Dredging the Goldfields
Corporate Gold Mining in the Yukon Territory

David Neufeld

Gold and the Klondike

CORPORATE capital investment and its pursuit of profit has largely shaped the mining industry in North America over the last century. To maximize the creation of wealth, successful corporations worked to gain the most complete knowledge of, and control over, those resources they were exploiting. Drawing upon the fields of science and technology, they developed effective administrative systems to assist their efforts. Governments, broadly supported by the bulk of voting citizens, were partners in this economically efficient form of resource development. The Klondike goldfields in northwest Canada, scene of some of the longest-lived gold dredging in North America, is an interesting example of this corporate industrialized form of mining.

The Klondike Gold Rush of 1897-1898 was part of a continuing expansion of Western society into the far corners of the world. The special character of the region's placer gold deposit initially supported individualistic hand-mining methods, but this was superseded by mechanical mining systems, founded on the centralized direction of corporate investment, early in the 20th century. Once in place, corporations secured their Klondike investments through an aggressive program of risk management. This strategy required control of the mineral resource, a rigorous exploration program to define it, the availability of administrative, transport, labor and financial infrastructure, the development of water management and power systems, and centralized management to collect information and direct extensive field operations using expensive, imported industrial equipment. The Klondike placer mining operations of the first half of the 20th century are an example of corporate resource extraction activity typical of Canadian northern development.

The bulk of the world's gold supply to the present has been mined from relatively accessible placer deposits — that is, from gold occurring in alluvial or glacial deposits rather than a lode (or hard rock) deposit. Placer deposits are formed by long-term natural mechanical and chemical processes. The most significant feature of an alluvial placer deposit is the extent and character of the pay streak. Generally the gold making up the pay streak is deposited along the bedrock under the gravel base of the stream. It is necessary to penetrate this gravel overburden and separate the heavier gold from the gravel in order to mine the gold.

In the Klondike, the apparent proximity of the source lode gold and the undisturbed nature of the land created a rich placer deposit that in places was close to the surface and easily mined.[1] However, much of the placer gold was not so easily recovered. The gold was worn into small particles and deposited along the streambeds in highly variable concentrations. In addition, the water courses changed considerably over time, and large amounts of non-gold-bearing material gradually filled up the old valleys. Much of this overburden was permanently frozen and was tens or even hundreds of feet thick.[2]

The first prospectors in the Yukon basin arrived in the late 1870s. A succession of small discoveries in the 1880s kept miners in the area. However, it was the major strike on Bonanza Creek in August 1896 that made "Klondike" known around the world. An unprecedented rush of 100,000 people turned a swampy slough on the shores of the Yukon River into the "San Francisco of the North" and the quiet wooded valleys of the Klondike River watershed into a churned gravel pit. While the Gold Rush enthusiasm soon spent itself, the Klondike placer gold deposit was not so quickly exhausted. The area has remained the center of significant gold mining activity for well over a century.

The mining history of the Klondike to the middle of the 20th century can be broken into three distinct divisions: an initial period, from 1896 to about 1902, with a massive influx of people and money geared toward the high grading of the rich placer deposit; a subsequent period of continued interest and infrastructure development, but limited capital; and, finally, from about 1906 on, a period of corporate capital investment, which directed future development. The following pages describe how mining in each of these periods attempted to address the challenges of making a profit in a northern placer field.

Labor Intensive Mining, 1896-1902

The Klondike's white population in the last decade of the 19th century consisted largely of stampeders chasing the Gold Rush as well as entrepreneurs following the stream of humanity north. Mining legislation, the development of transportation, and the evolution of

Stampeders crowding the summit of the Chilkoot Pass, waiting to get through a customs inspection by the Mounted Police. *Manuscripts, Special Collections, University Archives, University of Washington Libraries, Hegg Collection #210 Seattle*

government and services in the Klondike helped to define the mining industry during this initial period.

The legislation governing Yukon gold mining was simply an extension of the mining laws prepared for the British Columbia railway belt a decade earlier. Although this legislation evolved over time, its primary feature — the property rights of the individual — remained the same. Speculation in the field was prevented by regulations that limited the size of claims to that which could be practically worked by one man, a requirement to undertake development work on each claim in order to retain it, and provisions for the lapsing of a claim should the holder be absent for more than 72 hours. The individual was the primary agent of development.

Transportation into the Klondike was difficult and seasonal, initially limited to a rugged mountain climb through the Chilkoot Pass to the headwaters of the Yukon River, followed by a two- to three-week trip down the river. These conditions made transport both time-consuming and expensive, especially for bulk goods, effectively limiting mining activity to the labor-intensive hand-mining methods of the individual miner.

