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Comparison of All-in Sustaining Costs, Gold Grade, and Gold Prices in North American Gold Mining Companies

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ABSTRACT

Mining has evolved into an equilibrium of ore deposit management, environmental stewardship, and economic profitability that necessitates a proper understanding of economics and production efficiency. The All-In Sustaining Cost (AISC) was introduced in 2013 to better capture the cost of producing one ounce of gold and, when compared with the gold price and grade, could describe a company's gold production efficiency. In this paper, this novel analysis focuses on US and Canadian operations under Barrick and Newmont, the two largest gold mining companies in North America, from 2019-2022. Published data for Coeur and Kinross were also secondarily analyzed. Under Newmont Corporation, Cripple Creek & Victor (CC&V) consistently demonstrated higher AISC than Éléonore (except in 2020), hinting at potential challenges in profitability for CC&V. Overall, Éléonore boasted a higher gold grade, potentially mitigating certain production costs and bolstering profitability relative to CC&V. Under Barrick Corporation, Hemlo consistently demonstrated higher AISC compared to Nevada Gold Mines, suggesting potential profitability challenges. Despite boasting a higher gold grade overall, Hemlo encountered reduced cost efficiency due to its higher production costs relative to the prevailing gold price. In terms of sustainability, all operations must continue to address efficient resource management, adherence to regulatory standards, and community engagement efforts. Areas for future research include comparisons of AISC, gold cost, and gold grade between surface and underground mine operations, as well as intercontinental comparisons among settings with varying labor costs and degrees of sustainability efforts.

KEYWORDS

All-In Sustaining Cost, AISC, Gold Grade, Gold Cost, Gold Price, Sustainability

STATEMENTS AND DECLARATIONS

The authors do not have any financial or non-financial interests that are directly or indirectly related to the work submitted for publication.

INTRODUCTION

An ancient industry dating back to the use of rocks as tools, mining has evolved from an abstract task to an equilibrium of ore deposit management, environmental stewardship, and economic profitability [1]. A poor reputation concerning the economics of the mineral ore business, however, places the onus on mining companies to streamline production. This necessitates a thorough understanding of how production costs balance with the quality and selling price of the ore produced, especially within the gold industry.

The formerly ubiquitous cash cost reporting system only factored in the costs of mining and processing an ounce of gold but omitted administrative and reclamation expenditures. While this metric attracted financiers, the true costs of gold production, all factors considered, could not sustain such investments [2]. As part of efforts to standardize the reporting of gold cost metrics, the World Gold Council (WGC) proposed the All-In Sustaining Cost (AISC) in 2013 to facilitate complete transparency. The AISC is, simply, the full cost associated with producing one ounce of gold. It reflects several expenses, including adjusted operating costs, general and administrative costs, and sustaining capital expenditure (Table 1).

Table 1. Guidance note on non-GAAP metrics – All-in Sustaining Costs and All-in Costs [3].

Cost Category	Source	US \$ / gold ounces sold
On-site mining and processing costs (on a sales basis)	Income Statement	(a)
On-site general and administrative costs	Income Statement	(b)
Royalties and production taxes	Income Statement	(c)
Realised gains and losses on hedges of operating costs	Income Statement	(d)
Community costs related to current operations	Income Statement	(e)
Permitting costs related to current operations	Income Statement	(f)
3 rd party smelting, refining and transport costs	Income Statement	(g)
Non-cash remuneration (site-based)	Income Statement	(h)
Stockpile, leach pad and product inventory write-downs	Income Statement	(i)
Operational Stripping Costs	Income Statement	(j)
By-product and co-product credits (Note: will be a credit)	Income Statement	(k)
Sub-total (Adjusted operating costs)		(l) = (a)+(b)+(c)+(d)+(e)+(f)+(g)+(h)+(i)+(j)+(k)
Corporate or regional general and administrative costs, including share-based remuneration (sustaining)	Income Statement	(m)
Reclamation & remediation – accretion & amortisation (operating sites)	Income Statement	(n)
Exploration and study costs (sustaining)	Income Statement	(o)
Capital exploration (sustaining)	Cash Flow	(p)
Capitalised stripping & underground mine development (sustaining)	Cash Flow	(q)
Sustaining capital expenditure	Cash Flow	(r)
Sustaining leases	Cash Flow	(s)
All-in Sustaining Costs		(t) = (l)+(m)+(n)+(o)+(p)+(q)+(r)+(s)
Growth and development costs <u>not</u> related to current operations	Income Statement	(u)
Community costs <u>not</u> related to current operations	Income Statement	(v)
Permitting costs <u>not</u> related to current operations	Income Statement	(w)
Reclamation and remediation costs <u>not</u> related to current operations	Income Statement	(x)
Exploration and study costs (non-sustaining)	Income Statement	(y)
Capital exploration (non-sustaining)	Cash Flow	(z)
Capitalised stripping & underground mine development (non-sustaining)	Cash Flow	(aa)
Non-sustaining capital expenditure	Cash Flow	(bb)
Non-sustaining leases	Cash Flow	(cc)
All-in Costs		= (t)+(u)+(v)+(w)+(x)+(y)+(z)+(aa)+(bb)+(cc)

Hitherto, there has been literature published on AISC analysis, but there has not yet been a direct comparison of AISC with gold grade and prices. This paper demonstrates the efficiency of gold production, by these metrics, within North American gold companies. While companies like Coeur and Kinross are included in this analysis, emphasis will be laid on Barrick and Newmont, the two largest gold mining companies in North America.

DEFINITION OF TERMS

All-in Sustaining Cost (AISC)

All-in sustaining costs commence with total cash costs and encompass mine site sustaining capital expenditures, sustaining leases, general and administrative costs, mine site exploration and evaluation costs, as well as reclamation cost accretion and amortization. These supplementary costs represent the expenses incurred to sustain ongoing production levels [4].

To properly define the attributable AISC and All-in Cost (AIC) per equivalent ounce sold, each gold company utilizes non-GAAP measures. In these metrics, the silver production of the company is converted into gold-equivalent ounces and added to the total production. AISC encompasses both the operating and capital expenses necessary to maintain gold production consistently over time. In addition, AIC consists of not only the AISC but also operating expenses incurred at locations without current operations, costs related to other non-sustaining activities, and capital expenditures for major growth projects or enhancement capital for significant infrastructure improvements at existing operations.

Attributable AISC and AIC per ounce sold on a by-product basis simply involves adjusting the total production cost of sales. This adjustment includes adding the total production cost of sales, general and administrative costs, other operating expenses (sustaining), reclamation and remediation costs (sustaining), exploration and business development costs (sustaining), and additions to property, plant, and equipment costs (sustaining) [5].

Several of the largest gold mining companies have endorsed the AISC as a better, more transparent cost reporting metric. Coeur management, for instance, has since 2019 employed the AISC and Costs Applicable to Sales (CAS) to assess their operational performance, spanning from discovery to final reclamation. The company praised the AISC as a valuable metric for analysts, investors, and stakeholders, providing insights into the costs associated with metal production, the economics of metal mining, and the evaluation of operational performance and cash flow generation [6]. Newmont has likewise touted the AISC as a metric that goes beyond both GAAP measures, like the cost of goods sold, and non-GAAP measures, such as CAS per ounce [7].

According to Coeur, the AISC may not indicate operating profit or cash flow from operations at GAAP standards. This was supplemented using CAS to evaluate the company's current operations and life of mine performance (Figure I).

