

Yukon Placer Mining 2016 Development Overview

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INTRODUCTION

The Yukon placer gold mining industry continued to show signs of stability and growth in 2016. Primary variables that affect the industry including gold price, the Canada-U.S. exchange rate and fuel prices remained favourable. For a good portion of the production season the price of gold surpassed (CDN) \$1700/oz, while diesel prices remained 20% lower than the period 2011-2015¹ (NRCAN, 2016). Positive responses in the industry are also associated with the duration of the sustained strong gold price that has exceeded (CDN) \$1000/oz for the eighth year in a row. In a privately funded industry, where growth is dependent on profit, the sustained prices have allowed miners to improve equipment, efficiencies and take greater expansion risks. The end result has been increasing production and an opportunity for new-comers to gain a foothold in the industry. An estimated 170 placer mine sites, that directly employed approximately 700 people, were active in 2016.

CLIMATE FOR MINING

Early season weather patterns continue to improve for the placer mining industry. Snow cover in Dawson City had melted by April 11th and the average maximum daytime temperature in April was 11.5°C. The average low temperature for April was also favourable equalling -2.1°C. These temperatures improved in May with average maximum temperatures reaching 18°C. Ample precipitation fell in the Klondike region and included a deluge in early August that challenged mining infrastructure in narrow valley settings. A mid-summer precipitation shortage was felt in southwestern Yukon where only 5 mm was recorded between July 24th and August 24th at the Burwash airport; this affected some high elevation mines in the Ruby Range. Fall temperatures were generally cooler across most districts with overnight lows dropping below freezing by the fourth week of September.

GOLD PRODUCTION AND VALUE SUMMARY

Placer gold production, according to royalty reporting, reached 65,646 crude ounces for the period May 1st to November 14th, 2016 (Fig. 1). Additional reporting is expected from the 2016 mining season that will likely bring the production total above 70,000 crude ounces. This is the highest production total since 2005 when 70,322 crude ounces were reported. The total value of the production as of November 14th is (CDN) \$90.2 million, which, when adjusted for inflation is the highest value in 27 years (1989). The financial success of the industry in 2016 is owed in large part to the sustained gold price and favourable Canada-U.S. exchange rate that increased the value of an ounce of gold in Canadian dollars by a factor of 1.304².

¹ statistics calculated based on average weekly retail diesel prices for Whitehorse.

² average exchange rate from May 2nd to October 31st, 2016.

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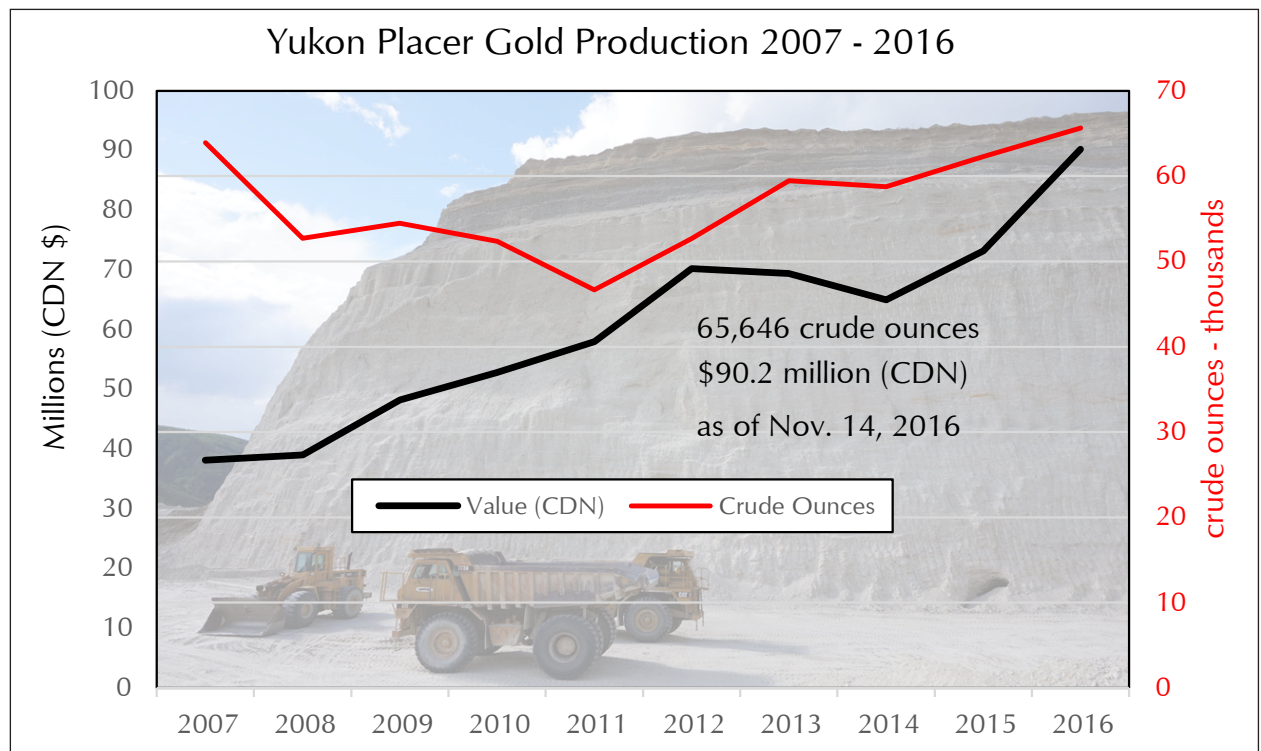


