

**U.S. Bureau of Mines  
Colville Mining District/NPR-A  
1990 Field Reconnaissance**

**By Mark P. Meyer**

**UNITED STATES DEPARTMENT OF THE INTERIOR**

**Manuel Lujan, Jr., Secretary**

**BUREAU OF MINES**

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**FIELD REPORT**

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# U.S. Bureau of Mines

## Colville Mining District/NPR-A 1990 Field Reconnaissance

By Mark P. Meyer<sup>1</sup>

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### ABSTRACT

The Colville Mining District is located in northern Alaska and includes the southern portion of the National Petroleum Reserve - Alaska (NPR-A). Section 105(c) of the Naval Petroleum Reserves Act of 1976 (PL 94-258) mandated that a mineral resource inventory be completed on the NPR-A. The U.S. Bureau of Mines and the U.S. Geological Survey were involved in the original minerals inventory of the 105(c) study. During 1977 and 1978, the USGS conducted regional geologic mapping and regional geochemical sampling while the Bureau conducted site-specific examinations and detailed sampling of mineralized localities.

Rocks with high zinc and lead values, along with anomalous values of silver, gallium, indium, and germanium, were found at two localities in the area as a result of the original investigation. Rocks with high fluorite, phosphate, rare earths (e.g. lanthanum, scandium, and yttrium), barium, vanadium, and chromium values, and coal are present in the area.

During 1990 a joint team of Bureau, USGS, BLM, and ADGGS personnel conducted a reconnaissance of the southern Colville Mining District/NPR-A in preparation of a full fledged mining district study starting in 1991. Nine mineralized locations were visited during the reconnaissance and samples were taken at eight of the localities. In-place mineral sources were located at three previously identified geochemically anomalous areas.

A pyritized conglomerate was sampled in an eastern tributary of Kivliktort Mountain. The sample contained 0.44% Zn. Sphalerite and galena-bearing breccia was located at a western tributary of Kivliktort Mountain. Samples contained up to 6 oz/ton Ag, 2.76% Pb, and 31.5% Zn. A mineralized zone was found at a western tributary of Koiyaktot Mountain. Samples contained up to 7.48 oz/ton Ag, 1.55% Pb, and 49.91% Zn.

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### INTRODUCTION

In 1923, a 23 million acre tract of land, in northern Alaska, was set aside by President Warren G. Harding as a petroleum reserve for the U.S. Navy. The tract, Naval Petroleum Reserve numbered 4 (NPR 4 or Pet 4), was under the jurisdiction of the U.S. Navy until June 1, 1977 when it was transferred to the U.S. Department of Interior's Bureau of Land Management (BLM). After the transfer it became known as the National Petroleum Reserve - Alaska (NPR-A). The transfer was mandated by the Naval Petroleum Reserves Act of 1976, Public Law 94-258. Section 105(c) of the act directed the Department of Interior to conduct a study of the mineral potential in the NPR-A.

The boundary of the Colville Mining District (CMD) was delineated by the U.S. Bureau of Mines (Bureau) in 1954. The district contains approximately 16.64 million acres covering the area drained by the Colville River and its tributaries flowing into the Arctic Ocean.

The Bureau's Alaska Field Operations Center (AFOC) has selected the CMD as the next area to study as part of its Alaskan mining district evaluation program. The BLM is interested in the mineral potential of the NPR-A and is willing to support the Bureau's work in the region. Due to the geographical overlap and interest in both areas the Bureau has combined the CMD and NPR-A into one study area.

Section 1010(a) of the Alaska National Interest Lands Conservation Act, P.L. 96-487, states that "the Secretary shall, to the full extent of his authority, assess the oil, gas, and other mineral potential on all public lands in

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the State of Alaska in order to expand the data base with respect to the mineral potential of such lands." In addition, the Anti-Apartheid Act of 1986, P.L. 99-440, mandates that the U.S. is to decrease its import reliance on South African supplies of platinum-group metals, chromium, manganese, cobalt, and selected other minerals. The mining district studies provide detailed information on the identified mineral resources on Federal and State lands and the potential for their economic development. Emphasis is also placed on developing more extensive quantitative information on potentially economic mineral resources, especially of strategic and critical minerals. This type of information helps Federal policy makers, land management agencies, regulatory agencies, and the Congress to make land-use and policy decisions that effect the long-term supply of domestically produced minerals.

In Fiscal Year 1985, the Senate Appropriations Committee directed the Bureau to develop a long-term plan to guide its minerals engineering and economic evaluation activities in Alaska. The Bureau proposed a systematic reconnaissance examination of Alaska mining districts, followed by site-specific evaluations of significant mineral deposits identified. The studies are designed to determine the development potential of mineral deposits in the district by identifying resources and reserves and evaluating their mining feasibility.

The CMD was selected for study because: (1) the district has a large quantity of public land that could be made available for mineral exploration and development; (2) a Land Management Plan is being prepared by the BLM for Federal land in the district and a mineral study would be valuable for the plan; and (3) lead, zinc, silver, phosphate, coal, and critical and strategic mineral-bearing deposits that may have high development potential are present in the district.

### LAND STATUS

Land status of the CMD/NPR-A includes lands controlled by the BLM (NPR-A), the U.S. Park Service (Gates of the Arctic National Park, Preserve, and Wilderness), State of Alaska, private, and Native corporations.

### LOCATION AND ACCESS

The CMD/NPR-A is located in northern Alaska along the northern slope of the Brooks Range (fig. 1). The area includes the northern divide draining the Colville, Kokolik, Kugra, Kukpowruk, Meade, Titaluk, and Utukok Rivers. Three physiographic divisions occur in the area and include; the Arctic Coastal Plain, the Arctic Foothills, and the Central and Eastern Brooks Range. The Central Brooks Range is composed of rugged glaciated east-trending ridges with elevations ranging from 3,000 to 7,000 feet. The Arctic Foothills consist of rolling plateaus and low linear mountains. The northern mountains, rising in elevation from 600 to 1,500 feet, have broad east-trending ridges dominated by mesa-like mountains. The southern mountains are characterized by irregular buttes, knobs, mesas, east-trending ridges ranging from 1,200 to 3,500 feet, and intervening gently undulating tundra plains. The Arctic Coastal Plain is a low lying smooth plain rising from the Arctic Ocean to an elevation of 600 feet. Numerous lakes occur in the low lying areas and an occasional abrupt scarp, up to 200 feet high, separates the coastal plain from the foothills (361)<sup>2</sup>. The higher elevations in the Brooks Range are devoid of trees and have lichens covering the rocky slopes. At the lower elevations the vegetation grades into typical tundra species with stunted alder and willow along the river gravel bars.

Villages within the study area include Umiat, located on the Colville River, and Anaktuvuk Pass, located on the southern boundary at the headwaters of the John and Anaktuvuk Rivers.

No roads, highways, or railroads occur in the study area. Very few airstrips are located within the study area and these are located at Umiat, Iivotuk, Anaktuvuk, and Galbraith Lake. Access to the villages and base camps in the CMD/NPR-A is by airplane usually from Fairbanks or Bettles. The Dalton Highway is located just outside the eastern boundary of the study area and Galbraith Lake could be used as a possible staging area.

