

# Australian & New Zealand Gold Operations

## March Quarter 2017 - Final Report

### Overview

The average All-in Sustaining Cost (AISC) for Australia and New Zealand was A\$1,210/oz up 4.4% (A\$51/oz) on the previous quarter average AISC of A\$1,159/oz. Evolution Mining's part of the Ernest Henry operations was the lowest cost producer reporting an AISC of A\$-447/oz followed by Newcrest's Cadia Valley operations with an AISC of A\$235/oz, then by Evolution Mining's Mt Carlton (A\$509/oz) and Cannon (A\$586/oz) a 50/50 profit share between Southern Gold Limited and Westgold Resources Limited. The average spot price for the quarter was A\$1,608/oz (US\$1,219/oz). It should be noted that both Ernest Henry and Cadia Valley benefit from significant copper by-product credits in Evolution Mining's and Newcrest's calculation of AISC respectively, leading to a vastly lower AISC compared to other gold operations.

Newmont's Boddington operation kept top spot as Australia's largest gold producer with 202,000oz for the quarter, followed by Barrick and Newmont's Kalgoorlie operations (172,000oz) then Newcrest's Cadia Valley (168,579oz). Of the mines where gold is a by-product, OZ Minerals' Prominent Hill produced the most gold 26,136oz followed by Evolution's Ernest Henry 22,246oz and BHP's Olympic Dam with 21,941oz. The production at a number of mines was impacted by heavy rains during the quarter, for example Newmont's Tanami operation.

Grade wise for the companies that report AISC, the average reported mill head/feed grade was 3.41g/t (Open Pit (OP) - 1.83g/t, Underground (UG) - 4.77g/t, Open Pit & Underground (OP/UG) - 2.59g/t) which was similar to the previous quarter, 3.46g/t. St Barbara's Gwalia mine again took out the honour as the operation with the highest average feed grade with 11.20g/t, followed by Kirkland Lake's Fosterville mine 11.10g/t. The lowest grade was Evolution's Ernest Henry processing an average head grade of 0.56g/t. The high grade operations that do not report an AISC were Mandalay's Costerfield with 8.33g/t and LionGold Corp's Ballarat operation with 6.30g/t.

### Top 10 Gold Producing Operations

Rank	Operation	Company	Mine Type	Au Produced (oz)
1	Boddington	Newmont Mining Corporation	OP	202,000
2	Kalgoorlie	Newmont Mining Corporation / Barrick Gold Corporation	OP/UG	172,000
3	Cadia Valley	Newcrest Mining Limited	UG	168,579
4	Tropicana	AngloGold Ashanti Limited / Independence Group NL	OP	99,884
5	Kalgoorlie Operations	Northern Star Resources Limited / Tribune Resources Limited / Rand Mining Limited	UG	91,301
6	St Ives	Gold Fields Limited	OP/UG	81,600
7	Telfer	Newcrest Mining Limited	OP/UG	76,022
8	Tanami	Newmont Mining Corporation	UG	74,000
9	Granny Smith	Gold Fields Limited	UG	71,900
10	Gwalia	St Barbara Limited	UG	64,916