However, the flow of commercial capital soon enabled significant improvements in the transportation system. The high volume of Klondike traffic led to the construction of a railway through the White Pass, a fleet of steamboats on the Yukon River, and the construction of a rail and road network through the goldfields. By 1900, mining machinery was being shipped in. Although transport was still effectively limited to the summer navigation season, there was regular access. The flow of investment assumed the continued expansion of mining activity in the Yukon, and the growth of mining in the Klondike was supported by a rapid expansion of commercial investment in supply services.[3]

Dawson was the focal point of the Klondike during the years of hand mining. Located on the Yukon River, this city of 10,000 to 20,000 was the regional entry point.[4] Equipped with extensive docks, the largest stores and hotels, and a wide range of miner's services, Dawson also had the huge warehouses needed to carry the community through the winters when connection to the "outside" was, for all practical purposes, closed. The city was the financial and administrative center of the Klondike, and by 1900 had several banks and gold buyers, as well as the offices of the Yukon Commissioner, Mining Recorder, and Territorial Court. The North-West Mounted Police maintained order and collected mining royalties from their posts in Dawson and throughout the goldfields. Stable civil government, necessary regional services, and reliable transportation were required for secure capital investment.

In spite of a remarkable flood of investments — estimated to total $100 million[5] — gold production in the Klondike had started to slide by 1902. The easily worked surface placers in the creek beds were depleted, and the days of the hand miner were strictly numbered. On the benches above the creeks, unmanageable depths of overburden overlay the bedrock, and unstable slopes on the steep valley sides endangered the creek claims. Mining operations often came to a standstill during the summer season as the small creeks dried up.

Miners confronted a host of difficulties, including stale air in the abnormally deep shafts, collapsing drifts, elusive pay streaks, and low wages.[6] Despite the great wealth won by a few and the steady wages gained by

Hand Mining. Life on the creek claims involved hard work in unhealthy and unsafe conditions. The hand miner generally sank his shaft in winter to avoid water problems, fire-thawing, and digging through three to ten meters of frozen muck and gravel overburden to reach the paystreak. Once bedrock was reached, the cycle of building fires and shoveling out wet, thawed pay dirt began. On a good day the miner could hope to thaw and winch out about 4½ yards of pay dirt. Deposited in a dump nearby, the pay dirt was sluiced to wash out the gold in the spring when running water was available once again. In addition to digging and sluicing, the miner had to cut cordwood, and build and maintain dams, flumes, sluice boxes, and a winch to support mining, as well as erect a cabin for himself.
Parks Canada, Whitehorse, Yukon

others, the largest part of the widely dispersed gold deposit remained untouched by the limited, if valiant, efforts of the pick and shovel.[7]

Attempts to Mechanize Individualistic Mining, 1899-1906

> Mining on the Klondike creeks is at present in a transition stage. The individual claim-owner is being replaced by companies owning groups of claims and working them with expensive plants. The fabulously rich placers which made Eldorado, Hunker and Bonanza creeks famous have been mostly drifted out and the gravels which remain are too lean, as a rule, to be worked with much profit by the early pick and shovel method.
> — R. G. McConnell, 1906[8]

To overcome the problems limiting hand mining, mine owners began to employ machinery to work their claims. An incredible range of mining equipment was imported or developed locally to address the need for more efficiency. The basics of successful placer mining involved locating the pay streak, removing the overburden, and separating the gold from the carrier deposit; but with the greater use of machinery, it became increasingly an exercise in the bulk handling of material. Two basic forms of mining can be identified: those that continued to be based upon an individual claim or group of claims, and those premised upon corporate capital investment.

Attempts to mechanize individual claims occurred as early as 1899. Steam thawing of permafrost gravel, widespread by 1900, supported year-round mining and increased the output of the miners that used it. Once steam boilers were dispersed for thawing work, it was not long before they were also powering the "Dawson self-dumping carrier." This locally designed and built cable shovel system allowed considerable efficiency in the movement of pay dirt from mineface to sluice box. Steam engines also powered overburden scrapers and water pumps for hydraulic work. By 1905, several steam shovels operated on claims on Eldorado Creek.[9]

In spite of these developments, poor engineering or inadequate support often meant that promising equipment failed to live up to the hopes of its operators. A second difficulty was the increasing price of fuel. The immense amounts of fuel required to heat buildings and fire steam boilers pushed up the price of local wood and coal. (The quality of the coal available locally was relatively poor, so wood was most frequently used.) In addition to power shortages, the continuing unreliable supply of water in the Klondike watershed still limited miners' ability to sluice gold. A large proportion of mining litigation in the Klondike involved the allocation of the available water.

