

ANVIL'S DISCOVERY AND DEVELOPMENT

Greater than the Klondike

SYNOPSIS

Anvil Mining Corporation, a major zinc - lead- silver producer that has opened up the subarctic wilderness of Central Yukon, is the culmination of intensive scientific mineral exploration by Dynasty Explorations Ltd. of Vancouver and of dynamic and capable risk financing and development by Cyprus Mines Corporation of Los Angeles.

This account of the discovery illustrates the complex problems of finding and developing new mines, emphasizing the need for continued incentives for risk enterprise in basic resource development in spite of increasing controls and regulations.

The Faro orebody stands as a monument to scientific mineral exploration, for it could never have been found by conventional prospecting alone. There were hints of mineralization on the surface but no outcrop or float of the ore itself; its discovery was dependent mainly on geochemistry and geophysics.

Many experienced professional personnel of appropriate capabilities, efficiently organized with the best modern methods, working persistently with incentives and creative imagination on a district with major potential, and backed by flexible risk financing of appropriate scale, were responsible in virtually every step of the complex developments. Team spirit inspired by incentives overcame the many obstacles of isolation, adverse weather, complex geology and geophysics, muskeg, equipment breakdowns, and scarcity of financing.

Dynasty, the discoverer, was organized and headed by Vancouver geological engineer Dr. Aaro E. Aho, managed in the field by geological engineer Gordon Davis, kept supplied and operating by prospector Alan Kulan, financed by the efforts of executive Ronald Markham, guided legally by lawyer John Bruks and furthered by others who were inspired with the convictions of this team.

Potential of the district was first indicated by Kulan's 1953 discovery of the Vangerda lead-zinc deposit. In 1964 a regional approach was decided upon but exploration of this extensive district cost half a million dollars before the Faro sulphidebody was discovered. In 1965, and much more before its value was proven.

Cyprus Mines Corporation, headed by Henry T. Mudd of international mining and financial renown, provided imaginative and flexible joint venture financing in the wildcat drilling phase in 1965. After the discovery, Anvil Mining Corporation was formed, 60% owned by Cyprus and 40% by Dynasty. Under the dynamic leadership of its president Kenneth Lieber and the competent Cyprus team, the new corporation worked out the complexities of continued exploration, development, feasibility studies, sales contracts, transportation, power, townsite, financing and construction in two further years of work costing ten million dollars.

Two more years of construction brought the giant to life late in 1969 at a total final cost of about \$65 million, with expenditures by government and other enterprises bringing total investment to over \$100 million.

Gross value of the Anvil mine is some two billion dollars, several times that of all the golden Klondike, and it unfolded a new era of development and economic self-sufficiency for Yukon.

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PRELUDE

EMPLACEMENT OF THE TREASURE

In the primordial history of this planet, billions of years ago, the continental regions around the Pacific ocean were somehow destined to become storehouses for huge base metal deposits.

Whatever may be the ultimate reason for existence of this mineral wealth, the Anvil deposits were born in the antiquity of geologic time. Several hundred million years ago rocks of the Anvil Range originally accumulated thousands of feet thick as sands, volcanic ash, and lava flows in a sea bottom with lenses of sulphur, iron, lead, zinc, copper, arsenic and rarer silver, gold and other metals being concentrated within them. Then they suffered long and complex periods of squeezing, re-crystallization and folding, with granite finally welling up deep in the core of the range, further crystallizing the severely deformed rocks.

As the miles of over-thickened earth's crust kept buoying up, ancestral peaks of the Anvil range rose and were eroded deeper and deeper over tens of millions of passing years, still jostled by earthquakes from the great Tintina rift bordering the southwest flank of the district. Some of the ore itself was eroded away by Late Tertiary time, only a million years ago.

Then accumulations of snow and ice, culminating in the great glaciers of the Pleistocene epoch, scoured the soil and weathered rock from the valleys and slopes, leaving extensive boulder-clay debris, partly redistributed by post-glacial streams, to mask most of the bedrock,

Subarctic vegetation now cloaked the land, then a volcanic eruption from the high crest of the St. Elias Mountains along the Alaska border dusted the area with a blanket of white volcanic ash, soon covered again by vegetation. Thus most of the riches of the Anvil district were concealed from casual eyes and only rush seepages, visible in a few places, showed where sulphides near the surface were being weathered away.

THE WAITING LAND

In this subarctic interior plateau system at the uninhabited top of the continent, the great gash of the Tintina trench stretches past the jumbled peaks of the Anvil range, and other isolated mountain groups fade into the distance as far as visible over the curvature of the earth. The silvery ribbon of the Pelly River, down which Robert Campbell led the first white fur trading expedition in 1843, snakes along the trench in the shallow ditch of its meander belt, like a master freeway between cutbanks wooded with dark northern spruce, jackpine, and shivering aspen. On the southwest, jewel-like lakes and limestone cliffs dot the low wooded hills of the trench, against a majestic backdrop of the Pelly and Glenlyon mountains which are broken only by the Magundy-Little Salmon gap, now the main highway route. On the northeast, open bunch-grass slopes, parklike aspen groves, and jackpine benches rise up to burn-mottled hills which interlock into a vista of peaks crowned by snow-streaked crags of Mt. Mye and Rose Mountain. This is the Anvil Range with granite in its rugged heart and massive orebodies hidden under nondescript slopes of its flanks. Southeast across the deep valley of Blind Creek, the range has foundered into lower lake and hill terrain.

None of the valleys of the Anvil range were master routes to anywhere in this unpeopled land, so it kept its secrets until they were unlocked by modern scientific prospecting.

FIRST REVELATIONS

In spite of many decades of fur trading and gold prospecting along the Pelly River, no hint of immense wealth in the nearby Anvil district was found. Old-timers had tested the creeks for placer gold, a trapper-pro prospector named Rose had reportedly found a gold-bearing vein on Rose Mountain, and Dell Van Gorder had trapped on the creek that bore his name. All were unaware of the most important mineralization.

However, the Alaska Highway and Canol Road which were built during World War II had opened up transportation in Yukon and, stimulated by advancing prices, base metal prospecting was started in the late 1940's. Hudson Bay Exploration worked off the Canol Road, made several finds, and stimulated some interest in this remote region.

Prospector Alan Kulan, lured to Yukon in 1946, by its mineral possibilities, found small lenses of lead and zinc in and around the granite of Mt. Mye in 1952. He returned again next season, backed by trading post operator Bert Law and accompanied by Peter Thompson and Ross River natives Arthur John, Chiney Sterriah, Jack Ladue and Robert Etsel. On July 2, 1953, out of food and his last pair of pants full of holes, Kulan checked on a heavy concentration of rust-reported near Vangorda Creek by Jack Sterriah. He found this gossan, prospected for about an hour nearby, discovered massive iron - lead-zinc mineralization in a rusty exposure 10 feet high and 100 feet long in the nearby creek bank, and staked it about a week later. Even so, others had been there before; near the showing was a pile of rusty tin cans probably left by a trapper.

The Vangorda discovery was optioned by exploration geologist E. O. (Ted) Chisholm, for a Toronto syndicate headed by Prospectors' Airways. Under 56 feet of overburden in the burned area next to the creek, diamond drilling proved up a flat-lying lens of massive sulphides 3,000 feet long, 480 feet wide and 51 feet thick totalling 9.4 million tons grading 4.96% zinc, 3.10% lead, 0.27% copper, 1.76 ounces per ton silver and .02 ounces per ton gold. At first supplies were flown in 130 miles from Whitehorse to crooked little "Jackknife" lake, then a D-4 cat was rafted down the Pelly to build an airstrip and service the drill sites. Drilling near two rust areas close to the Vangorda deposit revealed smaller sulphide bodies, the Champ and Firth.

In 1954, Prospectors' Airways grubstaked Kulan, who staked a rusty swamp 10 miles to the northwest, but the claims were allowed to lapse. Two years later he discovered copper float in the vicinity and the swamp was staked again. Follow-up work showed a geochemical and electromagnetic anomaly a few hundred feet south of the rusty swamp but a small packsack drill used to test the target failed to penetrate the overburden at 33 feet depth. Two packsack holes attempted in the rusty swamp also failed to reach bedrock. Chisholm recommended drilling with larger equipment but high costs, lack of transportation, and poorer metal prices forced curtailment of the program in 1956 and he published only a brief account of the project. This remained obscure until after discovery of the Faro sulphide body, whereupon it was found that if their first drill hole had penetrated a few feet deeper they would have made the discovery.

Kulan continued prospecting the Vangorda area in 1957 for Prospectors' Airways, and in 1960 at his own expense. In 1963, Mitsui Mining & Smelting Company of Japan was investigating feasibility of production from Vangorda and he persuaded Kerr Addison Mines, who had taken over Prospectors' Airways, to do geochemistry and an airborne magnetometer survey of Swim Lakes 8 miles southeast of Vangorda Creek.

Later that fall, well known Yukon prospector Gordon Dickson staked 200 claims for his Dickson Yukon Syndicate, covering once again the rusty swamp far to the northwest with an outlying block of claims.

Activity was now brewing, but only the old Vangorda deposit was known when Dynasty Explorations was organized in 1964.

