flowsheet development guided by metallurgical test work completed to date, in conjunction with mineralogy and geology
- Components:
  - Two stage crushing to P_{80} 14mm
  - Ore storage, 24 hrs or 1,150 t
  - Single stage ball mill (12'x 18', 1,250 kW) to P_{80} 75µm
  - Full stream gravity recovery on ball mill discharge, 2 x QS30
  - Intensive leach reactor, ILR 2000BA, processing 3-tonne per day
  - Pre-leach thickening and leach circuit (24 hrs)
  - PCIP circuit (6 x 15m³; 1.5 hrs)
  - 0.75t ZADRA elution circuit, carbon regeneration
  - Gold room with dedicated gravity and CIP electrowinning circuits
  - Air/SO_2 cyanide destruction
  - Flotation (5 x 10m³, 20 minutes)
  - Tails thickening and sulphide concentrate thickening
  - Filtration (PF1520, 90 chamber and PF800, 60 chamber) to 14% moisture
  - Paste Plant (40m³/hr)
  - Reagents
  - Services

Flowsheet Schematic



Layout



Construction Progress

Site Pad Preparation Progress

Ball Mill Shell Complete

- Key Dates:
  - Construction complete 17/11/26
  - Start Pre-Commissioning 16/10/26
  - Commissioning Start 24/11/26
  - First Gold 24/12/26