YUKON ENERGY MINES & RESOURCES

Yukon Placer Mining Sector GHG Target Baseline Study

PRESENTATION TO STAKEHOLDERS

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Sustainability is our business

Contents

Glossary of Terms

CH_4 – Methane or natural gas, a significant greenhouse gas, created from decomposition of organic matter.

CO_2 – Carbon dioxide, the largest greenhouse gas by mass, created as a byproduct of combustion processes.

CO_2e – Carbon dioxide equivalent, utilized when all greenhouse gases are calculated on a combined basis on global warming potential of each gas, converted to carbon dioxide equivalents.

GJ – Gigajoule, a measurement of energy, equivalent to 278 kilowatt-hours.

GHG – Greenhouse gas, the grouping of airborne emissions most responsible for atmospheric warming. For the purposes of this study, only carbon dioxide, methane and nitrous oxide are considered.

kWh/MWh – Kilowatt-hour/Megawatt-hour, the average amount of electric power consumed within an hourly period. i.e. a 10-watt lightbulb turned on for one hour would consume 0.01 kWh, or 0.00001 MWh.

Metric ton/mt – 1,000 kilograms (kg) = 1,000,000 grams (g) – all measurements in this study referencing tons are in metric tons.

N_2O – Nitrous oxide, a significant greenhouse gas, created as a byproduct of combustion processes.

Scope 1 Emissions – Direct source emissions, e.g. fuel usage from directly operated vehicles and machinery.

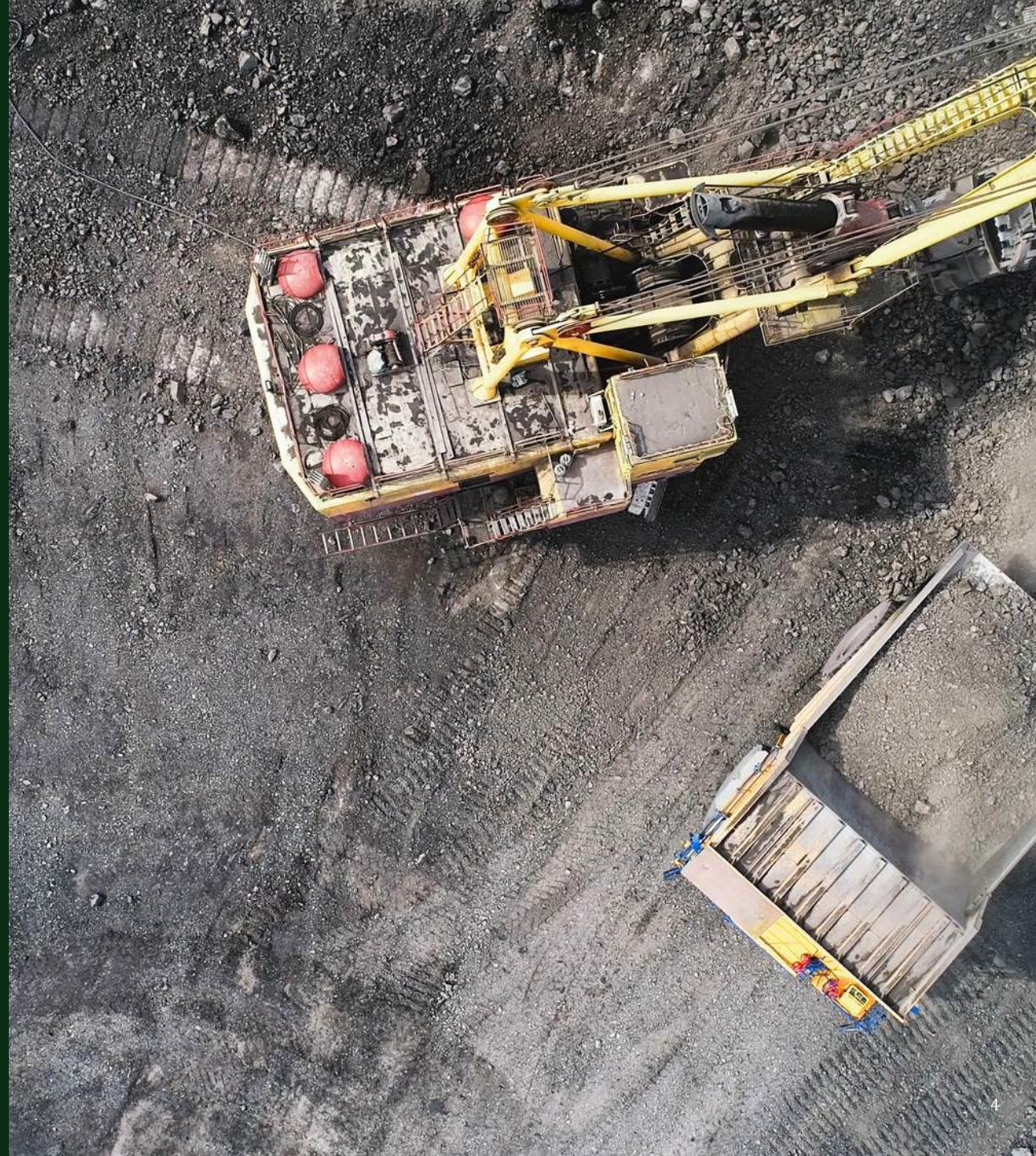
Scope 2 Emissions – Indirect source emissions, e.g. emissions from generation of electricity by electric utility purchased and consumed by company's structures and machinery on-site.