INSTIGATION

The main initiator and organizer of Dynasty, geological engineer Dr. Aaro E. Aho, had also been lured by the far frontier in 1946 and had become convinced that Yukon had great enough mineral potential to offset its relative remoteness, lack of development, short season, and austere climate. Over ten seasons of field work in the territory and a district approach evolved from Western Cordillerant Studies led him to conviction that mineral deposits in the billion dollar gross value range existed in Yukon. He constantly envisioned finding at least one such deposit to open up the territory and to build a smelter like Cominco, and persisted in this search on behalf of companies, syndicates, individuals and himself.

Working in the difficult-to-explore Keno Hill silver district of Yukon, he was persuaded to form a company, Silver Titan Mines. Needing an office manager with persistent ability to solicit financing, he approached Ronald V. Markham whom he had met five years before. Markham, born in Toronto, had successfully promoted and operated B. C. Slate Company but willingly accepted the new position. By unusual ability to sell, he was able to keep Silver Titan solvent until Dynasty's success.

Aho also organized Frances River Syndicate in 1962 to prospect near Watson Lake, Yukon and hired young geological engineer R. E. Gordon Davis as field manager. The inspiration of mine-finding in Yukon was vindicated for Davis when the syndicate made a rich new lead-zinc discovery near Watson Lake.

In 1963, Aho organized another small new venture called Dynasty Syndicate, consisting of Silver Titan Mines, a prospectors' group, and several individual participants. However, prospecting in the Dawson Range and Hess Mountain areas by John French and Thor Skonseng turned up only a little uneconomic copper mineralization. By fall this syndicate had spent \$8,800, and was over-expended with some members still not paid up.

During the same season drilling of the Frances River Syndicate lead-zinc discovery also proved unsuccessful. However, Aho retained Davis to compile information on Yukon, preparatory to organizing new exploration programs. Further prospecting was planned in the remote Hess region and also in the Anvil district. Somewhere in the wilderness on some inconspicuous hillside, or under some insignificant swamp might be found a billion-dollar deposit.

Then Aho was approached in his Vancouver office by Kulan, whom he had known since 1953, for advice on organizing an exploration syndicate for the Anvil district. Common objectives led to discussions and agreement to combine forces, explore and stake potential targets, and carry out a program of greater scope.

Study of possible economics of the Vangorda deposit indicated that, with improvements in open pit techniques, low stripping ratio, dry climate, and projected metal prices and Japanese markets, perhaps a profit of several dollars per ton might be realized; therefore it could be well worth searching for another similar deposit.

Early in 1964, about \$12,000 was spent on prospecting magnetic surveys and staking of 169 claims, mainly in areas prospected before by some of the principals. Some initial work was done using dog teams.

Dynasty Explorations was incorporated and vendor stock was reserved for the various principals for the original syndicate of the same name, and for incentives and financing. Aho, Markham and Kulan became directors; Davis was exploration manager and was elected director in October.

Dickson Yukon Syndicate was also approached to join this venture on a 50/50 basis. However, they made a counter-offer on a 2/3 - 1/3 basis with management control in their hands, feeling that their properties should be weighted more heavily because they adjoined both ends of the Vangorda Mines property which had the only known deposit in the area. The offer was declined.

Aho, Markham, Kulan and Davis, the instigators, now intensified their efforts, confident of essential discovery.

SATURATE THE DISTRICT

The Vangorda-type orebody, assumed to be typical of the district, was more magnetic, conductive, dense and base-metal-bearing than much of its surroundings and therefore might be detected as a zone of anomalously higher magnetic (mag), electro magnetic (EM), electrical, gravity, or geochemical indications.

However, the most simple, rapid and significant methods had to be chosen for searching any sizeable part of the district, and experienced interpretation of results was necessary because anomalies are most commonly caused by barren iron sulphides, magnetite, rock types, or overburden, all uneconomic. Thus the first approach was to do magnetic and geochemical surveys with the anomalies being checked and by gravity and electromagnetic methods.

The deposits occur in a broad belt of gently to moderately dipping phyllite between granite on the northeast and greenstone on the southwest and were thought to be localized by certain geologic factors.

In addition to the active principals, other competent field personnel were brought into the new organization. John S. Brock, a recently graduated geophysicist, carried out the geophysical program and later assisted in general management; Andrew Harman ran the geophysical surveys; geologists John Fairley and Robert Chaplin mapped the rocks; veteran prospectors Jacob Hundere and Kenneth Willison combed the district; and native soil samplers and linecutters from Ross River worked on the targets. All were given stock incentives or bonuses.

The program forged ahead even before there was enough money in the treasury to pay for it. With great foresight, manager E. P. Bowser of the Royal Bank of Canada granted personal loans and provided flexibility throughout the Dynasty financing.

Dynasty continued approaching other Canadian mining interests to provide \$150,000 financing for a joint venture program which was estimated to cost a minimum of \$120,000, but could find no takers, so decided to "go it alone" starting with about \$70,000 raised privately by sale of shares at 40 cents.

The 1964 program consisted of line cutting, geophysical, geochemical and geologic surveys, and prospecting, mainly in the Swim Lakes area. It was organized by Aho, executed by Davis, kept supplied by Kulan and financed by Markham's sales of stock.

In June, on a low burned-off ridge 12 miles southeast of Vangorda Creek on Dynasty's Sea claims, native linecutters found rusty outcrops mineralized with minor copper, zinc and lead. Further work soon showed coincident alteration, mineralization, and an extensive magnetic anomaly encouragingly similar to that at Vangorda. As the anomaly was traced to the west, the main base camp was moved from East Swim Lake to nearby main Swim Lake; here several tent frames snuggled against a low knoll and were serviced frequently by Beaver aircraft on floats from Whitehorse 130 miles away.

Five miles to the northwest, under John Irvin's direction, Kerr Addison were expectantly drilling their Swim anomaly on the forested permafrost hillside overlooking their camp, which consisted of four tents with spruce pole furniture set against the dark spruce forest fringing the other end of the same lake. Five miles farther at Shrimp Lake near Vangorda Creek, Dickson Yukon Syndicate were also drilling

a magnetic anomaly but by August they had moved out, for their target proved to be only greenstone.

Recreation was there for those who desired it. The creeks leapt with grayling and the lakes abounded with fighting trout up to 30 lbs. or more, the record catch being brought in by the Kerr crew. Because of abundant grizzly bear, the camps also bristled with the largest calibre sidearms and rifles, most popular of which was the Smith and Wesson .44 magnum revolver. This was indeed a matter of life or death for, in mid-September when Andy Harman approached the Vangorda cabin after doing a gravity survey on the nearby DY claims, a huge grizzly scrambled out of the window after him. As it charged and chased him several times around the outhouse, he fired repeatedly at point blank range with his .44 until it lurched away wounded into nearby willows.

Encouraged by the Sea anomaly, conscious of the short season, and needing more targets to stimulate lagging financing, Dynasty held a directors' meeting under the spruce trees. With only three directors at the time, any two were a quorum; decisions and action were rapid. It was resolved to fly an extensive aeromagnetic survey, estimated to cost up to about \$30,000, if Markham could sell enough stock to pay for it. He said he could, and the survey was ordered. This was a critical step in Dynasty's success since the survey outlined magnetic anomalies which enabled further financing and helped lead to discovery of the Faro orebodies.

Anxiously Dynasty waited day after day for the equipment to arrive, competitively hoping that Kerr's equipment in use in the Stikine, would not arrive first. Davis and Aho examined the Sea target and dug several hand trenches 6 to 8 feet deep, while Kulan nervously ferried in aviation gas.

Fresh from the hectic Timmins rush, Harold Sandau of Hunting (later Lockwood) Survey Corporation, finally arrived in Whitehorse and was registered in an out-of-the-way hotel while he installed the \$65,000 worth of aeromagnetic equipment in a Hiller 12 E helicopter contracted from Klondike Helicopters.

When the helicopter and equipment arrived in camp with Jim Durkie as pilot and Sandau as operator, Aho, Davis, Brock and Kulan outlined the areas and priorities to be flown, and the survey was off the ground.

The turbulent autumn skies were no longer quiet as the loaded machine roared over the lakes, trees and hills, trailing its magnetometer "bird", fighting its way up the slopes, and breaking off near the stall point on hills and climbing around for re-runs. Each day the anomalies were plotted roughly from the tapes and soon a pattern began to build up.

From 220 square miles covered at 1,000 foot line spacing, 23.5 miles of magnetic anomalies were outlined. These were finally staked, bringing the company's holdings to 805 claims and covering ground 10 miles northwest and 16 miles southeast of Kerr's Vangorda deposit.

On October 1 Markham and Deproy, who was brought into Dynasty by Markham to help sell and expedite, travelled to Yukon, selling 100,000 shares of 40 cent stock in Prince George, Whitehorse and Mayo.

By late fall, work on the Sea had expanded the known magnetic anomaly; a gravity survey gave some response; a D-6 cat was walked in over the tortuous cat trail along the north side of the Pelly; and diesel fuel, plywood, and drill equipment was shuttled down the river in old boats

by Kulan. Amid snow showers, the last trips down river were chilly, miserable, and uncertain until finally the last boat was frozen in, unable to reach shore. From Moose Creek the cat built a 6 mile road to the Sea property and started trenching, turning up massive sulphides but with low values. Then in the darkening days of freeze-up a diamond drill was brought in to test the target, and tarpaper winter shacks were built at the base camp.

