BC Ministry of Energy, Mines and Petroleum Resources

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BRITISH COLUMBIA GEOLOGICAL SURVEY

Geological Survey Branch

**MINERAL POTENTIAL MAP 1993-5**
**(sheet 1 of 4)**

# MINERAL POTENTIAL OF THE RANGE LAKE MAP SHEET

**NTS 114P/13**

**BY M.T. SMITH AND M.G. MIHALYNUK**

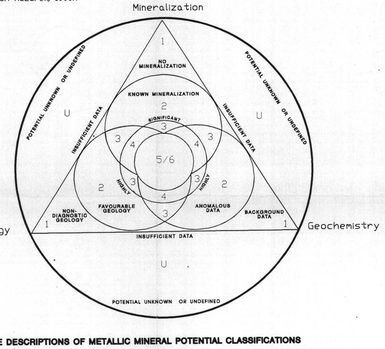



## INTRODUCTION

The Range Lake map area is primarily underlain by weakly metamorphosed lowermost Paleozoic basaltic and sedimentary rocks, and lower Paleozoic limestone and sedimentary rocks of the Alexander Terrane. The potential for these types of rocks to host significant mineral deposits is relatively low, although areas of skarn mineralization have been identified along the margins of three small diorite bodies which intrude them in this area. Upper Triassic rocks of the Tats Group are present in the extreme southern part of the map area. Immediately to the south of the map area, rocks of this type host the Windy Craggy copper-cobalt VMS deposit, and the potential for finding additional mineral deposits of this and related types in the southern part of the Range Lake map area is very high.

## CLASSIFICATION OF MINERAL POTENTIAL

(Modified from McLaren, 1990).




## QUALITATIVE DESCRIPTIONS OF METALLIC MINERAL POTENTIAL CLASSIFICATIONS

| Class | Mineral Potential | Description |
|---|---|---|
| 6 | Extremely High | Known deposits (developed prospects) with significant identified resources in the ground. Very favourable supporting data from all applicable areas; very high degree of confidence in designation. Continued exploration highly probable; potential for mine development is high. |
| 5 | Very High | Known prospects, developed prospects, past producing mines (with undefined resources in the ground) in highly favourable geological environment. Very good supporting data from all three criteria; high degree of confidence in designation. Future exploration expected. |
| 4 | High | Known or indicated resources in highly favourable geological environment. Very good supporting geological and geochemical data. Resources or deposits not necessarily identified; however, positive indications that deposit forming processes were active in the area. Moderate to high degree of confidence in designation. Future exploration expected. |
| 3 | Moderate | Favourable geological environment for resource occurrence. Very favourable geological data from one or more criteria; but significant occurrences lacking. Moderate degree of confidence in designation. Future exploration likely, particularly if near an area of higher designation. Good potential for upgrading classification. |
| 2 | Moderate | Moderately favourable environment for resource accumulation as indicated by one line of evidence (ie. favourable geology, mineralization or anomalous geochemistry with no other supporting data). Areas generally lack sufficient prospecting to identify resources. Moderate to low degree of confidence in designation. Future reconnaissance exploration to be expected. Good potential for upgrading classification. |
| 1 | Low | Current data indicates that the existence of resources is unlikely. Moderate to high degree of confidence in designation. Future exploration for deposit types considered is unlikely. |
| U | Unknown | Current data is either outdated or insufficiently detailed for a reasoned determination of mineral potential. High degree of confidence in designation. Future exploration could occur in parts of the area. |

LITHOGEOCHEMICAL SAMPLES

- ▽ Single element anomaly defined by anomalous value
- ▼ Multi-element anomaly defined by very anomalous values
- ● Mineral showing with MINFILE #, name, and commodities.