Scope 3 Emissions – Indirect emissions from value chain, e.g. emissions from transportation of employees to arrive on-site, and emissions of delivery vehicles from site to end customer.

Yukon Government – The relevant departments and staff within the territorial government that have been engaged on this scope of work – in this case largely confined to the Energy, Mines and Resources Energy Branch.

Placer Sector Emissions Intensity

INTRODUCTION



Introduction – Placer Mining Sector GHG Intensity Analysis

Methodology

- ERM's scope of work as requested by Yukon EMR has been to determine a GHG intensity per ounce of gold mined by the placer sector as a whole, this is in contrast to the quartz sector that must use unprocessed raw earth moved due to differing end metals.
- ERM has determined adjusted averages and medians to more accurately depict emissions intensities based on removing outliers from average and median GHG intensities for individual placer miners that fall below a minimum ounces mined per year, and extremely high outliers.
- ERM is to analyze any correlation between gold commodity prices and fuel prices with ounces mined
    - These considerations are driven by preliminary feedback with KPMA as well as experience with the quartz sector to account for economic behavior of individual placer miners

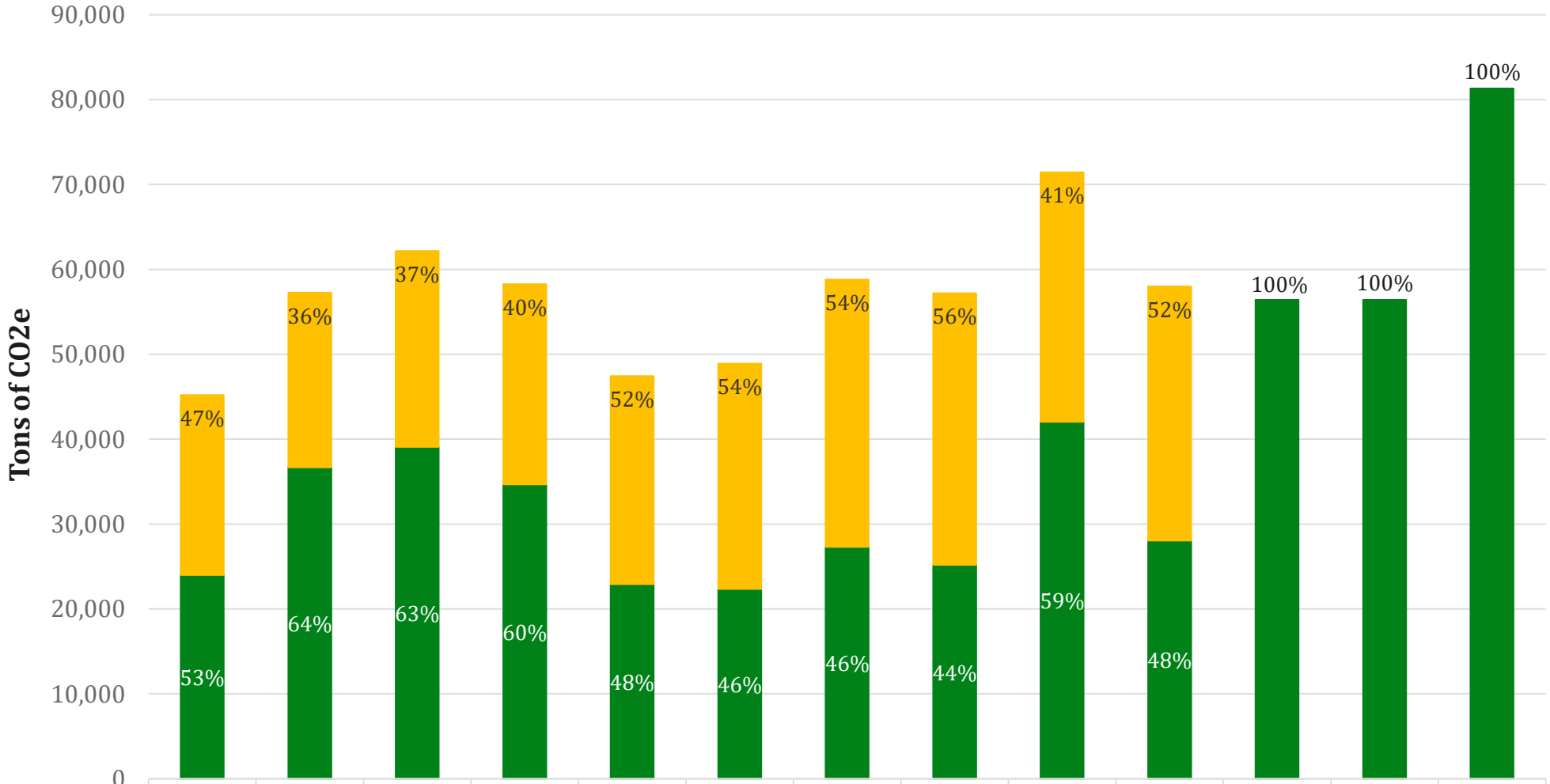
Analysis

- Based on consistent stakeholder feedback, the adjusted average for each year was correlated with diesel fuel prices and Canadian dollar gold prices to determine which variable indicated a stronger correlation driving placer mining activity.