The major limiting factor for early machine mining was the system of individual claims. With a single claim, or even in a group of claims, mechanization had to be carefully scaled to the extent and richness of the limited placer deposit within its boundaries. Most steam equipment could not mine such small areas economically. Even when a miner was successful in applying mechanical equipment, the storage of tailings and the space needed for operations meant that very little of the claim was left for actual mining. This situation was considerably more complicated for miners using hydraulic monitors — large nozzles whose high-pressure water jets broke up the gravel deposits.[10]

These difficulties stemmed from the fragmented approach to exploiting what was essentially a homogeneous resource. Without some comprehensive knowledge of the character of the resource and the means

to address the perennial shortages of water and power, successful development was largely based on luck.

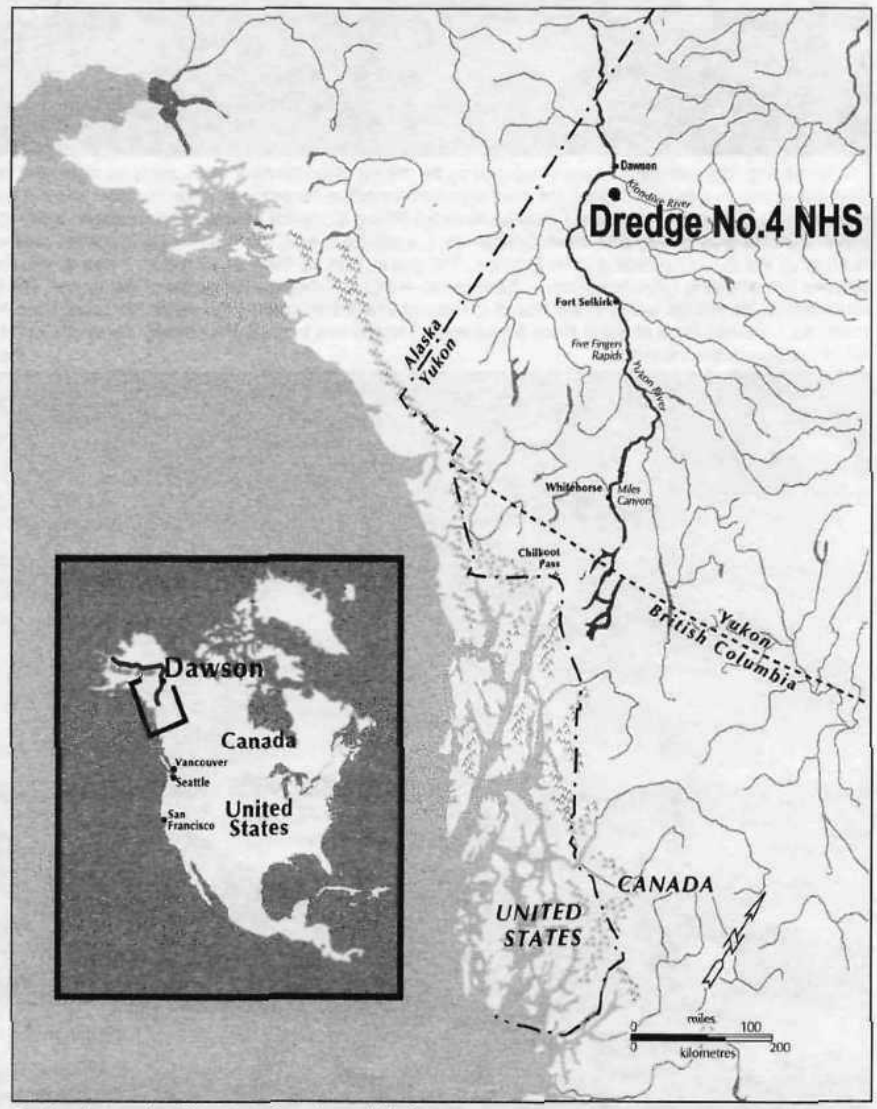
Corporate Capital in the Klondike, 1905-1910

By the late 19th century, many saw capital-intensive development as crucial to national growth. Large integrated corporations gradually increased their participation in the global economy. Backed by vast sums of investment capital, these corporations could command the most advanced scientific skills and technologies in their search for profit. Once in the field, they had both the money and the expertise to overcome the many variables affecting their operation and thus reduce their risk of loss. As a rapidly developing new nation, Canada could offer numerous investment opportunities and tailored its development policies to encourage capital investment.