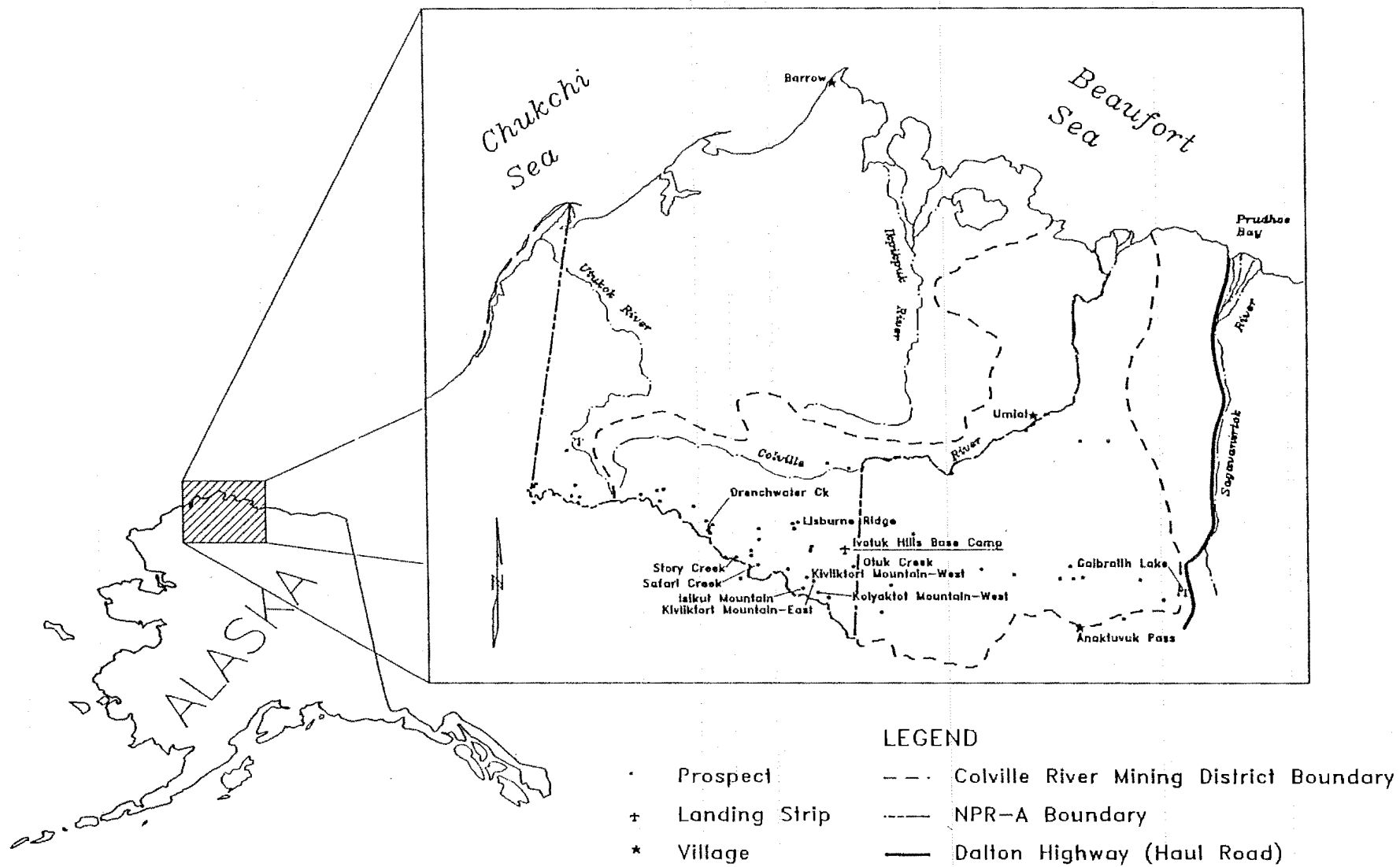
### CLIMATE

The north slope of Alaska lies within the zone of continuous permafrost (361). Summer temperatures average between 29 and 44° F and winter temperatures average between -26 and -6° F in Barrow (185). Strong winds blow

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<sup>2</sup>Underlined numbers in parentheses refer to items in the bibliography at the end of this report.

FIGURE 1. - Location Map of the CRMD/NPR-A study area.



persistently throughout the year.

Annual precipitation in the area is low, less than 5 inches in Barrow and 11 inches in Anaktuvuk, making the area technically a desert. Precipitation occurs mostly as snow, but light rain is common during the summer months (185). Occasional early morning fog, blowing in from the Arctic Ocean, extends to the Brooks Range.

### GEOLOGIC SETTING

The rock types, located within the CMD/NPR-A, consist of an intensely folded and faulted middle Paleozoic through Mesozoic sedimentary succession lying over a basement of lower Paleozoic and Precambrian sedimentary, volcanic, and plutonic rocks (128). Two major terrains are located in the study area; a southern basement section and a northern overlying section. The southern section is composed of Devonian black shale and chert of the Lisburne Group, overlain by argillite and chert of the Siksikput Formation. This in turn is overlain by limy chert, limestone, and shale of the Shublik Formation (95). This thin Carboniferous, Permian, and Triassic aged sequence is overlain, northward, by a thick section of Cretaceous age coarse clastic rocks (95).

Metallic mineral deposits, located within the CMD/NPR-A, can be divided into two groups; sediment- and/or volcanic-hosted deposits, and pluton-hosted deposits. The sediment- and/or volcanic-hosted deposits are syngenetic with their host rocks while the pluton-related deposits were formed in preexisting rocks (128). Shale-hosted stratiform Pb-Zn-(Ba) deposits are formed within rocks of Late Devonian to Late Mississippian age and appear to have formed at the same time as their host rocks (128). Pluton-related deposits are Devonian in age and occur as various types of skarn deposits (128).

The predominant type of metallic mineral deposits consist of the shale-hosted Zn-Pb-(Ba) deposits. These deposits occur within thrust sheets of Mississippian shale, sandstone, and limestone (128). Also located in the area are lesser known occurrences of breccia-hosted sphalerite, and galena within upper Devonian to Lower Mississippian sandstone, siltstone, shale, and limestone (128).

Other types of mineral deposits occurring in the CMD/NPR-A include coal, oil sands, and industrial minerals. The industrial minerals include phosphate, barium, clay, limestone, and sand and gravel.

### PREVIOUS STUDIES

The U.S. Geological Survey (USGS) and the Bureau appraised the mineral resources of the southern part of the NPR-A during 1977 and 1978. Time in the field, by the Bureau, totalled 8 weeks over the two year period.

During the field investigations the USGS conducted regional geological mapping to determine the geological setting of the NPR-A and performed detailed mapping on zones of mineralization and mineral potential. A regional geochemical survey (348-349) was also conducted by the USGS with the analytical results and preliminary interpretation used in selecting anomalous areas for further sampling and investigation. Eighty geochemically anomalous drainages were identified by the 1977 USGS geochemical survey. The Bureau's field work consisted of traverses along drainages with geochemical anomalies in search of mineralized rock causing those anomalies. Stream sediments and selected rock samples were collected from the anomalous drainages to define and identify further zones of mineralization.

The Bureau examined only 25 of the anomalous lead-zinc drainages during the two years of field work due to time constraints and the large geographic area needed to be examined during the 105(c) studies. The Bureau identified at least 61 mineralized occurrences along the southern portion of the NPR-A (Table 1). The occurrences are located within a 120-mile long east southeast - west northwest trending mineral belt which may be an eastern extension of the mineralized terrain that hosts the Red Dog deposit, which lies to the southwest of the NPR-A.

Two stratigraphic horizons of different geologic age containing four zones of significant lead-zinc mineralization were discovered by the Bureau (183). The first mineralized horizon was identified in the Drenchwater Creek area and contains high lead, zinc, silver, and germanium concentrates. The second mineralized horizon includes high-grade zinc, lead, silver, gallium, and germanium mineralization at Kivliktort Mountain, Story Creek, and Whoopee Creek (located in the Noatak National Preserve).

Additional sulfide mineralization was identified and sampled in widely scattered areas along the geochemical trends outlining the geological trends. Fluorite, phosphate, rare earth elements (e.g. lanthanum, scandium, and yttrium), barium, vanadium, chromium, and phosphate occurrences were also located within the NPR-A.

TABLE 1. - Mineral Deposits in the CRMD/NPR-A

Mineral deposit name	Commodity	Mineral deposit name	Commodity
Anaktuvuk River.....	Phos-V-REE	Nigu River.....	Phos-V
Awana River.....	Coal	Nuka Ridge.....	Zn-Cu-Pb
Awana River No.2.....	Coal	Nuka Ridge "Oil" Sands.....	Oil sands
Boundary Zone.....	Cu-Pb-Zn	Oolah Mountain.....	Pb-Zn-Cu-Ag
Central Sphinx Mountain.....	Zn-Cu-Pb-Mn	Oolamnagavik River.....	Unknown
Chandler Lake.....	Phos-V-REE	Otuk Creek.....	Zn
Chandler River.....	Clay	Plunge Creek.....	Zn-Cu-Pb
Chertchip Creek.....	Pb-Ba	Rampart, Recon, Jubilee.....	Pb-Zn
Colville River.....	Clay	Rolling Pin Creek.....	Cu-Pb-Zn
Colville River.....	Coal	Safari Creek.....	Pb-Zn
Cutaway Creek.....	Cu-Pb-Zn	Schrader Bluff.....	Clay
Drenchwater Creek.....	Pb-Zn	Sharp Peak.....	Zn-Cu-Pb-Ba
East Sphinx Mountain.....	Zn-Cu-Pb-Mo	Singayoak-Picnic Creek.....	Pb-Zn
Grizzly Creek.....	Pb-Zn-Cu-Ag	Sorepaw Creek.....	Pb-Ba
Ipnavik River.....	Pb-Zn	Spike Creek - East.....	Zn-Cu-Pb-Ba
Isikut Mountain.....	Pb-Zn	Spike Creek - West.....	Zn-Cu-Pb-Ba
Itkillik tributary.....	Pb-Zn-Cu-Ag	Story Creek.....	Pb-Zn-Ag
Kady.....	Zn-Pb-Ag	Swayback Creek.....	Pb-Zn
Kiligwa River.....	Cu-Pb-Zn	Tiglukupuk Creek.....	Phos-V-REE
Killik River.....	Coal	Twistem Creek.....	Pb-Zn
Kiruktagiak River.....	Phos-V-REE	Unnamed-Ekakevik Mtn.....	Phos
Kivliktort Mountain - East...	Pb-Zn	Unnamed-Fay Creek.....	Phos
Kivliktort Mountain - West..	Pb-Zn	Unnamed-Hardway Creek....	Phos
Koiyaktot Mountain - East...	Pb-Zn	Unnamed-Kanayuk Creek....	Phos
Koiyaktot Mountain - West..	Pb-Zn	Unnamed-Tulugak Lake.....	Phos
Lisburne Ridge.....	V-Phos	Upper False Wager Creek....	Cu-Pb-Zn
Mechanic Creek.....	Cu-Zn	Vidlee.....	Zn-Pb-Ag
Memorial Creek.....	Pb-Zn	West Fork Safari Creek.....	Pb-Zn
Mount Bupto.....	REE	West Sphinx Creek.....	Zn-Cu-Pb-Ba
Natvakruak River.....	Phos-V-REE	Whoopee Creek.....	Pb-Zn-Ag
Nigu Bluff.....	Ba-Cr		