Total Mining Sector Emissions Projections

FOR ACTIVE QUARTZ AND PLACER MINES

Total Scope 1 Emissions for Quartz and Placer

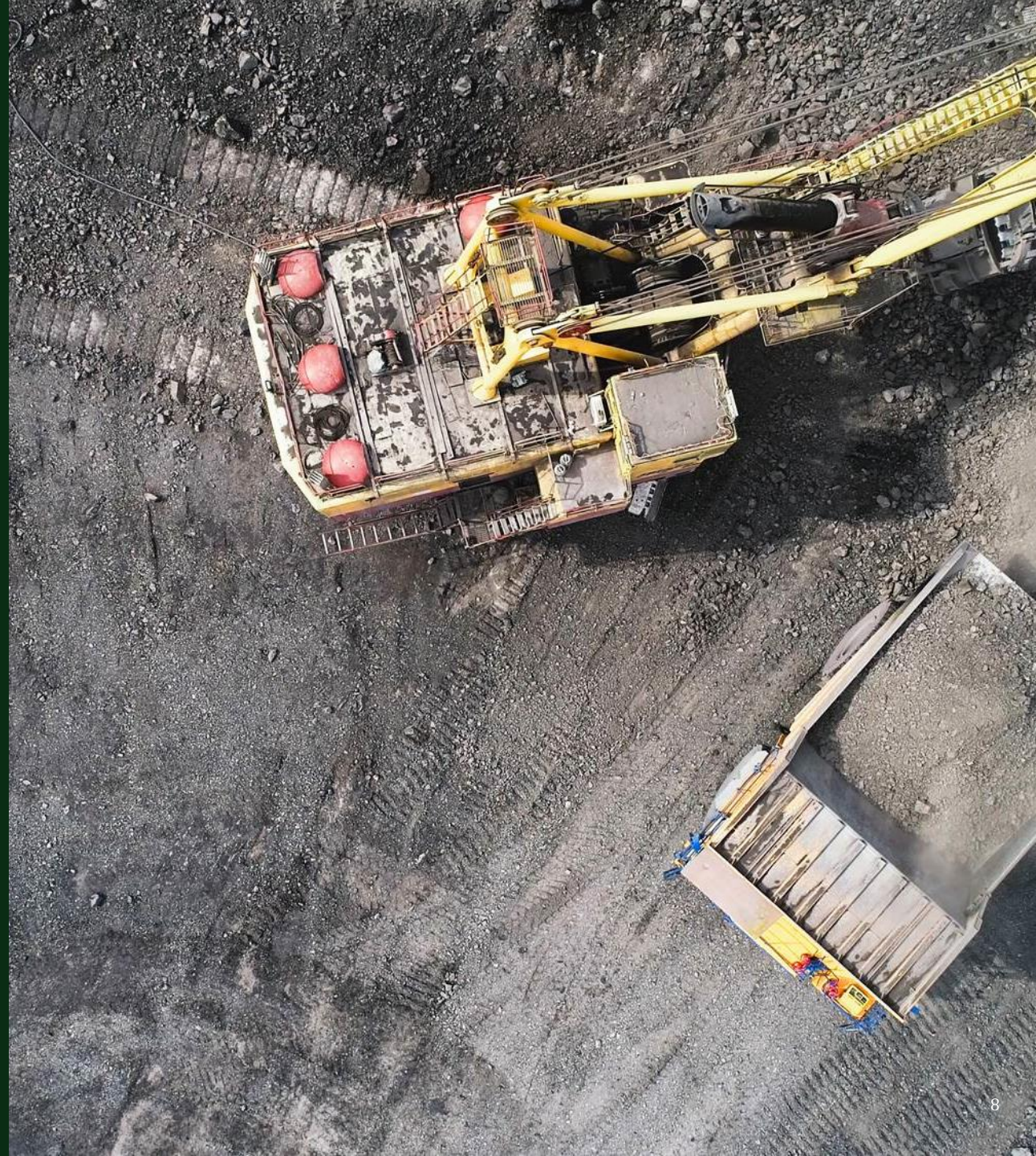


	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Placer	21,199	20,587	23,067	23,570	24,524	26,550	31,497	32,018	29,388	29,932	Not available for 2020 – 2022		
Quartz	24,012	36,660	39,098	34,680	22,925	22,349	27,293	25,181	42,041	28,058	56,402	56,423	81,313

Yearly totals of GHG emissions for both Quartz and Placer emissions were stacked into bar chart for comparison.

Placer Sector Emissions Intensity

METHODOLOGY AND ANALYSIS



Implications of Outlier Analysis

ERM determined that the most suitable method of filtering individual reporting entities was to set a threshold of a minimum of 50 ounces mined annually, and to remove significant outliers.