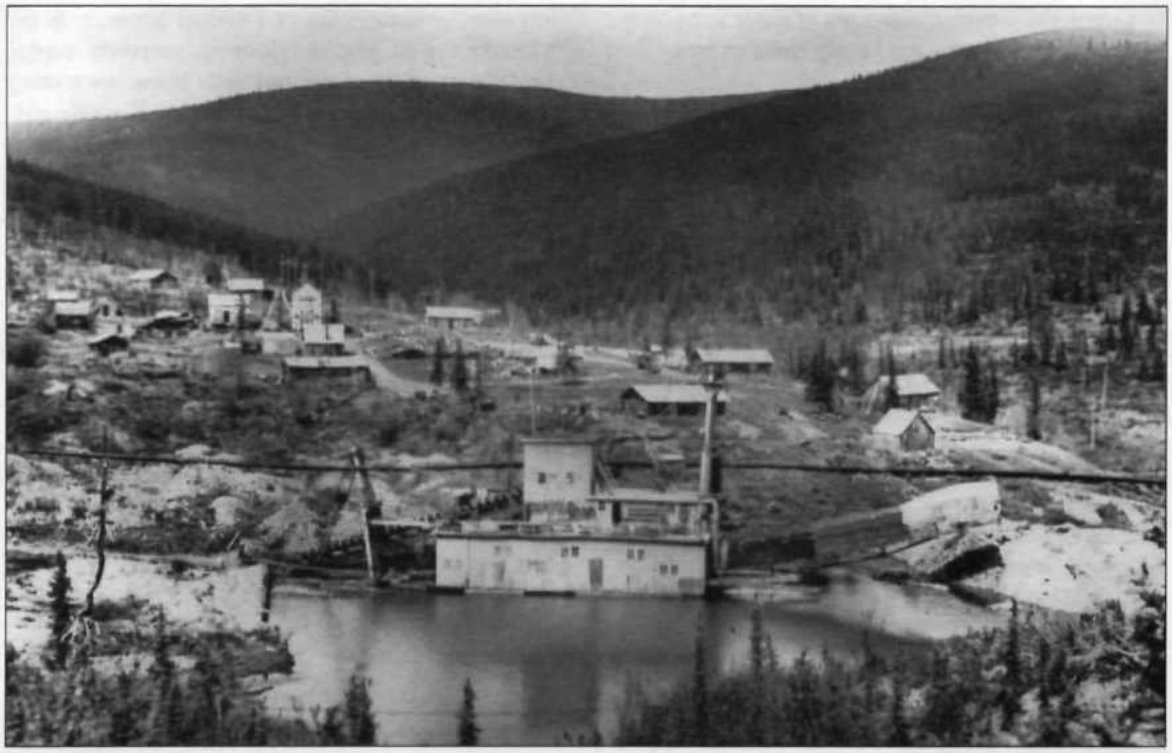
Even in the heady first days of the stampede there had been provisions for corporate investment: for example, rules allowing hydraulic and dredging concessions for ground unsuitable for hand mining supplemented placer-mining regulations. Both hydraulic and dredging operations required substantial capital and relatively sophisticated technology, as well as ample land, in order to achieve profitability through economies of scale. Hydraulic mining depended on an abundant water supply; the monitors used in the process went through huge amounts of water as they broke up and washed gold-bearing gravel. Dredges, by contrast, floated above the gravel deposits as their buckets excavated the gravel below. Sensitive to the requirements of such large-scale operations, the government offered secure grants of mining lands to interested companies, the first of which was conferred in January 1898.[11] The succeeding years saw ongoing efforts to create large mining holdings in order to enhance investment security.

Early in the rush, investors saw the possibilities of a unified approach to the Klondike's gold placers. However, corporate capital needed a guarantee of eventual profit before committing to any substantial investments. In the Klondike this meant secure and long-term tenure of mining property. Once this was assured, corporations began to create integrated mining systems. After an extended phase of development, which included streamlining administration, a long period of stable resource exploitation followed. This would become the model for resource development in the Canadian north.

Two men had a lasting impact on the shape of Klondike mining: Joe Boyle and A. N. C. Treadgold. Both were promoters for large-scale mechanized mining, and both gained the support of important investment interests. Working independently, they secured suitable land holdings for corporate mining that would form the basis for the subsequent industrial-scale mining systems.



Regional map of northwestern Canada and Alaska.