Davis, almost unrecognizable in thick winter clothing and black beard, ran the operation until shutdown; fighting freeze-up, equipment problems, and temperatures down to 30 below zero. By shutdown just before Christmas, five holes totalling 1,500 feet had been completed. One of the five holes hit some massive sulphides but values were negligible, the other holes showed only minor mineralization, and the last hole to the west failed to penetrate the overburden. The final temperature was 65 below when Brock and Harman worked as drillers helpers to replace a crew who had quit.

The principals continued to be convinced they would make a major discovery and the program was well publicized. However, investors were difficult to convince, but all through 1964 Markham proved repeatedly that financing could be done by persistent hard work, using all the data to promote. In spite of promising results well publicized, few had confidence to invest only in anomalies and plans, and buyers even had to be bonused. The airborne survey results made it somewhat easier to sell stock, but the project seemed too speculative and over promoted to interest major investors or joint venture partners.

Incentives and prospectors' interests for the most deserving field personnel were resolved by granting vendor stock, or a 40 cent stock bonus.

By December, Markham had been able to sell enough stock to pay debts and the issue of 40 cent stock had been increased to 700,000 shares to get ahead of the bills. Of this 637,700 shares were sold, finally covering the \$188,342 cost of the 1964 program and leaving about \$75,000 for next season plus a little for administration.

The Sea anomaly was not all eliminated; the airborne survey had defined many magnetic anomalies some of which might be caused by sulphides, and soil sampling had shown a few localities of high geochemical values. By year's end when data was correlated, it seemed more certain that Dynasty might find a major deposit, but would need much more time, money and effort in this extensive district.

Most of the anomalies would have to be drilled so it appeared that at least \$300,000 more was needed for 1965.

SWATHROUGH THE MUSKEG

By 1965 several major companies had been approached for financing but only one or two were interested and their terms were unsatisfactory so it was still necessary to do it alone and alternative plans were pushed ahead. Dynasty was converted to a 10 million share public company January 7 with an objective to sell an initial 200,000 shares at \$1.00 starting in February. An optimum program of geophysics, geochemistry and geology, followed by 30,000 feet of rotary drilling, was planned to test all significant targets at an estimated cost of \$50,000 per month.

Although there was only \$75,000 in the treasury to start with, the principals were confident of eventual success and the impetus of the program was expected to generate enough buying of stock to keep pace, or to bring in a joint venture partner.

All technical data had been compiled into maps and reports accompanied by Hunting's professionally prepared aeromagnetic maps. These and a report by consultant Douglas D. Campbell, served for assessment work, working data, and information for potential investors or joint venture partners and were displayed to shareholders and interested parties on February 23, 1965, while the program was being launched in the field.

Over 13 anomaly targets and mineralized zones in three main belts, totalling 23.5 miles in length, were slated to be tested by magnetic, gravity, electromagnetic and geochemical surveys followed up by drilling. Logistics were critical since three targets, the Sea, Ace and Faro, were at distant corners of this large district. The extensive Sea, Cub and Beta anomalies in the low-lying Swim lakes portion of the district were most accessible but should be drilled while muskeg was frozen. Twelve miles to the north, behind a ridge, was the Ace with its 5-mile-long magnetic anomaly and a new nearby copper discovery. To the northwest on higher and drier ground near Vangorda were the Dy, Sun and Gal targets; and finally the Faro, twenty miles away with high geochem, rusty swamp, and reported float. Dynasty planned to sweep through the Sea, Cub and Beta while the ground was frozen, put an airstrip and fuel cache into the Ace for later drilling, then move through the drier Vangorda-Faro zone where mobility could be maintained and supplies brought in later via with the Vangorda airstrip and Pelly River.

By early February, activity in the district was in full swing. Kerr Addison flew equipment to Swim Lake and started drilling on the ice. The government ploughed out the 138 miles of Canol road and Dynasty ploughed out a 35 mile winter trail, zig-zagging down the frozen Pelly River and its valley, and up to the property. Then 220 tons of supplies and equipment began rolling in for Dynasty. Huge White Pass Kenworths loaded with Nodwell track vehicles, oil tanks and camp trailers barreled down the Alaska Highway in a convoy, slithered over the first summit up the Canol road, and ploughed and bounced through water and slush ice of overflows caused by a spell of warm weather.

Up the gentle slope from camp, two huge aluminum-painted 15,000 gallon tanks, a 2,500 gallon mobile tank, and innumerable drums were filled by the tanker trucks, while new trailer-mounted prefab camp buildings of orange hue augmented the black tarpaper shacks crouching in the snow. A long, solid, log cart barn with corrugated iron roof and smoking stovepipe housed the machine repair shop. The main pride was Dynasty's brand new \$75,000 rental purchase D7E Cat.

In the brightening zestful days of March, with the sun creeping higher in the sky and starkly illuminating the frost-darkened spruce and the gray and purplish-tinted willow twigs against the settling snows of winter, the line cutters and geophysical crews tramped out on snowshoes. A Nodwell packed down the snow for an airstrip on the lake and the growling D7E peeled aside dwarf spruce, buckbrush and snow for access roads and baselines on the frozen ground.

Drilling was started on the Sea target March 6, using a highly mobile combination of Mayhew 1,000 rotary rig mounted on a Nodwell track carrier and a second Nodwell with compressor and water pump to supply both air and water. Although used in oil exploration, this

was the first time the combination had been applied to mineral exploration drilling. To the uninitiated, the Nodwells looked odd, rolling along on their tracks and rubber tires, towing their drill shack and drill stem. Equipment consisted of the two equipped Nodwells, extra compressor, two bombardiers, two 4-wheel drive vehicles, the new D7E bulldozer, five mobile camp buildings and other items. Under Gordon Davis and John Brock, the 20 man crew included geologist John Fairley on the drill, a surveyor, samplers, geophysicists, drillers, mechanic and bullcock, line cutters and one cat operator. This was probably one of the most unique and dynamic mineral exploration programs thus far launched in Canada, and was programmed to continue until either all targets had been tested, an orebody was discovered, or shortage of money forced shutdown.

Several holes up to 700 feet deep which were punched down on the deeper western end of the Sea anomaly target showed sulphides with no economic grade but did serve for shakedown and experimentation. Although Kulan welded up a cyclone-type hopper from 45 gallon drums to feed a Jones Splitter for dry sampling, air supply was insufficient and it was necessary to convert to slower water drilling which added to costs and made sampling inaccurate.

The program was now quickly going beyond the treasury and shareholder or joint venture money was urgently required. At the end of February Markham had driven to San Francisco with DeProy and then on to Los Angeles alone to contact still more possible joint venture partners, calling on several prospects including Cyprus Mines Corporation, which had been suggested by the Royal Bank of Canada.

He was introduced to vice-president James G. Hansen and exploration manager William K. Brown, both of whom expressed interest in the venture and asked for an initial proposal. Promptly next morning he presented a neatly typed outline of terms whereby Dynasty would retain control, but this was unacceptable to Cyprus. Later when tentative agreement on control was reached, Brown came to Vancouver with geologic consultant Ken Welker and called in geophysical consultant Sherwin Kelly to review all the data in detail with Aho. Further tentative terms were discussed and Dynasty was finally invited to come to Los Angeles to negotiate.

Aho and Markham brought down John Bruk, a shrewd, intelligent legal counsel who had recently joined the solicitors of Dynasty. Cyprus, ably represented by Hansen Brown, Vice-President Kenneth Lieber, President Robert M. Allen Jr., and counsel David Evans, were then interested.

While Aho presented the project with a 16 mm. movie of drilling in progress, Markham presented the terms and Bruk assisted negotiations with his legal analysis, caution and advice. During two days major terms and finer negotiations were completed and Henry Mudd handed over a cheque for \$50,000, the first instalment of joint venture participation as of March 31, 1965. Over the ensuing years this agreement proved to be so well drafted and beneficial to both parties that it was used as a prototype for other such agreements. Cyprus financed Dynasty's exploration and after certain expenditures would earn 60% in a joint venture which would be incorporated as Anvil Mining Corporation.

Bill Brown visited the property in April, giving considerable encouragement, although 3,780 feet of rotary drilling on the west part of the Sea anomaly had showed sulphides of uneconomic grade, and camp and drill were being moved to Cub Lake. The winter road wound like an angry black snake through the spruce-stippled white wilderness, and straight black baselines laced over the hills.

Fortunately, it was a cold spring and late breakup. Even Cub Lake criss crossed by bombardier tracks, did not break up until about mid-May when the last Beaver-loads of supplies were gingerly rushed in by passengers and bombardier alike, plunging through loose blocks of ice and water near shore. The Cub target was also abandoned May 2 and the drill and camp were moved to the similar, equally extensive Beta target near Blind Creek.

