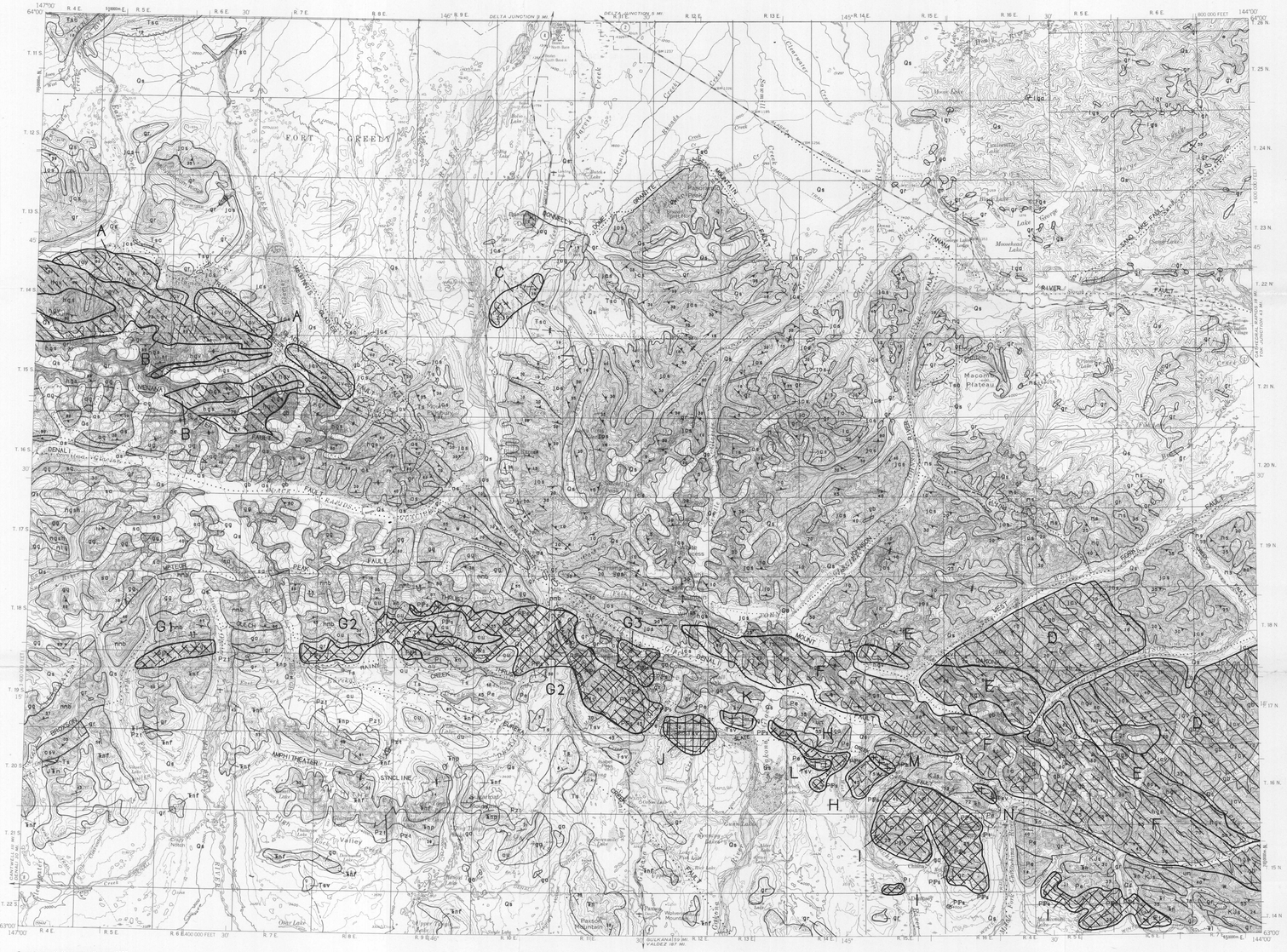
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

FOLIO OF THE MOUNT HAYES QUADRANGLE
MISCELLANEOUS FIELD STUDIES
MAP MF-1996-A
SHEET 2 OF 4
Explanatory pamphlet accompanies map



Base from U.S. Geological Survey, 1955
Universal Transverse Mercator projection

Generalized bedrock geologic map compiled by Warren J. Nokleberg from mapping by Warren J. Nokleberg, Ian M. Lange, John N. Aleinikoff, Ronny T. Miyaoka, and Richard E. Zehner, 1977-85

SCALE 1:250 000

5 0 5 10 15 20 25 MILES

5 0 5 10 15 20 25 KILOMETERS

CONTOUR INTERVAL 200 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

EPITHERMAL PRECIOUS- AND BASE-METAL DEPOSITS, KUROKO MASSIVE SULFIDE DEPOSITS, AND PORPHYRY Cu-Au-Ag DEPOSITS

METALLIFEROUS MINERAL RESOURCE ASSESSMENT MAPS OF THE MOUNT HAYES QUADRANGLE, EASTERN ALASKA RANGE, ALASKA

By
Warren J. Nokleberg, Ian M. Lange, Donald A. Singer, Gary C. Curtin, Richard B. Tripp,
David L. Campbell, and Warren Yeend

