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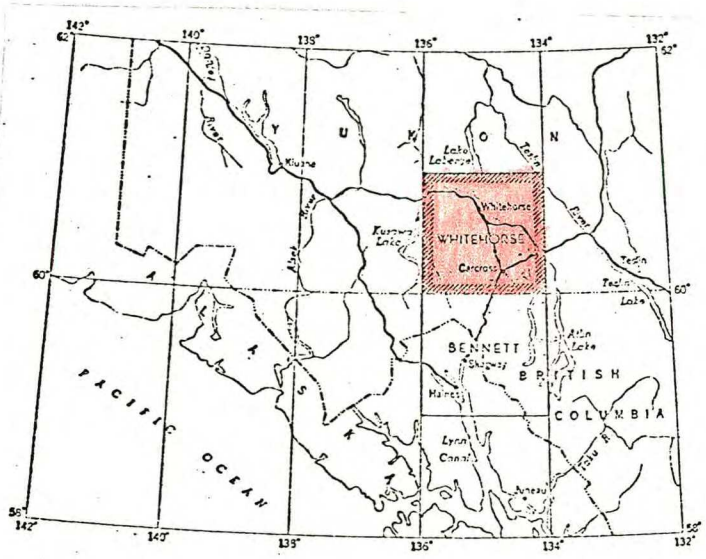

EDITION 2 ASE

LODE OCCURRENCES

#1 Arctic Caribou (Big Thing) Property (60°05'N, 134°42'W) (Gold-Silver)

1966

References: Cairnes (1906, pp. 24-25; 1908a, p. 14; 1917, pp. 28-36, in Bostock, 1957, pp. 209-217; 245-275; 426-459); Cockfield and Bell (1926, p. 39; 1944, p. 12); Wheeler (1961, p. 127); Green (1966, pp. 55-60).

Arctic Mining and Exploration Company Limited holds 123 claims in the vicinity of Sugarloaf Hill, Montana Mountain area. In 1965, the company began re-investigation of the old Big Thing property, covered by two Crown Grant claims (Pride of the Yukon, and Caribou), and first discovered in the early 1900's. Access to the present operation is by a 8.4 mile secondary road leading from the village of Carcross. A year-round camp, housing a work crew ranging from 8 to 20 men, has been maintained at the site since mid-1966.

During the period 1905-1916, underground development work carried out on the property included a 450-foot inclined shaft driven from an elevation of about 6,080 feet into the south side of Sugarloaf Hill, and about 1,050 feet of drifting on four levels. In addition, a 2,320-foot horizontal tunnel was driven southeasterly into Sugarloaf Hill from an elevation of about 5,100 feet, that eventually connected with the inclined shaft workings.

In past years, some hand-picked ore was stockpiled and it is reported (Annual Report, Arctic Mining and Exploration Company Limited, November, 1965) that approximately 3,000 tons of ore grading 1.08 ounces per ton gold and 27.7 ounces per ton silver were shipped.

The gold-silver ores occur in a series of northeast-striking, shallow to moderately northwest-dipping quartz veins that cut a medium-to coarse-grained, locally porphyritic granodiorite. The latter is part of a larger stock that probably extends north to Carcross (unit 8, Wheeler, 1961). The principal vein systems (No. 1 or 'Footwall', and No. 2) are fairly consistent, but contain gentle downdip flexures so that dips range from nearly horizontal to about 40 degrees northwest. Along strike the veins have been displaced by two fault systems, one striking across the veins, the other nearly parallel to them. The combination of changes in dip and slicing-off by flat faults has made underground work difficult.

The quartz veins range from single structures less than 1 foot thick, to stockworks up to 12 feet wide containing numerous branching and coalescing veinlets. Most mineralized zones are rarely more than 2 feet wide. The principal metallic minerals are pyrite, arsenopyrite, sphalerite, galena (minor) and rare chalcopyrite, occurring in irregular lenses and shoots within the quartz gangue. Gold and silver values up to 4-5 ounces per ton and 50-60 ounces per ton respectively occur locally, but other vein segments are barren; most well-mineralized zones average less than 1 ounce per ton gold and about 15-20 ounces per ton silver. A grab sample taken by the writer from a high-grade section at the junction of the main crosscut with the No. 1 (Footwall) vein assayed*: 0.44 ounces per ton gold, 40.6 ounces per ton silver, 1.9 per cent lead, 4.2 per cent zinc and 0.01 per cent copper.

The surface extensions of the veins have been exposed in a series of trenches on the hillslope above the present portal. They occur as highly-fractured, crumbly grey quartz stringers carrying fine sulphides (mainly arsenopyrite) in the deep-weathered granodiorite host. Alteration of the granodiorite is extensive and vein selvages are commonly stained with yellow and green powdery material, identified by Green (1966) as scorodite, a secondary arsenic mineral. A chip sample (mainly rubble) taken across one of the smaller surface exposures (about 2 feet) assayed*: trace gold, 1.38 ounces per ton silver, trace lead, zinc and copper.

1966

Underground work by the present company, begun in October, 1965, has included about 4,500 feet of drifting and about 3,000 feet of underground diamond drilling (to the end of 1966). Underground development included a new 1,000-foot adit (main crosscut) driven northeasterly from an elevation of about 5,800 feet, northeast of, and below the old inclined shaft entrance. From the main crosscut, five principal drifts - 835 E, 835 W, 850 E, 848 E and 848 W - followed the 'Footwall' and No. 2 vein trends for distances of about 225, 500, 450, 125 and 750 feet respectively. The 848 W drift did not encounter significant mineralization. The best ore grades were encountered in the junction area of the main crosscut and the No. 2 vein, approximately 750 feet from the portal, and along the 850 E drift from this point. In September of 1966, an underground drilling program was started to block out up- and down-dip extensions of the two principal veins. The drilling program continued throughout the winter.

In late February, 1967, the company announced (Northern Miner, February 23, 1967, p. 1) that production plans for the property on a 200 ton-per-day basis were being considered. Ore reserves were stated as 132,000 tons grading 0.69 ounces per ton gold and 19.8 ounces per ton silver with an additional estimated 40,000 tons of possible ore.

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*Assayed by G. Spalding, Whitehorse, Y.T.

CARCROSS AREA

Montana Mountain

NTS 105 D 2

(Gold-Silver)

Arctic Caribou (Big Thing) Property (60°05'N, 134°42'W)

1965

References: Cairnes (1906, pp. 24-25*; 1908, p. 14*; 1917, pp. 36-28)*; Cockfield and Bell (1926, p. 39; 1944, p.12); Wheeler (1961, p. 127).

During 1965, Arctic Mining and Exploration Limited optioned 2 crown granted mineral claims and acquired an additional 36 claims in the vicinity of the Big Thing property. The workings, located above timberline on Sugarloaf Hill, a satellite peak of Montana Mountain, at an elevation of about 5,600 feet, are reached by a road 8 miles in length from the town of Carcross. The showing consists of gold- and silver-bearing veins cutting granodiorite.

The property is an old one and was being explored underground when visited by Cairnes in 1906. Development work done between 1905 and 1912 (Cairnes, 1917, p. 36) included an inclined shaft 450 feet in length, which followed the vein for all but the last 50 feet, four levels, the first with 120 feet of drifting, the second with about 50 feet, the third or 300-foot level, about 185 feet, and the fourth or 400-foot level over 700 feet of drifting. In addition, an adit, 2,320 feet in length, was driven southeasterly at an elevation of about 5,100 feet from a valley on the opposite side of Sugarloaf Hill and eventually connected to the previous workings. During 1916, most of the old workings were re-opened and a minor amount of further

work done. At this time, Cairnes (1917, p. 37) estimated that 75,000 tons of ore had been blocked out that would average in the neighbourhood of $15 per ton of gold and silver (at 1916 prices) and that "probable ore" on the property would be several times this amount, Since 1916 the property appears to have been inactive with the exception of the late thirties, when some open-cuts and trenches were put in on a second vein parallel to the original one.

Some hand-sorted shipments have been made from the property and in the present company reports (Annual Report, November 1965) that old records of work between 1910 and 1915 state that approximately 3,000 tons of ore grading 1.08 ounces of gold and 27.7 ounces of silver per ton were shipped.

Work done in 1965 consisted of re-opening the road to the property, bulldozer trenching of surface showings, and driving a new adit intended to cut the vein near the east end of the 400 level in the old workings. Up to 10 men were employed in the underground operation.

When visited early in September, vein material had been exposed in 5 trenches east of the workings over a distance of about 1,000 feet and in two trenches west of the showing over a distance of about 500 feet. Later in the season, the company reports that the vein material was exposed in an additional 3 trenches west of the old workings for a total distance of 900 feet on this side. The trenches, up to 15 feet or more in depth and in frozen ground, were cut using a ripper tooth mounted on a bulldozer. Bedrock was obscured by sloughing soon after exposure.

Vein material, as exposed in the surfaced cuts, consists mainly of quartz including both fine grained dark grey quartz that is colored by fine sulphide minerals and vuggy, white, coarsely crystalline quartz. Metallic minerals present include arsenopyrite, both fine and coarsely crystalline, minor pyrite and galena. Scorodite, a green secondary arsenic mineral is common. As exposed in the surface cuts the veins strike about N 60° E.

The new adit, commenced in October 1965 and, located about 630 feet east of the old inclined shaft and approximately 200 feet lower in elevation, was driven to test the footwall vein exposed in the surface stripping and the main vein east of the old workings. The former was cut about 270 feet from the portal and the latter about 770 feet. When visited in late April 1966, the footwall vein had

been drifted for 235 feet to the northeast and 490 feet to the southwest, workings on the main vein joined to the 4th level of the old workings and the vein drifted for about 290 feet to the northeast.

Country rock of the deposit appears to be equi-granular granodiorite with a grain size of about 5 mm. Towards the vein, the rock is more altered and bleached; mafic minerals (principally hornblende and biotite) have commonly disappeared through alteration to fine grained secondary minerals; feldspars have been replaced by a fine grained mass of mica and clay minerals. Streaks of pyrite are common and small amounts of molybdenite were observed in the country rock, mainly along small slip surfaces.

The footwall vein as exposed underground varies from a single sulphide-bearing quartz vein, a foot or less in width, to a number of such veins spread over several feet. There are many small branching and joining veins and good values frequently occur at the junctions. Thin seams of both quartz and pyrite often parallel the vein in both hanging- and foot-wall. Quartz in the vein varies from white to dark grey, the latter darkened by fine sulphide minerals, probably arsenopyrite. Common sulphide minerals include arsenopyrite, often coarsely crystalline, pyrite, dark brown sphalerite, and less commonly galena. In places, the vein is marked by a blood-red staining believed due to secondary antimony minerals. East of the adit, the vein strikes about east, swinging to southwest on the opposite side of the adit and the dip is 30 to 45 degrees to the north and northwest. The vein is interrupted by numerous steeply dipping pre and post-mineral faults which strike at large angles to the vein and exhibit minor displacements. Where cut by the adit, the vein contains about 18 inches of massive sulphide minerals, mainly arsenopyrite and sphalerite, and is flanked by numerous small parallel veins in the hanging wall. True width of the vein at this point is reported to be about 8 feet but sampling across a width of 26 feet returned 0.55 ounces of gold and 4.85 ounces of silver per ton, and about 1 per cent lead (Northern Miner, 10 February 1966, p. 11) and of the length of 90 feet to the east (including the adit and about 80 feet of drifting) 0.834 ounces of gold and 5.02 ounces of silver per ton and 1 per cent lead across an average width of 7 feet (op. cit.).