ANOMALOUS THRESHOLDS

| | | | |
|---|---|---|---|
| Cu | 104 ppm | Pb | 30 ppm |
| Zn | 161 ppm | Sb | 6.2 ppm |
| As | 64 ppm | Ag | 0.50 ppm |
| Au | 26 ppb | | |

## DEFINITION OF ANOMALOUS THRESHOLDS (RGS)

Unpublished Regional Geochemical Survey (RGS) stream sediment data was used to identify drainage basins with anomalous geochemistry. All samples with concentrations of one or more element (Zn, Cu, Pb, Au, Ag, As and Sb) at or above the 95th percentile are here defined as anomalous.

## REFERENCES

*B.C. Ministry of Energy, Mines and Petroleum Resources* (1988): Tatshenshini River Mineral Occurrence Map; MINFILE Map 114P, 1 sheet.

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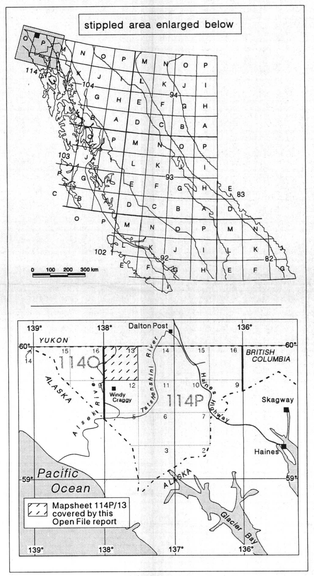
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Mihalynuk, M.G., Smith, M.T., Deschênes, M., Timmerman, J., Schiarizza, P. and MacIntyre, D.G. (1993): Range Lake Map Area Geology (114P13); *in* Mihalynuk, M.G., *et al.*; Northwest Tatshenshini River Map Area, Northwestern British Columbia, *B.C. Ministry of Energy, Mines and Petroleum Resources*, Open File 1993-13, Sheet 4 of 6.

Mihalynuk, M.G., Smith, M.T., MacIntyre, D.G., Deschênes, M., Timmerman, J. and Schiarizza, P. (1993): Northwest Tatshenshini River Map Area, Northwestern British Columbia, (NTS 114P/11, 12, 13, & 14); *B.C. Ministry of Energy, Mines and Petroleum Resources*, Open File 1993-13, Sheet 1 of 6.