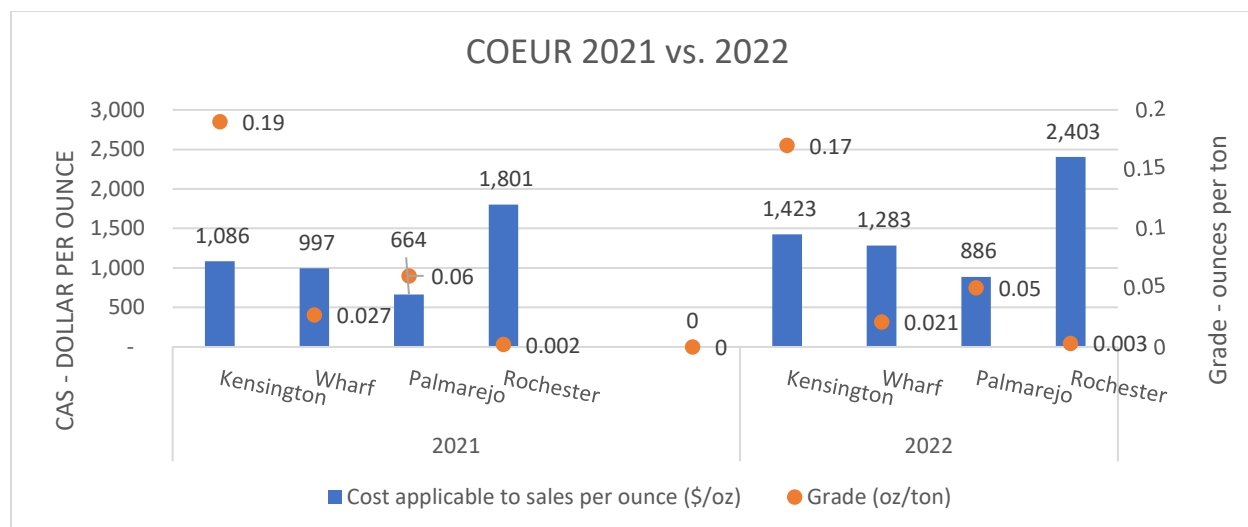


Figure 1. Coeur CAS comparison by operating sites from 2021-2022 (Company annual reports) [7-8].

Cost of Sales

The cost of sales, according to Barrick Gold Corporation in 2014, comprised direct mining costs, which involve personnel costs, specific general and administrative costs, energy costs (primarily diesel fuel and electricity), maintenance and repair costs, operating supplies, external services, third-party smelting, and transport fees. Additionally, it included depreciation related to sales, royalty expenses, and community relations expenses at operating sites [9]. However, the gold cost of sales per ounce is computed by dividing gold operation costs of sales (excluding sites in closure or care and maintenance) by the number of ounces sold, considering Barrick's ownership share on an attributable basis [4].

According to Kinross Gold Corporation, the attributable production cost of sales per equivalent ounce sold is a non-GAAP measure. It is calculated by dividing the attributable production cost of sales by the attributable number of gold equivalent ounces sold. This calculation involves converting the company's non-gold production into gold-equivalent ounces, which are then credited to the total production.

Consolidated production cost of sales per gold equivalent ounce sold is a non-GAAP measure. It is defined as the production cost of sales reported on the consolidated statement of operations divided by the total number of gold equivalent ounces sold. This measure involves converting the company's non-gold production into gold-equivalent ounces and including it in the total production.

The attributable production cost of sales per ounce sold on a by-product basis is a non-GAAP measure that credits the company's non-gold production against its per-ounce production costs. Unlike co-product accounting, where non-gold production is converted into gold equivalent ounces and credited to total production, this measure provides investors with the ability to evaluate Kinross' production cost of sales per ounce on a comparable basis with other

major gold producers. Many of these producers routinely calculate their cost of sales per ounce using by-product accounting instead of co-product accounting, according to management's belief [5].

According to Newmont, Costs applicable to sales (CAS) encompass all direct and indirect expenses associated with the ongoing gold production necessary to implement the current mine plan. CAS considers by-product credits from certain metals acquired during the extraction and processing of the primary ore body. It is accounted for on an accrual basis and does not include Amortization, Reclamation, and remediation [7].

Total Cash Costs

Prior to the introduction of AISC, Barrick stood out among the researched companies by exclusively employing cash cost in their cost reporting metrics, as opposed to CAS. According to Barrick Gold Corporation, cash cost is a metric that gauges the cost per ounce of gold. It is derived from the cost of sales related to gold production, excluding depreciation, the non-controlling interest of cost of sales, and incorporating by-product credits [4].

RESULTS AND DISCUSSION

The price of gold, according to Business Insider, remained stable from 2014-2019 and increased while COVID struck in 2020 (Figure 2). It is theorized that the consequent lockdown and stock market crash pushed investors to return to gold as their safe-haven asset and causality has been established between the rise in COVID-19 cases and increasing gold price [10]. By mid-2020, gold had risen from \$1500 to almost \$2000 (Figure 3).

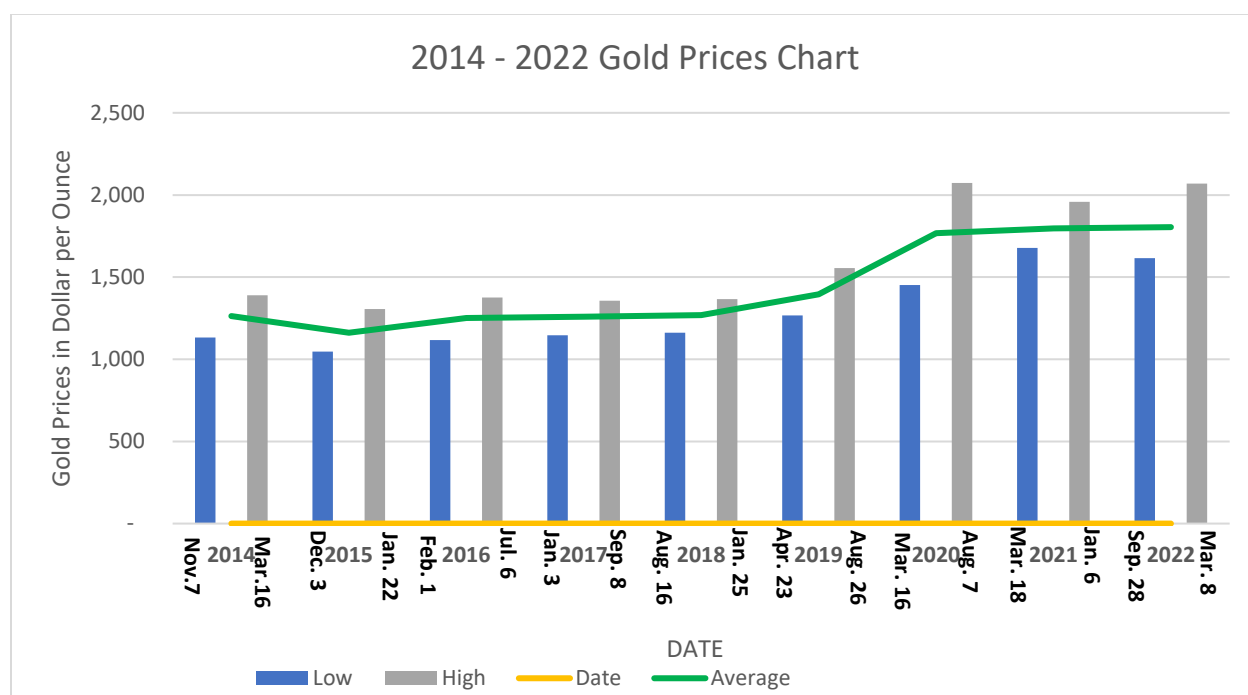


Figure 2. Summary of the Gold Prices from 2014–2022 (See Appendix for Gold Prices by year) [11].