Dredge Mining. The modern dredges introduced by the mining corporations actually made no significant change in the way gold was removed from the gravel, as gravity remained the most important aspect of the process. What changed was the scale of the technology. In the continuous process of dredging, the giant Canadian Klondike Mining Company vessels each averaged 8,000 to 10,000 cubic yards per day, about 2,000 times the work of the hand miner. Dredge No. 4, weighing over 2,700 tons, floated in a pond of its own making and used its bucket line to chew up the river and creek gravels before it. The gravel, from as deep as 17 meters below grade, was drawn up by the bucket line and dropped into a rotating cylindrical sieve — the trommel — located along the center line of the dredge. The larger rocks were separated out and conveyed up the tailings ladder at the rear of the vessel where they created the distinctive tailing piles of dredge mining. The fine sand and gravel were washed into a series of sluice boxes where the gold was trapped. Periodically, depending upon the richness of the gravels, a clean-out of the sluices was performed. *Parks Canada, Whitehorse, Yukon Territory*

Joe Boyle was granted his mining concession in November 1900. It stretched along seven miles of the Klondike River Valley, between Bonanza and Hunker Creeks. While Boyle could not infringe upon the claims or rights already granted to others within his concession, the terms of the grant were stacked in his favor. For example, any claim that lapsed could not be restaked by other miners, but immediately became a part of his concession. Further, Boyle obtained all the water and timber rights within his concession, thus providing him with a non-mining income that kept him afloat through the lengthy financial negotiations. In the winter of 1904-1905 Boyle finally arranged a deal with a group of Detroit investors who had previous interests in the Klondike. Together they formed the Canadian Klondyke Mining Company (CKM).[12]

The opportunities for major development had impressed A. N. C. Treadgold on his first trip to the Klondike during the Gold Rush. He began laying the ground for a massive hydraulic mining operation. Although his original request for a concession covering the entire goldfields was withdrawn in the face of local protest, Treadgold effectively revived his original idea through an ambitious program of purchasing individual claims, with the financial backing of the powerful Guggenheim family based in New York. The resulting company was known as the Yukon Gold Company.

The Guggenheims quickly expanded their investment in Klondike mining. Yukon Gold planned a combination of creek dredging and then hydraulic mining of the hillside claims. The facilities needed were soon put in place. From 1906 until 1909 the company fielded work crews of almost 2,000 men. In 1911 the company ran nine dredges and several hydraulic operations.[13]

The activities of the CKM on Boyle's concession focused on dredging the thawed gravels of the Klondike River Valley and exhibited the same integrated character as Yukon Gold's efforts. Boyle imported his first dredge in 1905, establishing a camp at the mouth of Bear Creek to support its erection. Other buildings soon followed quickly, and within a year the camp boasted a three-stack steam-electric plant, a machine shop, three warehouses, a stable, two rooming houses and a two-story bunkhouse and mess.[14] The company also began exploration of its holdings with four prospect drills.

The success of the first year's dredging was so encouraging that the CKM Company ordered three additional dredges from the Marion Steam Shovel Company of Ohio. These extraordinary machines, the last two each equipped with 16-cubic-foot buckets, were the largest dredges to be built in the Yukon. All four dredges were in operation by 1913.[15]

While considerably more efficient than hand mining, dredging required substantial infrastructure support. With a fleet of as many as nine dredges operating in a season, coordination of material resources and manpower was essential to efficient operation. At first, labor came from the substantial local population of individual miners willing to work for wages seasonally in order to finance their prospecting activities. During and after the First World War, however, this labor pool dried up. Large urban centers in the Canadian south, typically Vancouver, subsequently provided the work force, and the men tended to return there to wait out the long northern winter.

Constant review of prospect drilling information was needed to ensure that the dredges worked only profitable ground. Work was supervised by the administrative and engineering offices at Bear Creek and "Guggieville," the Yukon Gold camp. The camps also had well-equipped and supplied shops, necessary to maintain heavy equipment working difficult ground. In addition, the gold from the dredges was refined and cast into bars for shipment at the camps. Thus the camps became the heart of the corporate goldfield operation.

Yukon Gold required huge amounts of water for the hydraulic operations and to help manage the dredging work on the smaller creeks. To meet its immediate needs for water and to establish a local reservoir, the company erected a dam on Upper Bonanza Creek. The major hydraulic work, however, was the Twelve Mile ditch and pipeline that snaked some 120 kilometers into the goldfields from the Ogilvie Mountains north of the Klondike. This highly engineered work, finally completed in 1909, delivered the water needed to carve into the lucrative white channel gravels of Bonanza Creek. The pipeline route included a heavy metal siphon through the camp at Bear Creek where the bridge across the then Klondike River, and sections of the pipeline are still visible today.