Figure 1. A chart illustrating placer gold production and its value over the last 10 years. Production has been rising steadily since 2011 and its value in Canadian dollars is at a 27 year high.

REGIONAL PRODUCTION SUMMARIES

Regional production summaries provide an overview from the various informal placer districts in Yukon. Production is reported in crude ounces from royalty figures from May 1st to November 14th, 2016.

INDIAN RIVER

The Indian River drainage consistently produces the most placer gold in Yukon. Significant placer gold producing tributaries within the Indian River drainage include Dominion, Gold Run, Sulphur, Quartz and Eureka creeks. In 2016, placer gold produced from the drainage amounted to 31,796 crude ounces or 49% of the total Yukon production (Fig. 2). Much of the Yukon placer production increase in recent years is owed largely to activity in the Indian River drainage. This year was no exception with production exceeding 2015 totals by more than 5,000 crude ounces.

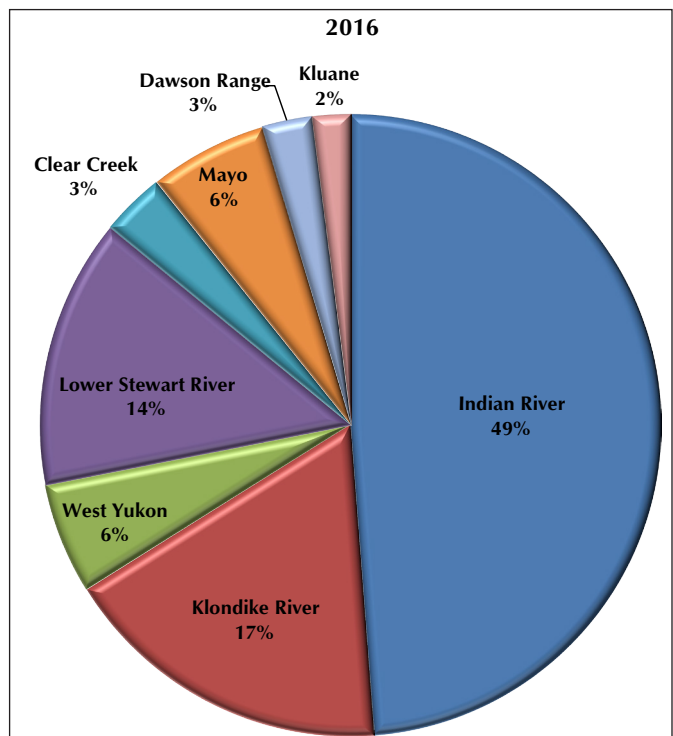


Figure 2. A pie chart illustrating production from the various regional placer districts in Yukon. Unglaciated districts account for 86% of the placer gold production and include Indian River, Klondike River, West Yukon and Lower Stewart River.

Quartz Creek

Large scale production continued from Schmidt Mining's operation on the Quartz Creek bench (Fig. 3). The White Channel Gravel pay zone varies between 61 and 91 m (200-300 ft) in width and has a total sluice thickness of 4.2 m (14 ft) including 2.4 m (8 ft) of gravel and 1.8 m (6 ft) of weathered bedrock. Overburden thicknesses are increasing towards the hillside and reached 23 m (75 ft) in 2016. Mining of the bench deposit continued upstream into Little Blanche Creek where undulations in the bedrock become more pronounced.