Both the Cub and Beta areas were completely overburden covered with low timbered ridges cloaked with muskeg and permafrost, so that the roads and grid lines rapidly became icy quagmires with runoff water cutting channels in the vehicle tracks. During the last trip to Beta camp, before a timber bridge was built, Blind Creek had opened up and the new D7E bulldozer suddenly slipped off the bottom anchor-ice into deep rushing water. It was immediately inundated except for the air breather and exhaust while ice and water surged up around the chests of operator and master mechanic William Carson and Brock, riding with him. In such an emergency, in this remote area where there was no other way of saving this expensive and crucial prime mover of the entire operation, it is a great credit to Carson, an experienced Yukoner, that he stayed with the machine, kept it running, and jostled it back and forth until he was able to climb out of the torrent, suffering from exposure.

If the 1964 operation was a well co-ordinated and spirited project, the 1965 operation was even more so with the exceptional comradeship, humour and good will of characters like prospectors Skonseng and French, geologists Davis and Fairley, jack-of-all-trades Kulan, mechanic Carson and his wife Lea the cook, gravity operator McComb, driller Lehman, and geophysicist John Brock who produced a type-written sheet called the "Swim Lake News" replete with every conceivable item of humour aided by select magazine photographs.

Within the drill shack accumulated an orderliness of hand-made shelves, stools, mineral specimens, bones, curious stones and twisted roots carved into "creatures" that bespoke of that unequalled trapper-pro prospector, Thor Skonseng, a sharpwitted Norwegian Yukoner from Mayo, working as panner and sampler on the drill.

The other sampler was John French, who resembled a typical Appalachian hillbilly with a bearded wild look that belied his exceptional abilities as a well-studied mineralogist and professional prospector. By late May he could no longer resist his urge to prospect and moved out on to the new Vangorda access road, camped out along like a hermit at a creek which then became called John French Creek.

From Beta camp a 10 mile access road had been roughed out to the Ace anomaly and a 2800-foot airstrip was built on the ridge to service this target later in the season. A 15-mile road to the Dy (L. C.) target and the old Vangorda airstrip had also been completed along Blind Creek and, by the time drilling on the Beta anomaly also showed no encouragement, this road was becoming extremely rough, and interspersed with mud holes, remnant ice patches, jagged tree stumps and steep grades. In this low muskeg, portion of the district water drilling and target preparation proved to be slower and more costly than

getting out onto the higher and crrier northwest section which could be serviced from Vangorda airstrip and the Pelly. The camp trailers would have to be left behind for possible use later on the Ace, but the drill equipment would have to fight its way out of the muskeg circuit.

Harman's crew had already spent a week constructing the Dy (L. C.) camp when Aho examined this area and decided that, because of lack of a promising enough target and the urgent need for further financing from Cyprus, drilling on the Dy should be abandoned and the entire operation be moved directly to the more promising Fargo target 28 miles away. With 19,000 feet drilled, no ore in sight, \$250,000 initial budget overexpended, and no Cyprus commitment until October 31, encouragement was needed immediately.

Thus, on the evening of June 4, the move from Vangorda cabin toward Faro was started with the bulldozer and trailer loaded with tents, survey equipment, supplies, fuel, Andy Harman and a crew of native line cutters. Equipment then began moving from Beta camp under the most difficult breakup conditions. The drill and Nodwell equipment was inoperable from May to the end of June. Trailer-loads of fuel got stuck on the hill to Vangorda, frames and drawbars broke on the Nodwells, the Nodwell and drill rolled sideways down the hill and the cat was bogged down repeatedly, but determination drove the operation on.

FARO

DISCOVERY

Rose Creek with its buckbrush meadows runs straight for miles, with nondescript wooded slopes rising through parklike alpine to ridges on each side. Under one of these slopes was the orebody. Beyond this the creek twists to join Anvil Creek, which winds through denser forest and canyons to emerge into the Tintina Trench and join Pelly River.

At the base of a granite spur jutting from a ridge of the Anvil range lay the rusty swamp flanked by the north fork of Rose Creek and another small tributary later called Faro Creek. About 4,000 feet to the northwest, if one searched closely, rust could also be found in a small swampy seepage on the hillside. In addition, careful searching amid the buckbrush might have revealed some pieces of cellular rust and a couple of small slightly rusty bedrock exposures. Other mineralization was extremely difficult to find but, with intensified effort, traces of copper, lead and zinc might be discovered although perhaps not any more abundantly than in many other areas. Although much of the area was covered with overburden, more bedrock was exposed than in many other localities but virtually all of this had a very barren crystalline appearance.

If the swampy depression had not been gouged from the base of the spur by glaciation or if it had been covered by more overburden, no hint whatever of the deposit would have been apparent, even with very detailed prospecting.

This was where Kulan had prospected and staked the Rust and Gal claims in 1954 and 1956 respectively, and whose Prospectors Airways' drill had failed to penetrate the overburden over a geochem-EM anomaly, still unknown to Dynasty.

This was where Dickson staking his 200 claims to tie onto Vangorda Mines for Dickson Yukon Syndicate in 1963, had made a point of covering the rusty swamp with an offset block of claims called the Rose group.

The following season, Dickson Yukon Syndicate had carried out limited examinations of what were considered to be the more interesting parts of their claims under the direction of Lief Ostensoe, with only one assistant. Most of the work had been devoted to the more accessible Vangorda vicinity, drilling a magnetic anomaly which proved to be a barren greenstone body. Only light reconnaissance was done on the rest of their claims, with a magnetometer and field geochemical kit. Ostensoe did not see the rusty swamp but found a small magnetic anomaly about three miles to the southeast, where he staked and recorded four L. O. claims. Next year, with \$50,000 spent, Dickson dealt off the Syndicate ground to Dynasty before the main discovery and Anvil spent much more on it by 1972, still without success.

In 1964 veteran prospectors Jack Hundere and Ken Willison had been dispatched by Dynasty to the northwest part of the district to cover the Rose Creek area, basing their work from a boat on the Pelly River. About mid-July, Aho and Davis had visited them in a Beaver aircraft, landing by dodging stumps and driftwood in the river to meet them on a bar where their supplies were unloaded, letters read, and maps and samples reviewed. They had covered much of Rose Mountain, finding little other than minor amounts of zinc and quartz. It was stressed that they should intensify coverage of the phyllite belt,

especially on the northeast side of Rose Creek around the rusty swamp and reported area of float, and that they should take as many soil and silt samples as possible.

For the rest of the season, they prospected and soil sampled this area intensively but became discouraged, for they found no mineralization. However, they did sample the rusty swamp and a small rust seepage on the hillside to the west, not knowing that they had walked over the orebodies like others before them.

Later in the fall, the rust samples yielded several thousand parts per million zinc which, along with Kulan's report of copper float and an east-west trending aeromagnetic anomaly zone nearby, attracted some Dynasty interest to this area. The eastern part of the anomaly zones and the rusty swamp were thought to be on Dickson Yukon Syndicate claims.

Finally with no work done on them, these farthest outlying claims were allowed to expire and when the time of grace for filing assessment work had lapsed, Dynasty decided to stake this ground also. With a crew of Ross River natives, Brock flew to Vangorda airstrip, mushed into the area with dog teams, and camped on Rose Creek in 45 below zero weather. Using the Government half-mile-scale staking map as a guide, they charged up to the ridge and staked Faro 1-36 claims on December 1 to 4, being somewhat surprised that the area was rugged and difficult to climb. Their claims were duly recorded in Whitehorse and some time later it was thought that the cold weather, short daylight and vigour of staking may have taken them farther up the creek than intended. The claims were thus possibly mis-located and although some were later found to touch the orebody it was not known whether this target was covered.

However, since Dynasty were working in the southeast part of the district early in 1965 and this area was to be explored later in the season, nothing more was done.

During the daylight night of June 4 to 5, Aho walked ahead of the cat procession grinding its way around thawing muskegs, patches of ice and through swollen creeks along Prospectors Airways' old D-4 trail, until they reached the main junction of Rose Creek.

Signs of predecessors in the buckbrush meadows were several prospecting camps with their greyed cardboard fragments, powder box boards, old tent poles, rusty tin cans, billy-sticks hanging over grass-tufted charcoal, gaunt caches in the nearby spruce trees, scattered rock and mineral specimens, spruce poles and un-used firewood. Mute grey axe cuttings jutted in places from frozen muskeg or from the side of moose trails. Old hunters' camps dotted creek or timberline valleys. In the Faro area, a number of grid lines cut for previous magnetometer surveys were still visible.

Choosing a route from aerial photographs, Aho directed the cat from Prospectors Airways' old campsite near the main junction of Rose Creek, up over the rusty swamp to a small gravel bench overlooking Faro Creek. Without knowing, but always hoping, he had camped right on top of the main Faro No. 1 orebody.

As supplies were unloaded, tents erected, and breakfast made at 6 a. m., he noticed claim posts visible in the buckbrush across the draw, realizing that they were probably Dickson's old posts and that the ground might still be unclaimed. Laying out a predetermined bearing on the bench above camp, Andy Harman started the crew cutting the main base line which subsequently served for all surveys. Aho began mapping on

aerial photographs, finding Brock's posts high up on the ridge - misinterpreting a contour on the map, Brock had staked over the top of the granite spur rather than the low nose of the ridge where the target area was. Davis and Kulan arrived a few days later and they agreed "Maybe we should stake once again".

Staked on June 12, 1965, Davis' Faro Nos. 39 to 44 were later found to cover most of No. 1 orebody; Aho's Faro Nos. 45 and 46 to cover the initial open pit; and Phil Nielsen's Faro Nos. 53 to 56 staked June 20, to cover No. 2 orebody.