Power demands for the dredges far outstripped that available from the steam plants initially erected in both Guggieville and Bear Creek, and the cost of fuel made such power too expensive. A hydroelectric plant erected on the Twelve Mile River 40 kilometers northeast of Dawson provided power for the seven dredges Yukon Gold had in operation by 1908. Treadgold, then operating his own company, completed a new 10,000 horsepower hydroelectric plant on the North Fork of the Klondike River in 1911. The new plant supplied power to both the Canadian Klondike Mining Company and Yukon Gold.[16] It remained the primary power source for corporate mining systems and the town of Dawson until finally shut down in the late 1960s.

The Klondike was of interest to corporate capital from the start of the Rush. The social impact of the change in development strategy was dramatic. The regional year-round population declined rapidly as the economic viability of entrepreneurial mining deteriorated, and a seasonal labor force took its place. The urban landscape of the individualistic gold fields was replaced by the centralized camps of the mining corporations.

The Character of Northern Corporate Mining

The economic pressures of the First World War and the postwar recession limited development interest in the Klondike. By the early 1920s, the regional gold mining industry was in the doldrums with Yukon Gold transferring its interest to placer operations in Malaysia and Alaska, while CKM floundered under ineffective leadership after Joe Boyle's departure during the war. In 1923, Treadgold picked up the assets of both companies, combining them into the Yukon Consolidated Gold Corporation (YCGC). He then initiated a spree of ill-advised and expensive mechanical innovations in gold mining technique that threatened the financial stability of the company. In 1930, Treadgold was relieved of his management position by a desperate board of directors.[17]

Although the Great Depression crippled the Western world economies, it benefited fixed-priced products such as gold. In mid-decade, the price of gold was doubled to $35 an ounce, and gold mining boomed. YCGC improved its goldfields road network, undertook an extensive prospecting project to establish its reserves more accurately, and rebuilt several of its dredges, including Number 4 in 1941. No significant changes were made to the corporate mining structure, though several steps were taken to refine its operation. By 1936 the company began mechanizing its transport operations, with trac-tors and Caterpillars replacing the horses. Bear Creek camp, the center of the YCGC operation, was revitalized, Guggieville having been dredged earlier in the 1920s. In 1933, a Bear Creek resident reported: "the new management is improving everything gradually, fixing up buildings around the camp and going into things generally. . . ."[18]

The roughly 30-hectare camp at Bear Creek was built around a central square, with the hulking mass of the huge machine shop, tall equipment garages, hay sheds, and busy open storage yards on the south. A two-story bunkhouse closed off the eastern approach, and offices, management residences, and the gold room, all of log, lined the north. The camp performed five general functions within the mining system: administration/engineering, repair and maintenance, warehousing, residential, and goldfield services. These functions addressed the basic requirements of large-scale mining and remained unchanged in their essentials throughout the history of corporate mining work in the central Yukon.

The camp was the administrative headquarters; all engineering planning, design work, and management of personnel and supplies was undertaken in the offices at Bear Creek. Prospect drilling records were filed there, the results shaping the long-term development programs necessary to keep the dredges working in profitable ground.

The largest, and certainly the busiest, buildings at the camp were the repair and maintenance shops. Extensive and well-equipped facilities to produce or repair the heavy fittings and castings, and perform ongoing maintenance to company dredges, prospecting drills, and — later — its fleet of Cats and trucks, allowed YCGC to reduce the handicap of its remote location. The machine shop at Bear Creek included milling and machine tools, huge metal presses, and a blacksmith shop. A tin fabricating shop, carpentry shop, and auto and Cat repairing garages supplemented the service capabilities of the main shop. Oxygen and acetylene were produced in a separate plant to supply the continuous welding work associated with heavy-equipment operations. Oxygen was also supplied to the hospital in Dawson.

Each outlying dredge camp was connected by telephone to the dredge superintendent at Bear Creek, supporting a rapid response to all field-repair requirements and minimizing downtime. The winter season was generally devoted to overhaul and preventative maintenance, keeping the shop busy year-round.[19] The camp also acted as a center for gold processing. All the raw gold collected from the dredges, usually once a week, or more often if an especially rich patch was hit, was processed at the camp's gold room and poured into bars ready for shipping.

The isolation of the Klondike meant that supplies were difficult to obtain and delivery times lengthy. Self-sufficiency of operations was an important characteristic of Bear Creek that was established early and retained for the life of the camp.[20] This was evident in the large and varied types of warehousing on the site — cold storage, gas and oil storage, dry goods warehouse, machine parts storage, and lumber yards — a range and volume of supply to support the widespread field operations and to provide the immediate response necessary to meet mine needs. Although designed to help the company operate with minimal summer downtime, this large inventory, and the extensive repair and fabrication facilities, helped the company to continue operations through the Second World War, when many of the gold mines in the United States and Canada shut down.