The main vein was cut about 15 feet below and just to the east

of the 4th level of the old workings. Where cut it is nearly flat lying and consists of about 2 feet of sulphide minerals, principally arsenopyrite, sphalerite, pyrite, and galena, and of dark grey quartz, underlain by 2 to 3 feet of quartz-rich material. The sulphide-rich portion of the vein is reported to carry a high precious metal content with lower values in the quartz-rich portion. The vein strikes about northeast and has an overall dip of about 15 degrees although a section through the old incline indicates considerable variation. Where cut by the new workings, the vein has a slight reverse dip and rises into the roof of the main crosscut. When the property was visited in late April 1966 the vein had been drifted for about 290 feet along the strike to the northeast. In this direction, there is an overall decrease in the amount of sulphide minerals and an increase in the amount of quartz present. Much of the vein contains blebs of white quartz to ½ inch in diameter surrounded by dark quartz containing both fine arsenopyrite and crystals to about ¼ inch in length. The vein is cut by numerous steeply dipping faults with minor displacements.

A short raise has been driven to the northeast end of the old 4th level and this was being re-sampled at the time of the visit. The main incline is partially filled with ice and the upper levels had not been re-opened. In the old workings stoping was done over a distance of about 255 feet along the 4th level, most of it between the old incline and the raise from the new workings. The vein in this portion appears to have a high sulphide mineral content, now indicated by the presence of thick coatings of secondary salts, probably containing arsenic, iron, and some copper, and to be broken into a number of blocks by steeply dipping faults with relatively minor displacement. The vein tested by the new workings is believed to be the displaced portion of the main vein lost near the northeast end of the old workings. West of the incline, the vein consists mainly of quartz and is more continuous due to the apparent absence of the minor faults. This portion has not been stoped and it is assumed that values were lower than in the sulphide-rich portion of the vein to the northeast.

#1 Peerless Group (60°05'N, 134°42'W) NTS 105 D 2
(Gold-Silver)

1966

Originally part of the old Big Thing property (see Arctic Caribou) the 7-claim Peerless group is now held by International Mine Services Limited. The claims encompass the original lower workings of the Big Thing property, including most of the 2,320-foot horizontal tunnel driven from the northwest side of Sugarloaf Hill at an elevation of about 5,100 feet. During the 1966 season, the company re-opened the tunnel. Some underground mapping and sampling was also done.

#2 Venus Group (Venus Mines Limited) (60°01'N, 134°38.2'W)
(Gold-Silver)

1966

References: Cairnes (1908, pp. 16-17; 1909, p. 31; 1817, pp. 39-41; in Bostock, 1957, pp. 254-255; 282; 447-449); MacLean (1914, pp. 194-200); Cockfield and Bell (1926, p. 40); Wheeler (1961, pp. 129-130).

The Venus group consists of 27 claims (including 8 Crown Grants) located along the west side of Windy Arm, Tagish Lake, near the site of the long-abandoned settlement of Conrad City. During the period 1904-1918 this area was under intermittent investigation for gold and silver and numerous properties, including Venus No. 1, Venus No. 2, Venus Extension, Vault, Montana, Mountain Hero, Dail, Flemming, and M and M, amongst others were worked to varying degrees. The remains of the original 100-ton mill built on the lakeshore in 1903 to treat ores from the Venus, Montana, Mountain Hero, and Vault operations are still present at Conrad, as are the aerial bucket tramway systems leading from the Venus and Montana portals downhill to the mill. Small ore shipments were made from time to time from the district and Cairnes (1917) reported that about 6,000 tons of ore was supposed to have been mined at the Venus operation, part of which was shipped to smelters.

Gold-silver values occur in a series of northerly-trending, shallow-dipping quartz vein systems cutting intermediate to acidic volcanic rocks of the Cretaceous Hutshi Group (unit 7, Wheeler, 1961). One of the principal veins, the Venus, is a persistent structure that has been traced, on surface and underground, for more than a mile. It consists of coarse crystalline quartz and carbonate, carrying irregular bands and lenses of pyrite, arsenopyrite, galena, and minor sphalerite and chalcopyrite. The vein ranges from a few inches to 5 feet in thickness, its strike averages N 10° E and its dip is about 35° W. It was explored by underground workings in four adjacent properties - Vault, Venus No. 1, Venus No. 2 and Venus Extension. Although good values were encountered in places (Wheeler, 1961, p. 130) development work showed that gold-silver distribution was erratic. A chip sample across 2 feet, taken by the present writer, from the main Venus vein exposed near the mouth of a small tunnel in the hillslope about 1,000 feet north of the Venus Extension tunnel assayed*: 1.42 ounces per ton gold, 5.14 ounces per ton silver, 1.1 per cent lead, trace zinc and copper.

In May 1966, the present company, Venus Mines Limited, constructed an 18-mile tote-road from Carcross to the Venus group, where a camp and portal site were established at an elevation of about 2,700 feet, and about 800 feet south of the Venus Extension tunnel. During the period June to late September, 1966, 1,614 feet of underground exploration was carried out. A crosscut was driven northwest and intersected the Venus vein about 200 feet from the protal; the vein was then followed in a northerly-trending drift (No. 1 N) for about 300 feet, at which point the vein was lost in a complex fault zone. The crosscut was then extended a further 130 feet past the No. 1 N drift and a second vein structure was intersected. This was followed by drifting approximately parallel to the No. 1 N drift, but after 250 feet the structure was lost due to faulting. The drift was continued through the fault zone where a vein structure up to 6 feet wide and striking approximately east and dipping about 30 degrees north was intersected. Except for its strike, the new vein reportedly has characteristics similar to the Venus vein.

Seventy feet past the new vein intersection, drifting was stopped and a diamond drilling program was initiated to outline the new structure. Drill-holes provided two intersections on the new vein as well as one on the projection of the Venus vein 80 feet to the east of the drift. This intersection assayed**: 0.39 ounces per ton gold, 4.7 ounces per ton silver and 1.4 per cent lead, over a width of 4 feet. The exploration program was suspended for the winter but in April 1967, the company resumed its underground drilling and drifting programs.

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*Assayed by G. Spalding, Whitehorse, Y.T.
**Information provided by Venus Mines Limited.

As exposed in the No. 1 N drift in the present workings, the Venus vein ranges from a few inches to nearly 1 foot in thickness. Pinches and swells are common, and ore mineralization is erratic. Well-mineralized zones show a crude banding of sulphides (mainly pyrite, arsenopyrite, and galena) parallel to the vein walls. Quartz in the interior part of the vein is commonly coarse, and vuggy openings contain well-formed inward-growing quartz crystals forming comb structures. The vein strike averages N 10° E and dips 30 to 35° W. A grab sample taken by the writer from the main vein in the No. 1 N drift assayed*: 0.12 ounces per ton gold, 0.50 ounces per ton silver, trace lead, zinc and copper.

In addition to the main vein, numerous other smaller, quartz-filled tension-gash structures have been intersected underground, some of which carry sulphide mineralization and gold-silver values.

NTS 105 d 2

#3 Bear Molybdenum Property (about 60°07'N, 134°43'W)
(Molybdenum)

1966

Gui-Por Uranium Mines and Metals Limited has an option on 38 claims (Tin Cup Group) and owns 19 adjacent claims (Liz and Bear Groups) straddling the Carcross-Arctic Caribou access road on the north slope of Montana Mountain. The area is underlain mainly by granitic rocks of the Coast Intrusion sequence (unit 8, Wheeler, 1961) and two small molybdenum showings are known on the property. During the 1966 season, a copper-molybdenum geochemical survey carried out over part of the property outlined an anomalous area. Late in the season a bulldozer trenching operation was begun over the anomaly, and some molybdenum mineralization associated with quartz veins was exposed.

CARCROSS AREA

Montana Mountain

NTS 105 D 2

#4 Giant Yellowknife Mines Limited (approximately: 60°02'N, 134°41'W)

1963

Reference: Wheeler (1961, pp. 119-131).

Giant Yellowknife Mines Limited conducted a geological evaluation of most of the many properties in the Montana Mountain area. A five-man crew worked most of the season in this area. Work included general prospecting, geological mapping, and sampling of showings. In particular, the Venus mine and related properties, held by J.L. Phelps and J.D. Scott, were extensively examined. Wheeler (1961) summarized the geology and development of the properties in the area.

NTS 105 D 2

#5 Jean Group (New Imperial Mines Limited) (60°04'N, 134°42'W)

1963

References: Bostock (1941, p. 26); Wheeler (1961, p. 127); Skinner (1961, p. 38; 1962, pp. 35-36); Green and Godwin (1963, p. 26).

New Imperial Mines Limited holds the Jean group of 25 mineral claims, of which three are owned by M.R. and H.M. Watson of Carcross. The claim group, accessible by a 10 mile truck road, is situated about 7 miles south of Carcross on Montana Mountain.

The company optioned the gold, silver, lead property in 1960, and during 1961 and 1962 drove a 226-foot adit on the Jean claim in an attempt to intersect a northwesterly trending gold-bearing quartz vein. The vein outcrops above the adit on a talus slope and occurs in the southwestern part of a granodiorite stock.

In the first half of September 1963, the company diamond drilled one 40-foot horizontal hole from the end of the adit, but the vein was not intersected. In addition, a small amount of hand trenching was done on the surface showing of the vein, and minor bulldozer stripping was done on the nearby Gladys claim. Four men were employed on the project.

CARCROSS AREA

Montana Mountain

NTS 105 D 2

#5 Jean Group (New Imperial Mines Limited) (60°04'N, 134°42'W)

Reference: Skinner (1962, pp. 35-36).

1962

The Jean Group of 23 mineral claims, of which 3 are owned by Mathew Watson of Carcross, is situated about 7 miles south of Carcross on Montana Mountain, about a mile northwest of the peak. Access is by a 10-mile truck road. New Imperial Mines Limited optioned the property in 1960 and in 1961 commenced, on the Jean claim, an adit intended to cut the gold-bearing quartz vein of the main showing at depth. In 1962, the adit was extended to a total length of 226 feet but did not intersect the vein. The company plans to continue work on the adit in 1963.

WHITEHORSE AREA

Montana Mountain

NTS 105 D 2

#5 Jean Group

References: Bostock (1941, p. 26); Wheeler (1961, p. 127); Skinner (1961, p. 38).

1961

The Jean Group of fifteen mineral claims—owned by Mathew Watson of Carcross—is situated about 7 miles south of Carcross on Montana Mountain, about a mile northwest of the peak. Access is by an 8-mile truck road. New Imperial Mines Limited optioned the property in 1960 and in 1961 drove an adit under the main showing.

The main showing is reported to be a 12- to 24-inch gold-bearing quartz vein containing about 20 per cent sulphides (galena, sphalerite, and pyrite). The vein outcrops on a talus slope at an elevation of 6,500 feet, and is in the southwestern part of a granodiorite stock. It is reported to strike S40°E and dip vertically, to be exposed over a 90-foot length, and to average $168 a ton. The adit is reported to strike S70°E, to be 160 feet long, and to require an advance of 45 feet to intersect the vein.