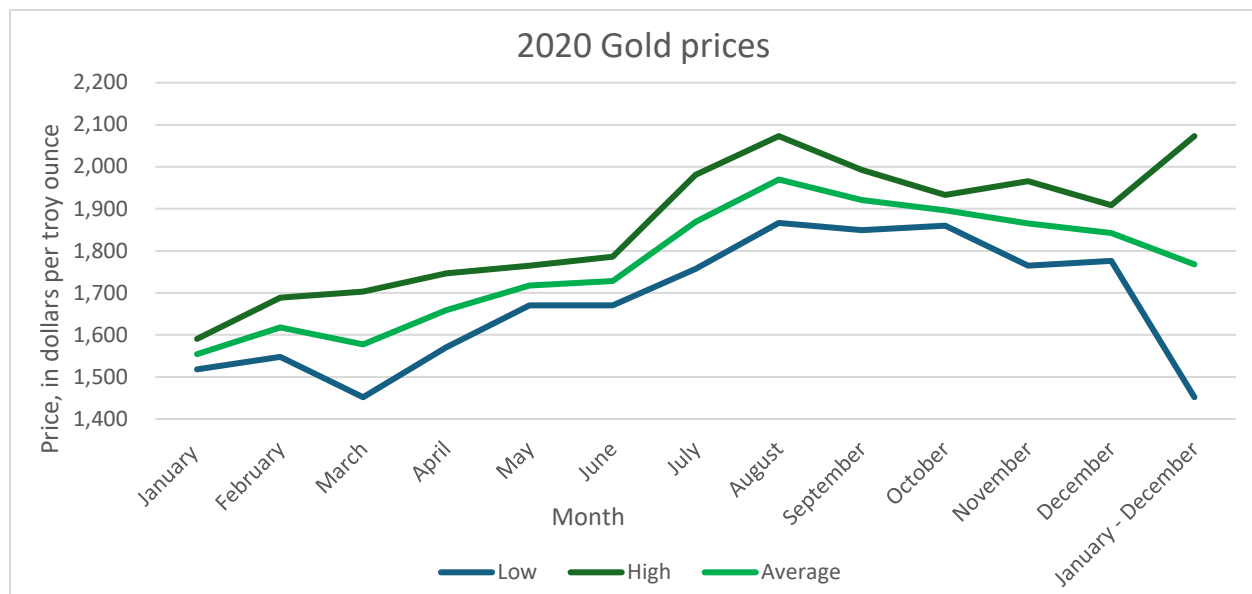


Figure 3. Gold Prices from January-December 2020 [11].

The vitality of the gold industry, even after a global economic crisis, underscores the need for economic acumen to maximize profit and efficiency. Our analysis, for simplicity, focuses on Newmont and Barrick. For adequate comparison, only data from 2019-2022 was used. AISC and gold grades reported prior to 2019 reflect horizontal mergers, acquisitions, and overlapping operation sites between the two companies, making any contrast of the two impossible and inconsistent over that period.

Summary of Tables

Newmont

Table 2. Newmont AISC and gold grade comparison between CC&V and Éléonore, 2019–2022 [7-8, 12-13]

	Newmont					
	CC&V			Éléonore		
	AISC (\$/oz)	Grade (gm/t)	Production (oz/yr)	AISC (\$/oz)	Grade (gm/t)	Production (oz/yr)
2019	1,071	0.53	322,000	1,013	4.84	246,000
2020	1,125	0.56	272,000	1,248	5.00	202,000
2021	1,338	0.53	220,000	1,256	5.05	253,000
2022	1,697	0.52	182,000	1,599	5.22	215,000

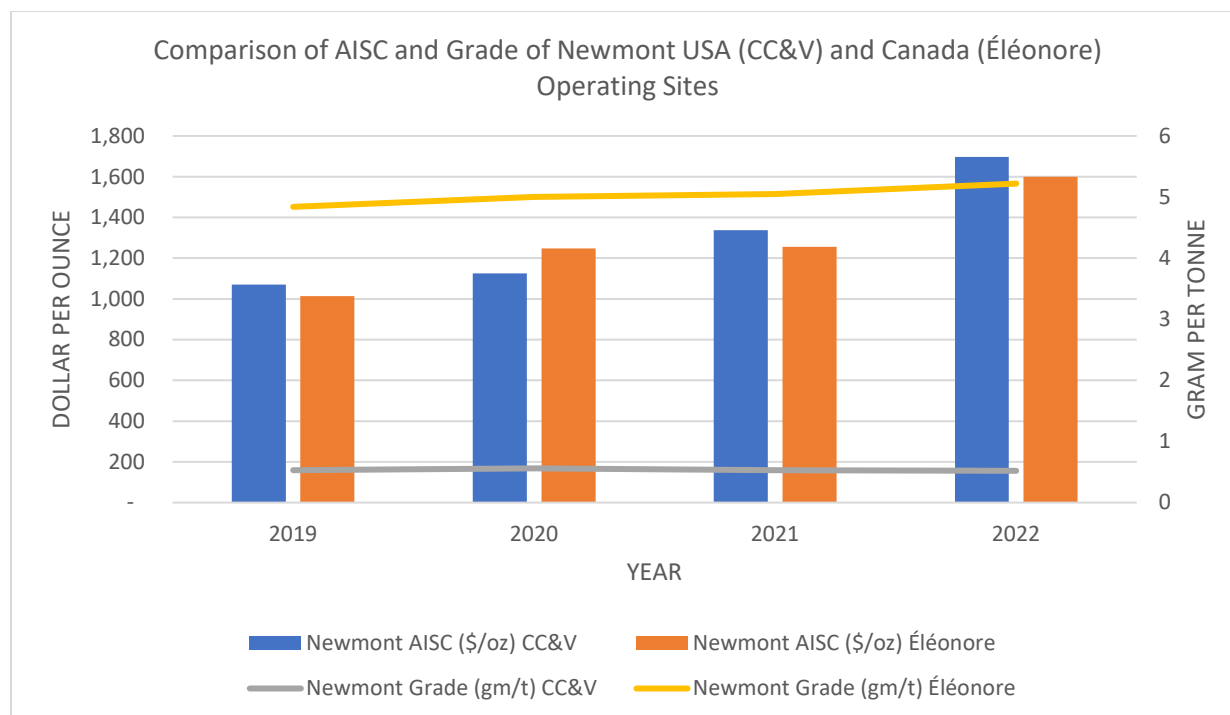


Figure 4. Newmont AISC and gold grade comparison between CC&V and Éléonore, 2019 – 2022 (Company Annual Reports) [7-8, 12-13].

In 2019, the Cripple Creek & Victor (CC&V) property incurred an AISC of \$1,071 per ounce to produce one ounce of gold. This placed the property's production costs at a relatively high level. With the average gold price standing at \$1,395 per ounce, the CC&V property operates with a margin of \$324 per ounce ($\$1,395 - \$1,071$). While this margin suggests profitability per ounce produced, it is relatively narrow, providing little buffer for unexpected expenses or market fluctuations. The sustainability of the CC&V property depends on its ability to maintain profitable operations over the long term. Given its lower grade, the property may need to process larger volumes of ore to sustain production levels, potentially impacting environmental sustainability.

In contrast, the Eleonore operation recorded an AISC of \$1,013 per ounce in 2019, indicating lower production costs compared to the average gold price of \$1,395 per ounce. This positions the Eleonore property with a margin of \$382 per ounce, indicating profitability per ounce produced. The operation benefits from a significantly higher gold grade of 4.84 g/t, enabling it to extract more gold from each ton of ore processed. This results in lower production costs per ounce compared to deposits with lower gold grades. The Eleonore operation may have a more optimistic outlook for sustainability relative to the CC&V property due to its lower production costs and higher grade. However, sustainable practices, including environmental stewardship, social responsibility, and economic viability, remain essential for both operations' long-term success.

The CC&V property recorded an AISC of \$1,125 per ounce, slightly below the average gold price of \$1,768 per ounce in 2020. This suggests a relatively healthy margin for profitability, with an operating margin of \$643 per ounce ($\$1,768 - \$1,125$). Despite a lower gold grade of 0.56 g/t, the CC&V property maintained efficient gold

extraction without significantly higher processing costs. This indicates reasonable economic performance, with production costs remaining below the prevailing gold price. However, the sustainability outlook for the CC&V property may face challenges due to its higher production costs compared to operations with higher gold grades. Nevertheless, efficient resource management and adherence to environmental and social standards are crucial for ensuring long-term sustainability.

On the other hand, the Eleonore operation had a slightly higher AISC of \$1,248 per ounce compared to the CC&V property. Despite this, its higher gold grade of 5.0 g/t contributed to a favorable margin for profitability, with an operating margin of \$520 per ounce (\$1,768 - \$1,248). The Eleonore operation benefited significantly from its higher gold grade, enabling more efficient gold extraction and potentially lower production costs per ounce. This indicates a stronger economic performance compared to the CC&V property. With its higher gold grade, Eleonore may exhibit better economic resilience and potential for long-term sustainability.

In 2021, the AISC of \$1,338 per ounce at the CC&V property represents the total expenses incurred to produce one ounce of gold. With the average gold price standing at \$1,797 per ounce, this suggests a relatively narrow margin for profitability, amounting to \$459. The property's lower gold grade of 0.53 g/t may necessitate processing larger ore volumes to extract equivalent gold amounts, potentially leading to higher production costs per ounce. The economic dynamics of the CC&V property are intricately linked to the interplay between production costs and the prevailing gold price. If the AISC surpasses the gold price, the operation may encounter profitability hurdles. Thus, economic viability hinges on various factors including operational efficiency, market conditions, and regulatory compliance. Given its higher production costs and lower gold grade, the CC&V property may encounter sustainability challenges.