1990 FIELD PROGRAM

The Bureau's 1990 CMD/NPR-A field season consisted of eight days, July 27 - August 4, based at the BLM's Ivotuk airstrip located along Otuk Creek. The Bureau's employees included Steve Fechner, Joe Kurtak, and the



Author, from AFOC, Anchorage, AK; and Uldis "Jake" Jansons from the Bureau's Intermountain Field Operations Center (IFOC), Denver, CO. Accompanying the Bureau geologists was Don Keill, geologist for the BLM Arctic District Office, Fairbanks, AK. USGS geologists were also utilizing the Ivotuk base camp during the same period.

A total of 23 samples were collected by the Bureau during the 1990 field reconnaissance. Nine mineralized sites were examined or sampled including; Drenchwater Creek, Isiktut Mountain, Kivliktort Mountain - East, Kivliktort Mountain - West, Koiyaktot Mountain - West, Lisburne Ridge, Otuk Creek, Safari Creek, and Story Creek.

### PROPERTY SUMMARIES

In preparing for the Bureau's 1990 field season sixty one mineralized properties were identified from a literature search (Table 1). Nine properties were visited by Bureau personnel during the reconnaissance examination of the CMD/NPR-A. Listed below are the results of those 1990 property investigations. Appendix A contains additional information on each property visited during the 1990 study.

#### DRENCHWATER CREEK

Several trips were made to Drenchwater Creek by various members of the field crew. The first trip was led by Jake Jansons, who originally described the deposit. A limonite-stained chert layer grading into a dacite porphyry plug was located along the northeast portion of the deposit. Westward, a black chert containing fine-grained sphalerite and galena rubblecrop, Jake's second discovery outcrop location, was located near the central section of the deposit. Along the creek, on the western most extension, sphalerite and galena bearing cherts are exposed at Jake's first discovery outcrop. A 1/10 yd<sup>3</sup> placer sample (CMD 4011) taken on Drenchwater Creek just below the chert outcrop contained 48 ppm Pb, 367 ppm Zn, 0.71 % Mg, and 0.81 % Mn.

A second trip was made by Joe Kurtak and a representative of the Arctic Slope Regional Corporation (ASRC). ASRC had spent time during previous years at the deposit delineating the ore deposit. Ideas of what work is still needed to be done at the deposit were discussed.

#### ISIKTUT MOUNTAIN

Two Bureau crews visited the southwest tributary of Isiktut Mountain. One field crew was looking for the source of a 1977 USGS geochemical anomaly. No visible mineralization was located during the traverses.

The second crew took two 1/10 yd<sup>3</sup> placer samples (CMD 4002-4003) from the two streams draining the valley. No visible mineralization was noted in either placer sample. The two samples contained 34 - 54 ppm Pb, 265 - 275 ppm Zn, 41 - 54 ppm Cu, 0.21 - 0.32 % Mn, 0.26 - 0.30 % Mg, and 840 - 1,196 ppm Ba.

#### KIVLIKTORT MOUNTAIN - EAST

Two trips were made into the Kivliktort Mountain - East tributary. The first trip consisted of an upstream traverse. One sample of massive sphalerite float (CMD 4015) contained 19.57 % Zn, 0.43 oz/ton Ag, 0.06 % Pb, 394 ppm Cu, 0.06 % Mg, and 0.02 % Mn. No other mineralization was located during the traverse.

During a second trip personnel landed on the saddle at the head of the valley and separated making three traverses down to the stream bed. A pyritized conglomerate was noted and sampled (CMD 4007) in the saddle. This sample contained 0.0303 % Pb, 0.4381 % Zn, 23 ppm Cu, 0.06 % Mg, and 0.04 % Mn. No more massive sphalerite was noted in float or in-place during the traverses.

A 1/10 yd<sup>3</sup> placer sample (CMD 4008) was taken below the mouth of the valley and contained 395 ppm Pb, 633 ppm Zn, 38 ppm Cu, 0.21 % Mg, and 0.65 % Mn. No visible mineralization was noted in the placer sample.

The mineralization noted in the saddle should be sampled more extensively to identify if this is the location of the "high-grade" float noted in the valley. The area north of sample CMD 4007 should be the prime area for sample concentration.

## KIVLIKTORT MOUNTAIN - WEST

Bureau personnel visited Kivliktort Mountain - West to follow up a 1977 USGS geochemical anomaly. A 1/10 yd<sup>3</sup> placer sample (CMD 4004) taken on the main tributary contained 23 ppm Pb, 172 ppm Zn, 37 ppm Cu, 0.29 % Mg, 0.25 % Mn, 0.5 ppm Ag. No visible mineralization was noted in the placer sample.

Traverses were also made from the north ridge-saddle line. A traverse down the northwest ridge noted bedrock composed of silicified slate and black slate trending N 40° W and dipping 51° S. A grab sample (CMD 4005) was taken of chert near the top of the ridge and contained 22 ppm Pb, 177 ppm Zn, 16 ppm Cu, 0.71 % Mg, 0.03 % Mn, and 0.4 ppm Ag. A random chip sample (CMD 4006) taken further down the slope consisted of iron-stained slate contained 40 ppm Pb, 124 ppm Zn, 20 ppm Cu, 0.80 % Mg, 0.04 % Mn, and 0.7 ppm Ag.

A traverse made on the west side of the saddle encountered bedded quartzite bedrock. Sphalerite/galena bearing brecciated quartz was located in the talus and in frost boils. Two grab and one select samples (CMD 4012-4014) were taken from this locality within a 50 x 150 foot area. These samples contained 1.70 - 6.01 oz/ton Ag, 1.58 - 2.76 % Pb, 7.36 - 31.50 % Zn, 100 - 328 ppm Cu, <0.005 % Mg, and <0.01 % Mn. The exact extent of the mineralized zone was not investigated but a detailed grid sampling pattern could be used to delineate the deposit.

## KOYAKTOT MOUNTAIN - WEST

Portions of two days were spent traversing the southwest drainage of Koiyaktot Mountain. Personnel followed up a 1977 USGS geochemical anomaly and mineralized float found by the Bureau in 1978. Halfway up the drainage a mineralized boulder containing sphalerite was encountered along with smaller cobbles containing massive galena. Mineralized float was traced to the south until a zone of brecciated quartz and sphalerite was located. The east-west trending zone covers an area of approximately 6 x 30 feet. A high grade sample (CMD 4009) taken of the sphalerite/quartz breccia contained 7.48 oz/ton Ag, 0.72 % Pb, 49.91 % Zn, 204 ppm Cu, <0.05 % Mg, and 0.52 % Mn. More mineralization composed of silicified sandstone with quartz veining was located to the east of the breccia zone. A select sample (CMD 4010) taken of the galena mineralization contained 0.8371 % Pb, 0.5317 % Zn, 6 ppm Cu, <0.01 % Mg, 0.63 % Mn, and 10.5 ppm Ag. This mineralized zone strikes north-south across the valley into the northern saddle.

A second traverse noted mineralized breccia zones, similar to those to the south, located in the northern saddle. These breccia zones also appear to trend in an east-west direction. Several high grade samples (CMD 4025-4026) were taken of the mineralized breccia which contained 0.45 - 3.05 oz/ton Ag, 0.22 - 1.55 % Pb, 2.41 - 13.19 % Zn, 41 - 531 ppm Cu, <0.05 % Mg, and <0.01 % Mn.

The mineralization may be associated with east-west fracture planes along a major north-south fault system cutting the southwest tributary of Koiyaktot Mountain; or, the 0.5 mile long mineralized trend may be a wide shear zone striking north-south with intermittently exposed massive sulfide mineralization. This area warrants more extensive mapping and sampling to identify the extent of the mineralization.