Whitehorse Area

NTS 105 D 2

#5 Montana Mountain 1960

New Imperial Mines Limited in 1960 optioned the Jean group of fifteen mineral claims from Matthew Watson of Carcross. The claims are situated about 7 miles south of Carcross on Montana Mountain, about a mile northwest of the peak. Access is by an 8-mile truck road. The main showing is reported to be a 12- to 24-inch, gold-bearing quartz vein containing about 20 per cent sulphides (galena, sphalerite, and pyrite). The vein outcrops on a talus slope at an elevation of 6,200 feet, and is in the southwestern part of a granodiorite stock. It strikes northerly and dips steeply, and has been exposed for 70 feet. The company engineer is reported to have taken several samples at regular intervals along the vein. These assayed up to 5 ounces of gold per ton, but averaged 3 ounces. The geology of the area and a description of similar deposits is given by Cockfield and Bell (1926, p. 39) and Wheeler (1952, p. 12).

New Imperial Mines also has options on the Montana group of six mineral claims, a mile southeast of the peak of Montana Mountain, and on the Charlton property at the head of Watson River. These are gold-silver-lead-zinc showings. It also holds twelve Crown-granted copper claims along the Whitehorse copper belt.

#6 Yukon Antimony Corporation Limited (Becker-Cochran Property)
(Antimony) 1966 (60°11'N, 135°13'W)

References: Cairnes (1916, p. 48; in Bostock, 1957, pp. 335-336); Bostock (1941, p. 35); Wheeler (1961, p. 132); Green (1965, p. 42; 1966, pp. 52-55).

Antimony was first discovered on Carbon and Chieftain Hills, near Wheaton River in 1893. Subsequently, the Becker-Cochran property, located on the east slope of Carbon Hill was explored by limited underground workings in the years 1914-1915. Wheeler (1961) reported that some work was done on the property in 1951.

In 1964 the present company acquired the Becker-Cochran property, in addition to several other showings in the area. An access road from Wheaton River to the property was re-opened, some bulldozer stripping was carried out, and a 12-ton bulk sample for metallurgical tests was mined (Green, 1965). In 1965 the company installed a camp on Becker Creek near Wheaton River, reached by a 23-mile access road that leaves the Carcross road at mile 11. Improved access roads were built from the camp to the Becker-Cochran property and other nearby showings. Extensive bulldozer stripping, surface mapping and sampling, surface and underground diamond drilling, and about 500 feet of underground exploration was carried out (Green, 1966).

During the 1966 season, an additional 1,025 feet of underground exploration work was done, as well as 1,500 feet of diamond drilling, about half underground and half from surface. A decision concerning future development work on the property is pending, subject to evaluation of assay results from the 1966 work.

The Becker-Cochran showing occurs along a pronounced gouge-filled shear zone up to 4 to 5 feet wide cutting altered rhyolitic to dacitic volcanic rocks of uncertain age (unit A, Wheeler, 1961) enclosed by granodiorite of the Coast Intrusions (unit 8, Wheeler, 1961). The main shear strikes N 50° W and dips 75° SW. Sulphide mineralization, including fine pyrite and stibnite and massive knots of coarse stibnite crystals, occurs with quartz gangue as irregular lenses and patches within the shear. Ore shoots are 4 to 12 inches wide and generally not continuous along strike for more than a few feet. In places, the ores are cut by rhyolite-porphyry dykes.

Underground exploration carried out in 1965 and 1966, involved work from three adits. In 1965, 350 feet of northwest drifting was done along the main shear from the No. 1 portal at an elevation of 5,260 feet. Locally heavy mineralization was encountered, particularly near the end of the drift. In 1966, the drift was extended 170 feet, but only minor mineralization was encountered. Three drill-holes were fanned from the end of the drift, but no additional mineralization was intersected. The No. 2 adit was driven southeast along the main shear, at the same elevation as the No. 1 adit and about 270 feet southeast of its portal. The 135-foot long drift intersected only minor mineralization. In 1966, the No. 3 adit was driven from an elevation of 5,110 feet and a location about 400 feet east of the No. 1 portal. A 452 foot crosscut, heading S 33° W intersected a shear system carrying good mineralization 425 feet from the portal; this was followed 250 feet to the northwest but no significant additional mineralization was encountered. A finger-drift was headed north for 60 feet from a point 145 feet along the northwest drift from its junction with the crosscut, but failed to intersect significant mineralization.

(Antimony) NTS 105 D 3

#6

Yukon Antimony Corporation Limited (Becker Cochran Property) (60°11'N, 135°13'W)

References: Cairnes (1916, p. 48)*; Bostock (1941, p. 35); Wheeler (1961, p. 132); Green (1965, p. 42).

1965

At year end, the company held 154 claims in the Wheaton River-Annie Lake area. These include many of the old properties in the Carbon Hill, Mt. Anderson, Chieftain Hill, Berney Creek-Skukum Creek, Folle Mountain-Schnabel Creek, Gold Hill, and Mineral Hill areas. Early in 1965, the company erected a permanent camp on Becker Creek, near the Wheaton River. The camp is reached by a road, 23 miles in length, that leaves the Carcross road about mile 11. From the camp a road was built to the Becker-Cochran property, about 5½ miles, and tote roads to a number of other showings in the district. A crew of up to 15 men was employed.

The first recorded work in the Wheaton area is in 1893 when two proppectors, Corwin and Rickman, spent the summer in the area and located a number of claims on Carbon Hill, Chieftain Hill, Idaho Hill and perhaps elsewhere (Cairnes, 1912, p. 3). They returned to Juneau with samples of antimony ore and some very rich gold-quartz ore but subsequently both died suddenly without disclosing the location of their claims. In August 1906, H.E. Porter found the old locations and workings on Carbon and Chieftain Hills and a staking rush to the area ensued.

The Becker-Cochran property on which most of the recent work was done, is located on the east side of Carbon Hill, at an elevation of about 5,100 feet, near the head of a small draw that joins an east-flowing tributary of Becker Creek, which in turn joins the main creek about 3 miles above the mouth. The showing was first visited by Cairnes (1916, p. 48) in 1915. Intermittent development work has been reported Bostock (1941, p. 35) in 1940 and Wheeler (1961, p. 132) in 1951. Previous underground workings consisted of a tunnel 100 feet in length which was open at the time of Bostock's visit. Work on the property in 1965 included extensive bulldozer stripping, surface mapping and sampling, about 500 feet of underground exploration, and diamond drilling from both surface and underground. The property was visited in early August and again in late October after the underground work had been completed.

The showing occurs in a strong shear zone, trending about N 50° W and dipping 60° SW, in a small body of altered acidic volcanic rocks located within a much larger mass of granitic rocks of the Coast Intrusions (Wheeler, 1961). The shear has been traced by bulldozer stripping in two cuts, a lower about 300 feet in length and an upper about 150 feet, spaced over a distance of about 1,000 feet. Steep slopes preclude stripping between the two cuts. As exposed in the cuts, the shear contains quartz with fine stibnite and some pods of massive stibnite in highly altered country rock that ranges from brown to black in colour. The ground is frozen and in mid-summer, details in the cuts are obscured by sloughing within a few hours of exposure. Considerable alteration of the stibnite to secondary red and yellow minerals has taken place. In the lower cut the vein was cut by a later dyke of younger volcanic rock about 20 feet wide and in the upper cut a lens of similar rock appeared to lie within the shear zone. Other rock types present in the cuts include a small amount of buff weathering chert pebble conglomerate and dark green, fresh-appearing, volcanic rocks.

Late in the 1965 season, an adit was driven on the vein at an elevation of about 5,000 feet roughly 40 feet below the old adit and up to 350 feet below the surface. The adit, about 370 feet in length, was driven on a bearing of N 50° W. Two spurs one trending west and 60 feet in length, the other S 25° W and 70 feet in length were driven from a point about 160 feet from the portal. The adit followed the vein for about half its length. About 120 feet from the portal the vein is cut by a dyke about 7 feet thick and 45 feet beyond by another dyke about 32 feet thick. The dyke contacts appear to be fault surfaces and are marked by a few inches of clayey gouge. Mapping of the vein suggest it is offset slightly to the left at each dyke. The vein was picked up again in the last 75 feet of the adit. As exposed at the face, the shear zone is about 7 feet wide and contains much sheared and broken wall rock; soft, rubbery gouge, ranging from light grey to black in colour; quartz with fine stibnite; and pods of massive stibnite to 6 inches or more. Individual crystals of stibnite are often up to several inches in length. Wall rock consists of grey to black, fine grained rock with considerable clayey material. A chip sample taken across a width of 4 feet at the face assayed*: 16.4 per cent antimony, 0.35 per cent arsenic, and traces of gold, silver, and lead. Early in 1966, the company announced (Northern Miner, 13 January 1966, p. 22) that the vein zone explored by the adit had an average width of 5 feet and a grade of 4.83 per cent antimony, 0.59 per cent arsenic, and 0.88 ounces of silver per ton.

Examined mircoscopically using refractive index oils, samples of country rock from the property were found to be highly altered. Most of the specimens appeared to have been completely altered to

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*Assayed by G. Spalding, Whitehorse, Y.T.

secondary minerals but a few contained partially altered remnants of sodic plagioclase, suggesting that the original rock was probably an acidic volcanic. What may have been the groundmass of the rock is now a fine-grained, indeterminate, mixture, probably containing much fine sericite. The development of carbonate, both as fine grains and larger crystals is common and many of the specimens contained as much as 25 per cent of this mineral. The N_O refractive index of the carbonate was observed to vary between 1.69 and 1.70, suggesting ferroan dolomite. Most of the specimens contained some distinct grains of quartz, and very fine grained material, similar in appearance to chert and probably composed mainly of quartz, was common. Much of the quartz may have originated through alteration of the volcanic rocks to carbonate and quartz. Brown weathering, characteristic of much of the country rock, probably results from the oxidation of contained ferroan dolomite. The dark grey colour of a number of specimens of clayey gouge was found to result from ubiquitous crystals of very fine pyrite.

The cross cutting dykes are composed of dark green, porphyritic, volcanic rock, containing feldspar phenocrysts to 2 mm in size. The dykes too are much altered but examined in index oils there are remnants of sodic plagioclase, probably oligoclase, and of hornblende. Some calcite is present and the finer grained alteration products are thought to include albite and epidote.

(Antimony) NTS 105 D 3

#6 Becker-Cochran Property (Yukon Antimony Corporation Limited N.P.L.) (60°11'N, 135°13'W)

1964 105 D

References: Cairnes (1961, p. 48)*; Bostock (1941, p. 35); Wheeler (1961, p. 132).

At year-end, the company held 48 claims in the Wheaton River-Annie Lake area. These include properties on Carbon Hill (Becker-Cochran, Fleming, Carbon, Empire, and Goddell's) and Chieftain Hill. Late in the 1964 field season, the company reopened an access road from the ford on the Wheaton River to the Becker-Cochran property, stripped the showing, and mined a bulk sample of about 12 tons for metallurgical tests (The Northern Miner, 8 October 1964, p. 13). The property was not visited by the writer.