1990

EPITHERMAL PRECIOUS- AND BASE-METAL DEPOSITS, KUROKO MASSIVE SULFIDE DEPOSITS, AND PORPHYRY Cu-Au-Ag DEPOSITS

EXPLANATION

Hot-Spring Au deposits--Area of moderate potential for undiscovered deposits. Letters refer to table 3

Moderate

Low

Epithermal precious and base-metal deposits--Area of potential for undiscovered deposits. Letters refer to table 4

Low

Very low

Kuroko massive sulfide deposits--Area of potential for undiscovered deposits. Letters refer to table 8

High

Moderate, low, and very low

Porphyry Cu-Au-Ag deposits--Area of potential for undiscovered deposits. Letters annd numbers refer to table 9

High

Moderate and low

NOTE: See sheet 1 for explanation of geologic symbols.

Table 3.--Potential and recognition criteria for hot-spring Au deposits, Mount Hayes quadrangle, eastern Alaska Range, Alaska

(+, letter, element, or mineral indicates criterion present; 0 indicates criterion not observed)

Potential		Recognition criteria present in each area												
		Diagnostic							Secondary					
	Area	1	2	3	4	5	6	7	1	2	3	4	5	6
Moderate	J	0	+	+	+	+	+		0	+	As	0	0	cin, py
Low	K	0	0	+	+	0	0		0	0	0	0	0	0
Low	L	0	0	+	+	0	0		0	0	0	0	0	cin, py
Low	M	0	0	+	0	0	0		0	0	0	0	0	cin, py
Low	N	0	0	0	0	0	0		0	0	0	0	0	py

Description of recognition criteria

Diagnostic

1. Geologically favorable environment of dacite and andesite with lesser rhyodacite and rhyolite formed at or near the surface.
2. Known deposit, prospect, or occurrence.
3. Large amount of felsic shallow-intrusive and extrusive rock.
4. Extensive areas of strong silification.
5. Brecciated volcanic rock.
6. Disseminated pyrite or relict disseminated pyrite.
7. Hot-spring deposits.

Secondary

1. Stockworks formed by abundant quartz veins.
2. Local areas of argillic to advanced argillic alteration.
3. Anomalous values of As, Sb, Ag, or Au in rock samples.
4. Anomalous values of As, Sb, Ag, or Au in stream-sediment samples.
5. Anomalous values of As, Sb, Ag, or Au in heavy-mineral-concentrate samples.
6. Occurrence of pyrite, gold, or cinnabar in heavy-mineral-concentrate samples.

Table 4.--Potential and recognition criteria for epithermal precious- and base-metal deposits, Mount Hayes quadrangle, eastern Alaska Range, Alaska

(+, letter, element, or mineral indicates criterion present; 0 indicates criterion not observed)

Potential		Recognition criteria present in each area										
		Diagnostic							Secondary			
	Area	1	2	3	4	5	6	7	1	2	3	4
Low	J	0	+	0	0	+	+		0	0	0	cin, cp
Very low	K	0	0	0	0	0	0		0	0	0	0
Very low	L	0	0	0	0	0	0		0	0	0	cin
Very low	M	0	0	0	0	0	0		Cu	0	0	cin, ep, sp, gn
Very low	N	0	0	0	0	0	0		0	0	0	0

Description of recognition criteria

Diagnostic

1. Geologically favorable environment of a large and thick volcanic field of andesite to rhyolite flows, ash flows, tuffs, and volcaniclastic rocks, locally with interbedded fluvial or lacustrine sedimentary rocks.
2. Known deposit, prospect, or occurrence.
3. Quartz veins, stockworks, or breccia pipes.
4. Open-space filling in veins and altered areas with banded veins, vuggy, fine-grained crystals, or possibly large zoned crystals.
5. Quartz, adularia, chalcedony, carbonate, barite, or fluorite fillings of veins and open spaces.
6. Conspicuous wall-rock alteration consisting of extensive replacement by propylitic and argillitic assemblages and replacement by silica, sericite, or alunite, within or adjacent to veins.
7. Disseminated pyrite.

Secondary

1. Anomalous values of Cu, Pb, Zn, As, Sb, Ag, or Au in rock samples.
2. Anomalous values of Cu, Pb, Zn, As, Sb, Ag, or Au in stream-sediment samples.
3. Anomalous values of Cu, Pb, Zn, As, Sb, Ag, or Au in heavy-mineral-concentrate samples.
4. Occurrence of gold, chalcopyrite, sphalerite, galena, cinnabar, arsenopyrite, tetrahedrite, or fluorite in heavy-mineral concentrate samples.