Figure 3. A view looking upstream along the right-limit of the Quartz Creek bench. A greyish gravel (unit 1) is visible near the base of the section. The lower 4.2 m (14 ft) of this unit is considered pay gravel and in places is separated from unit 2 by a woody layer representing a possible depositional hiatus. The section thickness measures 23 m (75 ft).

Canyon Creek

Two operations were active on Canyon Creek, a tributary to Quartz Creek. Schmidt Mining continued hydraulic stripping on the left limit of lower Canyon Creek and processed valley bottom pay gravel. In upper Canyon Creek, Lori Cail was actively mining valley bottom deposits in a narrow-valley setting (Fig. 4). The lower 1.5 m (5 ft) of gravel is processed and a 380 m-long (1250 ft) stretch of valley bottom was mined in 2016.

Eureka Creek

Fine Gold Resources operated up to four wash plants simultaneously on Eureka Creek and the Indian River in 2016. This included cuts both upstream and downstream of the mouth of Eureka Creek on the left limit of the Indian River and multiple locations within the Eureka Creek drainage. Notably, Fine Gold Resources continued

exploitation of the large left limit bench resource on Eureka Creek, which has added confidence in the continuity of this lengthy resource (Fig. 5). Encouraging results were obtained from an exploration program on the upper left fork of Eureka Creek where Fine Gold Resources, in partnership with the Yukon Mineral Exploration Program (YMEP), completed a program of geophysics, drilling and a 3000 cubic yard bulk sample near the mouth of the tributary.

Indian River

Northern Exposure's efforts on the Indian River shifted towards evaluating the potential of previously disturbed ground near the mouth of Quartz Creek. Some of the first mining efforts on the Indian River in the early 1980s were conducted in this area, and at first glance, the area looks mined out. Northern Exposure's perseverance identified a section of partially stripped, shallow, virgin ground, near their camp measuring approximately 28 000 m² (Fig. 6). The gravel section was 3 m (9.8 ft) thick and was overlain by 0.3 m (1 ft) of overbank sandy silt. Additional testing and mining is expected within this disturbed area in 2017.



Figure 4. Lori Cail's wash plant and settling ponds on upper Canyon Creek. Mining can be challenging in narrow valley settings but Mr. Cail does an excellent job managing water quality and recontouring overburden so vegetation can re-establish.



Figure 5. A view to the southwest of Fine Gold Resources left limit bench cut in 2016. Bulldozers are used to remove overburden and expose the pay gravel. The channel continues upstream in this photo and is visible by the change in slope at the base of the hill.



Figure 6. Al McGregor of Northern Exposure and geologist Kevin Kivi pose next to the Indian River cut they discovered in the disturbed area opposite the mouth of Quartz Creek. The entire gravel section visible in this photo was processed. Indian River Formation quartz pebble conglomerate forms the bedrock surface.

KLONDIKE RIVER

Production from the Klondike River and its tributaries continued to be steady with 11,310 crude ounces reported. The largest contributions were from Hunker, Bonanza and Last Chance creeks (Fig. 2).

Dago Hill

Favron Enterprises had a successful year on Dago Hill targeting both the upstream and downstream edges of the Neogene bench, and a gulch deposit that drains into Last Chance Creek (Fig. 7). The gulch deposit contains gold that was reconcentrated from the high-level bench gravel following incision of Last Chance Creek into the Neogene surface 2.6 million years ago. Mining on the north rim of the Neogene bench exploited Paradise gravel (Fig. 7).

Cheechako Hill

A new project was initiated on the upstream (south) end of Cheechako Hill by Beron Placers (Fig. 8). The goal of this project is to mine the remaining bench gravel that was not exploited during hydraulic operations in the early 1900s. This component of the White Channel Gravel

is adjacent to the main pay streak and represents the paleo-side channel of Bonanza Creek. To improve the economics of the project, Beron Placers is evaluating fine gold recovery techniques such as spirals and centrifuges in order to extract gold from the overlying low-grade gravel that would normally be stripped. Theoretically the fine gold extracted from the low-grade gravel will pay for stripping down to the enriched gravel near the bedrock interface. If their technique proves successful it could breathe new life into the remaining deposits on the Bonanza Creek benches.