The final method for outlier analysis was selected based on an understanding of the placer mining industry including:

- Market conditions
- Variability of entity name
- Burden of land removal
- Exploration of new sites
- Other yearly variability

Therefore, only individual records under 50 ounces for a given year were removed from emissions intensity calculations. This removes non-commercial placer mining activity, without skewing the data.

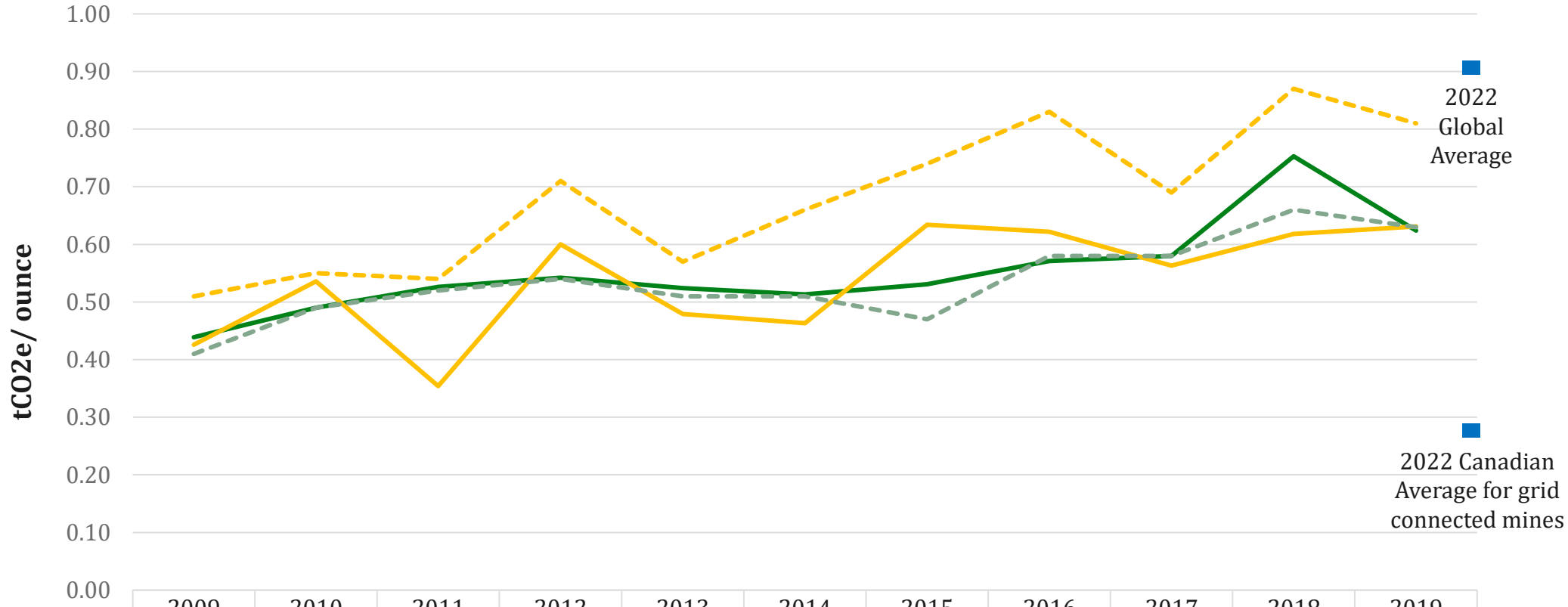
- 50 ounces per year set as a threshold based on previous recommendations and that the expected revenue from 50 ounces would amount to less than $100,000, indicating individual-level operations.

Utilizing the standard deviation method removes both low and high emissions intensity figures. When the reality is that some years, certain entities will require more fuel to yield higher gold ounces, and some entities can achieve low intensity through economies of scale.

- This method resulted in increased annual volatility.