### Supported By



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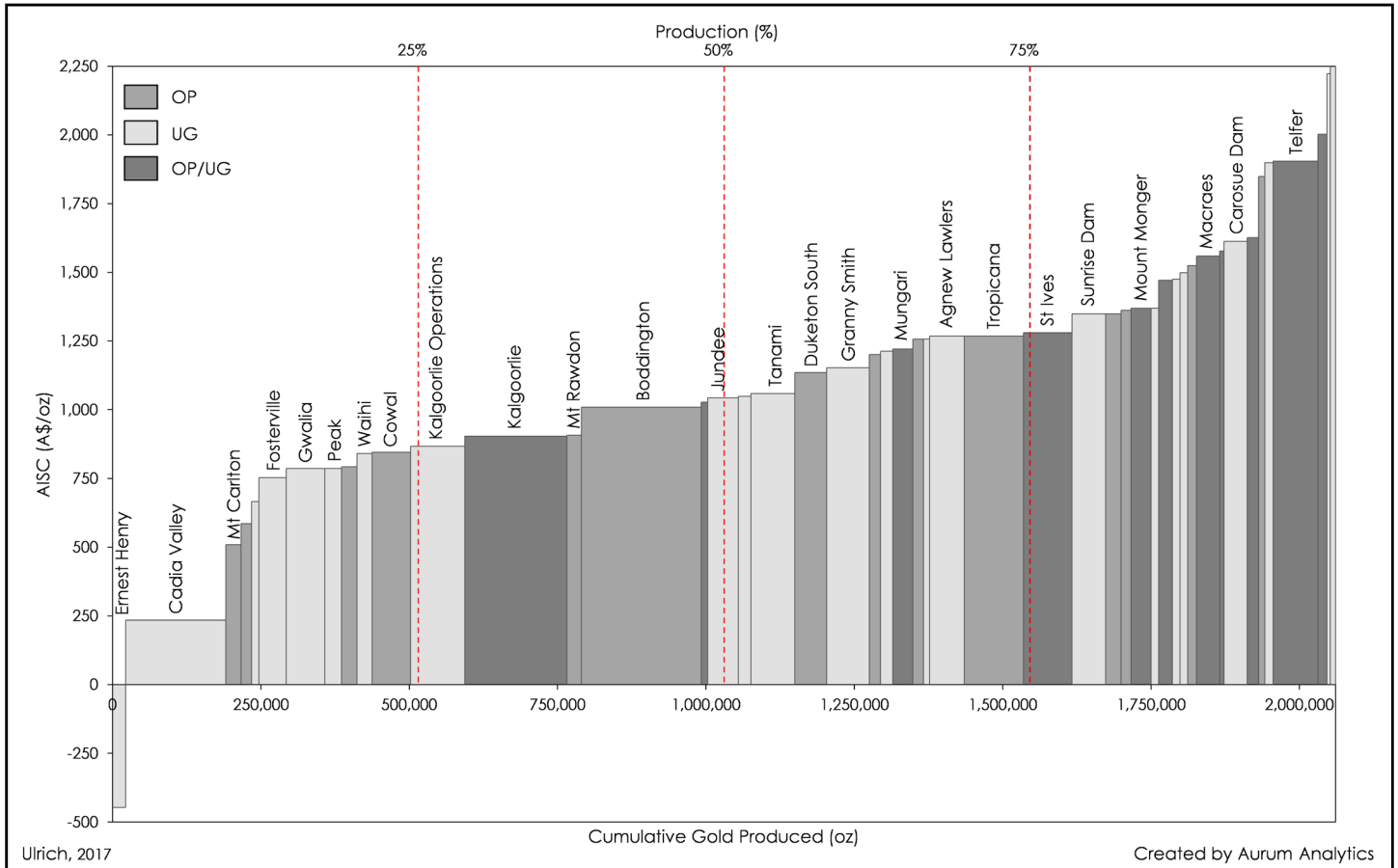
# All-in Sustaining Costs & Grade