Lovett Hill

Northern Shoveler continued to mine the White Channel Gravel near the mouth of Bonanza Creek (Fig. 9). This year's operation was closer to the Klondike River valley and under a greater thickness of Klondike River outwash gravel. The total section thickness exceeds 100 m (328 ft) with approximately equal parts White Channel Gravel and Klondike outwash. The pay gravel on bedrock was partially exploited by room and pillar mining in the early 1900s. Bostock (1957), reported in his compilation a grade of \$2-\$15 per cubic yard at \$20/ounce, which



Figure 7. Favron Enterprises cut near the north rim of Dago Hill. The section consists of Paradise gravel overlain by the former soil surface (black organics) and tailings.



Figure 8. Beron Placers operation on the south rim of Cheechako Hill. A cross cut of the remaining White Channel Gravel was completed in order to evaluate gold grades both vertically and laterally on the bench. The elevated site will facilitate a tiered processing system in 2017.



Figure 9. A view to the north of Northern Shoveler's cut on Lovett Hill in late September, 2016. Much of the season was spent excavating to the high grade pay channel on bedrock.

equals \$140 per cubic yard at the current gold prices. Northern Shoveler confirmed this grade while processing the remaining gravel in the underground workings. A hydraulic stripping program is planned for 2017 to assist in overburden removal.

All Gold

Dulac Mining shifted their focus onto the left limit bench of All Gold Creek in 2016 (Fig. 10). An accumulation of knowledge gained from mining in the valley bottom indicates that placer gold contributions or pay streaks originate from tributaries that eroded the left limit bench. This is further supported by old timer workings found over a significant area on the bench. The 2016 mining program excavated a cut measuring 45 m (148 ft) in width and discovered an economic gravel that is likely correlative with the White Channel Gravel in Hunker and Bonanza creeks. The lowermost unit is a cobble-pebble gravel measuring 3.4 m (11 ft) in thickness (unit 1; Fig. 10) and is overlain by an oxidized pebble-rich gravel that is 6 m (20 ft) in thickness (unit 2; Fig. 10). Capping the section is a finely-bedded glaciolacustrine silt to fine sand that was deposited when the All Gold Creek was dammed by a late Pliocene to early Pleistocene glacier in Tintina Trench (unit 3; Fig. 10). Placer gold mined from the bench is identical in character to the gold found in the pay streaks in the valley bottom. This discovery will add considerable mine life in All Gold Creek.

LOWER STEWART RIVER

Production from tributaries to the lower Stewart River continued to rise for the third year in a row. The total production, largely from Henderson, Black Hills, Kirkman, Maisey May and Scroggie, was 9174 ounces (Fig. 2).

Henderson

H.C. Mining focused their operations on lower Henderson Creek, with activity also on a left limit bench (Fig. 11). Progressively mining downstream towards the Yukon River, they targeted a 1.2 m (3.9 ft) thick poorly sorted, cobble-pebble gravel that overlies a 0.7 m (2.3 ft) thick mixing zone of gravel and weathered bedrock. Up to 1.8 m (6.0 ft) of weathered mafic schist bedrock was sluiced. A lower left limit bench was also exploited as a result of exploration in 2015. The bench contains 12 m (40 ft) of pebble-gravel with consistent grades; this represents a significant continuation of mineable ground remaining on Henderson Creek.



Figure 10. Dulac Mining’s cut on the left limit bench of All Gold Creek. Units 1 and 2 represent the Pliocene gravel that is equivalent in age to the upper White Channel Gravel. Unit 3 is a glacial lake sediment that was deposited during one of the first glaciations to block drainage in the Tintina Trench. The oxidized horizon at the top of unit 2 is the former pre-glacial soil about 2.6 million years old.



Figure 11. H.C. Mining operation on lower Henderson Creek in 2016.

Black Hills

Rod Smith and Paydirt Holdings, located on upper Black Hills Creek, continued to focus on a left limit bench gravel that is overlain by 20 m (66 ft) of muck (Fig. 12).

According to geophysics and drilling, the bench has a width of 46 m (150 ft) and only the rim has been exploited to date. This prospect has considerable length and the focus for 2017 is to expose a larger section of the deposit to determine its viability.

Brewer

Coulee Resources moved a part of their operation from Davidson Creek in the Mayo district to Brewer Creek, a tributary to the lower Stewart River. Limited development work has been completed on this creek in the past so efforts focused on building camp and excavating an initial cut to test the valley bottom pay gravel (Fig. 13).

WEST YUKON-FORTY MILE, SIXTY MILE AND MOOSEHORN

Production from placer creeks west of the Yukon River has declined over the past 3 years from 7236 crude ounces in 2013 to 3767 crude ounces in 2016 (Fig. 2). This trend is partly due to reduced activity from Matson, 10 Mile and Miller creeks. Despite the lower production total this district is seeing an increase in exploration activity and new operations have started in California Creek, 12 Mile Creek, Enchantment Creek and the 60 Mile River benches near the mouth of 12 Mile Creek. This added attention in the district will undoubtedly increase production in the coming years.