During Kulan's visit he and Aho scoured the area for signs of mineralization. They were unsuccessful in finding Kulan's copper float above the rusty swamp, and found only a trace of galena near Rose Creek and a boulder of copper mineralization near another slightly rusty swamp seepage to the south, a minor discovery that was later trenched by bulldozer without success. Most outcrops were barren of mineralization and no surface float was ever found from the main ore bodies.

By this time several slightly mineralized localities and geochemical, electromagnetic and magnetic anomalies were being defined, making the area appear attractive for drilling in spite of the predominant occurrence of many barren crystalline outcrops. A dozen reconnaissance samples taken by Aho in the General Faro area showed several high results, including one of 280 parts per million lead and 840 parts per million zinc taken from a xilt seepage in a swampy area, later proved to be the top of Faro No. 1 orebody. Then soil samples from the survey grid began to show geochemical anomalies in the vicinity of No. 2 zone, and also scattered highs in the vicinity of No. 1. Complete sampling showed strong anomalies in lead zinc and copper in the soils of both areas, but bulldozer trenching of a strong geochemical anomaly

on the hillside above the rusty swamp showed only small stringers of galena-magnetite mineralization uncharacteristic of the main orebodies.

Davis was in charge of the target preparation and the rotary drill program throughout. By the end of June a strong 1,500 foot long EM anomaly and geochemical anomalies in copper, lead and zinc had been defined south of the rusty swamp. Rotary drilling in July gave the following initial results: Hole No. 1 on the EM high went into 50 feet of massive sulphides with cuttings of pyrite and some lead-zinc where Prospectors Airways small drill had failed to penetrate. Hole No. 2 on the north side of the rusty swamp, went down several hundred feet but encountered altered rock with only minor traces of lead.

Hole No. 3, spotted near Faro Creek where the east end of an aeromagnetic anomaly appeared to be partly confirmed by geochemistry and slight airborne and ground EM, fought its way down to 265 feet in bouldery overburden and altered rock, then struck massive sulphides and continued for 175 feet until the bit twisted off. A "fishing" tool was built to try to recover the bit and penetrate farther but this also twisted off in the hole, so eventually it was abandoned still in sulphides. Being the larger intersection, this was named Faro No. 1 and the first intersection was called Faro No. 2.

Hole No. 4 was drilled 2,300 feet west on the peak of the magnetic anomaly and Brown and Hansen were both on hand to see 45 feet of sulphides intersected at shallow depth on what later proved to be in the highest grade section of Faro No. 1.

However, eventual assays from this drilling showed only 5 to 8% combined lead and zinc, scarcely economic in this region, regardless of tonnage. Everyone, including Brown and Hansen, agreed that the softer lead and zinc sulphides were perhaps being ground away and lost in the circulating drilling mud in the presence of harder pyrite and rock materials, but it was not possible to verify this or to estimate the true value without diamond drilling.

All the Cyprus financing commitments had been provided, and the treasury had long since been over-expended again although Markham had been making persistent progress in selling stock at \$1.00 per share. Brown had advised that more encouragement was needed for advancing an October commitment. It had been suggested that this be provided by Cyprus purchasing 150,000 shares of Dynasty stock at \$1.00 per share. 50 in a tent at the original campsite this was now agreed to in a discussion between Aho, Davis and Kulan on the one hand and Brown and Hansen on the other. It was also decided that a diamond drill should be brought in to give core intersections whereby representative assays of the material might be obtained.

In mid-July, Dynasty was still being traded at 70¢ per share over the counter in Vancouver, with not all the \$1.00 issue sold until August. The joint venture program had been announced but significance of the discovery was not known even by Dynasty and Cyprus. Preliminary indications of grade and tonnage did not begin to shape up until fall.

Aho had completed a fairly detailed geologic reconnaissance map of the Faro vicinity, showing individual outcrops of various rock types, geologic structures and also areas of probable and possible mineralization, with superimposed magnetic anomalies and other data. Davis and Brock had selected specific drill targets as electromagnetic and

geochemical data from the grid became available. Kulan was even busier shuttling freight downriver with his "navy" - a couple of old broken-down barges and later a jet-boat.

Skonseng spent his off-hours from the drill prospecting and found much new mineralization near Faro and later above Vangorda by picking, digging and using Dynamite in the old prospecting tradition. His main complaint was inability to sleep because a makshift half-native band with guitar, gas drum and other utensils kept rocking out "Jimmy Johnson Ah- Yea Yea Year!" and transmitting it to the drill by walkie-talkie.

By fall, a total of 17 rotary holes were completed in the Faro area, some barren, some in sulphides. Arsenault Diamond Drilling was contracted and two diamond drills were moved into test both No. 1 and No. 2 zones. Their diamond drill core assays confirmed grades 50% to 75% higher than the rotary cuttings. More drills were brought in to determine extent and a gravity survey was done to help outline the target. From this, with sulfide densities and drill intersections, Brock eventually hypothesized about 48.5 million tons in No. 1 zone, but this tonnage and its grade were not confirmed for another year.

BIG RECCY

What were the limits of this virgin district, prospected so sparsely and geologically mapped on a four-mile-to-the-inch scale only as recently as 1960? From all known indications the entire 60-by-40-mile Anvil range could be favourable.

As the discoveries attained possible significance, the overall program was also stepped up by increasing reconnaissance coverage. Cyprus sent in Donald W. Tully, an eastern mining geologist to handle diamond drilling and evaluation. The original camp of half-a-dozen tents began to mushroom on to the wider bench above, housing drillers, geophysicists, reconnaissance personnel, line-cutters and helicopter crews.

At first one, then two helicopters became based at the camp, one for reconnaissance and one later in September for carrying out an expanded magnetic and electromagnetic survey over all uncovered valleys around the central Anvil Range. This was an ambitious undertaking co-ordinated with reconnaissance for which Aho had assembled a crew consisting of John Fairley, Robert Chaplin, Colin Godwin, John Curry, John French, and experienced native soil samplers.

Almost as soon as he arrived, Chaplin found a piece of massive galena near the rusty swamp; Skonseng and Davis started digging pits and throwing out high grade. Aho joined them, then brought in the bulldozer which dug up massive boulders up to three feet across of solid bluish metallic galena assaying over 100 ounces per ton silver and 0.4 ounces per ton gold, mineralogically unique in containing large pinkish crystals of andalusite. However, only irregular lenses were found and subsequent diamond drilling failed to reveal any continuity to this rich vein discovery.

At first, aerial reconnaissance was done mostly above timberline and ground traverses were used to check overburden areas. But it was soon decided to "cover all areas in green", on the topographic map, or in other words to cover all low-lying wooded areas with airborne magnetic-electromagnetic equipment.

Every day the two choppers roared over the tents in take-offs, leaving canvas flapping, watchers ducking, and a cloud of dust settling in the clearing.

"Captain" I. H. S. Vandebos, a Dutchman with 5,000 flying hours in Europe, Morocco, Dutch New Guinea, United States and elsewhere, was new in Yukon. He was exceptionally careful, took very good care of his Bell G-2, gave excellent performance without mishap, and was most congenial.

Skip Young, an equally capable American pilot, first came in with the racks of his Hiller 12E loaded with two 32 foot long Mag-EM "birds" like twin rockets, flying high over the Pelly River searching for camp in 10:30 darkness, spotting the lights, then turning and landing between Coleman lanterns. Accompanied again by Sandau, Young flew all the airborne geophysics of the outlying areas of the district. At the camp elevation of 4,000 feet, the helicopter was too heavy to lift off the bird on its cable so this was based 2,000 feet lower in elevation on Pelly River. Each exhausting day for weeks on end Young flew the overloaded helicopter with Sandau and the equipment across the valleys of the Anvil Range, white-knuckled and tense, for there was no margin for error.

Each day Aho ran a tight schedule from 6 a.m. breakfast till midnight with his crew, In the morning he outlined traverses and exploratory activities to geologists and other personnel, deployed each reconnaissance party in turn with the helicopter while briefing the others, reviewed camp activities and geophysical programs with Brock and discussed the drill program with Tully, etc. Then, with his own traverse planned, he climbed into the helicopter where he watched the rotor and engine needles lock and sweep up to operating

range, and felt the pitch change and the ship lift off, moving forward and up over the trees. With hand signals he guided Vandenbos, who was very conscious of the limiting factors of wind, turbulence, air-speed, elevation and obstacles. Scanning the ground closely, he plotted rock types, geologic features and signs of possible mineralization, often landing to check, soil sample or to do a traverse. Back in camp late in the afternoon he plotted his own results, joined the rush to the cook tent, then at night interpreted the overall picture, planned the next day's traverses and selected aerial photographs. This hectic schedule went on for weeks but it kept reconnaissance apace with the airborne surveys and new geochemical results giving continually revised justifications for concentrating on certain areas.

The program was moving so rapidly that each day brought new developments and problems so that to anyone who was out of touch for a couple of days it seemed like organized chaos and did become unwieldy. Davis was punching down more rotary holes and sorting out drill targets. Brock was co-ordinating all geophysics, construction of roads, airstrip, and new camp as well as details of camp management. Kulan was expediting mountains of equipment, fuel and supplies down the river and later over a new access road that was being pushed through to the Ross River-Carmacks tote road. Tully was supervising the diamond drilling, plotting up sections, estimating tonnage and grade, and co-ordinating with Aho on overall project administration.