## LISBURNE RIDGE

Traverses were made along the northwest flank and ridge of Lisburne Ridge to try to locate a reported USGS oölotic phosphate occurrence. Four separate traverses made along the flank and ridge produced no visible oölotic phosphate. One grab sample (CMD 4021), taken of calcareous material containing lithic fragments, contained 1,127 ppm Ba, 1.2 % Fe, 0.48 % Mn, and 0.08 % Mg. The sample needs to have a P<sub>2</sub>O<sub>5</sub> analysis done on it.

## OTUK CREEK

Several samples were collected along Otuk Creek. A 1/10 yd<sup>3</sup> placer sample recovered visible gold but through later reinvestigations decided the sluice box was contaminated. A 4 pan placer sample (CMD 4023) and a second 1/10 yd<sup>3</sup> placer sample (CMD 4024) were taken in close proximity to the original sample site and contained no visible mineralization. Sample CMD 4023 contained 0.0050 % Pb, 0.0309 % Zn, 42 ppm Cu, 0.53 % Mg, 0.18 % Mn, >2,000 ppm Ba, 95 ppm Ni, 0.29 % Ti, and 378 ppm Cr. Sample CMD 4024 contained 0.0053 % Pb, 0.0330 % Zn, 54 ppm Cu, 0.40 % Mg, 0.34 % Mn, 982 ppm Ba, 113 ppm Ni, 0.02 % Ti, and 1,103 ppm Cr.

Several other test pans also did not recover visible gold.

Concretions previously described by a USGS geologist (Kelly personal communication) were noted along the base of a bluff cut by the stream. The concretions contain calcite as fracture fillings with occasional pyrite (also as fracture fillings and disseminated) and sphalerite crystals. A sample (CMD 4017) of the concretions is being sent to Bondar-Clegg for zinc analysis.

Further downstream a traverse was made along the south side of Ivoituk Hills. A random chip sample (CMD 4016) was taken from a 1.5 foot wide bed of Lisburne Formation siltstone showing limonite-staining and disseminated pyrite. This sample contained 0.0089 % Pb, 0.0482 % Zn, 13 ppm Cu, 2.86 % Mg, 0.07 % Mn, 110 ppm Ba, 59 ppm Ni, <0.05 % Ti, and 743 ppm Cr.

#### SAFARI CREEK

A large area of intense iron-staining with little to no vegetation was noted near the mouth of Safari Creek between Memorial and Story Creeks. Bedrock of the area consists of thin-bedded shale containing alternating beds of iron-stained silicified graywacke, both of which have been highly folded and faulted. Mineralization consists of disseminated pyrite within the graywacke. Several grab samples (CMD 4001, 4020, 4022) were taken of the iron-stained bedrock. The samples contained 0.0014 - 0.0031 % Pb, 0.0172 - 0.0635 % Zn, 10 - 37 ppm Cu, 2.43 - 5.92 % Mg, and 0.07 - 0.22 % Mn.

#### STORY CREEK

Personnel flew to Story Creek to relocate the lead-zinc mineralization discovered in 1978 by the Bureau. After several short traverses up two eastern tributaries, personnel located the mineralized site. Float and talus contains brecciated quartz and shale with sphalerite/galena mineralization. None of the breccia was located in-place but a zone of massive sphalerite/galena-bearing rubble was exposed. No samples were taken at this time, other than specimens, because the deposit was sampled in 1977 and 1978.

Story Creek needs extensive mapping and sampling to identify and delineate the extent of mineralization.

#### CONCLUSIONS

Very little mineral related investigative work has been done in the CMD/NPR-A study area. The Bureau has spent small portions of three summers looking at anomalous drainages along the southern NPR-A, while the USGS has spent a fair amount of time doing geological mapping and geochemical sampling over the years. Since all of the NPR-A and portions of the CMD are closed to mineral entry, private industry has not had the motivation to adequately prospect for and/or delineate mineral occurrences.

Using the regional geochemical samples, taken by the USGS during 1977, the Bureau identified 80 anomalous mineralized drainages. Several additional drainages with anomalous mineralization have been identified, by the Bureau, based upon the USGS's reanalysis of their 1977 geochemical samples. During 1977, 1978, and 1990 Bureau geologists examined 25 of those anomalous mineralized drainages. In-place massive sulfide mineralization was located in Drenchwater and Story Creeks, Kivloktork Mountain - East, and Koiyaktot Mountain - West. Disseminated sulfides were located at Kivliktort Mountain - East. Mineralized float was noted in several other drainages but their sources were not located due to time constraints placed on the field crews. To date a total of 61 mineralized occurrences have been identified, by the Bureau, in the CMD/NPR-A study area. Those occurrences with the greatest mineral potential based upon existing ore data include Drenchwater and Story Creeks, Kivliktort Mountain - West, and Koiyaktot Mountain - East. Additional mineral locations of note include those at Safari, Chertchip, Sphinx, Spike, and False Wager Creeks; Sphinx, Isikut, and Oolah Mountains; Ipnayik, Kiligwa, and Natvakruak Rivers; Kady, and Vidlee.

All of the occurrences identified within the study area need to be examined in greater detail to better delineate and characterize the mineralization present. Several of the mineralized locations warrant systematic detailed sampling and mapping, including possible trenching and/or core drilling. All of the geochemical anomalies identified from the USGS studies should be examined. Reexamination of the data could result in the identification of additional drainages with anomalous values that were previously missed.

Appendix A. - Property Summary Sheets - CRMD/NPR-A

NAME: DRENCHWATER CREEK

MAS No. 0020200002

LOCATION:

Deposit type: Prospect  
Commodities: Lead, Zinc

Quadrangle: Howard Pass (C-5), SE 1/4, Sec. 16, T. 10 S., R. 29 W., Meridian: Umiat

Geographic: Located near the headwaters of Drenchwater Creek just above the junction with Wager Creek.

Elevation: 2,200 ft.

Land status: NPR-A.

HISTORY: 1975-USGS obtained and analyzed surface samples (183).

1977-USGS/BuMines followed-up field work - discovered in-place mineralization (183).

1979-Bureau contracted baseline geochemical study through Univ. AK, Fairbanks, AK (229).

1990-Property visited and sampled by Bureau personnel.

WORKINGS: None.

GEOLOGIC SETTING: Sulfide mineralization occurs in gray to black shales, gray to black cherts, and intermediate to acid volcanic rocks of Mississippian age Lisburne Group in the Kagvik thrust sequence. The thrust plate is deformed and dismembered by local faulting. Also Triassic Shublik and Permian Siksikpuk Formation cherts and black shales occur in the area (183).

A 2 foot thick siliceous bed containing disseminated spherical grains of sphalerite which is intercalated in carbonaceous shale underlies pyritiferous tuffs and cherts which outcrop along Drenchwater Creek. The overlying tuff unit contains variable amounts of pyrite. A several-foot thick pyrite zone with no base metal sulfides occurs at the top of this unit. The tuffaceous unit is overlain by an unmineralized siliceous mudstone (183).

Gossans and zones of massive base metal sulfide mineralization crop out east of Drenchwater Creek. Galena-bearing boxworks in gossan outcrop east of the main sulfide outcrop. Other zones of pyrite and gossan-bearing float occur between Drenchwater and False Wager Creeks. Mineralized dark-gray cherts overlie black shales and mudstones to form the base of the tuffaceous section and contains mineralization including epigenetic pyrite, sphalerite, and galena as fracture fillings (183).

BUREAU INVESTIGATION: Lead-zinc sulfides located and sampled in 1977, and 1990.

Three types of mineralization were sampled: Mineralized sediments; massive sulfides in tuffs; and mineralized chert (183).

Three zones of base metal sulfide mineral and rock associations of limited extent spatially relate to an acid volcanic sequence that occurs at Drenchwater Creek. The lowest mineralized zone is a 2 foot thick sphalerite-bearing siliceous mudstone in carbonaceous shale which contains anomalous lead. A sample from the zone contained 23 % Zn; the black shale host rock contained up to 1,150 ppm Pb with no anomalous zinc values. The second zone is a massive, east-west striking, silver-bearing zinc and lead sulfide mineralized zone at or near the top of a several hundred foot thick, south dipping, tuffaceous acid volcanic sequence. Samples taken in 1977 contained up to 5.9% Pb and 26% Zn. The third zone is a dark grey chert bed at the base of a tuffaceous horizon above the black shales. Samples contained up to 5.1% Pb and 11.0% Zn (183).