2009 – 2019 Placer Data Summary

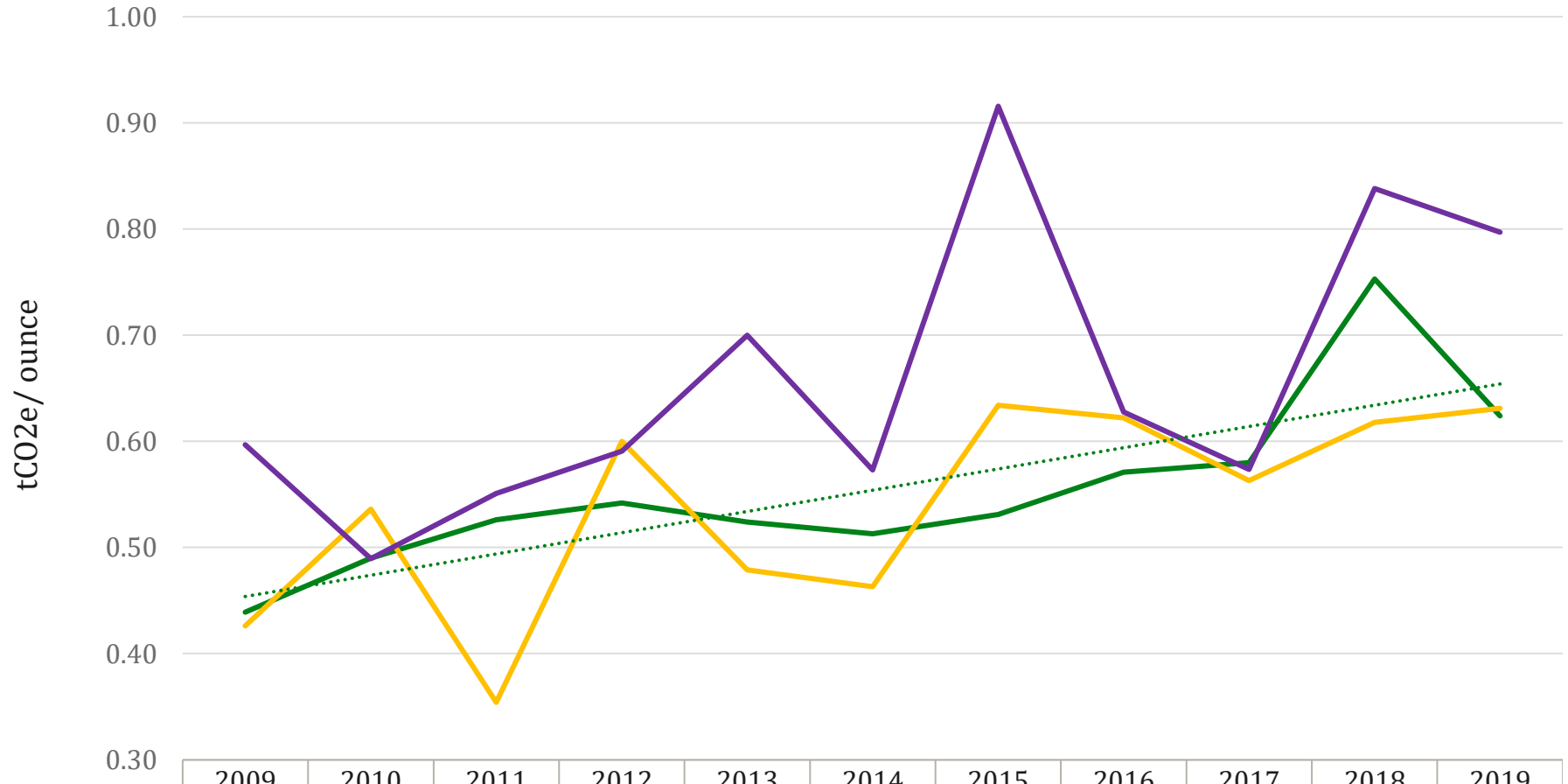
Adjusted averages and medians were used to remove records where yearly ounces of gold mined were less that 50 ounces or where extreme outliers were identified.



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Unadjusted Median	0.44	0.49	0.53	0.54	0.52	0.51	0.53	0.57	0.58	0.75	0.62
Unadjusted Average	0.43	0.54	0.35	0.60	0.48	0.46	0.63	0.62	0.56	0.62	0.63
Adjusted Median	0.41	0.49	0.52	0.54	0.51	0.51	0.47	0.58	0.58	0.66	0.63
Adjusted Average	0.51	0.55	0.54	0.71	0.57	0.66	0.74	0.83	0.69	0.87	0.81