Table 8.--Potential and recognition criteria for Kuroko massive sulfide deposits, Mount Hayes quadrangle, eastern Alaska Range, Alaska

(+, letter, element, or mineral indicates criterion present; 0 indicates criterion not observed)

Potential		Recognition criteria present in each area										
		Diagnostic					Secondary					
	Area	1	2	3	4	5	1	2	3	4	5	6
High	A	+	+	+	0	0	+	Cu, Pb, Zn, As, Ag, Au, Sb, Sn	Pb, Zn, Ag	Cu, Pb, Zn, As, Ag, Au, Sn	cp, ar, sp, gn, py
Moderate	B	0	0	+	0	0	0	Pb, Zn, Ag, Au, Sn	Pg, Ag, Sn	Cu, As	cp, ar, sp, gn, py
Very low	C	0	0	0	0	0	0	0	Pg, Ag	0	0
High	D	+	+	+	0	0	+	Cu, Pg, Zn, As, Ag, Au, Sn, Sb	Cu, Pb, Zn, As, Ag, Sn	Cu, Pg, Zn, As, Ag, Sn, Sb	cp, ar, sp, gn, py
Moderate	E	0	0	0	0	0	0	Zn, Ag	Pb, Zn, Ag	Cu, Pb, Zn, As, Ag	cp, ar, sp, gn, py
Low	F	0	0	0	0	0	0	Pb, Ag	Cu, Zn, Ag	Cu, Pg, Zn, Ag	cp, ar, sp, gn, py
Moderate	G1-G3	+	0	0	+	0	0	Cu, Pb, Zn, As, Ag, Au	Cu, Zn	Cu, Zn, As, Ag, Au, Sn	cp, ar, sp, gn, py
Low	H	0	0	0	0	0	0	Cu, Pb, Zn, As, Ag, Au	Cu	Cu, Pb, As, Ag	cp, ar, gn, py
Low	I	0	0	0	0	0	0	Cu, Pb, Zn, Ag, Au	Cu, Zn	Cu, Pb, Zn, Sn	cp, sp, gn, py

Description of recognition criteria

Diagnostic

1. Geologically favorable environment of submarine volcanic rock of intermediate to felsic, generally calc-alkaline composition, and associated tuffs, breccias, and sedimentary rocks.
2. Known deposit, prospect, or occurrence.
3. Felsic pyroclastic deposits.
4. Siliceous chemical sedimentary rock.
5. Hydrothermally altered volcanic rocks.

Secondary

1. Primary barite or gypsum in volcanic or sedimentary rocks.
2. Hydrothermal alteration along a narrow stratigraphic interval.
4. Anomalous values of Cu, Pb, Zn, Ag, Au, Sn, or Sb in stream-sediment samples.

Table 9.--Potential and recognition criteria for porphyry Cu-Au-Ag deposits, Mount Hayes quadrangle, eastern Alaska Range, Alaska.

(+, letter, element, or mineral indicates criterion present; 0 indicates criterion not observed)

Potential		Recognition criteria present in each area								
		Diagnostic				Secondary				
	Area	1	2	3	4	1	2	3	4	5	6
Moderate	G1	0	+	+		0	Cu, Ag, Mo, Au	Cu, Ag	Cu, Ag	cp, gn, ar, gold	+
High	G2	+	+	+		+	Cu, Pb, Zn, As, Mo, Ag, Au	Cu, Pb, Zn, Ag	Cu, Pb, Zn, Ag	cp, gn, ar, sp, py, gold	+
Low	G3	0	+	+		0	0	0	0	cp	+
Moderate	H	+	+	+		0	Cu, Pb, Zn, Mo, Ag, Au	Cu, As	Cu, Mo, Pb, Ag, Au, As	cp, ar, mo, gn	+
High	I	+	+	+		+	Cu, Pb, Zn, Mo, Ag, As, Au	Cu, Pb, Zn, Mo, Ag	Cu, Pb, Zn, Au	cp, ar, gn, sp, gold	+

Description of recognition criteria

Diagnostic

1. Geological favorable environment of calc-alkalic and alkalic porphyritic granitic plutons and stocks and (or) stocks, dikes, or sills of andesite to rhyodacite or trachyte.
2. Known deposit, prospect, or occurrence.
3. Coeval coeval granitic, hypabyssal, and (or) volcanic rocks.
4. Hydrothermal alteration in and adjacent to intrusive rocks.

Secondary

1. Massive sulfide minerals in volcanic rocks or in skarns formed in carbonate layers in volcanic pile.
2. Anomalous values of Cu, Pb, Zn, As, Mo, Ag, or Au in rock samples.
3. Anomalous values of Cu, Pb, Zn, As, Mo, Ag, or Au in stream-sediment samples.
4. Anomalous values of Cu, Pb, Zn, As, Mo, Ag, or Au in heavy-mineral-concentrate samples.
5. Occurrence of chalcopyrite, bornite, pyrite, molybdenite, sphalerite, galena, arsenopyrite, magnetite, monozite, and thorite in heavy-mineral-concentrate samples.
6. Local equidimensional aeromagnetic highs, particularly with reentrant or central lows.