The area was visited several times by various Bureau personnel in 1990. The first trip was to reconnoiter the deposit, along with Uldis Jansons, to become familiar to its mineralization and geology. A limonite-stained chert layer grading into a dacite porphyry plug was located along the northeast portion of the

deposit. Westward a black chert containing fine-grained sphalerite and galena rubblecrop, Jake's second discovery outcrop location, was located near the central section of the deposit. On the westward extension, along the creek, sphalerite and galena bearing cherts are exposed at Jake's first discovery outcrop. A 1/10 yd<sup>3</sup> placer sample (CMD 4011) was taken on Drenchwater Creek just below the chert outcrop and contained 48 ppm Pb, 367 ppm Zn, 0.71 % Mg, and 0.81 % Mn.

A second trip was made by Joe Kurtak and a representative of the Arctic Slope Regional Corporation (ASRC). ASRC had spent time during previous years at the deposit delineating the ore deposit. Ideas of what work is still needed to be done at the deposit was discussed.

RESOURCE ESTIMATE: Unknown.

MINERAL DEVELOPMENT: Unknown.

RECOMMENDATIONS: Recon - Map - Grid - Sample - Trench - Drill(?).

REFERENCES: 95-96, 128, 140, 183-184, 201, 204, 210-211, 229, 264, 267, 269-270, 336, 341, 355.

NAME: ISIKUT MOUNTAIN

MAS No. \_\_\_\_\_

LOCATION:

Deposit type: Occurrence

Commodities: Lead, Zinc, Copper, Manganese

Quadrangle: Howard Pass (A-2), SE 1/4, Sec. 25, T. 34 N., R. 09 E., Meridian: Kateel River

Geographic: Located in the southwestern drainage of Isikut Mountain east of Howard Pass and Nigtum Lake.

Elevation: 3,000 ft.

Land status: NPR-A.

HISTORY: 1977- USGS sampling identified a geochemical anomaly (187).

1978-Prospected and sampled by Bureau geologists (187).

1990-Prospected and sampled by Bureau personnel.

WORKINGS: None.

GEOLOGIC SETTING: Lower Mississippian-Upper Devonian Kanayuk Conglomerate consisting of quartz and chert pebble conglomerate and clean white sandstone underlies the northern and eastern slopes of Isikut Mountain. Mississippian Kayak Shale consisting of siltstone, sandstone, and shale underlies the southern foothills and western portion of the mountain (187).

BUREAU INVESTIGATION: Prospected and sampled in 1978 and 1990.

Sixteen stream sediment and three rock samples were taken in the area during 1978. The stream sediment samples contained: 10-20 ppm Pb, 75-135 ppm Zn, and 25-50 ppm Cu. The rock samples contained: 10-55 ppm Pb, 50-135 ppm Zn, 60-75 ppm Cu, and 500-3,000 Mn (187).

During 1990 two Bureau crews flew into the southwest tributary of Isiktut Mountain. One field crew was looking for the source of a 1977 USGS geochemical anomaly. No visible mineralization was located during the traverses.

The second crew took two 1/10 yd<sup>3</sup> placer samples (CMD 4002-4003) from the two streams draining the valley. No visible mineralization was noted in either placer sample. The two samples contained 34 - 54 ppm Pb, 265 - 275 ppm Zn, 41 - 54 ppm Cu, 0.21 - 0.32% Mn, 0.26 - 0.30% Mg, and 840 - 1,196 ppm Ba.

RESOURCE ESTIMATE: Unknown.

MINERAL DEVELOPMENT: Unknown.

RECOMMENDATIONS: Recon - Sample.

REFERENCES: 187.

NAME: KIVLIKTORT MOUNTAIN - EAST

MAS No. \_\_\_\_\_

LOCATION:

Deposit type: Occurrence  
Commodities: Zinc, Lead, Copper

Quadrangle: Howard Pass (B-1), SE 1/4, Sec. 13, T. 33 N., R. 10 E., Meridian: Kateel River

Geographic: Located on the southeast end of Kivliktort Mountain. A southwest tributary of Nigu River.

Elevation: 2,410 ft.

Land status: NPR-A.

HISTORY: 1977-USGS samples identified geochemical anomaly (187).

1978-Prospected and sampled by Bureau geologists (187).

1990-Prospected and sampled by Bureau geologists.

WORKINGS: None.

GEOLOGIC SETTING: Rocks in the area consist of Mississippian Kayak shale, which includes siltstone, shale, and sandstone; and an unnamed Lower Mississippian - Upper Devonian sandstone, siltstone, and shale unit. Disseminated pyrite was found in a sandstone boulder (187).

BUREAU INVESTIGATION: Prospected and sampled in 1978 and 1990.

Stream sediment samples taken in 1978 contained 35 to 245 ppm Zn, 10 to 80 ppm Pb, and 5 to 30 ppm Cu (187).

During 1990 two trips were made by Bureau personnel into the Kivliktort Mountain - East tributary. The first trip consisted of an upstream traverse by all members of the crew. One piece of massive sphalerite float sampled (CMD 4015) contained 19.57% Zn, 0.43 oz/ton Au, 0.06% Pb, 394 ppm Cu, 0.06% Mg, and 0.02% Mn. No other mineralization was located during the traverse.

A second trip was made with three members of the crew. Personnel landed on the saddle at the head of the valley and separated making three traverses down to the stream bed. A pyritized conglomerate was noted and sampled (CMD 4007) in the saddle. This sample contained 0.0303% Pb, 0.4381% Zn, 23 ppm Cu, 0.06% Mg, and 0.04% Mn. No more massive sphalerite was noted in float or in-place during the traverses.

A 1/10 yd<sup>3</sup> placer sample (CMD 4008) was taken below the mouth of the valley and contained 395 ppm Pb, 633 ppm Zn, 38 ppm Cu, 0.21% Mg, and 0.65% Mn. No visible mineralization was noted in the placer sample.

RESOURCE ESTIMATE: Unknown.

MINERAL DEVELOPMENT: Unknown.

RECOMMENDATIONS: Recon - Sample.

The mineralization noted in the saddle should be sampled more extensively to identify if this is the location of the "high-grade" float noted in the valley. The area north of sample CMD 4007 should be the prime area of sample concentration.

REFERENCES: 183, 187.



NAME: KIVLIKTORT MOUNTAIN - WEST

MAS No. 0020200003

LOCATION:

Deposit type: Occurrence  
Commodities: Lead, Zinc

Quadrangle: Howard Pass (B-2), SW 1/4, Sec. 29, T. 34 N., R. 10 E., Meridian: Kateel River

Geographic: Located on the northwest end of Kivliktort Mountain at the headwaters of the Etivluk River.

Elevation: 2,340 ft.

Land status: NPR-A.

HISTORY: 1977-USGS sampling identified a geochemical anomaly (183).

1978-Prospected and sampled by Bureau geologists (183).

1990-Located and sampled by Bureau geologists.

WORKINGS: None.

GEOLOGIC SETTING: Rocks in the area consist of Lower Mississippian-Upper Devonian Kanayut Conglomerate, composed of a quartz and chert pebble conglomerate and a clean white sandstone. The Mississippian ~~H~~ Shale composed of siltstone, shale, and sandstone is exposed at the 2,200' elevation (183). Mineralization occurs in sphalerite-and galena-bearing siliceous breccia and in a sphalerite-bearing chert-pebble conglomerate (183). Mineralized breccias and shear zones were located on both the north and south sides of the drainage.

BUREAU INVESTIGATION: Prospected and sampled in 1978. Located and sampled in 1990.

Samples taken of mineralized float in 1978 contained 0.0015-0.33 % Pb, 0.002-30.5 % Zn, and 5-35 ppm Cu (187).

The area was sampled by Bureau personnel in 1990 following up the 1977 USGS geochemical anomaly. One crew took a 1/10 yd<sup>3</sup> placer sample (CMD 4004) on the main tributary, which contained 23 ppm Pb, 172 ppm Zn, 37 ppm Cu, 0.29 % Mg, 0.25 % Mn, 0.5 ppm Ag. No visible mineralization was noted in the placer sample.

Traverses were made from the north ridge-saddle line. A traverse down the northwest ridge line noted bedrock composed of silicified slate and black slate trending N 40° W and dipping 51° S. A grab sample (CMD 4005) was taken of chert near the top of the ridge and contained 22 ppm Pb, 177 ppm Zn, 16 ppm Cu, 0.71 % Mg, 0.03 % Mn, and 0.4 ppm Ag. A random chip sample (CMD 4006) taken further down the slope consisted of iron-stained slate contained 40 ppm Pb, 124 ppm Zn, 20 ppm Cu, 0.80 % Mg, 0.04 % Mn, and 0.7 ppm Ag.