2009 – 2019 Placer Data Summary – Standard Deviation Methodology

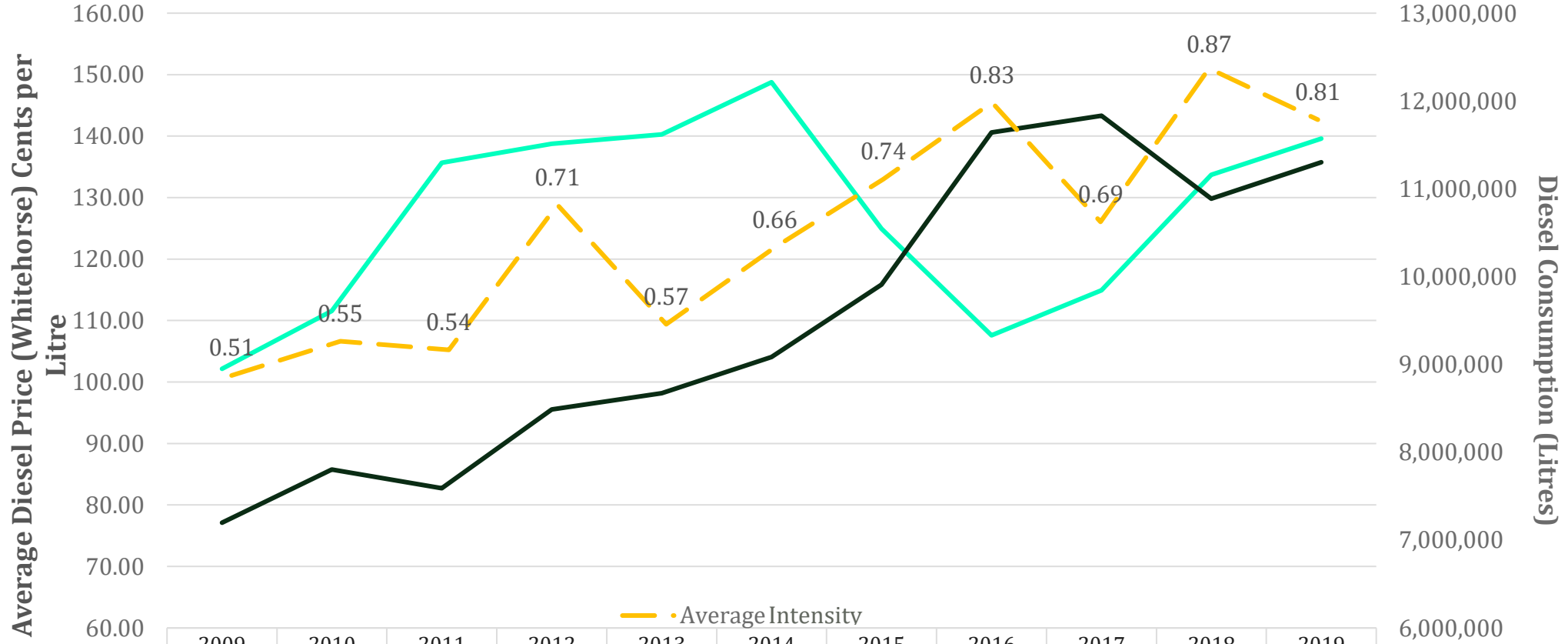
Average was calculated using a 95% confidence interval as the first attempt at outlier removal from average.



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Unadjusted Median	0.44	0.49	0.53	0.54	0.52	0.51	0.53	0.57	0.58	0.75	0.62
Unadjusted Average	0.43	0.54	0.35	0.60	0.48	0.46	0.63	0.62	0.56	0.62	0.63
Average 95% Confidence Interval	0.60	0.49	0.55	0.59	0.70	0.57	0.92	0.63	0.57	0.84	0.80

2009 – 2019 Diesel Prices v. Placer Diesel Consumption

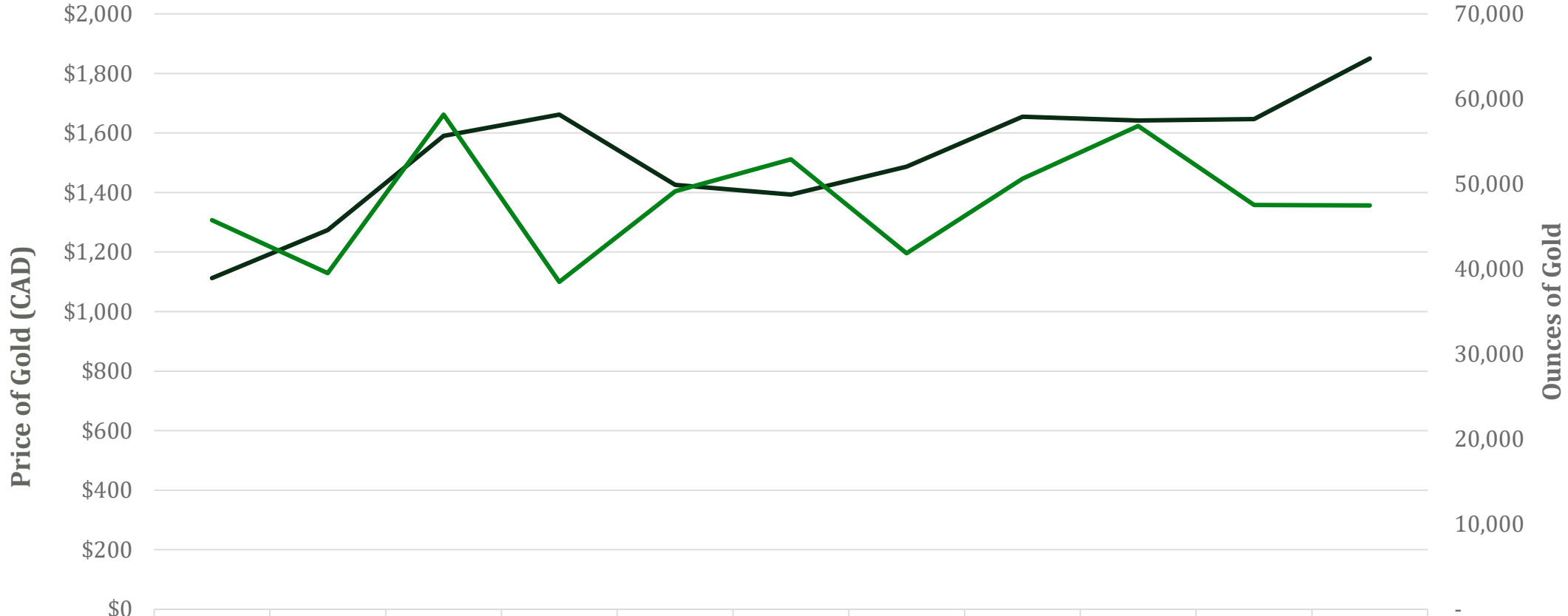
Adjusted average intensity was plotted against the average diesel price and total diesel consumption on a yearly basis from placer mining. The correlation between diesel price and consumption is extremely low at 0.012, indicating the price of diesel has little to no effect on amount of diesel consumption. Average intensity for 2009 – 2019 is 0.68.