## Gold Operations That Report AISC

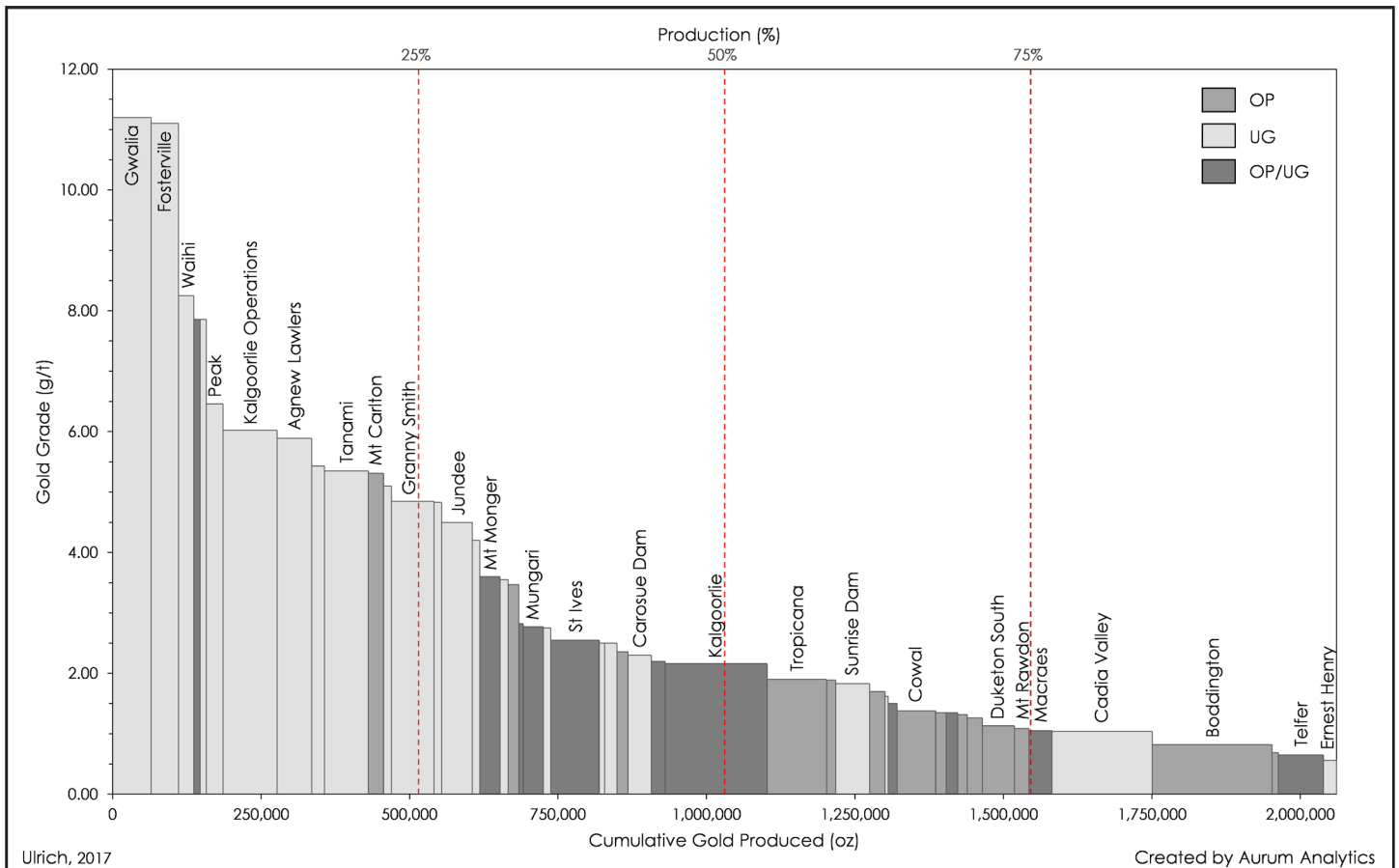
AISC Rank	Operation	Company	Mine Type	AISC (A\$/oz)	Grade (g/t)	Grade Rank	Au Produced (oz)
1	Ernest Henry	Evolution Mining Limited	UG	-447	0.56	48	22,246
2	Cadia Valley	Newcrest Mining Limited	UG	235	1.04	44	168,579
3	Mt Carlton	Evolution Mining Limited	OP	509	5.31	11	25,536
4	Cannon	Southern Gold Limited	OP	586	3.47	19	17,898
5	Hera	Aurelia Metals Limited	UG	666	4.83	14	12,488
6	Fosterville	Kirkland Lake Gold Limited	UG	753	11.10	2	46,083
7=	Gwalia	St Barbara Limited	UG	786	11.20	1	64,916
7=	Peak	New Gold Inc	UG	786	6.46	6	28,347
9	Duketon North	Regis Resources Limited	OP	792	1.26	40	25,591
10	Waihi	OceanaGold Corporation	UG	841	8.25	3	25,860
11	Cowal	Evolution Mining Limited	OP	845	1.38	36	64,699
12	Kalgoorlie Operations	JV Northern Star / Tribune / Rand	UG	867	6.02	7	91,301
13	Kalgoorlie	JV Newmont / Barrick	OP/UG	904	2.16	29	172,000
14	Mt Rawdon	Evolution Mining Limited	OP	907	1.09	42	24,662
15	Boddington	Newmont Mining Corporation	OP	1,010	0.82	45	202,000
16	Nicolsons	Pantoro Limited	OP/UG	1,028	7.86	4=	10,348
17	Jundee	Northern Star Resources Limited	UG	1,043	4.50	15	51,926
18	Cracow	Evolution Mining Limited	UG	1,049	5.43	9	21,388
19	Tanami	Newmont Mining Corporation	UG	1,059	5.35	10	74,000
20	Duketon South	Regis Resources Limited	OP	1,135	1.13	41	53,632
21	Granny Smith	Gold Fields Limited	UG	1,153	4.85	13	71,900
22	Tomingley	Alkane Resources Limited	OP	1,201	2.36	26	18,721
23	Plutonic	Superior Gold Inc	UG	1,213	2.50	24=	20,769
24	Mungari	Evolution Mining Limited	OP/UG	1,221	2.77	21	33,915
25=	Mt Magnet	Ramelius Resources Limited	OP	1,257	1.35	37=	17,774
25=	Vivien	Ramelius Resources Limited	UG	1,257	7.86	4=	10,309
27=	Agnew Lawlers	Gold Fields Limited	UG	1,268	5.89	8	58,300
27=	Tropicana	JV AngloGold / Independence	OP	1,268	1.90	30	99,884
29	St Ives	Gold Fields Limited	OP/UG	1,280	2.55	23	81,600
30=	Sunrise Dam	AngloGold Ashanti Limited	UG	1,349	1.83	32	57,000
30=	Thunderbox	Saracen Mineral Holdings Limited	OP	1,349	1.70	33	26,097
32	Nullagine	Millennium Minerals Limited	OP	1,362	1.32	39	16,543
33=	Mount Monger	Silver Lake Resources Limited	OP/UG	1,370	3.60	17	33,868
33=	Paulsens	Northern Star Resources Limited	UG	1,370	4.20	16	12,697
35	Central Murchison	Westgold Resources Limited	OP/UG	1,471	2.20	28	23,328
36	Challenger	WPG Resources Limited	UG	1,475	2.75	22	12,406
37	Andy Well	Doray Minerals Limited	UG	1,498	5.10	12	13,042
38	Higginsville	Westgold Resources Limited	OP	1,525	1.89	31	15,267
39	Macraes	OceanaGold Corporation	OP/UG	1,559	1.05	43	38,550
40	South Kalgoorlie	Westgold Resources Limited	OP/UG	1,578	2.82	20	7,646
41	Carosue Dam	Saracen Mineral Holdings Limited	UG	1,613	2.30	27	39,033
42	Ravenswood	Resolute Mining Limited	OP/UG	1,626	1.35	37=	19,328
43	Edna May	Evolution Mining Limited	OP	1,849	0.69	46	10,480
44	Darlot	Gold Fields Limited	UG	1,899	3.55	18	13,700
45	Telfer	Newcrest Mining Limited	OP/UG	1,904	0.65	47	76,022
46	Matilda-Wiluna	Blackham Resources Limited	OP/UG	2,002	1.50	35	14,920
47	Beta Hunt	Royal Nickel Corporation	UG	2,222	1.62	34	5,535
48	Cosmo	Kirkland Lake Gold Limited	UG	2,590	2.50	24=	9,092