#7 Skukum Copper Property (60°11'N, 135°22'W)
(Copper)

1966

Yukon Antimony Corporation Limited holds a 27-claim property on Skukum and Berney Creeks, near their junction with Wheaton River, immediately west of Carbon Hill. During the 1966 season a copper showing was discovered on the property, on the north side of Skukum Creek, just upstream from its junction with Berney Creek. The showing was not visited, but is reported to consist of disseminated chalcopyrite and malachite in granitic rocks. It has been estimated that the deposit may contain 3 million tons grading approximately 0.5 per cent copper (Financial Post Survey of Mines 1967, p. 301). An extensive exploration program is planned for 1967.

#8 Tally-Ho Gulch (60°14.5'N, 135°03'W)
(Gold-Silver)

References: Cairnes (1910b, in Bostock 1957, p. 334; 1912, pp. 108-110; 1916, p. 44, in Bostock 1957, p. 419); Cockfield and Bell (1926, p. 43; 1944, p. 15); Wheeler (1961, p. 123).

1966

Silver Pack Mines Limited, an affiliate company of International Mine Services Limited, holds an option on eight Crown Grant claims on Tally-Ho Mountain, southeast of Wheaton River. An additional 104 claims surrounding the Crown Grants are held by J.D.S. Bohme, attorney for International Mine Services Limited. The property includes the original Tally-Ho Gulch gold-silver showing, discovered in the early 1900's and explored intermittently between 1909 and 1912. Mineralization, principally argentiferous galena, occurs in a quartz-impregnated fault-breccia zone cutting granodiorite of the Coast Intrusions (unit 8, Wheeler, 1961). In the early years the property was investigated by means of two adits, one about 700 feet long, the other less than 500 feet, and limited crosscutting and drifting was done. Since about 1926 the property has been idle. Cairnes (1910b) reported assays averaging $80 per ton in gold and silver (at $20 per ounce gold) from part of the underground workings.

During 1966, the present owners constructed an access road to the old workings from mile 18 on the Carcross-Yukon Antimony road. The two adits were partly re-opened, and about 1,500 feet of diamond drilling (6 holes) carried out from a crosscut in the lower adit. The property was not visited.

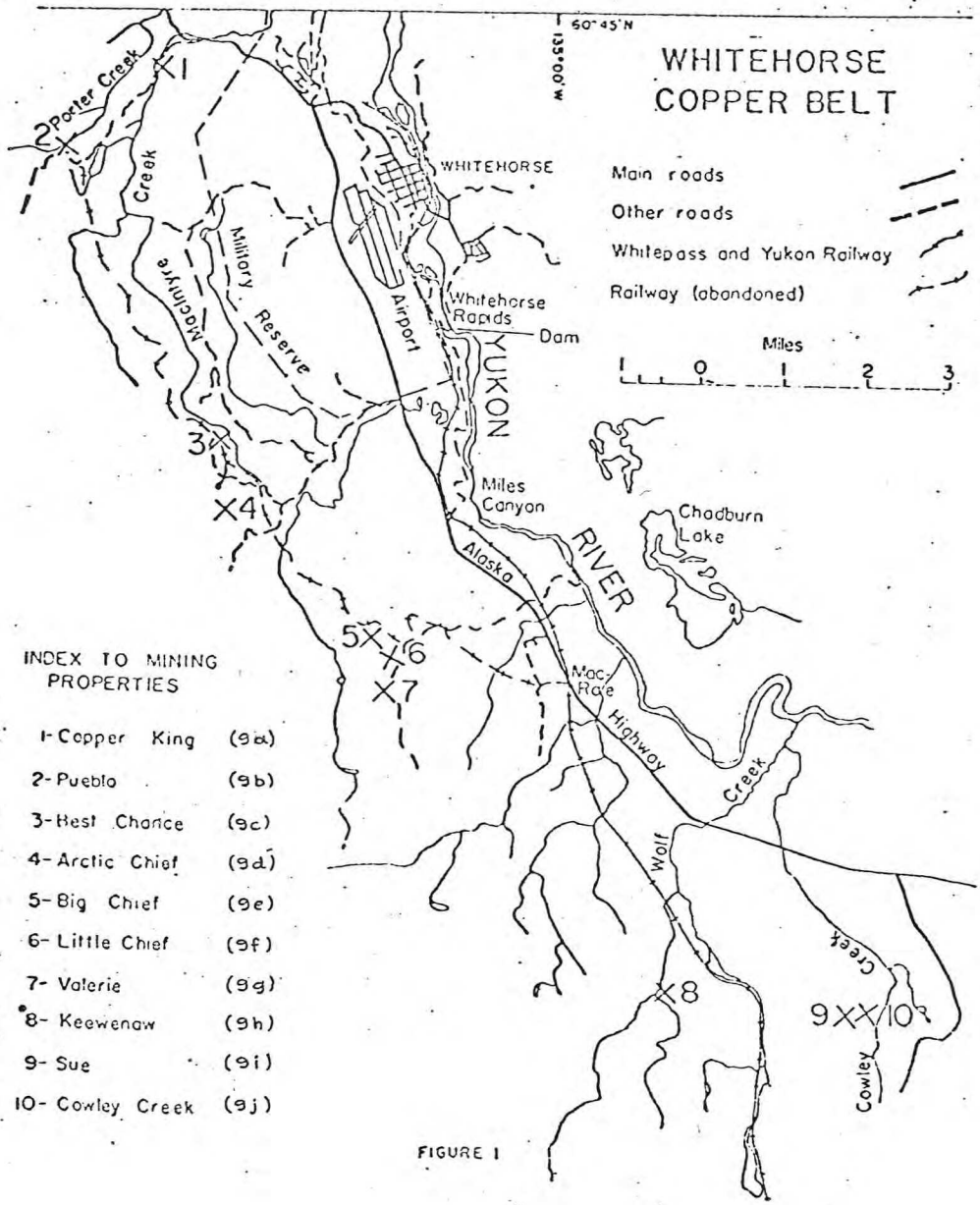
WHITEHORSE
COPPER BELT
60°45'N
135°00'W
Main roads
Other roads
Whitepass and Yukon Railway
Railway (abandoned)
Miles
0 1 2 3
WHITEHORSE
Whitehorse Rapids Dam
Airport
Military Reserve
McClintyre
Porter Creek
YUKON
RIVER
Miles Canyon
Alaska
Chadburn Lake
Mac Rae
Highway
Wolf Creek
Cowley Creek
INDEX TO MINING PROPERTIES
1- Copper King (9a)
2- Pueblo (9b)
3- West Chance (9c)
4- Arctic Chief (9d)
5- Big Chief (9e)
6- Little Chief (9f)
7- Valerie (9g)
8- Keewenaw (9h)
9- Sue (9i)
10- Cowley Creek (9j)

FIGURE 1

WHITEHORSE AREA

NTS 105 D 10,11

Whitehorse Copper Belt

#9 New Imperial Mines Limited (60°33'N to 60°45'N, 134°53'W to 135° 10'W)
(Copper-Iron)

1966

References: McConnell (1909); MacLean (1914, pp. 159-165); Cockfield and Bell (1926, pp. 48-49; 1944, pp. 18-19); Wheeler (1961, pp. 137-142); Green and Godwin (1964, pp. 33-39); Kindle (1964); Green (1965, pp. 33-39; 1966, pp. 50-51).

During 1966, New Imperial Mines Limited completed preparations for bringing its Little Chief open-pit mine into production (60°38.3'N, 135°03.7'W), and at the end of April, 1967, the mill began treating ore from the pit-head stockpile. The Little Chief deposit is the first of a number of copper properties held by the company in the Whitehorse Copper Belt to be brought to a production stage. The other principal deposits - War Eagle, Arctic Chief, Best Chance, Cowley Park and Keewenaw - have been initially explored by the company over the past few seasons, but will not be extensively developed until the Little Chief operation is well into production.

The Copper Belt operations are being developed in conjunction with Sumitomo Metal Mining Company of Japan, who have provided part of the development capital and who will purchase all copper, gold, and silver concentrates from the mines for a minimum 10-year period. The central, 2,500 ton-per-day mill, located about 2 miles east of MacRae (mile 911, Alaska Highway) at the Little Chief mine is designed to eventually treat ores from the other properties also. Concentrates will be shipped by rail and ship to Vancouver, via Skagway, and thence transhipped on ocean ore-carriers to smelters in Japan.

The copper-iron deposits of the Whitehorse Copper Belt have had a long and erratic history of piecemeal exploration and development. The first discoveries in 1887-88 (Copper King, Anaconda, Big Chief, and Little Chief) precipitated extensive prospecting and staking in the area, and by late 1899 most of the nearly thirty presently-known occurrences had been discovered (Kindle, 1964). The showings are distributed within a 17-mile by 2 to 3-mile wide belt lying to the west of the Alaska Highway and extending from the northeast flank of Golden Horn Mountain on the south (Cowley Park) to about 4 miles northwest of Whitehorse (War Eagle) on the north. During the period 1900-1915, intermittent production of high-grade, direct-shipping copper ore, totalling 162,440 tons and ranging in grade from 3.5 per cent to 46.4 per cent copper was reported to have been shipped from various of the properties (Kindle, 1964). After 1920 little work was done until 1947-48, when Noranda Mines Limited carried out a surface exploration program, including diamond drilling. The present company began intensive re-investigation of some of the Copper Belt properties in 1963.

The copper ores occur mainly as contact metasomatic deposits developed in skarn zones formed near intrusive contacts between granodioritic to dioritic rocks of the Coast Intrusion sequence and limestones of the Upper Triassic Lewes River Group (unit 3c, Wheeler, 1961). Two types of ore-mineral assemblages occur; disseminated to massive lenses of bornite and chalcopyrite in calcium-magnesium-silicate skarn composed essentially of diopside, chlorite, epidote, garnet, and tremolite; and, bornite-chalcopyrite-magnetite deposits in calcium-magnesium-iron skarn that contains abundant serpentine, and rarely, asbestos. The latter type appear to be mainly concentrated in deposits in the central part of the belt, such as the Little Chief, Big Chief, and Arctic Chief.

9f

At the Little Chief mine, bornite-chalcopyrite and bornite-chalcopyrite-magnetite ores occur in irregular lenses lying near the west boundary of a large calcium-magnesium-silicate skarn body that extends from the south end of Little Chief Lake (now drained in preparation for open-pit mining) northwest for about 2,400 feet to Big Chief Lake. The skarn is bounded on the east by dioritic intrusive rocks and along its north and northwest sides by massive limestone and, locally, diorite. The skarn probably partly overlies limestone, and drilling in the Little Chief mine area has intersected relatively unaltered lenses of limestone intercalated with skarn.

Drilling of the Little Chief orebody has outlined an estimated 1,910,000 tons of ore averaging 1.4 per cent copper (Northern Miner, January 19, 1967) to be mined from the approximately 900 feet by 450 feet by 300 feet deep open pit. In addition, encouraging results were obtained from a 5-hole deep drilling program (totalling 4,254 feet) carried out late in the 1966 season, which indicated a further 3,452,000 tons of possible ore grading 2.14 per cent copper below the pit floor (op. cit.). Early in 1967, the deep drilling program was resumed to further block out the deep ore. The drilling, coupled with surface information, has established that in gross form, the orebody is roughly tabular, strikes approximately north, dips about 55 degrees east, and is still open to 900 feet below surface.