Conversely, the Eleonore operation's AISC of \$1,256 per ounce in 2021 suggests a more promising margin for profitability compared to the CC&V property, given the identical average gold price. Benefiting from a higher gold grade of 5.05 g/t, the Eleonore operation can extract more gold from each ton of ore processed, potentially mitigating production costs per ounce. The economic landscape of the Eleonore operation is shaped by its production costs, gold grade, and the prevailing market gold price. Generally, higher gold grades correlate with improved economics, as they tend to reduce production costs per ounce. Despite its potentially superior cost profitability, the Eleonore operation must prioritize sustainability endeavors to ensure its long-term viability.

In 2022, the CC&V property incurred an AISC of \$1,697 per ounce, representing the total expenses to produce one ounce of gold. Despite the average gold price matching at \$1,804 per ounce, the margin for profitability is relatively narrow. The lower gold grade of 0.52 g/t at the CC&V property may necessitate processing larger ore volumes to extract the same amount of gold, potentially leading to higher production costs per ounce. Economic viability at the CC&V property hinges on the delicate balance between production costs and the prevailing gold price, and if the

AISC exceeds the gold price, the operation may face profitability challenges. Additionally, the CC&V property may encounter sustainability challenges due to its higher production costs and lower gold grade.

Contrastingly, the Eleonore operation exhibited an AISC of \$1,599 per ounce, suggesting a relatively better margin for profitability compared to the CC&V property, despite the identical average gold price. With a higher gold grade of 5.22 g/t, the Eleonore operation can extract more gold from each ton of ore processed, potentially reducing production costs per ounce. The economic performance of the Eleonore operation is influenced by its production costs, gold grade, and the prevailing market gold price. Typically, higher gold grades lead to improved economics by lowering production costs per ounce.

From 2019 to 2022, both the CC&V property and the Eleonore operation underwent fluctuations in their AISC. The CC&V property consistently demonstrated higher AISC compared to the Eleonore operation (except in 2020), hinting at potential challenges in profitability. Changes in the average gold price affected the gap between AISC and the gold price, directly influencing the profitability of both operations. Some years witnessed margins allowing profitability per ounce produced for both operations, while in others, narrower margins presented challenges. Overall, the Eleonore operation tended to boast a higher gold grade, potentially mitigating certain production costs and bolstering profitability relative to the CC&V property. Prioritizing sustainable practices is imperative for both operations to secure long-term success, encompassing aspects such as environmental stewardship, social responsibility, and economic viability.

The CC&V property's sustainability may encounter hurdles due to its relatively higher production costs and lower gold grade, necessitating meticulous resource management and community engagement endeavors. On the other hand, the Eleonore operation benefits from a superior gold grade, which may facilitate more efficient resource utilization and potentially reduce environmental impacts per ounce of gold produced. Nonetheless, addressing sustainability challenges remains vital for the Eleonore operation to uphold its long-term viability.

Barrick

Table 3. Barrick AISC and gold grade comparison between NGM and Hemlo, 2019- 2022 [4, 9, 14-15].

	Barrick					
	Nevada Gold Mines			Hemlo		
	AISC (\$/oz)	Grade (gm/t)	Production (oz/yr.)	AISC (\$/oz)	Grade (gm/t)	Production (oz/yr.)
2019	828	1.96	2,218,000	1,140	3.90	213,000
2020	941	2.05	2,131,000	1,423	4.82	223,000
2021	949	1.90	2,036,000	1,970	5.16	150,000
2022	1,214	2.53	1,862,000	1,788	2.25	133,000

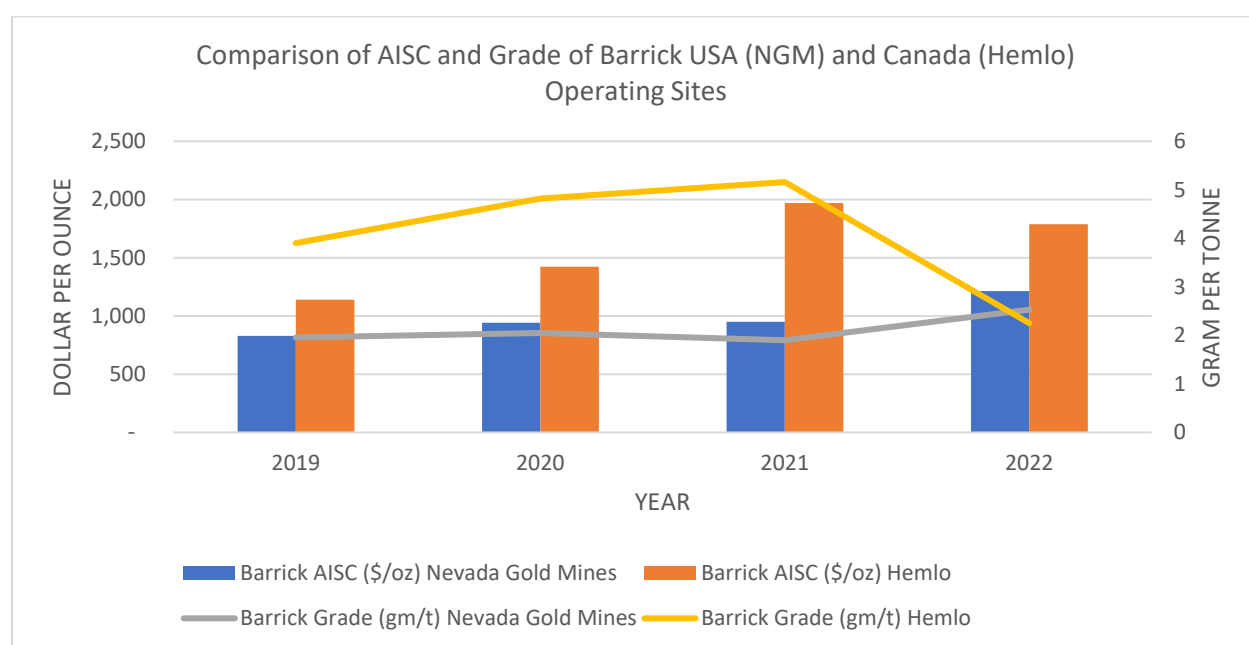


Figure 5. Barrick AISC and gold grade comparison between NGM and Hemlo, 2019- 2022 (Company Annual Reports) [4, 9, 14-15].

In 2019, The Nevada Gold Mines (NGM) property showcased a favorable cost-profitability scenario with an AISC of \$828 per ounce, significantly below the average gold price of \$1,395 per ounce. This substantial operating margin of \$467 per ounce suggests a robust profitability outlook. Despite a moderate gold grade of 1.96 g/t, efficient gold extraction methods are employed, keeping processing costs in check. Economically, the property appears resilient, with production costs comfortably beneath the prevailing gold price. Furthermore, the sustainability outlook for the NGM property appears promising, owing to its efficient production processes and favorable cost-profitability dynamics.

In contrast, Hemlo presents a less favorable cost – profitability scenario compared to the NGM property, with an All-in Sustaining Cost (AISC) of \$1,140 per ounce, falling below the average gold price of \$1,395 per ounce. This results in a narrower operating margin of \$225 per ounce. Additionally, Hemlo boasts a higher gold grade of 3.9g/t, indicating that production costs are below the prevailing gold price. Sustainability considerations are imperative for Hemlo to address its economic challenges

In 2020, NGM boasted AISC of \$941 per ounce, which is below the average gold price of \$1,768 per ounce. Despite its lower gold grade of 2.05 gm/t, this indicates a relatively healthy margin for profitability. With an operating margin of \$827 per ounce ($\$1,768 - \941), the property efficiently extracts gold without incurring significantly higher processing costs. Economically, although there are some cost pressures, the property demonstrates resilience as its costs remain somewhat below the prevailing gold price.

On the other hand, Hemlo had a slightly higher AISC of \$1,423 per ounce compared to NGM. Despite its higher gold grade of 4.82 g/t, it operated at a slightly lower margin for profitability, with an operating margin of \$345 per ounce ($\$1,768 - \$1,423$).