Notes: Operations are shown on a 100% basis.

## Gold Production Cost Curve Ranked By Reported AISC



## Gold Production Grade Curve Ranked By Average Mill Feed/Head Grade



## Gold Mines That Did Not Report All-in Sustaining Costs

Rank	Operation	Company	Mine Type	Grade (g/t)	Au Produced (oz)
1	Ballarat	LionGold Corp Ltd	UG	6.30	11,000
2	Deflector	Doray Minerals Limited	OP/UG	3.60	9,455
3	Costerfield	Mandalay Resources Limited	UG	8.33	7,987
4	Kalgoorlie North	Excelsior Gold Limited	OP	1.80	6,883
5	A1	Centennial Mining Limited	UG	6.29	4,632
NR	Pajingo	Minjar Gold Pty Ltd <sup>1</sup>	UG	NA	NA
NR	Marvel Loch	China Hanking Holdings Limited <sup>1</sup>	OP/UG	NA	NA
NR	Paddington	Zijin Mining Group Company Limited <sup>1</sup>	OP/UG	NA	NA

1. These companies do not provide detailed quarterly production statistics.

## Mines Where Gold Is A By-Product

Rank	Operation	Company	Mine Type	Au Produced (oz)
1	Prominent Hill	OZ Minerals Limited	OP/UG	26,135
2	Ernest Henry	Evolution Mining Limited	UG	22,246
3	Olympic Dam	BHP Billiton Limited	UG	21,941
4	North Parkes <sup>1</sup>	China Molybdenum Co Ltd / Sumitomo Australia Pty Ltd	UG	10,349
5	DeGrussa	Sandfire Resources NL	UG	8,988
6	Rosebery	MMG Limited	UG	7,336
7	Kanmantoo	Hillgrove Resources Limited	OP	1,060
8	Jaguar	Independence Group NL	UG	439
NR	Golden Grove	EMR Capital	UG	NA

1. North Parkes is a joint venture between China Molybdenum Co Ltd (80%) and Sumitomo Australia Pty Ltd (20%).

## Quarter on Quarter Change in AISC and Grade

Statistic	AISC (A\$/oz)	Change (%)	Grade (g/t)	Change (%)
Average (Simple) <sup>1</sup>	1,210	4.4	3.41	-1.3
Average (Weighted) <sup>2</sup>	1,059	0.5	1.65	-1.9
Minimum	-447	-292.1	0.56	-3.4
First Quartile	867	-10.2	1.05	1.0
Median	1,043	-3.5	2.16	-1.4
Third Quartile	1,268	4.5	4.85	1.3
Maximum	2,590	34.8	11.20	-0.9