In addition to the pre-production work at the Little Chief mine, the company continued its surface exploration program over other of its ground in the area during the 1966 season. Work done included geological mapping, ground magnetic surveys, and evaluation of airborne geophysical survey results.

WHITEHORSE AREA

Whitehorse Copper Belt

(Copper-Iron)

NTS 105 D 10,11

#9

New Imperial Mines Limited (60°33'N to 60°45'N, 134°53'W to 135°10'W)

References: McConnell(1909); MacLean (1914, pp. 159-165); Cockfield and Bell (1926, pp. 48-49; 1944, pp. 18-19); Wheeler (1961, pp. 137-142); Green and Godwin (1964, pp. 33-39); Kindle (1964); Green (1965, pp. 33-39).

1965

During 1965, New Imperial Mines Limited continued an extensive exploration program, begun in 1963, on a number of old properties in the Whitehorse Copper Belt. The deposits are of the contact metamorphic type and most occur along the contact between discontinuous bodies of limestone, of the Lewes River group of Upper Triassic age, and granitic rocks of probable Cretaceous age. Recent descriptions of individual properties are given in Kindle (1964) and Green and Godwin (1964, pp. 33-39).

At year end, the company held 286 mineral claims and one crown-granted mineral claim. The company also held options on 104 mineral claims and 21 crown-granted mineral claims. Work done during the year consisted of diamond drilling (129 holes with a total length of 44,212 feet), surface stripping, geological mapping, and a mill-feasibility study. Exploration work in 1965 was done mainly on the War Eagle, Little Chief, and Cowley Park properties. Up to 40 men were employed in the field.

Late in 1965, the company announced (The Northern Miner, 16 December 1965, p. 5) that they and Sumitomo Metal Mining Company had signed a letter of intent under which the latter company would provide senior financing to bring the property into production and would purchase all copper, gold, and silver concentrates for a minimum 10 year period.

Properties with known ore reserves are strung out over a distance of 18½ miles along a northwest-trending belt that lies a few miles west of Whitehorse. Open-pit mining is planned, with the ore to be trucked to a centrally located 2,500 ton-per-day mill located near MacRae. Mining would commence on the Little Chief orebody nearby. Early in 1966 (Whitehorse Star, 17 March 1966, p. 7) the company reported open-pit reserves of 5,023,000 tons grading 1.10 per cent copper (allowing for mining dilution) and more than $1 per ton in gold, silver, and molybdenum. In addition, (op. cit.) deep drilling beneath the propsed Little Chief open-pit has indicated reserves of 435,000 tons containing 1.63 per cent copper.

WHITEHORSE AREA

Whitehorse Copper Belt

(Copper-Iron) NTS 105 D 10,11

#9 New Imperial Mines Limited (60°33'N to 60°45'N, 134°53'W to 135°10'W)

References: McConnell (1909); MacLean (1914, pp. 159-165); Cockfield and Bell (1926, pp. 48-49; 1944, pp. 18-19); Wheeler (1961, pp. 137-142); Green and Godwin (1964, pp. 33-39); Kindle (1964).

1964

During 1964, New Imperial Mines Limited continued an extensive exploration program, begun in 1963, on a number of old properties in the Whitehorse Copper Belt. The deposits are of the contact metamorphic type and most occur along the contact between discontinuous bodies of limestone, of the Lewes River group of Upper Triassic age, and granitic rocks of probable Cretaceous age. Recent descriptions of individual properties are given in Kindle (1964) and Green and Godwin (1964, pp. 33-39).

At year end, the company held 270 mineral claims and one crown-granted mineral claim. The company also held options on 81 mineral claims and 21 crown-granted mineral claims. Work done during the year consisted of diamond drilling (95 holes with a total length of 26,942 feet), surface stripping, a contracted Induced Polarization survey, and a mill-feasibility study. Up to 32 men were employed in the field.

Late in 1964, Sumitomo Metal Mining Company of Japan entered into an agreement with the company giving it the exclusive rights to negotiate financing, construction of a mill, and purchase of ore and concentrates (The Northern Miner, 10 September 1964, p. 3).

Early in 1965, the company announced (The Northern Miner, 11 February 1965, p. 12) that the following tonnages had been indicated by drilling up to 31 January 1965:

Deposit	Tons	Per Cent Copper
Positive		
Little Chief (9f)	1,150,000	1.20
Arctic Chief (9d)	400,000	1.30
Best Chance (9c)	300,000	1.00
War Eagle	450,000	1.40
Keewenaw (9h)	200,000	1.15
Cowley Park (9j)	75,000	1.00
Probable		
War Eagle	450,000	1.40
Keewenaw	200,000	1.15
Cowley Park	75,000	1.00
Total	3,300,000	1.22

The properties with known ore reserves are strung out over a distance of 15 miles along a northwest-trending belt that lies a few miles west of Whitehorse. It is proposed that all would be open-pit operations and that the ore would be trucked to a central mill. During 1964, exploration work was concentrated on the War Eagle, Cowley Park, Keewenaw, and Little Chief properties and, in addition, some work was done on the Copper King and Pueblo.

Whitehorse Copper Belt NTS 105 D 10,11

#9 New Imperial Mines Limited (60°33'N to 60°45'N, 134°53'W to 135°10'W)

References: McConnell (1909); MacLean (1914, pp. 159-165); Cockfield and Bell (1926, pp. 48-49; 1944, pp. 18-19); Cockfield (1928a, pp. 14-18)*; Wheeler (1952, pp. 11-15); Dominion Bureau of Statistics (1957, p. 119); Skinner (1961, p. 38); Wheeler (1961, pp. 137-142); Kindle (1963); Geological Survey of Canada (1963c).

1963

New Imperial Mines Limited undertook an extensive exploration and development program during 1963 on a number of old copper properties** in the Whitehorse copper belt. This northwesterly trending belt, reached by secondary roads, is about 4 miles southwest of Whitehorse and roughly 16 miles long by 3 miles wide.

Until the present program little work has been done on the belt since 1947. At the end of 1963, the company owned 225 mineral claims and one crown-granted mineral claim. The company also held options on 62 mineral claims and 17 crown-granted mineral claims. Estimated total tonnage at the end of 1963 in the properties drilled by the company was about 1,600,000 tons (Dr. A.C. Skerl, personal communication). A tentative mill site has been picked out. Much of the following material is drawn from McConnell's authoritative report (1909), and Wheeler's (1961) compilation of reports on the belt.

The history of the Whitehorse copper belt dates back to the early Klondike gold rush. Discoveries of copper-bearing outcrops are reported to have been made by miners on their way to Dawson in the summer of 1897. The discoverers were hunting at the time, and the finds were not located. The credit for staking the first claim goes to Jack McIntyre, who located the Copper King on 6 July 1898. By the end of the following year most of the district had been thoroughly prospected on the surface, and most of the important claims had been discovered and staked.

The first shipment of ore was made in 1900 from the Copper King mine. The shipment was made up of 9 tons of rich bornite ore, and is stated to have yielded 46.40 per cent copper. Other early shipments included: a small one from the Valerie in 1903, a second of 460 tons from the Copper King in 1903, and a 170 ton

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* Reprinted in Geological Survey of Canada, Memoir 284 (Bostock, 1957, pp. 581-585).

** For locations of properties see Figure 1.

shipment of selected ore from the Arctic Chief in 1904. Very little work was done in the years 1904 to 1905, but the rising price of copper in 1906 revived interest in the camp. The copper production of the Yukon from 1900 to 1930 was 13,062,512 pounds, valued at 2,711,695 dollars (Dominion Bureau of Statistics, Canadian Mineral Statistics, 1957, p. 119); undoubtedly almost all of this came from the Whitehorse Copper Belt. Except for two minor years in 1929 and 1930, the belt has had no recorded production since 1920.

Development to 1907 was considered by R.G. McConnell (1909, p. 2) to be remarkably slow considering the many favourable showings. He attributed the slow progress to the delay in providing proper transportation facilities. Most of the important mines, at that time, were situated at distances of 4 to 7 miles from the White Pass and Yukon Railway terminus in Whitehorse, and were connected with it by wagon roads constructed by the Territorial Government. The transportation charges to Whitehorse by wagon were from 3 to 4 dollars per ton, and from Whitehorse by rail and steamer to the various coast smelters, 6 dollars per ton. The large iron-bearing deposits on which the camp depended were all comparatively low grade at that time, averaging about 4 per cent copper, so that the margin of profit under those conditions was small. White Pass, however, completed a 12 1/2-mile spur line in 1909 that went from McRae through the belt close to many of the important producers to the Pueblo mine. MacLean (1914) reported that this extension of railway facilities, along with a reduction in freight and smelter charges, had by 1912 reduced the total cost of transportation and smelting to approximately 5.14 dollars per ton. Cockfield (1928, p. 15A) noted a limitation of the deposits that was due to their irregular and bunchy character, which added considerably to the cost of mining.

Noranda Mines Limited undertook an extensive exploration program on the belt in 1946 and 1947. In this period exploration was concentrated on the Big Chief, Little Chief, Keewenaw, and Valerie properties. Options on the property were abandoned in 1948 after completing: hand trenching and bulldozing, 20 diamond drill holes totalling about 6,000 feet, self-potential surveys, dip-needle surveys, and geological mapping of the areas investigated.

Imperial Mines and Metals Limited, incorporated in 1954, held 42 claims on the belt and subsequently did some preliminary surface mapping and diamond drilling. In 1956, 11 drill holes totalling approximately 2,200 feet were drilled on the Best Chance property. At the same time a magnetometer survey of the Best Chance and the Arctic Chief property was conducted.

In 1957, New Imperial Mines Limited succeeded Imperial Mines and Metals Limited. Until 1962 the new company did only representation work on the copper belt. Geological mapping and a magnetometer survey was done on the Little Chief property in 1962.

On 24 May 1963, New Imperial Mines Limited commenced work on the belt under the direction of consulting geologist Dr. A.C. Skerl of Vancouver. Magnetometer surveys, self-potential surveys, 2 rotary-drill holes, and 74 diamond-drill holes totalling 15,929 feet were completed by 15 December 1963. Two diamond drills were operated most of the summer and a third was utilized later in the season. In addition, one Winkie portable diamond drill was used for preliminary exploration. Two drills were winterized and operated until 15 December 1963. Work was recommenced by the company on 13 January 1964. Around the clock drilling employed four men per machine. In addition, a drilling supervisor and up to six field men were employed.

On the belt, work by New Imperial Mines Limited during the 1963 season was concentrated on the following properties: Sue 9-16, Arctic Chief, Best Chance, Valerie, Cowley Park (site of the Sue 1-4 and Cowley Creek properties), and during the winter, on the Little Chief. The following brief summary of the geology of the belt and these properties is taken almost entirely from McConnell (1909) and Wheeler (1961, pp. 137-142).

General Geology

The deposits of the Whitehorse copper belt are of the contact metamorphic type and lie at or near the contact of the granitic rocks with the limestones of the Upper Triassic Lewes River Group. The chief ore minerals are bornite and chalcopyrite, which occur most commonly in a skarn composed of brown garnet, diopside, some epidote, and tremolite; they are also found in a magnetite-rich skarn at the Arctic Chief mine in the south-central part of the copper belt. Specular hematite is common in the ore from the Pueblo mine in the northern part of the belt.