In 2021, despite an AISC of \$949 per ounce, NGM maintained a relatively favorable cost-profitability margin. Although slightly exceeding the average gold price of \$1,797 per ounce, the resulting operating margin ($\$1,797/\text{ounce} - \$949/\text{ounce} = \$848/\text{ounce}$) indicates a reasonably healthy profitability margin. Despite a moderate gold grade of 1.9 g/t, the property showcases efficiency in gold extraction, effectively minimizing processing costs. Economically, NGM demonstrates resilience, with production costs remaining below the prevailing gold price.

Conversely, Hemlo faced a less favorable cost-profitability scenario in 2021, with an AISC of \$1,970 per ounce surpassing the average gold price of \$1,797 per ounce. This led to a negative operating margin ($\$1,797/\text{ounce} - \$1,970/\text{ounce} = -\$173/\text{ounce}$), indicating potential profitability challenges. Despite boasting a higher gold grade of 5.16 g/t, Hemlo encountered reduced cost efficiency due to its higher production costs relative to the prevailing gold price. Economically, Hemlo grappled with hurdles associated with these higher production costs, potentially impacting its profitability.

Regarding sustainability, both operations must address their environmental, social, and economic impacts. Efficient resource management, adherence to regulatory standards, and community engagement efforts are imperative for long-term sustainability. Additionally, investments in technologies and practices aimed at reducing environmental footprint and enhancing community well-being contribute to sustainable operations in the mining industry.

In 2022, NGM maintained an AISC of \$1,214 per ounce, which was below the average gold price of \$1,804 per ounce. Despite a relatively lower gold grade of 2.53 gm/t, this suggests a reasonably healthy margin for profitability. With an operating margin of \$590 per ounce ($\$1,804 - \$1,214$), the property exhibits efficiency in gold extraction

without significantly elevated processing costs. Economically, although facing some cost pressures, NGM appears resilient, with its costs relatively below the prevailing gold price.

Hemlo's AISC of \$1,788 per ounce is indeed lower than the average gold price of \$1,804 per ounce, indicating a potential profitability advantage. In conjunction with a slightly lower gold grade of 2.25 g/t, the operation may still face challenges due to higher production costs compared to NGM. Economically, Hemlo could potentially benefit from its lower AISC relative to the gold price, but efficiency in cost management remains crucial for sustained profitability. Sustainability efforts should still be a priority to ensure responsible resource management and minimize environmental and social impacts.

In terms of sustainability, both operations need to address environmental, social, and economic impacts. Efficient resource management, adherence to regulatory standards, and community engagement efforts are vital for ensuring long-term sustainability. Additionally, investments in technologies and practices aimed at reducing environmental impact and enhancing community well-being contribute to sustainable operations in the mining industry.

Kinross

Kinross employs a unique approach to reporting their cost metrics, focusing on two key metrics: AISC -Attributable and Attributable AISC per equivalent ounce sold. Unlike Newmont and Barrick, they do not specifically analyze the AISC for individual properties. The Attributable AISC is derived by adjusting the total production cost of sales, while the Attributable AISC per equivalent ounce sold is plotted against the gold grade in this report. They calculate the Attributable AISC from continuing operations per equivalent ounce by adjusting various financial indicators, including net earnings, operating cash flow, free cash flow, and adjusted net earnings per share attributable to common stakeholders. This approach provides a comprehensive view of the company's cost performance and financial health, aiding investors, and stakeholders in assessing Kinross's operations [5].

Table 4. Kinross AISC and Gold Grade Comparison from 2014 – 2022 [5, 16-23]

KINROSS				
Year	AISC - Attributable (\$/oz)	Attributable AISC per equivalent ounce sold (\$/oz)	Grade (g/t)	Production (oz/yr)
2014	2,643	973	0.52	2,739,044
2015	2,544	975	0.50	2,620,262
2016	2,713	984	0.60	2,810,345
2017	2,391	946	0.60	2,698,136
2018	2,423	965	0.50	2,475,068
2019	2,450	983	0.50	2,527,788
2020	2,329	987	0.50	2,383,307
2021	2,345	1,138	0.50	2,083,016
2022	2,449	1,271	0.50	2,208,453



Figure 6. The Graph of Kinross Attributable AISC per equivalent ounce of gold sold versus the gold grade between 2014 – 2022 (Company Annual Reports) [5, 16-23].

Between 2014 – 2022, Kinross has maintained a positive profit margin throughout the years, indicating profitability even as AISC and gold prices fluctuate. This is a reflection of effective cost management and operational efficiency.

Coeur

Table 5. Coeur Cost Applicable to sales and gold grade comparison between Kensington and Wharf Operating Sites, 2015 – 2022 [6, 24-30].

Year	COEUR					
	Kensington			Wharf		
	CAS	Grade (oz/ton)	Production (oz/yr)	CAS	Grade (oz/ton)	Production (oz/yr)
2015	803	0.20	126,266	706	0.03	78,132
2016	795	0.21	124,331	606	0.03	109,175
2017	922	0.18	115,094	697	0.03	95,372
2018	1055	0.18	105,570	880	0.02	76,840
2019	917	0.21	127,914	937	0.023	84,172
2020	975	0.2	124,867	923	0.027	93,056
2021	1086	0.19	121,140	997	0.027	91,136
2022	1423	0.17	109,061	1,283	0.021	79,768

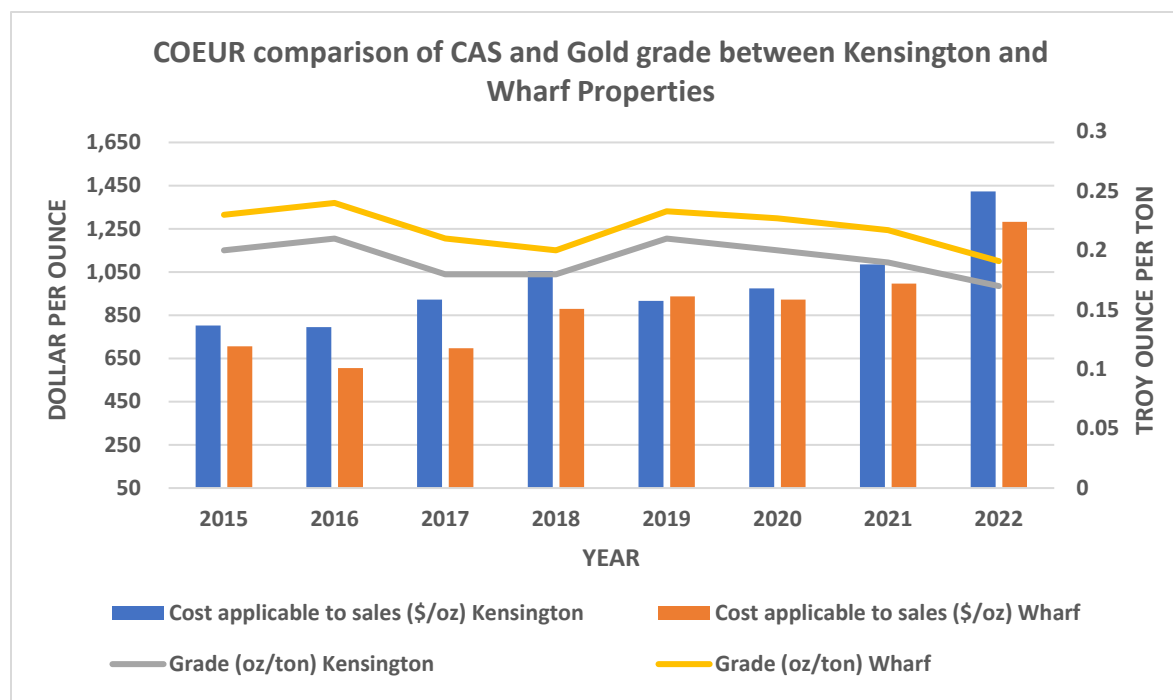


Figure 7. Coeur CAS and gold grade comparison between Kensington and Wharf Operating Sites 2015 – 2022. (Company Annual Reports) [6, 24-30].