The camp, with an exhilarating air of excitement, was bursting with 117 people, 22 tents, 2 helicopters, a double cook tent running 3 shifts, and people sleeping on the floors. Cats, bombardiers and Nodwells rumbled through at all hours. In the last remaining grove of spruce

trees at the centre of the camp, heavily bearded John French, now on reconnaissance, had pitched his lone weathered prospector's tent and was an object of curiosity, frying his own supper over a campfire as drillers and other members of the crew rushed past for the dinner gong.

For efficient servicing Brock and Aho started an airstrip on the gravel flat in the valley of Rose Creek, a site suggested by Kulan. In September a good 4,000-foot-long strip was completed, used regularly by a twin Beechcraft piloted by Sam McCracken who could feel his way into the camp in the worst of weather.

With so much activity it was decided to bring in a camp manager to handle daily routines. This worked well at first but individualistic personnel of the camp "persuaded" him to leave by a rash of practical jokes culminated by a motorcycle, with motor idling, hung from the ridge-pole of his tent.

An access road was also badly needed. The Department of Indian Affairs and Northern Development had announced in April a \$3.8 million program of construction of the Campbell Highway 140 miles long to link Ross River to Carmacks, past the Anvil area. The government was now working on the section near Ross River but the company had to push the old tote trail through to the Pelly and build a serviceable road to camp as soon as possible. A cat was started on each end, the one at camp working on 24 hour shifts on the road and on freighting fuel and supplies being sent down river by Kulan.

The uppermost ridges of Anvil and Rose Creeks and the ridges north of the Faro were mostly broad, featureless, buckbrush and grass slopes above timberline, topped and hemmed in by more rugged

rock ridges and incised locally by gulches. Some of the reconnaissance traverses covered these rolling uplands where herds of caribou and roving moose were often encountered; some covered wooded hills with willow and cottonwood-choked creek channels and occasional grassy meadows; some were in the higher talus and grass slopes above timberline.

Covering all within a 30 mile radius of Faro camp, Aho and his crew found several geochemical anomalies, a barite showing, and new and old rust seepages, sampled them, had several staked, and had airborne and ground geophysics done on them.

With darkening nights and the nip of frost, the ephemeral Yukon fall burst forth in its blaze of colour; shivering yellow aspens on the breccia bluff behind the camp framed a brilliant tapestry against the dark green spruce and deeper red dwarf birch on the spur which rose up into an intense blue sky. Rose Creek valley was a rusty purple swath of buckbrush laced by intermitten aspen, poplar and water, all shimmering in the autumn sunshine. The higher alpine and buckbrush uplands above timberline were rich Persian carpets of red, green, yellow and grey buckbrush, timberline balsam, willow and rock. The Tintina trench was green and gold with silvery-blue strips and jewels of water.

Amid the profusion of all colours it was now virtually impossible to spot any more rust, but one more rust area, the Ivan, was found. This gave high lead and zinc geochem and a coincident airborne mag-EM anomaly so it was staked and the following season Anvil Mining Corporation drilled four holes on the targets but found only scattered mineralization.

Kulan was doing an outstanding job of getting materials in, sending in another bulldozer, a new truck, and other equipment. The road to the mouth of Blind Creek and the connecting road from the Ross River-Carmacks tote trail were being finished by the two cats. Still, in spite of all this frenzied activity, few if any other mining companies were aware of a promising discovery. The principals on the project were swamped with the field program, and although the Vancouver office was informed of developments, no one on the project thought much about value of the stock until someone brought in a surprising radio report that Dynasty was up to \$2.00 on the Vancouver unlisted market.

The area could have received a heavy snow at any time that would have stopped the reconnaissance, but with sheer good fortune the weather held for almost 3 weeks well into October. The chill winds jiggled the leaves to the ground, leaving the hills a dull purplish grey with leafless buckbrush, and every capable bush man was pressed into service. While freezing slopes and ice cold streams were sampled, Vandebos shivered in blankets with two heaters in the chopper. The weather warmed up once and a light dusting of premonitory snow disappeared, leaving the new road to the Pelly muddy and impassable. With a new three ton truck broken down and the over-worked river boats also out of commission, a mountain of supplies for the new Anvil camp began to pile up on the gravel bar of the Pelly and at Ross River. These included hundreds of drums of diesel and gasoline, pills of prefabricated building sections for a new camp, equipment, oil and miscellaneous items which totalled some 500 tons by freezeup. Still the weather held surprisingly, giving enough grace to complete all that was hoped.

With the deepening chill of October, an almost unreal dusting of bluish-white snow like icing sugar was growing from the higher peaks downward, but much had been accomplished. The entire Anvil range had been covered by reconnaissance; the main valleys had been flown and coincident magnetic and electromagnetic anomalies had been plotted by Brock and checked by reconnaissance geology, geochemistry and prospecting. Linecutting, soil sampling, geophysics and geology had been done or started on five areas. Reconnaissance was terminated when ground became too heavily frozen; but further staking was still in progress.

The camp stood in a double row of white tents cradled against the wrinkle of the hillside next to Faro Creek. Bulldozed roads, trenches, grid lines and diamond drill sites criss-crossed the small yet substantial section of wilderness underlain by mineralization. No. 2 zone was a gridwork but No. 1 zone still had only a few grid lines topped by a square clearing where Tully had intended to strip to the sub-outcrop of sulphides to obtain a bulk ~~sample~~ sample. Several drills were grinding away. By mid-October Cyprus had concluded that the mineralization was promising and that if enough of the kind indicated by initial diamond drilling could be found, and if it posed no unusual metallurgical problems, the discovery would have economic significance.

Any time now a major staking rush could begin. It was essential to make sure Dynasty had all the favourable ground staked even if targets had not all been checked. Dynasty had engaged Dominion land surveyor Paul White to organize crews for fill-in staking around the Faro and throughout the main phyllite belt as far as Swim Lakes. Then the field crews were also swung into staking whatever additional anomalous

areas were felt to have any reasonable possibilities of containing additional mineralization. Results were cranked out of the geo-chemical laboratory, plotted up, correlated with airborne magnetic and EM results by Brock, and decisions made on staking.

The jackpine benches between Blind and Vangorda Creeks could be the site of a smelter or town, and the narrow part of the river could be a bridge site. In anticipation of a forthcoming staking rush it was decided to stake the potential townsite area since the government could not guarantee a reserve on it.

Results of the exploration were released from time to time and as the staking was being completed and information on the discovery spread. Dynasty stock rose to \$9.00 in wild market speculation. Most of the principals were still busy in the field, concerned mainly with completion of the program.

STAKING RUSH

As Dynasty's staking was being completed, bringing the total holdings up to 2,400 claims, competition began to move in. Dynasty had known via "grapevin" about a week before that other staking was being planned. Len White had asked about the general situation without saying why, then Kulan had come in to say that Jack Foley and Barry O'Neill were in Whitehorse organizing to go in.

In the best tradition of organized staking rushes, to avoid duplicate over-staking as much as possible, a map showing all the claims in the district was posted by Brock in a new camp built at the airstrip and all parts were requested to check the map before staking and to sketch in new claims when staked. Although many never got near the camp because of distance or secretiveness, others came in,

area in which they were interested, then hurriedly asking for all details when their competitors were out of sight.

It was not until Dynasty stock was finally listed on November 8, 1965 on the Vancouver Exchange, trading heavily at \$15.00 with no offering and unable to open for an hour until stock became available, that competitors and speculators began the most frantic rush into the area. In the fantastic staking that ensued, cords of stunted spruce trees were truncated at the four-foot mark, squared off and written on, then lines cut and paced or taped off fifteen hundred feet to the next post, and onward. Although little documented and relatively unpublicized, the Dynasty staking rush was the largest in Yukon since the Klondike. Some twenty companies and many individuals surrounded and inter-connected the widespread Dynasty claims. Over the winter months over 10,000 claims were staked under severe weather conditions by hundreds of stakers using a fleet of helicopters, contributing to many colourful incidents. About \$2 million were subsequently spent exploring these claims without success.

Dynasty crews staking the "Last" claims to cover the townsite area during the beginning of the stampede were met and quickly surrounded by stakers thinking they were tying onto a hot target, and their triumph was touted in news releases.

Having by now spent over a million dollars with more needed to evaluate the discovery, Cyprus elected to form the proposed joint venture company, Anvil Mining Corporation, which was incorporated December 1 and organized at the Bayshore Inn in Vancouver on December 4. Being 60% owned by Cyprus and 40% by Dynasty, Anvil now continued exploration with Tully in charge. The reconnaissance crews disbanded and Brock remained in the new Anvil camp until December 15 as the last official member of a Dynasty crew in the district. Dynasty had done its job

well and now it was up to the equally competent Cyprus team. Still the last results of the reconnaissance warranted more final staking during the main stampede, adding to the competitive zeal.