A large residential unit grew at Bear Creek. Most of the permanent housing was for the year-round employees — management, engineering, and skilled workers. Large gardens, greenhouses, and a community hall reflected the social life. The camp also maintained several large bunkhouses for the seasonal work crews. In the early days, the crews stayed in the camp; but as the operations of the company expanded through the goldfields in the 1930s, the dredge and thawing-point crews were housed at dispersed dredge camps.

The overall impression of the camp was that of an island of modern technology in a remote wilderness. Bear Creek roared with activity throughout the nightless summers of the north. A constant stream of vehicles passed through and around the facility, hauling supplies, exchanging work crews, or bringing in gold from a clean-up at one of the dredges. The broad metal-clad buildings dominated the activity, while all around, the tailing piles from past dredging preserved the separation

of the camp from the surrounding wilderness. Well-groomed and colorful flower gardens, bordered with white painted rocks — a legacy of Joe Boyle's time, tempered the mechanistic appearance of the camp without disturbing its orderly tenor.

Once established, neither functions nor equipment at the camp underwent substantial change. The basic supports for economically profitable dredging operations were identified and provided. From the 1910s until the complete withdrawal of corporate capital in 1966, there was little recapitalization of the camp; equipment and buildings were repaired or moved rather than replaced. The longevity necessary for the corporate mining development strategy is noteworthy.

The rationalized approach of the bookkeeper colored every aspect of camp life and activity. The camp was part of a scientific mining system, and only those characteristics contributing to profitability were incorporated. Bear Creek was one of the earlier examples of the application of scientific management practices to the mining industry in Canada. The subsequent lack of change at the site preserves the camp in an early form, making it a fine example of the physical environment resulting from this approach.

During the 1940s, however, the North American gold mining industry began a precipitous slide. Deemed a non-essential industry during the war, gold mining struggled in the face of labor shortages and a low priority in equipment purchasing. Yet, while gold production dropped, YCGC managed to continue operations. Nevertheless, the end of the war did not improve the situation materially, as the fixed price of gold gradually lost its value in the face of postwar inflation in the late 1940s and early 1950s. In face of this, YCGC refused to reinvest in capital structures: their Klondike dredge mining system was simply run into the ground. Capital expenses were minimized, attempts were made to write off equipment at an accelerated rate, and the company began to consider investments in the Alberta oil fields. Through the 1950s, as the dredges ran out of paying ground or just wore out, they were abandoned. Dredge Number 4, shut down in the fall of 1959, sank the following spring. Seven years later, the last four small dredges were ordered to cease work, and the entire system, by then almost completely collapsed, ceased operation.

Conclusion

Placer gold mining was the largest single contributor to the Yukon economy in the first half of the 20th century.[21] The dredging operations in the Klondike regularly contributed two-thirds of total Yukon gold produced. From the 1920s on, YCGC was also the major employer in the territory, which was especially important during the Great Depression when the company provided about 100 permanent positions and another 600 seasonal jobs.[22] The company's economic importance to, and social influence on, the Yukon cannot be overstated. During the 1930s, it was said that the territory was run by three people: the territorial gold commissioner, the senior Royal Canadian Mounted Police officer, and the manager of YCGC.

Corporate dredge mining played an important role in shaping modern Yukon. Based upon scientific management techniques and modern engineering capabilities, corporations created a mining system geared toward the maximization of profit. This aim was achieved by giving each component of the well-regulated system clearly defined operational responsibilities and economic objectives. The extension of these rationalized principles of corporate organization and associated technologies into remote northern environments enabled an enduring resource exploitation while integrating those areas more fully into the international economy. The Klondike dredge-mining system is representative of the integrated network of facilities and services that characterized resource extraction development throughout the North and the Canadian Shield in the 20th century.

The history of gold extraction in the Klondike in the 20th century is identified with a fundamental shift in the economic organization and technological basis of Canada's northern development. Although the basic principles of gold recovery remained the same, the scale of gold-mining technology changed dramatically over time, most importantly in the nature of the development process and the character of its control. These changes are best illustrated by studying the structures raised to support mining.

From an original strategy based upon individualistic entrepreneurship of the 19th-century agricultural settlement frontier, northern Canadian mineral resources in the 20th century have been subjected to the organized and calculated strategies of corporate capital. The Klondike, with sites such as Dawson and Bear Creek, remains one of the very few places where the stages of this history and the actual process of economic transformation can be seen.