A traverse made on the west side of the saddle encountered bedded quartzite bedrock. A sphalerite/galena bearing brecciated quartz was located in the talus and in frost boils. Two grab and one select samples (CMD 4012-4014) were taken from this locality within a 50 x 150 foot area. These samples contained 1.70 - 6.01 oz/ton Ag, 1.58 - 2.76 % Pb, 7.36 - 31.50 % Zn, 100 - 328 ppm Cu, <0.005 % Mg, and <0.01 % Mn. The exact extent of the mineralized zone was not investigated but a detailed grid sampling pattern could delineate the deposit.

RESOURCE ESTIMATE: Unknown.

MINERAL DEVELOPMENT: Unknown.

RECOMMENDATIONS: Recon - Map - Grid - Sample - Trench - Drill(?).

REFERENCES: 132, 183, 187.

NAME: KOIYAKTOT MOUNTAIN - WEST

MAS No. \_\_\_\_\_

LOCATION:

Deposit type: Occurrence  
Commodities: Lead, Zinc

Quadrangle: Howard Pass (A-1), NW 1/4, Sec. 34, T. 33 N., R. 11 E., Meridian: Kateel River

Geographic: Located on the southwest side of Koiyaktot Mountain east of Iuyorurak Pass.

Elevation: 3,000 ft.

Land status: NPR-A.

HISTORY: 1977-USGS sampling identified a geochemical anomaly (187).

1978-Prospected and sampled by Bureau geologists (187).

1990-Located and sampled by Bureau geologists.

WORKINGS: None.

GEOLOGIC SETTING: Underlain by two sequences of Lower to Upper Devonian clastic sedimentary rock. The Kanayut Conglomerate consisting of quartz and chert pebble conglomerate and clean white sandstone makes up the overlying sequence. An unnamed sequence of sandstone, silt, and shale underlies the coarse clastic sequence. The sequences are mapped as part of the North Central Brooks Range thrust sequence (187).

BUREAU INVESTIGATION: Prospected and sampled in 1978. Located and sampled in 1990.

Disseminated galena and galena-filled fractures were found in sandstone boulders and cobbles (187).

Eight stream sediment and five rock samples were taken in 1978. The stream sediment samples contained 20-510 ppm Pb, 75-2,400 ppm Zn, and 10-40 ppm Cu. The rock samples contained 5-14,000 ppm Pb, 15-4,500 ppm Zn, and 15-80 ppm Cu (187). Emission spectrographic analysis of the rock samples contained high concentrations up to 70 ppm Cu, 7,000 ppm Pb, 7,000 ppm Zn, and 1,500 ppm Mn (187).

Two areas were sampled by the Bureau in 1990, the southeast area and the northwest saddle. Portions of two days were spent traversing the southwest drainage of Koiyaktot Mountain. Personnel followed up a 1977 USGS geochemical anomaly and mineralized float found by the Bureau in 1978. Halfway up the drainage a mineralized boulder containing sphalerite was encountered along with smaller cobbles containing massive galena. Mineralized float was followed-up to the south until a zone of brecciated quartz and sphalerite was located. The zone covers an area of approximately 6 x 30 feet trending east-west. A high grade sample (CMD 4009) taken of the sphalerite/quartz breccia contained 7.48 oz/ton Ag, 0.72% Pb, 49.91% Zn, 204 ppm Cu, <0.05% Mg, and 0.52% Mn. More mineralization, located to the east of the breccia zone, was composed of silicified sandstone with quartz veining. A select sample (CMD 4010) was taken of the galena mineralization and contained 0.8371% Pb, 0.5317% Zn, 6 ppm Cu, <0.01% Mg, 0.63% Mn, and 10.5 ppm Ag. This mineralized zone strikes north-south across the valley into the northern saddle.

A second traverse noted mineralized breccia zones, similar to those to the south, located in the northern saddle. These breccia zones seem also to trend in a east-west direction. Several high grade samples (CMD 4025-4026) were taken of the mineralized breccia which contained 0.45 - 3.05 oz/ton Ag, 0.22 - 1.55% Pb, 2.41 - 13.19% Zn, 41 - 531 ppm Cu, <0.05% Mg, and <0.01% Mn.

RESOURCE ESTIMATE: Unknown.

MINERAL DEVELOPMENT: Unknown.

RECOMMENDATIONS: Recon - Map - Grid - Sample - Trench - Drill(?).

Could be that the mineralization is associated with east-west fracture planes along a major north-south fault system cutting the southwest tributary of Koiyaktot Mountain. Or, the 0.5 mile mineralized trend is a wide shear zone striking north-south with intermittently exposed massive sulfide mineralization. This area needs more extensive mapping and sampling to identify the extent of the mineralization.

REFERENCES: 96, 187.

NAME: LISBURNE RIDGE

MAS No. 0020200004

LOCATION:

Deposit type: Occurrence  
Commodities: Vanadium, Phosphate

Quadrangle: Howard Pass (C-1), NE 1/4, Sec. 26, T. 09 S., R. 21 W., Meridian: Umiat

Geographic: Located on the northwest side of Lisburne Ridge at the headwaters of Blankenship Creek.

Elevation: 1,800 ft.

Land status: NPR-A.

HISTORY: Discovered by USGS geologists between 1944-1953 (278).  
1978-Prospected by Bureau geologists (184).  
1990-Traverses made and a sample taken by Bureau geologists.

WORKINGS: None.

GEOLOGIC SETTING: Phosphatic mineralization occurs within the Mississippian Lisburne Group. The phosphatic zone is made up of phosphorate, phosphatic limestone, and phosphatic mudstone. Phosphorites are generally stained by carbonaceous matter to a dark brown or black color. Phosphatic pellets range from 0.1 to 2 mm, with larger pellets noted, and form a pavement on bedding plane surfaces. The pellets can occur as massive pellets with no growth rings or more commonly as oölites with concentric growth rings, alternating hues of brown carbonaceous material (216).

Phosphate mineralization occurs in a 8 foot rubble zone of black chert, black paper shale, black shale, dolomite, and oölitic phosphate rock. Zone underlies an outcrop and float of interbedded black chert and dark gray dolomite. At least 2 horizons of phosphate rock, each about 6 inches thick occur (278). USGS samples contain 24.8% P<sub>2</sub>O<sub>5</sub>, 0.17% V<sub>2</sub>O<sub>5</sub>, and 0.008% eU (278).

BUREAU INVESTIGATION: Two paperwork reports were published in 1978 and 1979 (355-356).

The outcrop visited in 1978 by Bureau personnel but was not relocated (184).

The area was traversed by Bureau personnel during 1990. The reported oölitic phosphate occurrence was not located. Traverses were made along the northwest flank and ridge of Lisburne Ridge. Four separate traverses made along the flank and ridge produced no visible oölitic phosphate. One grab sample (CMD 4021) was taken of calcareous material containing lithic fragments contained 1,127 ppm Ba, 1.2% Fe, 0.48% Mn, and 0.08% Mg. The sample needs to have a P<sub>2</sub>O<sub>5</sub> analysis done on it.

RESOURCE ESTIMATE: Unknown.

MINERAL DEVELOPMENT: Unknown.

RECOMMENDATIONS: Recon - Sample.

REFERENCES: 94, 98, 102, 133, 147, 184, 216, 278, 355-356.

NAME: OTUK CREEK

MAS No. \_\_\_\_\_

LOCATION:

Deposit type: Occurrence

Commodities: Zinc

Quadrangle: Killik River (B-5), NE 1/4, Sec. 30, T. 34 N., R. 14 E., Meridian: Kateel River

Geographic: Located near the headwaters of Otuk Creek along a 150 foot tall eastern bluff cut by the creek.

Elevation: 2,380 ft.

Land status: NPR-A.

HISTORY: Located by USGS geologists.

1990-Visited and samples taken by Bureau geologists.

WORKINGS: None.

GEOLOGIC SETTING: Concretions containing fracture fillings of calcite. Also may contain pyrite as disseminations and/or as fracture filling. Sphalerite is also found in some of the concretions.

BUREAU INVESTIGATION: The area was prospected by Bureau personnel during 1990. Several stops were made in prospecting Otuk Creek. A 1/10 yd<sup>3</sup> placer sample showed visible gold but through later reinvestigations decided the sluice box was contaminated. A 4 pan placer sample (CMD 4023) and a second 1/10 yd<sup>3</sup> placer sample (CMD 4024) were taken in close proximity to the original sample site and contained no visible mineralization. Sample CMD 4023 contained 0.0050% Pb, 0.0309% Zn, 42 ppm Cu, 0.53% Mg, 0.18% Mn, >2,000 ppm Ba, 95 ppm Ni, 0.29% Ti, and 378 ppm Cr. Sample CMD 4024 contained 0.0053% Pb, 0.0330% Zn, 54 ppm Cu, 0.40% Mg, 0.34% Mn, 982 ppm Ba, 113 ppm Ni, 0.02% Ti, and 1,103 ppm Cr. Several other test pans also could not uncover visible gold.