From 2015 to 2022, both Kensington and Wharf properties of Coeur consistently achieved positive profit margins, demonstrating profitability despite variations in the cost applicable to sales and gold prices. This sustained profitability underscores the effective cost management and operational efficiency of these properties. It's worth noting that Kensington consistently reported higher CAS values (\$/oz) and gold grades (oz/ton) compared to Wharf Mines throughout the specified years.

AREAS OF FUTURE RESEARCH

Areas for future research include comparisons of AISC, gold cost, and gold grade between surface and underground mine operations, as well as intercontinental comparisons among settings with varying labor costs and degrees of sustainability efforts.

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APPENDIX

Table 6. Gold Price, 2014 [11].

		Low	Date	High	Date	Average
2014						
	January	1,204	Jan.2	1,278	Jan.27	1,241
	February	1,241	Feb.3	1,345	Feb.26	1,293
	March	1,283	Mar.31	1,390	Mar.16	1,336
	April	1,269	Apr.24	1,331	Apr.14	1,300
	May	1,242	May.30	1,315	Apr.5	1,279
	June	1,241	June. 2	1,330	June.30	1,285
	July	1,280	July.31	1,344	July.10	1,312
	August	1,272	Aug.25	1,322	Aug.8	1,297
	September	1,204	Sep.30	1,290	Sep.1	1,247
	October	1,162	Oct.31	1,255	Oct.21	1,208
	November	1,133	Nov.7	1,207	Nov.21	1,170
	December	1,144	Dec.1	1,238	Dec.10	1,191
	January - December	1,133	Nov.7	1,390	Mar.16	1,263

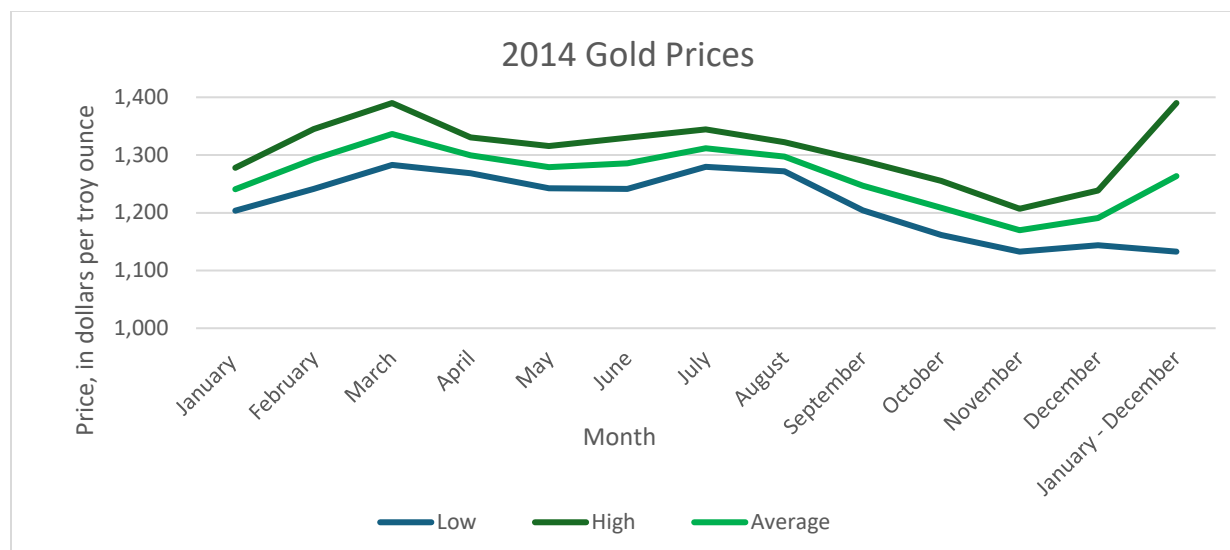


Figure 8. Gold prices for 2014 [11].

Table 7. Gold Price, 2015 [11].

		Low	Date	High	Date	Average
2015						
	January	1,169	Jan.2	1,306	Jan.22	1,238
	February	1,191	Feb.24	1,285	Feb.2	1,238
	March	1,144	Mar.17	1,223	Mar.2	1,184
	April	1,175	Apr. 24	1,224	Apr.6	1,200
	May	1,171	May.1	1,232	May. 18	1,202
	June	1,163	June. 5	1,206	June.18	1,184
	July	1,078	July. 24	1,179	July.1	1,128
	August	1,081	Aug.4	1,170	Aug.24	1,126
	September	1,102	Sep.9	1,148	Sep.28	1,125
	October	1,105	Oct.2	1,191	Oct.15	1,148
	November	1,054	Nov. 30	1,143	Nov.2	1,098
	December	1,046	Dec. 3	1,089	Dec.4	1,068
	January - December	1,046	Dec. 3	1,306	Jan.22	1,162

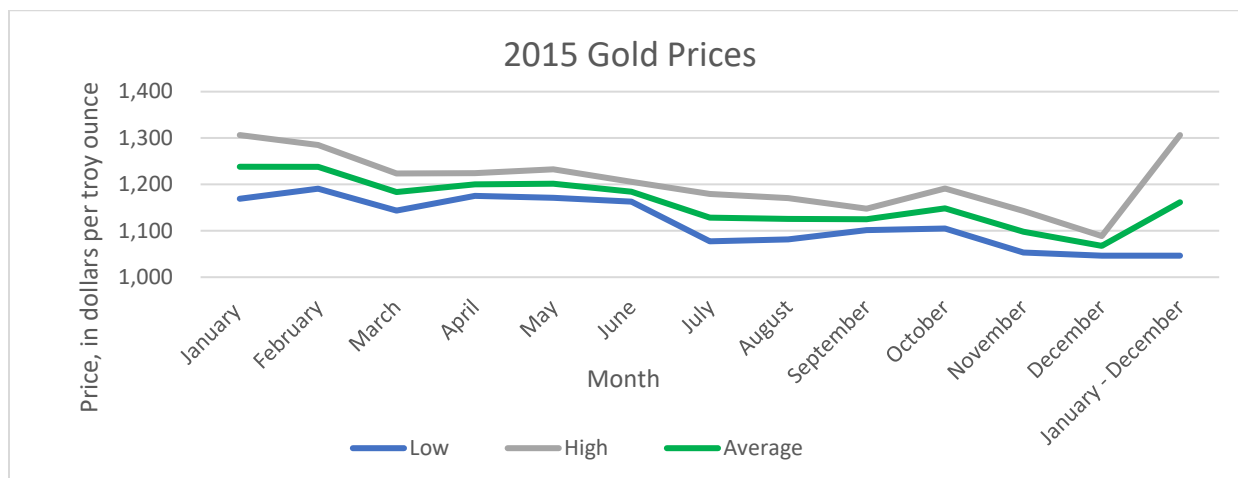


Figure 9. Gold prices for 2015 [11].

Table 8. Gold Price, 2016 [11].

		Low	Date	High	Date	Average
2016						
	January	1,062	Jan.4	1,130	Jan.27	1,096
	February	1,116	Feb. 1	1,261	Feb.11	1,189
	March	1,209	Mar.28	1,283	Mar.3	1,246
	April	1,209	Apr. 1	1,297	Apr.29	1,253
	May	1,200	May.30	1,304	May.2	1,252
	June	1,206	June. 1	1,358	June. 24	1,282
	July	1,311	July.20	1,375	July. 6	1,343
	August	1,306	Aug.31	1,367	Aug.2	1,337
	September	1,303	Sept.1	1,352	Sept.6	1,327
	October	1,248	Oct.14	1,320	Oct.3	1,284
	November	1,169	Nov.30	1,337	Nov.9	1,253
	December	1,123	Dec.15	1,180	Dec.7	1,152
	January - December	1,116	Feb. 1	1,375	July. 6	1,251

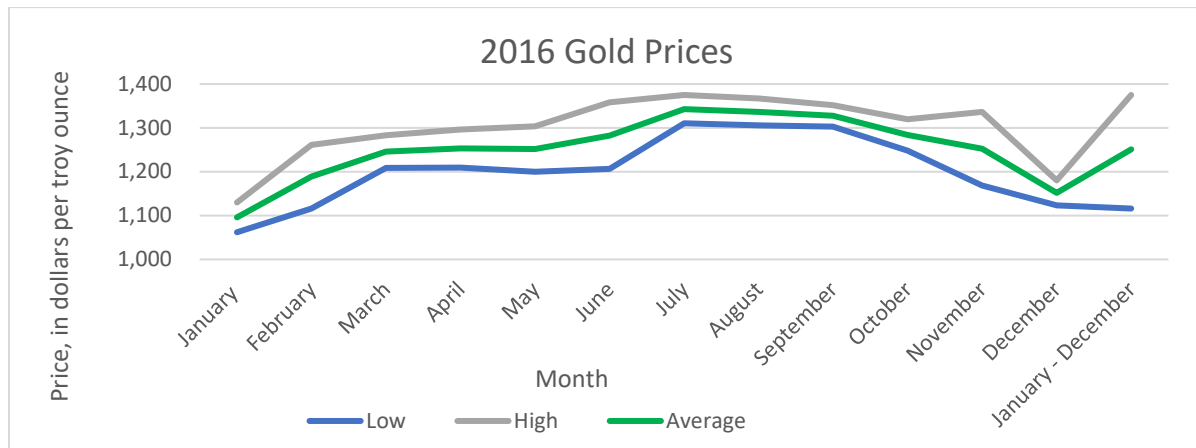


Figure 10. Gold prices for 2016 [11].