In most places the contact between the limestone and the granitic rocks is masked by the skarn, which occurs partly in the altered granite and partly in the limestone. In the granitic areas the skarn is massive, and grades gradually into dark, dioritic-looking rocks, whereas, in many parts of the limestone areas the skarn shows a distinct banding. Bodies of copper sulphides, either as massive pockets or disseminated masses, are nearly always found in the skarn along the limestone-skarn contact.

Exposures are not plentiful along the copper belt, and much of the drift-covered area may conceal more deposits. The magnetite-rich skarns of the central part of the belt lend themselves to magnetic methods of exploration.

An airborne magnetic survey of the Whitehorse Copper Belt was flown in 1961 as part of a program carried out by the Geological Survey of Canada. The survey was flown at a nominal 1,000 feet above ground level (where terrain permitted), and flight lines were spaced at about 1/2 mile intervals. Map 1413G (Geological Survey of Canada, 1962) shows elliptical magnetic anomalies with a general alignment of their long axis parallel to the length of the belt. Only the Arctic Chief, however, coincides with the crest of an anomaly (about 100 gammas above background).

#9i Sue 9-16 (northern belt)

The Sue 9 to 16 claim group, staked in 1963 by New Imperial Mines Limited, is approximately 1 3/4 miles south of the Pueblo Mine. Aeromagnetic map 1413G (Geological Survey of Canada, 1962) has a broad circular anomaly over this area, which is about 1 mile across and 200 gammas above background. The claims were tested with a ground magnetometer survey, a self-potential survey, and two rotary drill holes. The two geophysical surveys showed coincident anomalies, but the second drill hole, which hit bedrock through 205 feet of overburden, encountered artesian water and amygdaloidal basalt (Miles Canyon Basalt of Quaternary age) containing magnetite. The basalt is thought to be responsible for the magnetic anomaly.

*9d Arctic Chief (central belt)

The Arctic Chief is at an elevation of about 2,700 feet above sea-level at the head of McIntyre Creek. It is accessible by a rough road 3 miles long from mile 913.4 on the Alaska Highway.

The orebody lies on the west side of a northerly trending limestone body intruded by altered quartz diorite of variable composition. The granitic rocks near the Arctic Chief are strongly mineralized over a width of 400 feet for a length of 1,000 feet along the limestone-quartz diorite contact. The mineralization gradually diminishes away from the orebody. Bornite and chalcopyrite occurs as lenses and as disseminated grains in a massive magnetite lode. Two adits connected by a 50-foot winze have exposed two lenses of magnetite that may be connected. The main lens, as exposed in the upper adit, which is about 65 feet below the surface, is about 250 feet long and 25 to 40 feet wide. Two shipments made in 1904 and 1907 totalled 223 tons and exceeded an average of 5 per cent copper. The silver tenor of the ordinary shipping ores averages about 2 ounces to the ton; and assays of 147 ounces to the ton have been obtained from a tetrahedrite vein, a few inches to a couple of feet in width, intersected in the lower level.

In 1963, New Imperial Mines Limited diamond drilled 37 holes totalling 8,540 feet on this property. Overburden at the drill sites varied from 6 to 30 feet in depth. Estimated tonnage of the property is 400,000 (Dr. A.C. Skerl, personal communication).

*9c Best Chance (central belt)

The Best Chance, elevation approximately 2,800 feet, lies about 1 mile north of the Arctic Chief, from which it can be reached by a rough road. It has the largest surface showing of cupriferous magnetite so far discovered in the belt. The outcrops of ore measure 360 feet in length, with a maximum width of 65 feet and an average width of about 30 feet, and project above the surface as a miniature range of low hummocky iron-garnet hills, from 6 to 20 feet in height.

Ore lies along a quartz diorite-limestone contact and both rocks are intensely altered near the contact. The zone of skarn is barely 50 feet thick. It is composed principally of andradite, diopside, actinolite, epidote, chalcopyrite, and magnetite. The copper minerals, which are associated with the magnetite, consist mostly of bornite and chalcopyrite, and minor carbonates and oxides.

Early development consisted of three shallow shafts and three open cuts. As previously noted, Imperial Mines and Metals drilled 11 holes totalling approximately 2,200 feet in 1956.

In 1963, New Imperial Mines Limited drilled 9 holes totalling 3,499 feet. Overburden at the drill sites was 6 to 20 feet deep. Estimated tonnage of the property is 300,000 (Dr. A.C. Skerl, personal communication).

*9g Valerie (southern belt)

The Valerie, elevation approximately 2,800 feet, lies about 3 miles southeast of the Arctic Chief. It is accessible by a rough road 3 miles long from mile 910.2 on the Alaska Highway. The Valerie is the only claim in the southern part of the belt upon which much development work has been done.

The western part of the Valerie is underlain by limestone, and the eastern part by hornblende granite (?), passing in places into a diorite. The orebodies developed along the ragged contact between these rocks.

The workings consist of a 92-foot inclined shaft that affords a depth of 84 feet. From the foot of the shaft exploratory drifts, totalling 270 feet in length, have been run in various directions, partly in ore and partly in more or less altered limestone and diorite. Besides the main shaft, two other shafts, each about 20 feet in depth, have been sunk on promising outcrops of ore.

Copper minerals are irregularly distributed along the limestone-granodiorite contact and occur as massive lenses separated by lean stretches. The ores have no bornite, but consist of chalcopyrite and derived carbonates and oxides. Other minerals are arsenopyrite, magnetite, diopside, garnet, and calcite. About 40 tons of selected ore, obtained from the surface workings, are said to have averaged 18 per cent copper.

In 1963, New Imperial Mines Limited conducted a ground magnetometer and self-potential survey on the property. Four areas showed a coincidence of anomalies from both geophysical methods. Three drill holes totalling 643 feet were drilled on the property. No tonnage from this property is included in the overall tonnage of the belt.

* 9j Cowley Park (extreme southern belt)

The Cowley Park Group (site of the Sue 1-4, and Cowley Creek properties) lies at an elevation of approximately 2,450 feet, and is about 7 miles southeast of the Valerie. It is accessible by a 1/2 mile road from mile 2 on the Carcross Road.

Kindle (1963) shows the prospects to be in an east-west trending outcrop of Lewes River Group limestone, which is about 1/2 mile in length and completely surrounded by granitic rocks.

In 1963, New Imperial Mines Limited mapped the geology and ran a self-potential survey on the property. Ten diamond drill holes totalling 996 feet were drilled with a small, portable diamond drill. Bornite, chalcopyrite, and molybdenite were the main "ore" minerals encountered. No tonnage from this property is included in the overall tonnage of the belt.

* 9f Little Chief (southern belt)

The Little Chief, elevation approximately 2,800 feet, lies about 1/2 mile north of the Valerie, and is accessible via the same road.

The principal showing outcrops as a nearly solid cupriferous magnetite mass, over 100 feet long, and fully 50 feet wide. The magnetite has developed in highly crystalline limestone along a hornblende granite contact.

As previously noted, geological mapping and magnetometer survey was done on the property in 1962 by New Imperial Mines Limited. In 1963, the company drilled 13 holes totalling approximately 3,550 feet. Estimated tonnage of the property is 900,000 (Dr. A.C. Skerl, personal communication).

WHITEHORSE AREA

NTS 105 D 10,11

#9

Whitehorse Copper Belt (60°37'N, 134°57'W)

References: Geological Survey of Canada (1962, a, b, c); Kindle (1963).

1961

The release, early in January 1963, of Geological Survey of Canada (1962, a, b, c) aeromagnetic maps covering the Whitehorse Copper Belt and a possible extension into the drift-covered area to the southeast, resulted in considerable staking activity. A total of 170 claims were recorded, reportedly for an undisclosed syndicate. New Imperial Mines Limited, which holds much of the ground within the Copper Belt, did only representation work during 1962.

NTS 105 D 11

#10 Quatsino Copper-Gold Mines Limited (about 60°37'N, 135°06'W)
New Privateer Mine Limited
Buchanan Mines Limited
(Antimony) 1966

. A 56-claim property lying west of and adjacent to the Little Chief and Arctic Chief properties of New Imperial Mines Limited is jointly held by Quatsino Copper-Gold Mines Limited, New Privateer Mine Limited and Buchanan Mines Limited. Early in 1967 it was announced (Northern Miner, February 16, 1967) that a high-grade antimony discovery had been made on the property. Assays of up to 27.5 per cent antimony were reported from 3-foot channel samples across the showing. The property was not visited.

PLACER OCCURRENCES

NTS & Occur. Number	Reference	Name of Occurrence	Date	Lat.& Long.	Metals	Host Rock (with age)	Alteration, Gangue and Control	Remarks
WHITEHORSE 105-D								
105D1-11	155 GSC P67-36	Jubilee Mtn.	1961	60°12'N 134°06'W	Cu	Actinolite epidote, garnet, Skarn Lst.	Contact serp, dunite & Lst.	Disseminated bo, cpy, specularite, hematite. Mem. 312.
105D2-1	159 GSC P67-36	(Arctic Mining) Arctic Caribou (Big Thing) Peerless Group	1966	60°05'N 134°42'W	Au,Ag	Granodiorite stock	Series of qtz. veins	Qtz. vein NE/moderate NW dip with down dip flexures - displ along strike by two fault syst one across veins, one nearly parallel - range from single u to 1' to stockworks up to 12' py, aspy, sph, gal, and rare cpy. Values from 4-60 oz. Ag. and usually less than 1 oz. Au extensive d.d. workings. Pres work 4,500' drilling and 3000' underground drilling reserves. 132,000 tons of 0.69 oz. Au 19.8 oz. Ag.
105D2-2	158 GSC P67-36	Venus Mines Ltd.	1966	60°01'N 134°38'W	Au,Ag	Volcanic rocks of Cretac. Hutshi Grp.	Series of N/shallow Qtz. vein	Venus vein - few inches to 5' & traced for over 1 mile. Qtz carb, py, aspy, gal, sphal. - values erratic, one chip sampl over 2' - 1.42 oz. Au, 5.14 o Ag, 1.1% Pb - 1614' undergrou work 1966
105D2-3	182 GSC P67-36	Bear Moly Prop.	1966	60°07'N 134°43'W	Mo.	Granite of coast intrusions	Qtz. veins	Geochem - trenching
105D2-5	160 GSC P67-36	Jean	1961	60°05'N 134°41'W	Au,Ag	Hb.-bio.-olig. granodiorite	Vein 5' Qtz.	See Mem. 312 - Map 1093 A P64-36 (not in library) 2' of vein reported $50.40 Au

NTS &. Occur. Number	Reference	Name of Occurrence	Date	Lat.& Long.	Metals	Host Rock (with age)	Alteration, Gangue and Control	Remarks
105-D Contd.								
105D2-12	GSC 161 P67-36	College Green	1961	60°09½'N 134°50'W	Cu	Andesitic volcanic & along 50'wide band Lst.	Irregular veins	
105D3-6	167 GSC P67-36	Yukon Antimony	1966	60°11'N 135°13'W	Sb	Rhyolite dacite	Gouge filled shear zone 5' wide N50°W/75SW	Py. & stibnite with quartz shoots 4"-12" x few ft. cut places by rhyolite porphyry dikes - 3 adits & drifts totalling 1500' & d.d.h.-150
105D3-7	168 GSC P67-36	Yukon Antimony Skukum Copper	1966	60°11'N 135°22'W	Cu	Granitic rocks	Disseminated cpy & malachite	Estimated 3 million tons 0.5
105D3-8	162 GSC P67-36	(Silver Pack Mines) Mt. Stevens Area (Tally Ho Gulch)	1966	60°14.5'N 135 03'W	Au,Ag	Granodiorite of coast intrusions	Fault breccia zone - impreg. with qtz.	Argentiferous galena 1900's 1926 estimated $80/ton. Present - two adits partly re-opened and about 1500' of d.d.h. from crosscut.
105D3-13	166 GSC P67-36	Mount Anderson Area	1961	60°13'N 135°10'W	Au,Ag, Pb	Granodiorite	Qtz. fissure vein	Mem. 312 - 2 veins exposed over 2000' strike W to N00°W/90 - ave. 18" galena, py, erratic distribution
105D3-14	169 GSC P67-36	Mount Reid Mascot	1961	60°10'N 135°29½'W	Au,Ag, Pb,Zn	Granodiorite	Sheared & brecciated granodiorite veins of qtz.	2 veins strike ENE/SE steep 2' to 25' vein in gouge over 1000' long. 6 of 12 channel samples carri over 0.5 Au highest values 0.765 oz. Au, 59.90 oz. Ag, 11.8 Pb, 8.4 Zn.