A helicopter used by an Anvil staking crew near Tay Mountain 27 miles to the northwest attempted to detour behind the Faro part of the range and was forced down, the pilot spending two days beside a fire in 30 to 40 below zero weather. For helicopter flying, 35 degrees below zero is marginal because of stiffening of lubricants contributing to motor failure. Moreover, setting down in a locality without heating facilities made the motor impossible to start. A major search was organized by Brock. Some five or six helicopters, servicing all the other staking parties, quickly deposited all competitive stakers in a central camp where each viewed the other with suspicion while the search began as soon as the weather cleared. The lost helicopter was soon found; the pilot was unharmed, and a Herman Nelson heater was flown out to get the machine started and brought back to camp.

Legally one person could stake only 8 claims in any 10-mile radius and swore an affidavit that he had done so. Thus the demand for stakers depleted Ross River and even Whitehorse until getting willing people became a problem. Early the next year police came into the area to enquire about stakers who had recorded claims for one of the tie-on companies, the problem being that some of the "stakers" whose names were used were drunk in town or in jail at the time of staking and therefore could not have been out on the ground as required by the Yukon Quartz Mining Act. Through no fault of the principals, this company's claims were invalidated, leading to a lawsuit.

In the intense speculative activity that followed the staking the stock of companies who had any sort of anomaly on their ground rose in trading in Vancouver and even in Whitehorse where local quotations were posted on the wall in one of the banks and were discussed in all the cocktail bars. As a gag, one of the wives in Whitehorse had commented that Purple Pit was a hot issue, and quotations were posted although no such company existed.

In Vancouver some traders had sold short on the steadily rising market on Dynasty stock at \$2, \$3, then \$5, believing it was over-promoted, and were ruined when the market continued an everupward rise, reaching a final peak of \$23.60 per share. About the same time Pyramid Mined had also struck rich leadzinc at Pine Point and stocks of both companies were traded frantically neck and neck, triggering a boom in mining stocks.

To loyal shareholders and staff, some of whom had borrowed to buy stock at 40 cents and \$1.00; to cat operators, cooks, geologists, geophysicists, prospectors, soil samplers and others in the field who had bought or were given a bonus; and to stewardesses, pilots, bartenders, speculators, housewives and others, who bought early and held, it was like an unbelievable fairy tale come true. To numerous others who sold early or shorted the stock, it was a grave disappointment. To the principals, however, the stock value was mainly a side issue because of the continuing obligations to evaluate the discovery and to finance it.

Against the background of dark spruce and rounded white hills of winter, ten near prefabricated buildings had been erected at the airstrip, serviced by the twin Beechcraft and by trucks over the new road. On the hill, the tripods of up to seven diamond drills

stood silhouetted against the subzero winter sky, smoke oozing from the drill shacks with only the growl of the motors breaking the stillness as they probed the depths of No. 1 orebody. Isolated dark spruce like sentries stood nearby and toneless grey wisps of snow clouds gathered on the far horizon. Rack upon rack of drill core was accumulating from four drills, building up tonnage and grade information throughout the winter. Drilling based from the new camp was now the only activity in the entire district during the dark, sub-zero months.

"Outside" in civilization, a general feasibility study was initiated to determine possible means and economics of production.

ANVIL

CHOOSING THE PATH

Cyprus commissioned Parsons-Jurden Corporation of New York to do the general feasibility study of the Anvil project. This was a comprehensive study which included not only open pit mining, milling, hydroelectric power, transportation, townsite and other ancillary facilities necessary in the area, but also smelter processes.

In addition to a galaxy of specialists with Parsons-Jurden, other consultants on the project were E. N. Pennebaker, a well-known U. S. geologist preparing qualifying reports on exploration, ore reserve calculations, and mining plans; Eugene S. Allen, a foremost U. S. metallurgist studying mill design and testing in conjunction with the Galigher Company of Salt Lake City, Utah, and other laboratories; J. D. Little and Ben D. Roberts, experts on smelting; and Robert J. Hendricks, an authority on mining and milling. The overall project

came under the capable direction of Robert E. Thurmond, vice-president and general manager, under president Kenneth Lieber.

Throughout the winter and on into the summer of 1966, the diamond drills continued boring into Faro No. 1 orebody, then No. 2, and also near the rusty swamp between Nos. 1 and 2. In the spring of 1966, two drills were added to obtain large diameter core for detailed metallurgical testing and feasibility study. A preliminary microscopic study of textures of the ore in polished sections of drill core, done by Dr. R. M. Thompson of the University of British Columbia in 1965, had suggested fair milling characteristics.

In addition to drilling of targets in the vicinity of Faro Nos. 1 and 2 orebodies, follow-up geophysical, geochemical and geologic surveys and drilling were done on the targets staked by Dynasty. Over the years to 1972 another \$2 million were spent exploring and drilling these and other targets, all without further success.

After months of intensive study and liaison between Cyprus and Parsons, a comprehensive preliminary feasibility report was ready by May 1966. The open pit and concentrator feasibility was along conventional lines; but for a smelter it was necessary to investigate nine various alternatives, including several metallurgical processes ranging from simple lead smelting through lead and zinc smelting to Imperial smelting and to chemical processes.

An analysis of processes indicated that straight shipping of separate lead and zinc concentrates to outside smelters would be most profitable, at least in the early phases of the operation in which higher grade ore was to be mined. However, if lead and zinc prices slumped, or if much lower grade ore was to be treated, then a smelter might be more

profitable providing reserves were sufficient to repay a much greater initial capital investment. Simple lead smelting with shipping of zinc concentrates appeared most economic; next came lead and zinc smelting if sufficient power was available for a zinc plant; and thirdly, combined lead-zinc smelting by the Imperial process if the concentrate was sufficiently free of iron. However, establishment of a smelter was more costly and posed more complex problems including disposal of sulphur, so until a much more refined feasibility study could be completed, a decision was made to investigate the route of a simple concentrator shipping concentrates to outside smelters.

In addition to Parsons and the other consultants on specific phases of the project, overall reviews were made by Anvil management, mainly by Thurmond, on a day-to-day basis; by Wright Engineers of Vancouver for Anvil; and by James Buffam and Cooper of Toronto for the Toronto Dominion Bank, leader of the financing group. The project was thus well engineered.

The Ralph M. Parsons Construction Co. of Canada, under general supervision of project manager Colin Macdonald and general manager Thurmond, was appointed general contractor in the engineering design, construction and installation of the concentrator and associated service facilities.

For pilot plant testing it was also necessary to obtain a larger bulk sample. A tunnel under contract by Cameron-McMynn Ltd. early in 1967 fought its way through 300 feet of watery sand gravel in the overburden and into 650 feet of the top of the orebody. A small crushing plant was erected and by break-up in 1967 2,950 feet of underground workings and 2,850 feet of diamond drilling had been completed. Bulk samples totalling 315 tons were sent for testing

by Hazen Research Inc. in a 200 ton continuous pilot plant and well equipped laboratories at Golden, Colorado.

Throughout 1967 two drills continued working on the Faro principally filling in the faulted section between Nos. 1 and 2 orebodies. By the end of 1967, 42,878 feet of drilling to depths of 300 to 800 feet on the two orebodies had defined 63 million tons averaging 9.126% combined lead and zinc and 1.19 ounces of silver per ton. No. 1 orebody was a gently dipping basin-shaped lens 2,400 feet long, 1,100 feet wide and 50 to 150 feet thick under overburden averaging 56 feet in depth and rock cover up to 300 feet thick; No. 2 ~~was~~ 1,200 feet long and 1,000 feet wide but thinner and under less cover. It had been apparent that recovery of metals, ike. metallurgy, rather than tonnage was critical, but now it looked feasible provided sales contracts, financing, and government assistance could be satisfactorily resolved. To arrive at this stage \$10 million had been risked by ~~the~~ 1967. Construction started in June, 1967.

Now the district was really being opened up. The new Campbell Highway, a first-class gravel road designed to carry 95,000 lb. truck loads of ore, was being built from both Ross River and Carmacks. The cutoff to the Pelly and up to the mine had been greatly improved for normal truck and automobile traffic, and a government cable ferry was in operation at the river. A main bridge site had been selected between Vangorda and Blind Creeks where the Pelly narrowed, a 540 feet two-span bridge sufficient for eventual railway traffic was designed, and a new 17.3 mile access road was started past the townsite area to the mine. In the winter, the government kept the Canol road open and roads were linked with an ice bridge built up by pumping water onto criss-cross trees laid on the ice across the Pelly.

At the mine a new clearing halfway up the hill, partly occupied by a large new construction camp for 500 men, was being prepared for thill foundations, and a huge swath was being sliced from the hillside on top of the orebody, the beginnings of the open pit mine.

A refined feasibility study had been completed by mid-1967, in the fall preliminary engineering plans were concluded, and preliminary contracts for steel, concrete mix plant, foundations and various other items were entered into. The final go-ahead was given in August, and by October, foundation grading was started for the concentrator, designed to mill 2 million tons of 12% ore for five years, then 3 million tons of lower grade per year, recovering 88 - 90% of the lead, 75 - 80% of the silver and 85 - 88% of the zinc. The path was chosen.