Table 9. Gold Price, 2017 [11].

		Low	Date	High	Date	Average
2017						
	January	1,146	Jan.3	1,220	Jan.23	1,183
	February	1,198	Feb.1	1,264	Feb.27	1,231
	March	1,195	Mar.10	1,261	Mar.27	1,228
	April	1,244	Apr.5	1,295	Apr.17	1,270
	May	1,215	May.9	1,274	May.31	1,244
	June	1,237	June.26	1,299	June.6	1,268
	July	1,205	July.10	1,271	July.31	1,238
	August	1,252	Aug.8	1,325	Aug.31	1,288
	September	1,275	Sep.29	1,357	Sep.8	1,316
	October	1,261	Oct.6	1,306	Oct.16	1,283
	November	1,266	Nov.3	1,299	Nov.27	1,283
	December	1,237	Dec.12	1,308	Dec.29	1,272
	January - December	1,146	Jan.3	1,357	Sep.8	1,259

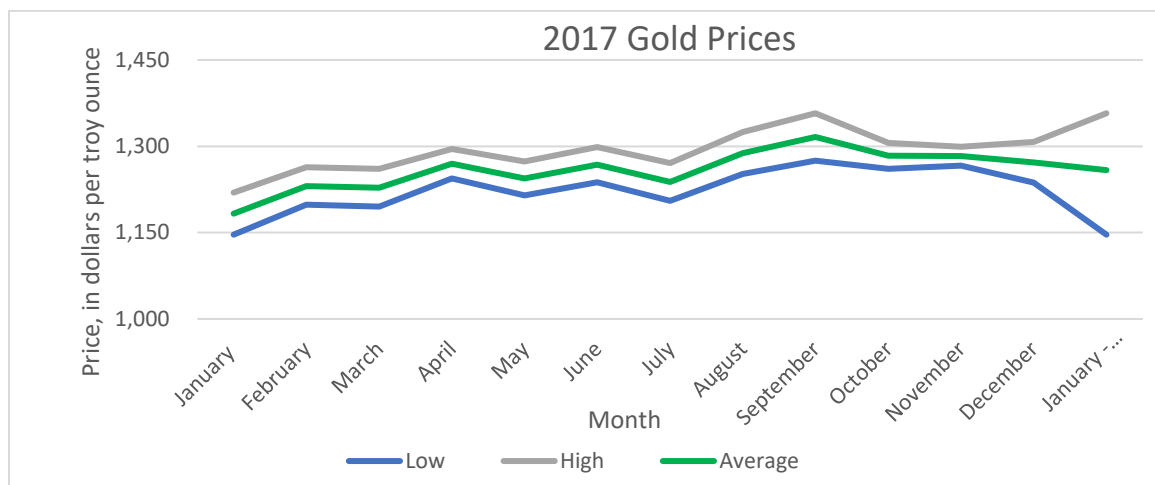


Figure 11. Gold prices for 2017 [11].

Table 10. Gold Price, 2018 [11].

		Low	Date	High	Date	Average
2018						
	January	1,303	Jan.2	1,366	Jan.25	1,334
	February	1,307	Feb.8	1,362	Feb.16	1,334
	March	1,303	Mar.1	1,357	Mar.27	1,330
	April	1,311	Apr.30	1,365	Apr.11	1,338
	May	1,282	May.21	1,326	May.11	1,304
	June	1,246	June.28	1,309	June.14	1,278
	July	1,212	July. 19	1,266	July.9	1,239
	August	1,161	Aug.16	1,225	Aug.1	1,193
	September	1,181	Sep.28	1,213	Sep.13	1,197
	October	1,184	Oct.9	1,240	Oct.23	1,212
	November	1,196	Nov.13	1,237	Nov.1	1,217
	December	1,231	Dec.4	1,284	Dec.3	1,257
	January - December	1,161	Aug.16	1,366	Jan.25	1,269

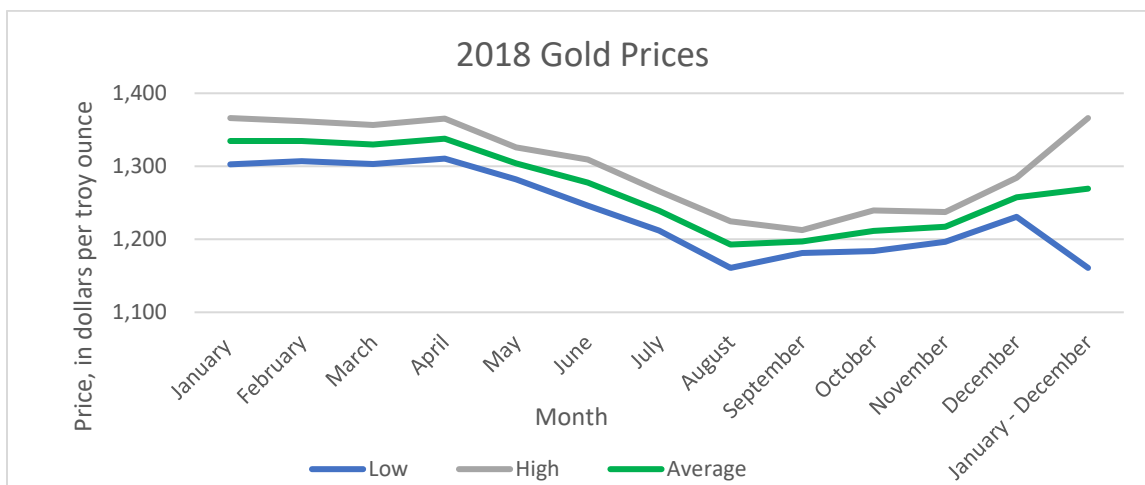


Figure 12. Gold prices for 2018 [11].

Table 11. Gold Price, 2019 [11].

		Low	Date	High	Date	Average
2019						
	January	1,277	Jan.21	1,326	Jan.31	1,302
	February	1,303	Feb.7	1,346	Feb.20	1,325
	March	1,281	Mar.7	1,324	Mar.25	1,303
	April	1,267	Apr.23	1,311	Apr.10	1,289
	May	1,267	May.2	1,307	May.31	1,287
	June	1,320	June. 11	1,424	June.28	1,372
	July	1,382	Jul.1	1,452	Jul.19	1,417
	August	1,401	Aug.1	1,555	Aug.26	1,478
	September	1,465	Sep.30	1,557	Sep.4	1,511
	October	1,459	Oct.1	1,518	Oct.25	1,489
	November	1,446	Nov.12	1,515	Nov.1	1,481
	December	1,454	Dec.2	1,516	Dec.30	1,485
	January - December	1,267	Apr.23	1,555	Aug.26	1,395