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Average Diesel Price	102.15	111.58	135.68	138.76	140.27	148.77	124.96	107.59	114.93	133.71	139.59
Total Diesel	7,198,109	7,803,494	7,590,366	8,488,117	8,673,424	9,084,223	9,908,106	11,642,41	11,833,49	10,889,10	11,303,55

2009 – 2019 Gold Price v. Ounces

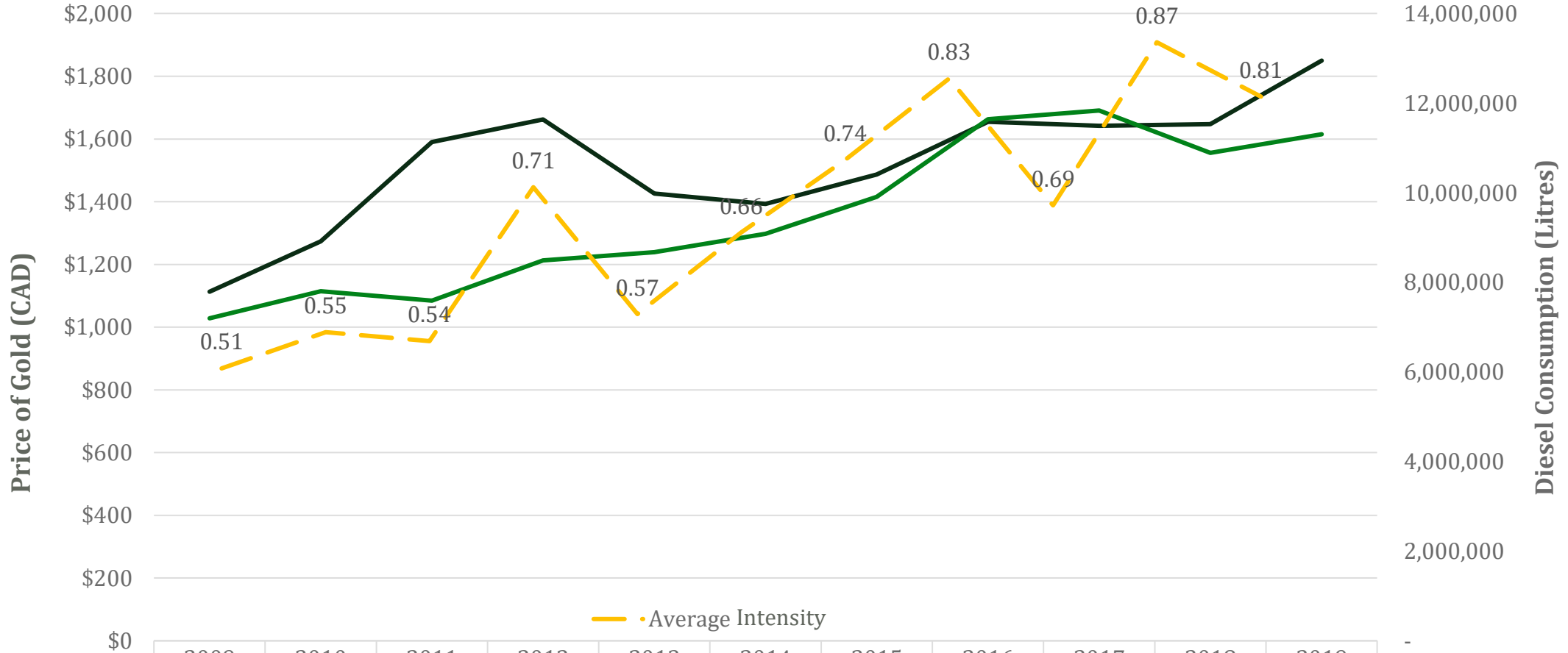
Total ounces of gold per year from the placer data was plotted against price of Gold (CAD). The correlation between these variables is low, at 0.050. Gold pricing data was sourced from the World Gold Council, and yearly average calculated for comparison purposes.



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Gold Price	1,113	1,274	1,590	1,662	1,426	1,393	1,487	1,655	1,642	1,647	1,850
Ounces	45,744	39,514	58,166	38,499	49,161	52,910	41,849	50,627	56,837	47,534	47,467

2009 – 2019 Gold Price v. Diesel Consumption

Price of Gold (CAD) compared to both total annual diesel consumption and average yearly intensity. Correlation between gold price and average intensity is slightly higher at 0.571, with correlation between gold price and diesel at 0.509.