Noted concretions along the base of a bluff cut by the stream previously noted by a USGS geologist. The concretions contain calcite as fracture fillings with occasional pyrite (also as fracture fillings and disseminated) and sphalerite crystals. A sample (CMD 4017) of the concretions is being sent to Bondar-Clegg for zinc analysis.

Further downstream a traverse was made along the south side of Iyotuk Hills. A random chip sample (CMD 4016) was taken from a 1.5 foot wide bed of Lisburne Formation siltstone showing limonite-staining and disseminated pyrite. This sample contained 0.0089% Pb, 0.0482% Zn, 13 ppm Cu, 2.86% Mg, 0.07% Mn, 110 ppm Ba, 59 ppm Ni, <0.05% Ti, and 743 ppm Cr.

RESOURCE ESTIMATE: Unknown.

MINERAL DEVELOPMENT: Unknown.

RECOMMENDATIONS: Recon - Sample.

REFERENCES:

NAME: SAFARI CREEK

MAS No. \_\_\_\_\_

LOCATION:

Deposit type: Occurrence

Commodities: Lead, Zinc, Barium, Copper

Quadrangle: Howard Pass (B-3), SE 1/4, Sec. 13, T. 12 S., R. 25 W., Meridian: Umat

Geographic: Located on the southside of the pass between Safari and Memorial Creeks.

Elevation: 2,800 ft.

Land status: NPR-A.

HISTORY: 1977-USGS sampling identified a geochemical anomaly (187).

1978-Located and sampled by Bureau geologists (187).

1990-Sampled by Bureau geologists.

WORKINGS: None.

GEOLOGIC SETTING: Lower Mississippian-Upper Devonian Kanayut Conglomerate consisting of quartz and chert pebble conglomerate and clean white sandstone occurs in the area (187).

Two mineralized zones occur in the area: zone 1 contains barite nodules weathering out of the Siksikpuk Formation; zone 2 contains dark red weathered rocks of the Kayak Formation within black shales overlain (?) by pyritiferous carbonates and cherts (184).

BUREAU INVESTIGATION: Located and sampled areas in 1978 and 1990.

Three samples, taken in 1978, from zone 1 contained 0.035-46% Ba and 84.4-99.5% BaSO<sub>4</sub>. Twelve samples from zone 2 contained <5-130 ppm Pb, 15-380 ppm Zn, and <5-45 ppm Cu (184).

During 1990 Bureau personnel sampled a large area of intense iron-staining with little to no vegetation near the mouth of Safari Creek between Memorial and Story Creeks. Bedrock of the area consists of thin-bedded shale containing alternating beds of iron-stained silicified graywacke, both of which has been highly folded and faulted. Mineralization consists of disseminated pyrite within the graywacke. Several grab samples (CMD 4001, 4020, 4022) were taken of the iron-stained bedrock. The samples contained 0.0014 - 0.0031% Pb, 0.0172 - 0.0635% Zn, 10 - 37 ppm Cu, 2.43 - 5.92% Mg, and 0.07 - 0.22% Mn.

RESOURCE ESTIMATE: Unknown.

MINERAL DEVELOPMENT: Unknown.

RECOMMENDATIONS: Recon - Sample.

REFERENCES: 96, 184, 187.

NAME: STORY CREEK

MAS No. \_\_\_\_\_

LOCATION:

Deposit type: Prospect

Commodities: Lead, Zinc, Silver, Gold

Quadrangle: Howard Pass (B-4), SW 1/4, Sec. 23, T. 12 S., R. 26 W., Meridian: Umiat

Geographic: Located at the headwaters of a southeastern tributary of Story Creek.

Elevation: 2,200 ft.

HISTORY: 1977-USGS sampling identified a geochemical anomaly (187).

1978-Located and sampled by Bureau geologists (187).

1990-Visited by Bureau geologists.

WORKINGS: None.

GEOLOGIC SETTING: The host rock is an interval at the top of the Stuver Member of the Upper Devonian Kanayut Conglomerate and the bottom of the Lower Mississippian Kayak Shale. It is predominantly dark-reddish-brown siltstone and silty shale, with interbedded sandstone and minor amounts of dolomite and coal. The bedding is tightly folded and disrupted by numerous thrust faults. Axial planes of the folds strike northeast and dip south (132).

Three types of mineralization occur in the area: banded massive sphalerite and galena; brecciated sphalerite with galena matrix; and shale-chip breccia with overgrowths of quartz on the chips and galena and sphalerite in the interstices. The width of the mineralized zone is 33-50 feet with float and outcrops following a N 65° E trend (132).

BUREAU INVESTIGATION: Located and sampled in 1978 and 1990.

1978 sample results (187): High grade surface material - 6.1% Pb, 9.0% Zn, 130 ppm Ag; composite sample - 1.15% Pb, 1.4% Zn, 35 ppm Ag; selected high-grade - 35% Pb, 28% Zn, 940 ppm Ag, 1.2 ppm Au; and massive sulfide breccia - 1.15% Pb, 49% Zn, 500 ppm Ag, 0.16 ppm Au.

The area was visited by Bureau personnel during 1990. Personnel flew to Story Creek to relocate the lead-zinc mineralization discovered in 1978 by the Bureau. After several short traverses up two eastern tributaries, personnel eventually located the mineralized site. Float and talus contains brecciated quartz and shale with sphalerite/galena mineralization. None of the breccia was located in-place but a zone of massive sphalerite/galena bedrock was exposed. No samples were taken at this time, other than specimens, because the deposit was sampled adequately in 1977 and 1978.

RESOURCE ESTIMATE: Unknown.

MINERAL DEVELOPMENT: Unknown.

RECOMMENDATIONS: Recon - Map - Grid - Sample - Trench - Drill(?).

Story Creek needs extensive mapping and sampling to identify and delineate the extent of mineralization.

REFERENCES: 128, 132, 183, 187, 201, 211, 264.



Appendix B. - Analytical Results 1990 CRMD/NPR-A Study.

TABLE B-1. - Sample analysis detection limits

Element	Lower limit (ppm)	Upper limit (ppm)	Element	Lower limit (ppm)	Upper limit (ppm)
ICP-ATOMIC EMISSION SPECTROSCOPY			Sn	20	2,000
Ag	0.2	50	Sr	1	2,000
Al	0.02 %	10.00 %	Ta	1	2,000
As	5	2,000	Te	10	2,000
Ba	1	2,000	Ti	0.05 %	10.00 %
Bi	5	2,000	V	1	2,000
Ca	0.05 %	10.00 %	W	10	2,000
Cd	1	2,000	Y	1	2,000
Co	1	20,000	Zn	0.0002 %	2.0 %
Cr	1	20,000	Zr	1	2,000
Cu	1	20,000	QUANTITATIVE ANALYSIS		
Fe	0.01 %	10.00 %	Pb	0.01 %	10.00 %
Ga	2	2,000	Zn	0.01 %	4.00 %
K	0.05 %	10.00 %	FIRE ASSAY		
La	1	2,000	Ag	0.02 oz/ton	Not reported
Li	1	2,000	PGM-NICKEL SULFIDE FIRE ASSAY/INAA		
Mg	0.05 %	10.00 %	Au	1 ppb	10,000 ppb
Mn	0.01 %	10.00 %	Pt	20 ppb	10,000 ppb
Mo	1	20,000	Pb	20 ppb	10,000 ppb
Na	0.05 %	10.00 %	Ir	1 ppb	10,000 ppb
Nb	1	2,000	Os	10 ppb	10,000 ppb
Ni	1	20,000	Ru	50 ppb	10,000 ppb
Pb	0.0002 %	1.0 %	Rh	5 ppb	10,000 ppb
Sb	5	2,000			

APPENDIX B. - Analytical results 1990 CRMD/NPR-A study.