LAUNCHING THE PROJECT

~~The path was chosen~~ Throughout the feasibility surveys, drilling, underground work, and additional exploration, many facets of the project had to be resolved and critical decisions made by the Board of Anvil Mining Corporation and also by Dynasty and Cyprus separately. The key matters during these two years were the physical execution of the project; feasibility studies, metal market studies and sales contract negotiations; Canadian government assistance for power, roads townsite, and a smelter study; bank negotiations for optimum loans; Dynasty-Cyprus inter-company negotiations related to financing; and transportation study and negotiations.

These extensive studies and negotiations were done more or less concurrently while Kenneth Lieber, president of Anvil, juggled all the factors and, like the master of a ship, guided the new corporation through numerous problems to its destiny.

On the Cyprus side was a new president, Robert Allan, an intelligent and progressive executive; Kenneth Lieber, senior vicepresident of Cyprus who had all the drive, ability, diplomacy and decisiveness necessary as the president of Anvil and was dedicated to make it a success; Donlin P. Murdy, a conservative and capable comptroller and also a newcomer to Cyprus; and Gerald G. Kelly, serious senior partner of the company's solicitors, Musick, Peeler and Garrett. In a class of his own but always available for guidance and final decision, was corporation chairman, Henry T. Mudd, great in stature financially, physically and personally. He often asked how the project was proceeding, sat in on discussions, or joined the Anvil board for lunch at the exclusive California Club.

On the Dynasty side was Aho, feeling his way into this new field of corporate growth and negotiations with a long-term viewpoint; Davis, who grasped the new situations with basic engineering sense; Markham who continued to contribute to negotiations and finance; and John Bruk, a well-balanced and capable legal counsel.

Numerous times the principals of both sides conversed by long distance telephone and met in Los Angeles or Vancouver.

Metal markets in Japan, U. S. and Europe had been investigated on a letter-of-intent offer basis by Ametalco. The Japanese market was concluded to be the best, and Joseph Kline was brought into Anvil to negotiate because of his experience in Japan. For months these Japanese negotiations continued, with Lieber and other members of the Cyprus team flying to Japan, and Japanese visiting Los Angeles.

Represented by eminent attorney H. Heward Stikeman, Q. C., Lieber and his team visited Ottawa, held frank discussions with Deputy Minister, John A. Macdonald, Resources Director Digby Hunt and other officials and, over several months, negotiated an agreement with the Canadian Government. The Government would assure adequate transportation to the area, would provide hydro-electric power from Whitehorse and would provide basic facilities for a townsite as well as C. M. H. C. loans for housing. Anvil agreed to spend half a million dollars for a smelter feasibility study upon insistence of Minister of Indian Affairs and Northern Development Arthur Laing, who wanted a smelter for Yukon if possible. Also concurrent with the feasibility study and other negotiations and as an alternative to the White Pass route, Anvil made careful studies of truck transportation via road to Haines, Alaska and of construction of port loading facilities.

By mid-1967, feasibility surveys and negotiations for sales contracts and government assistance had proceeded to a point where financial negotiations could be entered into. Cyprus and Dynasty had already been approached by several Canadian and U. S. financial institutions and banks.

For Dynasty, J. A. C. Ross, consulting mining engineer, reviewed the initial feasibility report, and Richardson Securities, a blue-chip Canadian investment dealer, had evaluated Dynasty's position in 1966, this being their initial entry into junior mine financing. H. Richard Whittall of Richardsons had visited Cyprus in April 1967 and suggested public financing for Anvil, but Cyprus conservatively favoured private financing. Certain banks had proposed financing loans up to about \$40 million if \$15 to \$20 million equity financing were provided, of which \$11 million was committed by Cyprus, leaving about \$8 million still to be provided by both Cyprus and Dynasty.

One of the most critical items in the overall financing was that the banks insisted on completion guarantee from Cyprus and a guarantee that the project would pay back the entire bank debt of \$42 million plus interest. Only with these guarantees would the banks loan the maximum necessary. Moreover, this was favoured by the balance of payments situation between Canada and the United States.

The Toronto Dominion Bank, represented by intelligent and aggressive Richard M. Thomson, then deputy chief general manager, had studied the situation intensively with the aid of Burns, Bros. & Denton, who had introduced them to the project and had it evaluated by James Buffam and Cooper. In a few months the Toronto Dominion Bank had taken all the Canadian commitment.

Financial negotiations had now approached a point of decision and Dynasty had every intention of upholding its 40% interest. After intensive meetings and negotiations, a letter-agreement was concluded June 28, 1967 between Dynasty and Cyprus whereby these matters were resolved in principle.

On August 25, 1967 Cyprus and Dynasty jointly issued a news release that Anvil Mining Corporation had reached the final decision to go ahead with a U.S. \$56 million program for production of lead and zinc concentrates subject to finalization of marketing, financing and government agreements which had been negotiated over the months.

Anvil had signed sales contracts with Mitsui Mining & Smelting Co. Ltd., and Tho Zinc Co. Ltd. in Japan for the total mine output over an eight-year period. About 130,000 short tons of lead concentrates containing about 69% lead and 20 ozs. of silver per ton, and 240,000 tons of zinc concentrates containing about 54% zinc were to be shipped annually, making a total of about \$250 million over the contract period. This was the biggest and longest term agreement ever signed by Japanese companies for importation of lead and zinc concentrates.

First deliveries of concentrates were scheduled for late 1969, and Ralph M. Parsons Construction Co. of Canada Ltd., general contractor, was proceeding with final engineering design and construction.

The financing agreement was one of the largest entered into by Canadian banks in the mining industry, a total of U.S. \$42 million bank loans, half from the Toronto Dominion Bank, the lead bank, with the balance coming from the First National City Bank of New York, Bankers Trust Company and United California Bank.

built tear-drop containers of 30 tons capacity in a Vancouver-based assembly line.

Once the course of financing was resolved, Dynasty raised its share \$6 million U.S. by May 1, 1968 by an underwriting agreement with Richardson Securities.

By then a \$100 million construction boom was in progress. Permanent roads were built; millions of tons of overburden and rock were stripped to expose the ore; a giant steel concentrator, machine shop, warehouse and engineering offices were constructed; the "instant town" of Faro was erected; the Campbell Highway was completed; Pelly River was bridged; more generating capacity was installed at Whitehorse and connected by transmission line to the mine, and the White Pass and Yukon Corporation completed container trucks, loading facilities, railway improvements and a bulk loading terminal at Skagway.

During initial construction of Faro, lightning struck nearby and on Friday, June 13th, 1969, driven by winds, a ranging forest fire destroyed 78 partly completed buildings and the surrounding forest. Insurance covered the \$2 million loss but the beautiful surrounding forest takes decades to recover. Nevertheless, the town was finished by fall, the surroundings were cleared and replanted in subsequent seasons and more houses were added, making a total of 260 modern houses. By 1972, a shopping centre, paved streets and the Faro Hotel were completed. The second largest community in Yukon, Faro has all amenities of life including modern homes and gardens, the finest recreation centre north of 60 degrees and abundant outdoor recreation.

Mining and milling were started on schedule in October, 1969 and reached full production in February 1970. The non-descript valley of Rose Creek is now beautified by a reservoir with the mine and concentrator as an interesting background.

In the pit rotary drills bore 9½ inch holes for blasting each bench, and 5-cubic-yard electric shovels scoop the broken waste or ore into 65 and 85 ton haulage trucks which unload at the dump or concentrator, 2 to 3 cubic yards of waste per ton of ore.

In the concentrator, 10,000 tons of ore per day are dumped through a huge primary crusher and conveyed through screens and secondary crushers with deafening noise; then ground to slurry with water and chemicals in ball and rod mills; agitated and separated by flotation cells into lead and zinc sulphide froths which are thickened, filtered, dried, and shipped; while waste rock particles and iron sulphides run down to a tailings pond at Rose Creek. Heating is supplied by a native-operated coal mine at Carmacks.

This new operation, like many, suffered compounded problems in initial mining and milling, then decline in metals demand, increased costs, and increased smelter charges and sales contract cutbacks, all of which necessitated deferred repayment of investments. By the end of 1972 debt and interest was still \$65 million but \$20 million of bank loans had been repaid.

The great mine development, like most others, was not a bonanza that repaid investors quickly. It exemplifies the high risks, and unforeseen complexities in mineral discovery, exploration, feasibility studies, development, and production which are faced until the

inexorable exhaustion of reserves; in this case about 20 years if expensive exploration does not reveal more ore. Although single individuals have played significant roles, each phase has required the specialized talents of teams. Only when an operation has repaid investments with an acceptable return can it be said to have been truly a success.

In addition, this great development has attracted tens of millions of dollars for exploration in Yukon, still without another major success. The instigators themselves, together and separately have brought in some \$10 million in new ventures, resulting in many new discoveries, none economic so far. All this has been possible thanks to a healthy government policy of incentives and assistance to industry, which has created much new employment and tax revenues.

Anvil's impact will be felt for many decades since it is the largest in Yukon to date, the first great project that will raise this region from financial deficiency to self-sufficiency. Six hundred miles closer to east Asian markets than Vancouver, Yukon's main industry is evolving from remote, high-cost, small-tonnage operations to large-tonnage operations competitive in cost with other major world producers. Klondike was the golden beginning, Keno Hill and Cassiar were the sustenance over the years, and Anvil is the start of major development.

With a giant orebody found and developed into production, the dreams of many people to open up Yukon are being realized, and more will surely come.