NTS & Occur. Number	Reference	Name of Occurrence	Date	Lat.& Long.	Metals	Host Rock (with age)	Alteration, Gangue and Control	Remarks
105-D Contd.								
105D6-15	163 GSC P67-36	Idaho Hill	1961	60°19'N 135°03'W	Ag, Pb, Zn	Greywacke of Laberge Grp.	Qtz. veins subordinate calcite	Veins strike N-NW/W- 4"-12" thick - several hundred ft. exposed - galena-dissem. and massive association with arsenopyrite also sph. cpy, pyrite.
105D6-16	164 GSC P67-36	Mt. Bush	1961	60°19'N 135°04'N	Coal	Tantalus Fm.	Seams 18" 6' + 3"	Strike 6/80-80W. Fault 2000' down dip.
105D6-17	165 GSC P67-36	Gold Hill	1961	60°17'N 135°04'W	Au, Ag.	4 showings in narrow belt of greenstone & green schists or in granites bordering this belt	Qtz. veins	1. Gold Reef - vein 4-5' wide ov 1000' strike N55W/50-60SW parallel to foliation, Pyrit rich pockets of Au, sylvanit hessite, petzite and telluric ochre. Old workings several hundred ft. underground. 2. Dail Creek - Vein 8-20" wid strike N82°W/75-85S -iron st qtz. - dissem. galena some sylvanite- .11 to 1.51 oz. A 0.75 to 15.74 oz. Ag. 3. Lucky Boy- Qtz. vein strikes in green schist. Cpy, chalco malachite. 4. Legal Tender in granodiorite strike NW/NE-90. Argentifero galena, cpy.
105D9-18	156 GSC P67-36	Marsh Lake	1961	60°34½'N 134°26'W	Cu	Greenstone		Small showings cpy, bo, and py Memoir 312.

NTS. & Occur. Number	Reference	Name of Occurrence	Date	Lat. & Long.	Metals	Host Rock (with age)	Alteration, Gangue and Control	Remarks
105-D Contd.								
105D10-19	171 GSC P67-36	Golconda	1933	60°39'N 134°59'W	Au	Laberge shale (calc.) interbedded with Lst.	Qtz. veins & stockworks	Strikes N41°W/40-50 NE- 6-26' qtz. and up to 100' wide stock works - old shaft - reported $40/ton. 8 mi. SE of Whitehorse on Canyon Mtn.
105D11-9	172 GSC P67-36	New Imp. Mines	1966	60°43'N 135°11'W	Cu, Fe, Mo.	Skarn zones in upper Trias. Lst. contacting intermediate rocks of Coast Intrusion	Contact metas.	17 mi. x 2-3 mi. belt- early 1900's, 162,440 tons high grade shipped - cpy, bornite, massive lenses and disseminated. Little Chief 1.9 M. tons, 1.4 % not bottomed.
105D11-10		Quatsino Etc.	1966	60°37'N 135°0'W	Sb.			High grade Sb - up to 27.5% from 3' channel samples
105D13-20	173 GSC P67-36	Mt. Ingram	1946	60°45½'N 135°09'W	Ag, Pb, An, Cu	Granitic rock granitized Arkose or Coast Instrusion	Shear zone, limonite	1½ ft. wide mineral zone. N10°E/80°W. Ag 3.23 oz, Zn 8.5, Pb 1.89, Cu 0.54
105D15-21	157 GSC P67-36	Joe Creek		60°54'N 134°49'W	Cu	Lewes R. sediments Triassic		
105D-22	170 GSC P67-36	Whitehorse		60°29'N 135°17'W	Coal			

Canada
Department of Mines
HON. CHARLES STEWART, MINISTER; CHARLES CAMSELL, DEPUTY MINISTER.
GEOLOGICAL SURVEY
W. H. COLLINS, DIRECTOR.

Issued 1926

LEGEND

CENOZOIC — QUATERNARY
- RECENT AND PLEISTOCENE
  - 1 — Gravel, sand, soil, silt, muck, clay, volcanic ash and ground ice

CENOZOIC — TERTIARY
- 2 — Rhyolite, granite porphyry, syenite porphyry
- 3 — Andesite and basalt
- 4 — Granitic intrusives

MESOZOIC
- 5 — Andesite, diabase, basalt
- JURASSIC(?)
  - 6 — Conglomerate, shale, arkose, sandstone, argillite and tuff
- TRIASSIC (OR AND) CARBONIFEROUS
  - 7 — Limestone
- DEVONIAN(?)
  - 8 — Cherty quartzite, slate and limestone

PALÆOZOIC — PRECAMBRIAN(?)
- 9 — Pyroxenite and peridotite
- 10 — Granite gneiss, quartzite, mica and hornblende schist, crystalline limestone

Symbols

- Geological boundary
- Coal
- Au — Gold-silver vein
- Ag — Silver-lead vein
- Cu — Copper deposit
- Sb — Antimony silver vein
- Road
- Trail
- Marsh
- Glacier
- 5751 — Height in feet

C. O. Senécal, *Geographer and Chief Draughtsman.*
A. McGregor, *Draughtsman.*

Lithographed and printed by the Geographical Section, G.S., Department of National Defence.

Publication No. 2071

WHITEHORSE SHEET

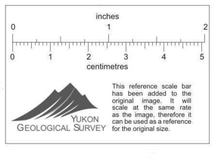
YUKON

105 D

Scale, 253,440 or 1 Inch to 4 Miles

Miles 5 4 3 2 1 0 5 10

Kilometres 5 4 3 2 1 0 5 10 15



SOURCES OF INFORMATION

Geology compiled by W.E. Cockfield *from surveys by the* Geological Survey, 1899 to 1924.

Geography compiled by W.E. Cockfield *from surveys by the* Geological Survey *and the* Department of the Interior, 1887 to 1924.

To accompany Paper 44-14

CANADA

DEPARTMENT OF MINES AND RESOURCES

MINES, FORESTS AND SCIENTIFIC SERVICES BRANCH

SURVEYS AND MAPPING BUREAU
TOPOGRAPHICAL SURVEY

NATIONAL TOPOGRAPHIC SERIES

CANADA, SHEET 105 D

REFERENCE

- Road, loose surface graded and drained 2 lanes
- Other roads — poor condition
- Trail
- Railway (narrow gauge) — Station or stop
- Abandoned railway grade
- Telephone or telegraph line — along road
- Building
- School — S.
- Post Office — P.O.
- Provincial boundary and monument
- Height in feet above mean sea-level — 8055
- Glacier
- Intermittent stream
- Marsh or swamp
- Sand or gravel
- Contours (interval 500 feet)
- Contours (position approximate)
- Wooded areas

Published 1949.

Surveyed, 1944 and compiled, 1947 by the Topographical Survey.

Lithographed and printed by the Army Survey Establishment R.C.E., Department of National Defence, 1949.

Approximate magnetic declination, 31°30′ East.

MAP 953A

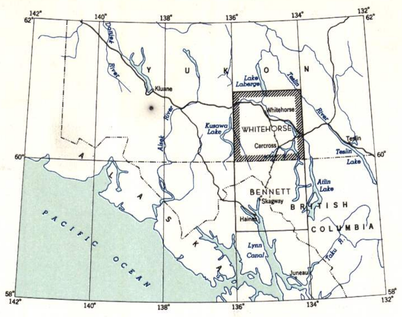
WHITEHORSE

YUKON TERRITORY

(FIRST EDITION)