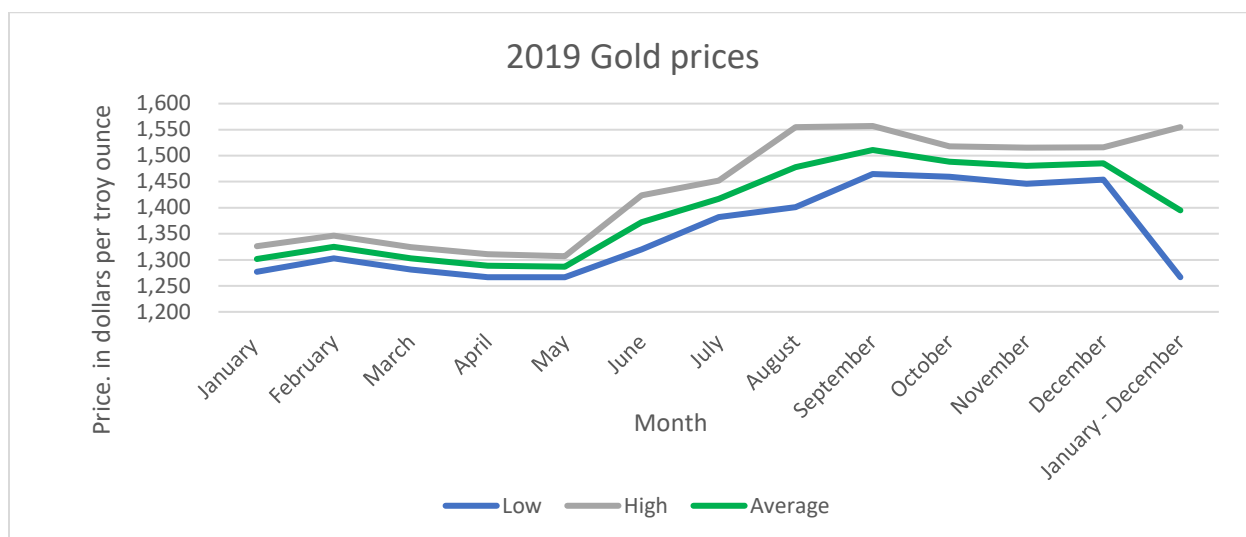


Figure 13. Gold prices for 2019 [11].

Table 12. Gold Price, 2020 [11].

		Low	Date	High	Date	Average
2020						
	January	1,518	Jan.2	1,591	Jan.31	1,554
	February	1,548	Feb.5	1,689	Feb.24	1,618
	March	1,452	Mar.16	1,703	Mar.9	1,577
	April	1,570	Apr.1	1,747	Apr.14	1,659
	May	1,671	May.1	1,765	May.18	1,718
	June	1,670	June.5	1,786	June.30	1,728
	July	1,757	Jul.2	1,981	Jul.28	1,869
	August	1,866	Aug.12	2,073	Aug.7	1,970
	September	1,849	Sep.24	1,992	Sep.1	1,921
	October	1,860	Oct.29	1,933	Oct.12	1,896
	November	1,765	Nov.30	1,966	Nov.9	1,865
	December	1,776	Dec.1	1,909	Dec.25, Dec.27	1,842
	January - December	1,452	Mar.16	2,073	Aug.7	1,768

Table 13. Gold Price, 2021 [11].

		Low	Date	High	Date	Average
2021						
	January	1,811	Jan.18	1,959	Jan.6	1,885
	February	1,718	Feb.26	1,864	Feb.2	1,791
	March	1,677	Mar.8	1,760	Mar.1	1,718
	April	1,706	Apr.1	1,798	Apr.22	1,752
	May	1,771	May.5	1,912	May.26	1,841
	June	1,751	June.29	1,916	June. 1	1,834
	July	1,766	Jul.7	1,833	Jul.15	1,800
	August	1,710	Aug.9	1,832	Aug.4	1,771
	September	1,721	Sep.29	1,833	Sep.3	1,777
	October	1,746	Oct.6	1,813	Oct.22	1,780
	November	1,759	Nov.3	1,876	Nov.16	1,818
	December	1,756	Dec.15	1,827	Dec.31	1,792
	January - December	1,677	Mar.18	1,959	Jan.6	1,797

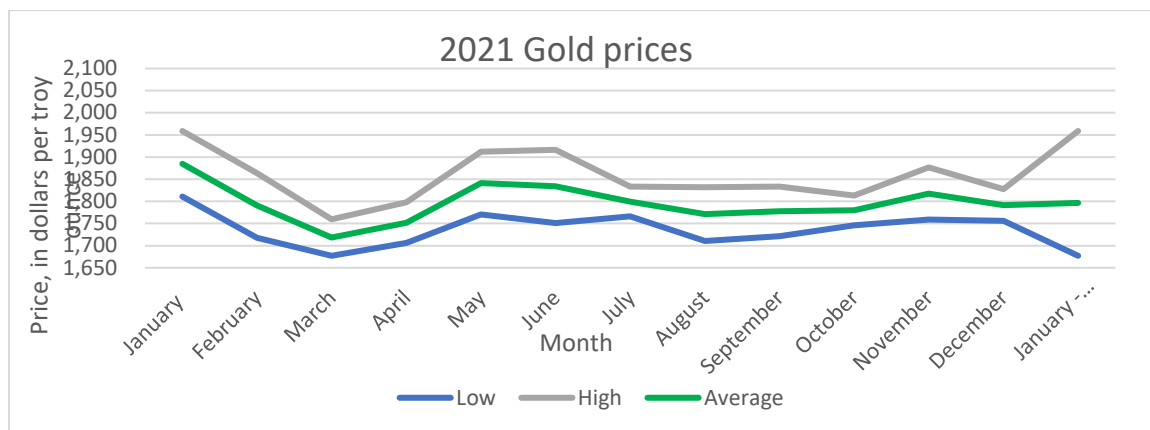


Figure 14. Gold prices for 2021 [11].

Table 14. Gold Price, 2022 [11].

		Low	Date	High	Date	Average
2022						
	January	1,780	Jan.28	1,853	Jan.25	1,817
	February	1,789	Feb.3	1,973	Feb.24	1,881
	March	1,890	Mar.29	2,070	Mar.8	1,980
	April	1,873	Apr.28	1,998	Apr.18	1,936
	May	1,780	May.14, May.15	1,910	May.5	1,845
	June	1,803	June.30	1,877	June.13	1,840
	July	1,681	Jul.21	1,813	Jul.4	1,747
	August	1,710	Aug.31	1,802	Aug.12	1,756
	September	1,615	Sep.28	1,735	Sep.12	1,675
	October	1,618	Oct.21	1,729	Oct.4	1,674
	November	1,617	Nov.3	1,786	Nov.15	1,701
	December	1,766	Dec.5	1,832	Dec.27	1,799
	January - December	1,615	Sep.28	2,070	Mar.8	1,804

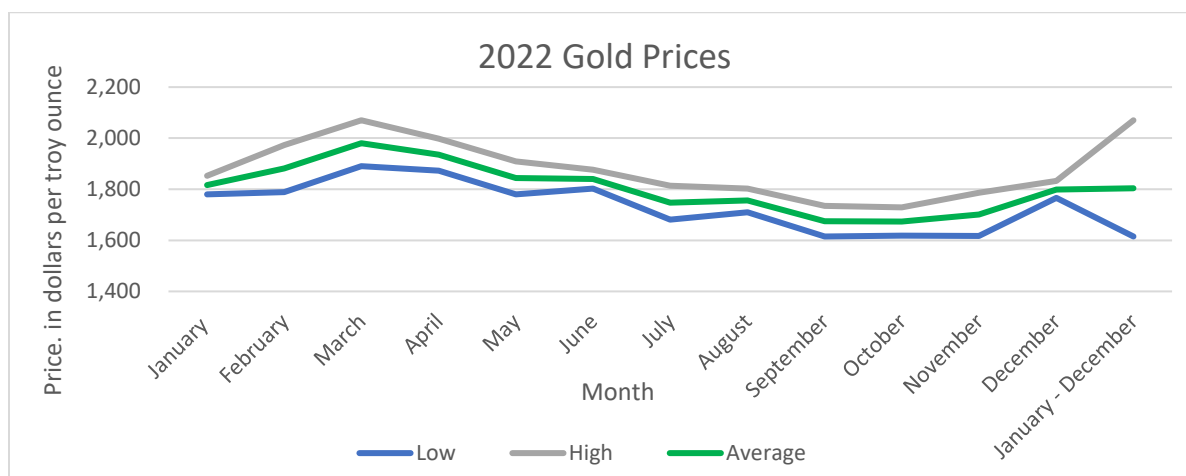


Figure 15. Gold prices for 2022 [11].