Figure 12. Exposure of the left limit bank at Rod Smith's mine on upper Black Hills Creek. The pay gravel is overlain by 20 m of ice-rich muck and a monitor is used for stripping.

Sixty Mile

M2 Gold, who is also active on the lower Indian River, initiated an option on the Hakonson claims on the left limit 60 Mile River bench at the mouth of 12 Mile Creek (Fig. 14). The focus in 2016 was to test the viability of the bench and valley bottom deposits in order to make a long term investment decision on the property. The bench gravels are relatively thin and overlain by an apron of silt (loess) that increases in thickness towards the valley side. Near the rim of the bench the fluvial gravel is 1.5 to 2.0 m (5-6.5 ft) thick and overlain by 2.8 m (9 ft) of muck. A cut measuring 50 by 750 m (164 by 2461 ft) was mined in 2016 which represented only a narrow portion of the benches overall width.

Glacier

K-1 Mining was active on Glacier Creek, a tributary to 60 Mile River, in 2016. One of their objectives in the upper parts of the drainage was to follow the wandering valley bottom pay streak onto a low terrace under the right limit colluvial blanket (Fig. 15). The section consisted of 2 m (6.6 ft) of Glacier Creek gravel overlain by 14 m (46 ft) of frozen colluviated angular bedrock, massive ice and silt. The majority of the placer gold is found within 0.3 m (1 ft) of the bedrock contact and therefore the sluice volume is relatively low. An old timer drift is present in the area, which adds further support that the pay streak trends well over to the right limit.



Figure 13. A view down Brewer Creek of Coulee Resources' camp and first cut.



Figure 14. M2 Gold's operation on the 60 Mile River bench in 2016. A 50 m-wide cut was processed along the rim of the bench using two excavators and a mobile plant.



Figure 15. A view of the right limit bank on upper Glacier Creek. K-1 Mining is excavating the pay streak under colluviated weathered bedrock and muck.

California

Clayton Construction, a newcomer to the placer mining scene, in partnership with Yukon Exploration Green Gold Inc., started a new mining operation in the upper California Creek drainage in 2016. Efforts this season included road building, mine training and exploitation of a valley bottom deposit. Bands of marble bedrock crosscut the valley providing a unique and challenging bedrock character on the property. Fluvial erosion and mass wasting of the marble has created an undulatory bedrock surface that is more difficult to clean (Fig. 16). This characteristic may also be responsible for trapping some of the placer gold.

CLEAR CREEK AND MAYO

Production from the Clear Creek and Mayo district has steadily increased in recent years with a combined production total of 6161 crude ounces in 2016 (Fig. 2). Increased production from streams like Granite and Minto creeks is a large part of the success in the district. This is expected to continue in coming years with new attention given to the Little South Klondike tributaries that lie east of Clear Creek.

Barlow

Storm Structures operated two shifts on lower Barlow Creek in 2016 and estimated that 120,000 cubic yards was processed (Fig. 17). The pay gravel is a 2 m-thick (6.5 ft), poorly to moderately sorted, boulder-rich unit that overlies a false bedrock of sand. The upper surface of the pay preserves a paleo-soil that contains silt, which was affected by cryoturbation and is more compact compared to rest of the underlying pay material. This compact layer provides a good marker to identify the top of the economic gravel. Overlying the pay gravel is modern Barlow Creek gravel, which consists of a cobble-pebble gravel, fewer boulders and is often capped by 1 m (3 ft) of overbank fluvial silt.



Figure 16. Bands of marble bedrock have created an unusual bedrock surface at the base of upper California Creek where Clayton Construction and Yukon Exploration Green Gold Inc. is operating.

Big

Test mining was initiated on a tributary to Big Creek in the Little South Klondike River drainage. Schmidt Mining optioned the ground from Yukon Exploration Green Gold Inc. and opened a cut on an unnamed right limit tributary to Big Creek (Fig. 18). Little is known about the placer deposits in this drainage and how early Pleistocene alpine glaciation may have affected gold distribution. Results were encouraging in 2016 and operations are expected to expand in 2017.