ICP-Atomic Emission Spectroscopy

Sample no.	Ag ppm	Ag <sup>1</sup> oz/ton	Cu ppm	Pb <sup>2</sup> %	Pb %	Zn <sup>2</sup> %	Zn %	Al %	As ppm
CMD4001	3.0		10		0.0031		0.0172	1.41	<5
CMD4002	1.8		54		0.0054		0.0275	5.13	31
CMD4003	1.1		41		0.0034		0.0265	5.38	<5
CMD4004	1.4		37		0.0023		0.0172	4.65	<5
CMD4005	0.4		16		0.0022		0.0177	4.27	<5
CMD4006	0.7		20		0.0040		0.0124	4.96	10
CMD4007	2.5		23		0.0303		0.4381	2.76	34
CMD4008	1.9		38		0.0395		0.0633	3.92	<5
CMD4009	>50.0	7.48	204	0.72	0.7940	49.91	>2.0000	0.06	209
CMD4010	10.5		6		0.8317		0.5317	1.52	<5
CMD4011	1.4		68		0.0048		0.0367	1.02	39
CMD4012	>50.0	6.01	171	2.08	>1.0000	15.82	>2.0000	2.98	115
CMD4013	>50.0	4.35	328	2.76	>1.0000	31.50	>2.0000	0.67	149
CMD4014	>50.0	1.70	100	1.58	>1.0000	7.36	>2.0000	1.24	87
CMD4015	15.7	0.43	394	0.06	0.0691	19.57	>2.0000	0.95	376
CMD4016	3.8		13		0.0089		0.0482	0.52	148
CMD4020	1.1		17		0.0014		0.0635	1.95	<5
CMD4021	<0.2		7		0.0012		0.0099	0.46	9
CMD4022	0.8		37		0.0029		0.0509	2.12	12
CMD4023	0.5		42		0.0050		0.0309	6.14	5
CMD4024	2.1		54		0.0053		0.0330	3.29	11
CMD4025	>50.0	3.05	531	0.22	0.2460	13.19	>2.0000	0.53	57
CMD4026	21.0	0.56	41	1.55	>1.0000	2.41	>2.0000	1.23	59

<sup>1</sup>Fire Assay.

<sup>2</sup>Quantitative analysis.

Sample no.	Ba ppm	Bi ppm	Ca %	Cd ppm	Co ppm	Cr ppm	Fe %	Ga ppm	K %	La ppm
CMD4001	215	<5	2.38	<1	10	65	>10.00	<2	0.27	6
CMD4002	1196	7	0.11	<1	45	263	>10.00	<2	1.04	25
CMD4003	840	5	0.10	<1	32	303	9.58	<2	1.00	24
CMD4004	490	17	0.19	<1	41	189	>10.00	<2	1.05	21
CMD4005	1051	<5	0.23	<1	12	150	4.22	<2	0.89	38
CMD4006	467	<5	0.14	<1	14	137	5.02	<2	0.82	36
CMD4007	288	<5	<0.05	<1	55	168	>10.00	<2	0.47	20
CMD4008	396	8	0.06	<1	45	321	>10.00	<2	0.87	22
CMD4009	8	359	<0.05	1679	80	99	4.87	3	<0.05	<1
CMD4010	200	11	0.20	13	14	184	>10.00	<2	0.58	11
CMD4011	172	<5	<0.05	730	24	134	5.47	<2	0.34	<1
CMD4012	>2000	140	0.63	1712	39	182	1.98	8	0.33	<1
CMD4013	87	251	<0.05	<1	93	140	1.45	19	0.25	2
CMD4014	358	76	<0.05	394	16	228	0.78	<2	0.41	2
CMD4015	132	180	<0.05	1062	79	239	3.16	3	0.43	5
CMD4016	110	<5	3.75	<1	7	743	>10.00	<2	0.12	32
CMD4020	51	16	9.06	<1	19	123	>10.00	<2	0.38	3
CMD4021	1127	19	>10.00	<1	12	35	1.20	<2	0.14	10
CMD4022	325	39	>10.00	<1	12	103	>10.00	<2	0.53	18
CMD4023	>2000	<5	0.23	<1	37	378	9.51	<2	1.05	27
CMD4024	982	<5	0.22	<1	43	1103	>10.00	<2	0.76	7
CMD4025	167	145	<0.05	687	62	321	3.77	<2	0.22	<1
CMD4026	400	41	<0.05	81	12	284	2.10	<2	0.48	9

Sample no.	Li ppm	Mg %	Mn %	Mo ppm	Na %	Nb ppm	Ni ppm	Sb ppm	Sn ppm	Sr ppm	Ta ppm
CMD4001	27	5.92	0.22	<1	0.19	15	44	18	<20	98	13
CMD4002	44	0.30	0.32	<1	0.24	14	115	<5	<20	115	<1
CMD4003	40	0.26	0.21	<1	0.22	12	85	<5	<20	128	<1
CMD4004	24	0.29	0.25	<1	0.24	10	103	<5	<20	75	<1
CMD4005	40	0.71	0.03	<1	0.57	11	48	<5	<20	62	<1
CMD4006	48	0.80	0.04	<1	0.58	15	52	<5	<20	59	<1
CMD4007	20	0.06	0.65	5	0.11	11	109	15	<20	152	<1
CMD4008	22	0.21	0.45	<1	0.18	16	106	5	<20	99	8
CMD4009	6	<0.05	<0.01	216	<0.05	<1	23	404	87	2	<1
CMD4010	7	0.52	0.63	2	0.07	7	53	<5	<20	34	<1
CMD4011	36	0.71	0.18	3	0.38	5	89	<5	<20	145	<1
CMD4012	24	<0.05	<0.01	107	<0.05	2	9	117	<20	17	<1
CMD4013	19	<0.05	<0.01	171	<0.05	2	16	248	59	20	<1
CMD4014	26	<0.05	<0.01	51	<0.05	<1	11	46	55	27	<1
CMD4015	20	0.06	0.02	122	0.13	5	147	881	73	18	<1
CMD4016	11	2.86	0.07	2	0.12	17	59	14	<20	71	55
CMD4020	16	2.43	0.12	<1	0.11	10	98	37	<20	56	47
CMD4021	3	0.48	0.08	<1	0.17	4	29	18	<20	310	<1
CMD4022	39	5.12	0.07	3	0.10	8	75	<5	<20	267	15
CMD4023	82	0.53	0.18	<1	0.33	14	95	<5	<20	76	<1
CMD4024	46	0.40	0.35	2	0.22	10	113	<5	<20	126	<1
CMD4025	12	<0.05	<0.01	83	<0.05	<1	11	147	27	7	<1
CMD4026	33	<0.05	<0.01	15	0.05	1	8	16	30	19	<1

Sample no.	Te ppm	Ti %	V ppm	W ppm	Y ppm	Zr ppm
CMD4001	35	0.07	128	21	13	24
CMD4002	< 10	0.26	142	25	25	106
CMD4003	< 10	0.28	121	22	21	109
CMD4004	< 10	0.26	128	< 10	20	90
CMD4005	< 10	0.41	101	< 10	27	155
CMD4006	< 10	0.36	93	< 10	24	148
CMD4007	15	0.19	88	< 10	15	83
CMD4008	13	0.25	127	< 10	17	94
CMD4009	238	< 0.05	2	< 10	< 1	< 1
CMD4010	< 10	0.12	103	< 10	12	32
CMD4011	< 10	0.54	21	< 10	21	44
CMD4012	121	0.07	233	< 10	8	19
CMD4013	218	< 0.05	13	< 10	4	14
CMD4014	54	0.09	24	< 10	8	25
CMD4015	165	0.09	25	< 10	2	53
CMD4016	78	< 0.05	188	40	55	19
CMD4020	27	0.08	85	24	26	27
CMD4021	< 10	0.07	51	< 10	14	6
CMD4022	< 10	0.09	71	< 10	34	32
CMD4023	< 10	0.29	137	24	25	112
CMD4024	29	0.02	142	< 10	17	78
CMD4025	93	< 0.05	12	< 10	6	5
CMD4026	< 10	0.10	28	< 10	12	31

PGM-Nickel Sulfide Fire Assay/INAA

Sample no.	Au ppb	Pt ppb	Pb ppb	Ir ppb	Os ppb	Ru ppb	Rh ppb
CMD4001	24	38	<20	1	<10	<50	<5
CMD4002	7	22	<20	2	<10	<50	<5
CMD4003	16	36	<20	1	<10	<50	<5
CMD4004	5	32	<20	<1	<10	<50	<5
CMD4005	8	33	<20	2	<10	<50	<5
CMD4006	5	26	<20	<1	<10	<50	<5
CMD4007	6	24	<20	2	<10	<50	<5
CMD4008	4	31	<20	<1	<10	<50	<5
CMD4009	NR	NR	NR	NR	NR	NR	NR
CMD4010	12	26	<20	<1	<10	<50	<5
CMD4011	6	29	<20	<1	<10	<50	<5
CMD4012	131	<88	<20	1	<10	<50	<5
CMD4013	NR	NR	NR	NR	NR	NR	NR
CMD4014	94	<70	<20	2	<10	<60	<5
CMD4015	220	<150	<20	<1	<20	<140	<5
CMD4016	3	32	<20	1	<10	<50	<5
CMD4020	4	29	<20	<1	<10	<50	<5
CMD4021	5	25	<20	<1	<10	<50	<5
CMD4022	27	<70	<20	3	<10	<120	<5
CMD4023	5	29	<20	2	<10	<50	<5
CMD4024	8	43	<20	<1	<10	<50	<5
CMD4025	NR	NR	NR	NR	NR	NR	NR
CMD4026	52	67	<20	2	<10	<50	<5