Scale: 1/250,000 or Approximately 4 Miles to 1 Inch

4 3 2 1 0 4 8 12 16 20



inches
0 1 2
0 1 2 3 4 5
centimetres

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YUKON GEOLOGICAL SURVEY

CANADA

DEPARTMENT OF MINES AND RESOURCES

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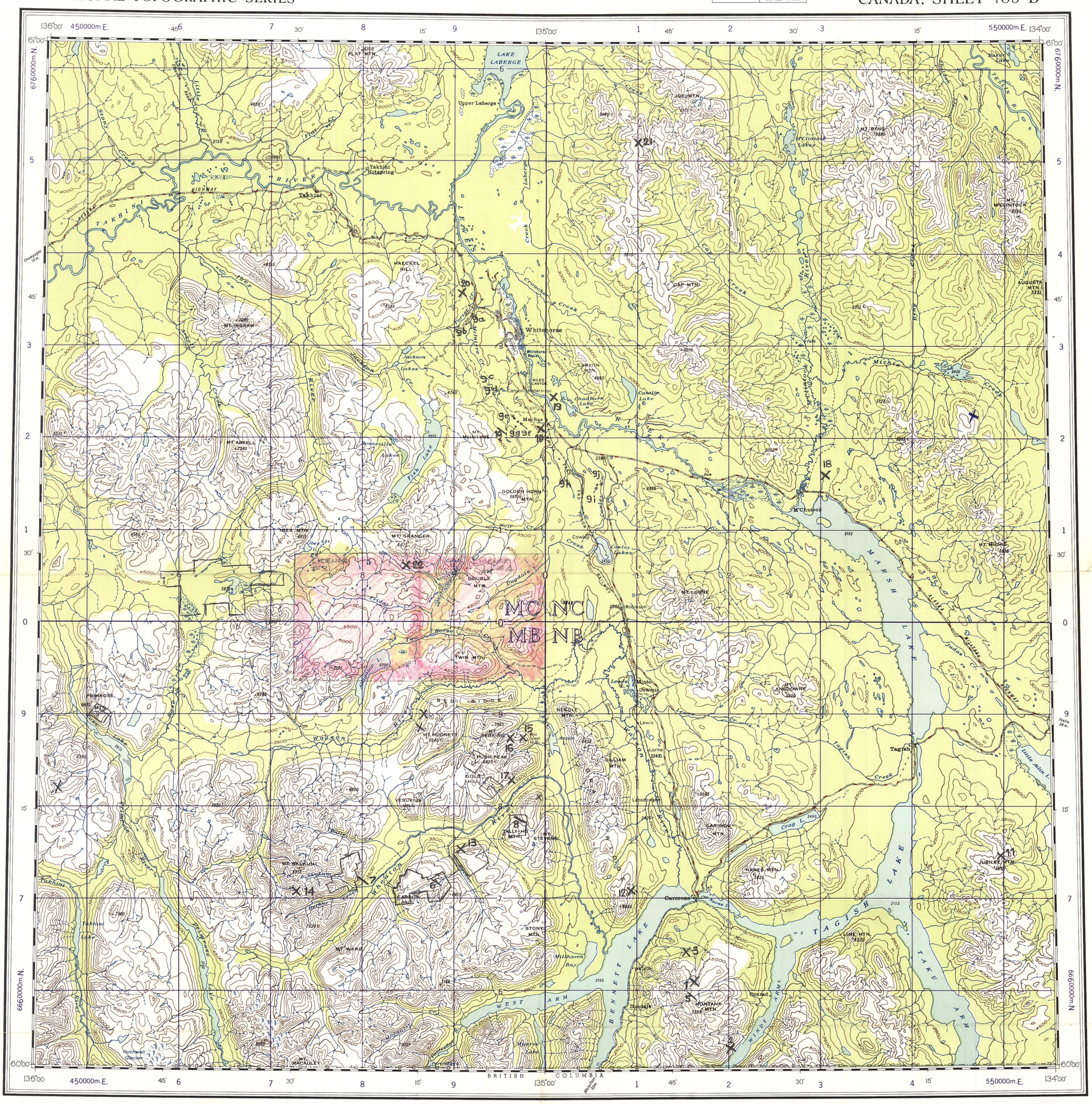
SURVEYS AND MAPPING BUREAU
TOPOGRAPHICAL SURVEY

Refer to this map as:	105 D EDITION 2 ASE SERIES A 502

NATIONAL TOPOGRAPHIC SERIES

CANADA, SHEET 105 D



REFERENCE

Road, loose surface graded and drained 2 lanes	
Other roads	poor condition
Trail	
Railway (narrow gauge)	Station or stop
Abandoned railway grade	
Telephone or telegraph line	along road
Building	
School	
Post Office	
Provincial boundary and monument	
Height in feet above mean sea-level	8055
Glacier	
Intermittent stream	
Marsh or swamp	
Sand or gravel	
Contours (interval 500 feet)	5000
Contours (position approximate)	5000
Wooded areas	

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Lithographed and printed by the Army Survey Establishment R.C.E., Department of National Defence, 1949.
Approximate magnetic declination, 31°30' East.

GRID ZONE DESIGNATION	100,000 M. SQUARE IDENTIFICATION
8V	MC NC / MB NB — 670 — 50

TO GIVE A REFERENCE TO NEAREST 1000 METRES

EXAMPLE: ROAD JUNCTION

SQUARE: Read letters of 100,000 m. square	NC
EASTING: Read number on grid line immediately to left of point. Estimate tenths of a square from this line eastward to point.	07
NORTHING: Read number on grid line immediately below point. Estimate tenths of a square from this line northward to point.	18
MILITARY GRID REFERENCE (to nearest 1,000 metres)	NC 0718

If reporting beyond 18° in any direction, prefix Grid Zone Designation as: 8V NC 0718

TEN THOUSAND METRE
UNIVERSAL TRANSVERSE MERCATOR GRID
ZONE 8

MAP 953A

WHITEHORSE

YUKON TERRITORY

(FIRST EDITION)

Scale: 1/250,000 or Approximately 4 Miles to 1 Inch

4 3 2 1 0 4 8 12 16 20

inches 0 1 2
0 1 2 3 4 5 centimetres

YUKON GEOLOGICAL SURVEY

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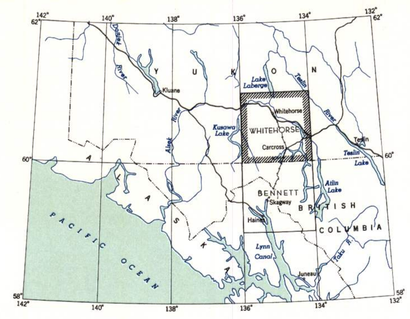


EDITION 2 ASE

105 D

CANADA

DEPARTMENT OF MINES AND RESOURCES

MINES, FORESTS AND SCIENTIFIC SERVICES BRANCH

SURVEYS AND MAPPING BUREAU
TOPOGRAPHICAL SURVEY

NATIONAL TOPOGRAPHIC SERIES

Refer to this map as:	105 D EDITION 2 ASE SERIES A 502

MINERAL SHOWINGS LOCATION MAP

LEGEND :

LODE DEPOSITS

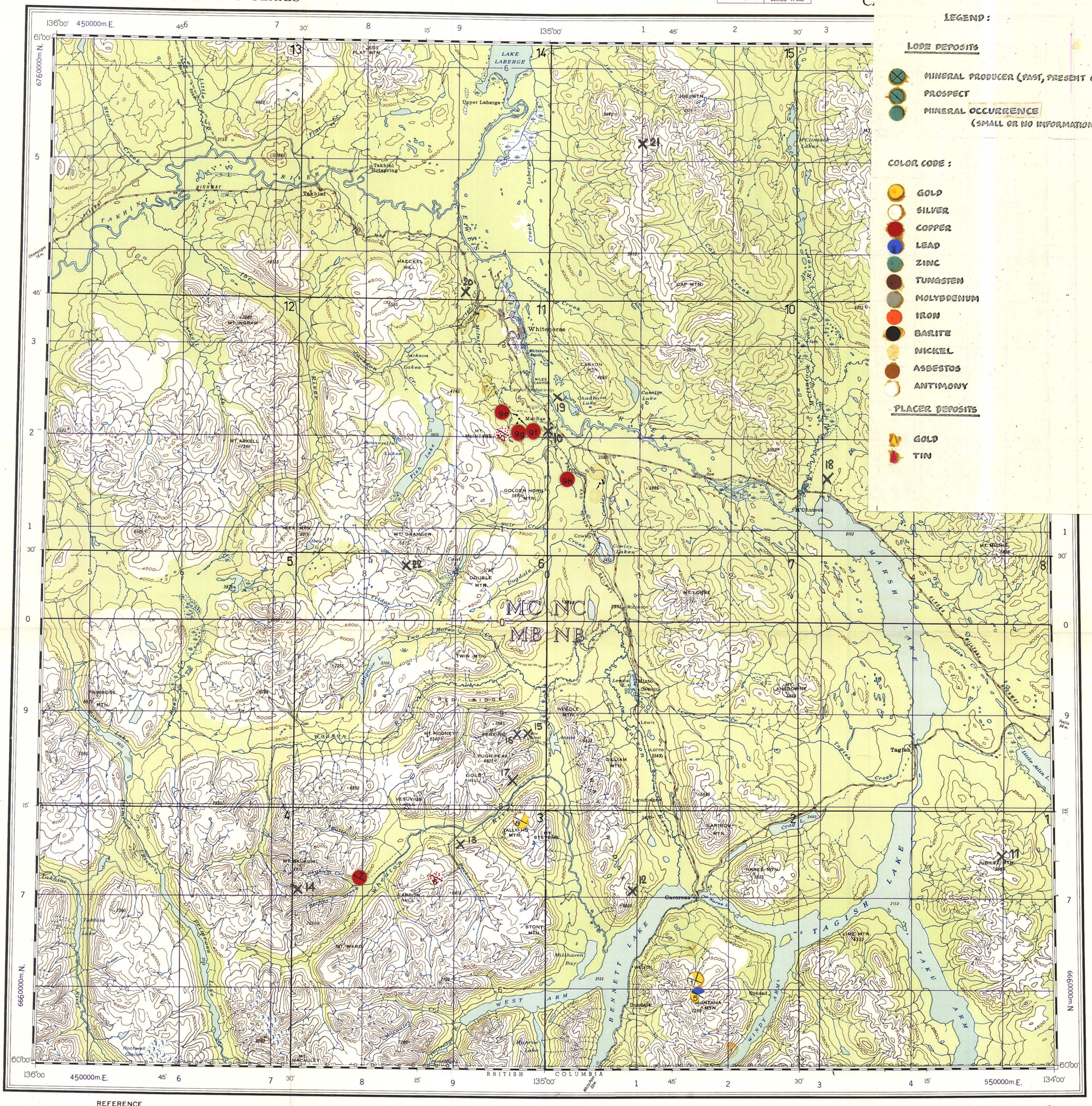
- MINERAL PRODUCER (PAST, PRESENT OR FUTURE)
- PROSPECT
- MINERAL OCCURRENCE (SMALL OR NO INFORMATION AVAILABLE)

COLOR CODE :

- GOLD
- SILVER
- COPPER
- LEAD
- ZINC
- TUNGSTEN
- MOLYBDENUM
- IRON
- BARITE
- NICKEL
- ASBESTOS
- ANTIMONY

PLACER DEPOSITS

- GOLD
- TIN



REFERENCE

- Road, loose surface graded and drained 2 lanes ..... poor condition
- Other roads .....
- Trail .....
- Railway (narrow gauge) ..... Station or stop
- Abandoned railway grade .....
- Telephone or telegraph line ..... along road
- Building .....
- School ..... S
- Post Office ..... P
- Provincial boundary and monument .....
- Height in feet above mean sea-level 8055
- Glacier .....
- Intermittent stream .....
- Marsh or swamp .....
- Sand or gravel .....
- Contours (interval 500 feet) 5000
- Contours (position approximate) 5000
- Wooded areas .....

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GRID ZONE DESIGNATION	100,000 M. SQUARE IDENTIFICATION
8V	MC NC / MB NB — 670 — 50

TO GIVE A REFERENCE TO NEAREST 1000 METRES

EXAMPLE: ROAD JUNCTION

SQUARE: Read letters of 100,000 m. square	NC
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MILITARY GRID REFERENCE (to nearest 1,000 metres)	NC 0718

If reporting beyond 18" in any direction, prefix Grid Zone Designation as: 8V NC 0718

TEN THOUSAND METRE
UNIVERSAL TRANSVERSE MERCATOR GRID
ZONE 8

MAP 953A

WHITEHORSE

YUKON TERRITORY

(FIRST EDITION)

Scale: 1/250,000 or Approximately 4 Miles to 1 Inch

4 3 2 1 0 4 8 12 16 20

inches 0 1 2
0 1 2 3 4 5 centimetres

YUKON GEOLOGICAL SURVEY

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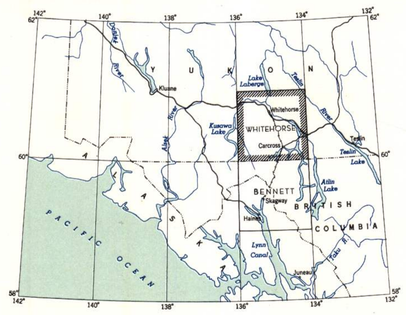

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