1. Simple averages done by number of mining operations.

2. AISC weighted by gold ounces produced, Au grade weighted by ore tonnes milled.

## Top 5 Gold Operations - Major Gold Miners

Gold Production (Attributable)			All-in Sustaining Costs		
Rank	Operation	oz	Rank	Operation	A\$/oz
1	Boddington	202,000	1	Cadia Valley	235
2	Kalgoorlie <sup>1</sup>	172,000	2	Kalgoorlie <sup>1</sup>	904
3	Cadia Valley	168,579	3	Boddington	1,010
4	Tropicana <sup>2</sup>	99,884	4	Tanami	1,059
5	St Ives	81,600	5	Granny Smith	1,153

1. Kalgoorlie is a joint venture between Newmont Mining Corporation (50%) and Barrick Gold Corporation (50%).

2. Tropicana is a joint Venture between AgloGold Ashanti Limited (70%) and Independence Group NL (30%).

## Top 5 Gold Operations - Mid-Tier Gold Miners

Gold Production (Attributable)			All-in Sustaining Costs		
Rank	Operation	oz	Rank	Operation	A\$/oz
1	Gwalia	64,916	1	Ernest Henry	-447
2	Cowal	64,699	2	Mt Carlton	509
3	Kalgoorlie Operations <sup>1</sup>	61,130	3	Fosterville	753
4	Duketon South	53,632	4=	Gwalia	786
5	Jundee	51,926	4=	Peak	786

1. Kalgoorlie Operations gold produced represents Northern Star Resources Limited's attributable gold produced only.

## Top 5 Gold Operations - Junior Gold Miners

Gold Production (Attributable)			All-in Sustaining Costs		
Rank	Operation	oz	Rank	Operation	A\$/oz
1	Mount Monger	33,868	1	Cannon <sup>2</sup>	586
2	Kalgoorlie Operations <sup>1</sup>	22,628	2	Hera	666
3	Plutonic	20,769	3	Nicolsons	1,028
4	Tomingley	18,721	4	Tomingley	1,201
5	Cannon <sup>2</sup>	17,898	5	Plutonic	1,213

1. Kalgoorlie Operations gold produced represents Tribune Resources Limited's attributable gold production from the East Kundana Joint Venture.

2. Cannon is owned by Southern Gold Limited, but has a mining and processing arrangement with Westgold Resources Limited for 50% of gold produced.

## Top 5 Pure Gold Operations (No Base Metal By or Co-Products)

Gold Production (Total)			All-in Sustaining Costs		
Rank	Operation	oz	Rank	Operation	A\$/oz
1	Kalgoorlie <sup>1</sup>	172,000	1	Cannon <sup>4</sup>	586
2	Tropicana <sup>2</sup>	99,884	2	Fosterville	753
3	Kalgoorlie Operations <sup>3</sup>	91,301	3	Gwalia	786
4	St Ives	81,600	4	Duketon North	792
5	Tanami <sup>3</sup>	74,000	5	Waihi	841

1. Kalgoorlie is a joint venture between Newmont Mining Corporation (50%) and Barrick Gold Corporation (50%).

2. Tropicana is a joint venture between AngloGold Ashanti Limited (70%) and Independence Group NL (30%).

3. Kalgoorlie Operations gold produced represents total gold attributable to Northern Star Resources Limited, Tribune Resources Limited and Rand Mining Limited.

4. Cannon is owned by Southern Gold Limited, but has a mining and processing arrangement with Westgold Resources Limited for 50% of gold produced.

## General Notes

Data was sourced from company quarterly reports. Aurum Analytics created the cost and grade curves. Mine Type reflects the source of the ore mined for the quarter, OP - Open Pit, UG - Underground, OP/UG - Open Pit and Underground and NM - No Mining.

For operations in joint venture such as Kalgoorlie and Tropicana AISC values were apportioned by equity ownership percentages. Kalgoorlie Operations is based on Northern Star Resources Limited's reported AISC only as Tribune Resources Limited and Rand Mining Limited do not report an AISC. Ocean-aGold's Macraes and Waihi operations, the quarterly AISC values were back calculated using the previous quarter(s) AISC results.

Where AISC values were reported in US\$ and no A\$ equivalent provided, the quarterly average US\$/A\$ exchange rate (0.7583) from the Reserve Bank of Australia was used.

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## About Aurum Analytics

Aurum Analytics is an independent business providing information and analysis on the Australian and New Zealand gold industry. The information and analysis given is a by-product of Sam Ulrich's PhD research at The University of Western Australia's Centre for Exploration Targeting titled "Geological drivers and strategic implications of competitive advantage in Australian and New Zealand gold mines, linking geology to mine economics."

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