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Gold Price	1,113	1,274	1,590	1,662	1,426	1,393	1,487	1,655	1,642	1,647	1,850
Diesel Consumption	7,198,10	7,803,49	7,590,36	8,488,11	8,673,42	9,084,22	9,908,10	11,642,4	11,833,4	10,889,1	11,303,5

Conclusions

SUMMARY OF FINDINGS

Conclusions

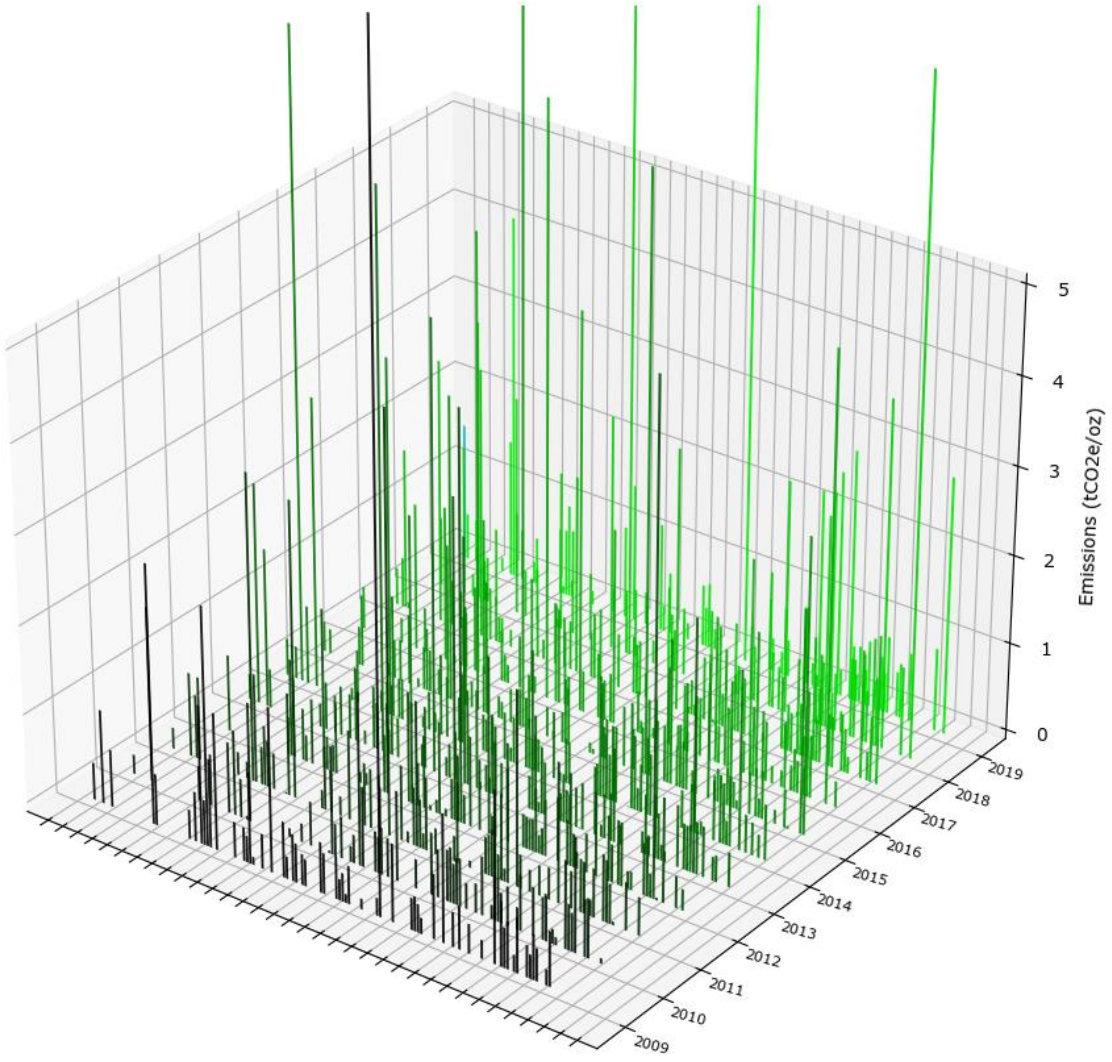
Results of Annual Placer Mining Intensities

- There has been an upward trend in emissions intensity from 0.51 tCO2e/oz in 2009 to 0.81 tCO2e/oz in 2019 – largely driven by increases in diesel fuel use by placer miners.
- Increase in ounces mined due to the long-term trend of rising Canadian Dollar gold commodity price, consistent with stakeholder feedback, and with low correlation (0.05) between the gold price and ounces mined, compared to the higher correlation (0.57) between increased emissions intensity with increased gold prices.
- The adjusted average of all placer mines in 2019 of 0.81 tCO2e/oz is 3x more carbon intensive than benchmark Canadian gold mining intensities of approximately 0.28 tCO2e/oz which include grid-connected mines in more southern jurisdictions.

Appendix A

2009 – 2019 UNADJUSTED PLACER EMISSIONS INTENSITY GRAPHS BY OPERATION

2009 – 2019 Placer Mining tCO2e/oz Intensities per Operation



Intensity of carbon dioxide per entity from 2009 – 2019 was illustrated in 3D to demonstrate data variability and trends. 3 high outliers were removed from this data prior to graphing.