NOTES

1. R. W. Boyle, *The Geochemistry of Gold and Its Deposits*, Geological Survey Bull. 280 (Ottawa: Geological Survey of Canada, 1979), 333-334, 356-357.
2. *Ibid.*, 335, 347-348, 352.
3. For detail on the development of transportation during this period, see Gordon Bennett, *Yukon Transportation: A History* (Ottawa: National Historic Parks and Sites Branch, Parks Canada, 1978); Occasional Papers in Archaeology and History, No. 19; and Harold A. Innis, *Settlement and the Mining Frontier* (Toronto: Macmillan Company of Canada, 1936). Typically river navigation was possible June through September.
4. H. Guest, "A History of the City of Dawson, Yukon Territory," Microfiche Report Series 7 (Winnipeg: Parks Canada, 1981), 63, 272-277. Guest draws attention to the highly mobile character of Dawson's population.
5. Innis, *Settlement and the Mining Frontier*, 191; D. Newell MacDougall, "Canada's Share of the Klondike: The Character of Gold-Rush Publicity," Master's thesis (Carleton University, Ottawa, Ontario, 1974), 44.
6. I. Clarke, "In the Jaws of the Bear: A History of Gold Mining on

Bear Creek, 1896-1904" (Winnipeg: Environment Canada, Parks, 1983, unpubl. ms.), 20-21.

7. In 1906, R. G. McConnell of the Geological Survey of Canada estimated that almost $95 million in gold had been taken from the gravels of the Klondike, while probably $54 million remained recoverable (R. G. McConnell, "Report on Gold Values in the Klondike High-Level Gravel," Ottawa, 1907), 33.
8. *Canada, Geological Survey of Canada, Summary Report, 1906*, 20-21, quoted in Morris Zaslow, *The Opening of the Canadian North, 1870-1914* (Toronto, Can.: McClelland and Stewart, 1971), 119.
9. Innis, *Settlement and the Mining Frontier*, 216, 220-221; Clarke, "In the Jaws of the Bear," 62.
10. Clarke, "In the Jaws of the Bear," 63; Innis, *Settlement and the Mining Frontier*, 224.
11. Lewis Green, *The Gold Hustlers* (Anchorage: Alaska Northwest Publishing Co., 1977), 17-20; Zaslow, *The Opening of the Canadian North*, 114-115.
12. Clarke, "In the Jaws of the Bear," 9-10. This discussion of corporate activities in the Klondike is based on Green, *The Gold Hustlers*, ch. 4-6.
13. Green, *The Gold Hustlers*, 307-308. The Guggenheims were the central figures in the powerful American Smelting and Refining Company (ASARCO), described in Isaac F. Marcosson, *Metal Magic: The Story of the American Smelting and Refining Company* (New York: Farrar, Straus, 1949).
14. Great Plains Research Consultants, "The Bear Creek Industrial Complex: A Functional and Corporate History 1905-1966" (Winnipeg: Environment Canada, 1987, unpubl. ms.), 29.
15. Green, *The Gold Hustlers*, 304; David Neufeld and Patrick Habiluk, *Make It Pay! Gold Dredge #4* (Missoula, MT: Pictorial Histories Publishing Co., 1994). Canadian Number 4 is now owned by Parks Canada and open to the public.
16. Green, *The Gold Hustlers*, 168-173.
17. *Ibid.*, 245, 300.
18. Yukon Archives, 80/32, F-102, Craig Family Collection, C. Craig to parents, July 6, 1933, quoted in Great Plains Research Consultants, "The Bear Creek Industrial Complex," 85.
19. Great Plains Research Consultants, "The Bear Creek Industrial Complex," 41-44.
20. J. Light, "An Industrial Smithy: Bear Creek, Yukon," *IA: The Journal of the Society for Industrial Archeology*, 12, 1 (1986): 39, 46.
21. *The Yukon Today: A Reference Paper* (Ottawa, Can.: Indian and Northern Affairs, 1968), 27.
22. W. H. S. McFarland, "Operations of the Yukon Consolidated Gold Corporation," *Transactions of the Canadian Institute of Mining and Metallurgy*, 42 (1939): 549.

David Neufeld, Yukon and Western Arctic Historian for Parks Canada, lives and works in the Yukon Territory of northwestern Canada. His research in northern and mining history includes the curation of a major exhibit on northern bush flying at the Western Canada Aviation Museum in Winnipeg, Manitoba; the preparation of *An Annotated Bibliography of Placer Gold Mining 1896-1966* (1994); numerous articles; and two books, *Make it Pay! Gold Dredge #4* (1994) and *Chilkoot Trail — Heritage Route to the Klondike* (1996). His recent work addresses the history of Yukon aboriginal peoples.