Granite

Davies Contracting continued to mine on upper Granite Creek in the Gustavus Range southeast of Keno City. Placer gold is being extracted from a pre-last glaciation till that underlies an alpine glacier end moraine from the last glaciation (Fig. 19). This unique placer setting likely developed when a local alpine glacier in upper Granite Creek reworked a pre-existing fluvial gravel enriched with coarse gold. Evidence of glacio-tectonic thrusting of near surface bedrock is also present within the economic deposits, which may have inverted the stratigraphy of the pay zone by emplacing stratigraphically lower units higher in the section. In 2017, mining is expected to continue upstream where the older tills may have become reworked into till from the last glaciation.

Minto

Mining interests in Minto Creek, a tributary to Mayo River, have increased in recent years. Ken Wilson had the largest operation in the drainage near the mouth of Bennett Creek. The primary map unit in the valley bottom is a near surface coarse gravel that overlies a false bedrock of sand. A testing operation on a left limit bench at the mouth of Bennett Creek contained similar near surface stratigraphy, although the gravel appears to originate from Bennett Creek. Fine-grained sediment that forms the false bedrock in Minto Creek was likely deposited when the Cordilleran Ice Sheet, flowing from the east, dammed the mouth of Minto Creek valley causing the valley to in-fill with glacio-deltaic and glacial lake sediment.



Figure 17. Storm Structures wash plant on Barlow Creek.



Figure 18. A view to the southwest of Schmidt Mining's operation on a tributary to Big Creek. Big Creek is the valley visible on the right side of the photograph looking toward West Ridge.



Figure 19. Jim Davies is mining oxidized (orange) till from under grey morainal sediment deposited during the last glaciation. The oxidized-gold-bearing till is likely from an older alpine glacier that reworked a pre-existing fluvial deposit.

DAWSON RANGE

Production from the Dawson Range, including Mount Nansen and the Freegold Mountain placer camps, improved in 2016 to 1699 crude ounces (Fig. 2). Primary production was from Back, Nansen, Seymour and Summit creeks.

Seymour

Derek Dodge was active on Seymour Creek and made a significant investment decision to mine the deep channel based on a YMEP-funded drilling program in 2015. Early season work in 2016 consisted of a Boart Longyear mini sonic drilling program to further refine the orientation of the deep channel and develop a mine plan. Two Volvo 750 excavators were purchased and used to open up the channel that ranged between 27 and 30 m (90-100 ft) in depth (Fig. 20). The pay gravel is a rounded boulder-rich unit that was likely emplaced from high energy run-off from a former ice sheet near the drainage divide. Encouraging grades have been identified in areas of the channel that are wider and permitted the outwash flow to decrease. Mining will continue in the deep channel in 2017 and near surface pay gravel will be targeted at the mouth of Guder Creek.



Figure 20. A view of the right limit deep channel pit on Seymour Creek in 2016.

reworking that has occurred in a particular location of the valley bottom. Deposits closer to the valley side were more likely to have been buried by slumped sediment and therefore protected from reworking. Deposits in the middle of the valley were likely reworked by recent fluvial activity. Regardless of the amount of reworking, economic placer deposits seem to be found on the till surface across the valley bottom.

KLUANE

Placer gold production from the Kluane district in southwest Yukon was largely associated with mining on Gladstone, Burwash, Rabbit and Ruby creeks. The total production from the district was 1289 crude ounces with 60% of the production coming from Gladstone Creek (Fig. 2).

Gladstone

Tic Exploration had two wash plants operating on Gladstone Creek in 2016 and was the most productive mine in the Kluane district. Cuts on both the left and right limits mine down to a false bedrock of consolidated grey till that may have originated in the Ruby Range prior to the last glaciation (Fig. 21). The placer gold-enriched coarse gravel overlying the till can have different origins depending on the amount of

Rabbit

A new operation, FTG Placers, in the Ruby Range initiated mining on Rabbit Creek, a tributary to Larose and 12th of July creeks (Fig. 22). Their focus was a near surface periglacial gravel on a fan-like deposit at the mouth of Rabbit Creek. The mine employed 6 crew and represents the first mining activity in the 4th of July drainage in a number of years. Activity is expected to increase in the area as a result of Sidhu Trucking buying the 4th of July Creek claims.

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Figure 21. A view of the right limit excavation on Gladstone Creek. Mining efforts are focused in coarse gravel deposits overlying a compact till. Thick sequences of sediment are located above the excavation that contain past interglacial and glacial material.



Figure 22. FTG Placers operation at the confluence of Rabbit and Larose creeks in the Ruby Range.