## LOCATION



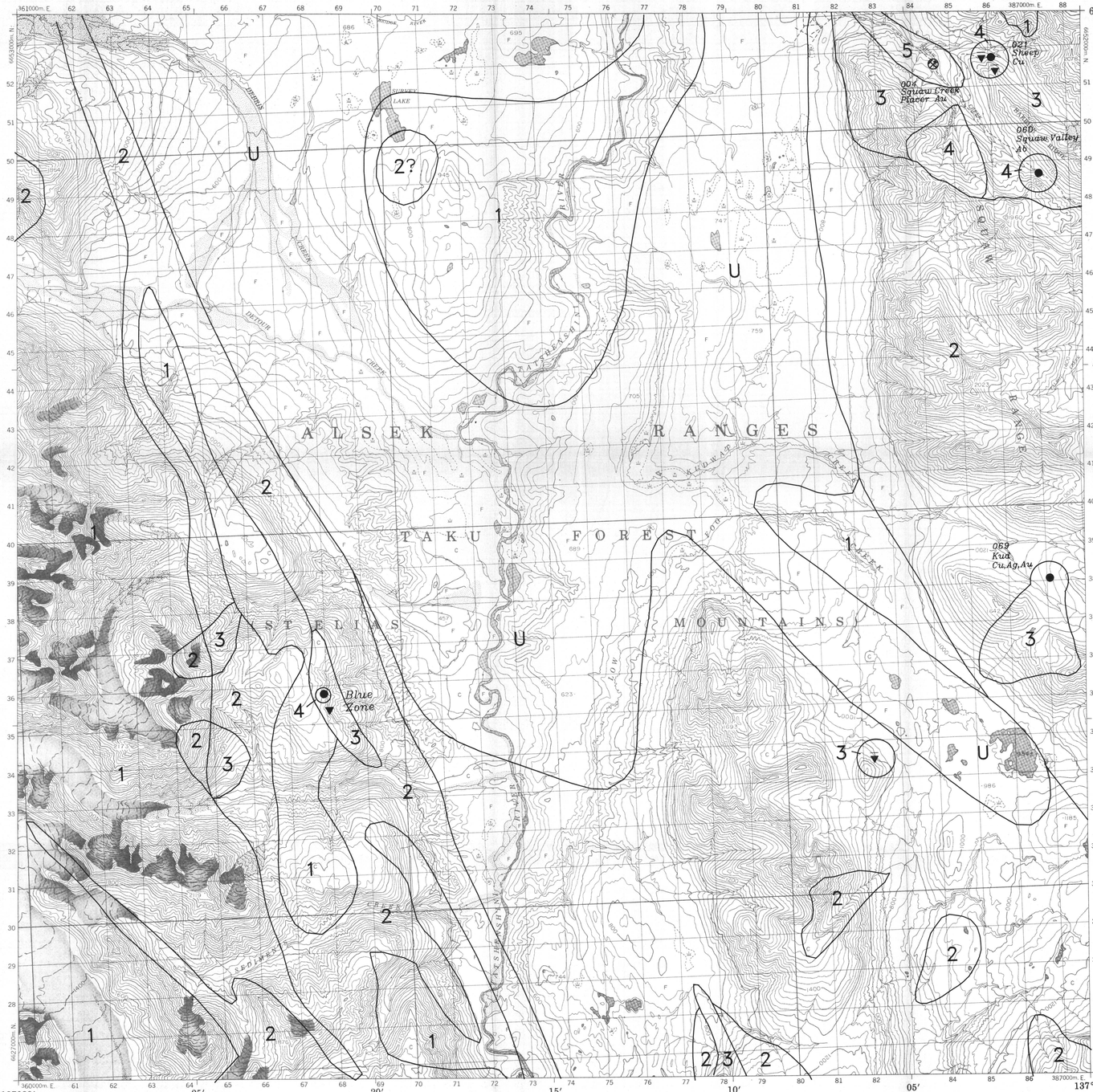

## DEPOSIT MODELS

| Ref.[1] | Deposit Type | Commodities | Geological Indicators and Environment | Examples |
|---|---|---|---|---|
| K5 | Polymetallic veins | Ag, Pb, Zn, Au | Mineralized quartz carbonate veins are commonly related to shallow felsic intrusions. | Norm ( 540g/t Ag, 10.5% Pb); Humbird (Creek, South; Ag, Pb) |
| M2 | Pb-Zn-Ag Manto | Pb, Zn, Ag | Sulphide lenses, pipes and veins occur chiefly in carbonate host rocks that have undergone moderate deformation and are intruded by small plutons. | Humbird (Discovery, Ag, Pb, Zn). Despite large prospective areas of favorable geology, this type of mineralization is known at only two relatively restricted occurrences in the area. |
| N1 | Copper skarn | Cu, Au, Ag | Typically chalcopyrite in association with skarn gangue occurs where granitoids intrude continental margin carbonates. | Maid of Erin (2441 Cu, 1487 kg Ag); State of Montana (21 Cu, 14 kg Ag) are the only known past producers. Most copper skarn occurs in carbonates intruded by Oligocene granitoids in the Rainy Hollow area. |
| E2 | Carbonate-hosted Cu-Pb-Zn | Cu, Pb, Zn | Mineralization occurs in zones of high fluid-flow (breccia or karst) in fine-grained, massive to laminated, carbonaceous dolomite and shale deposited on passive or rifted continental platform or shelf environments. | None are recognized in this part of the Alexander terrane. |
| H3 | Sediment-hosted Cu-Co-Au (Besshi) | Cu, Zn, Pb, Au, Co, Ag | Tabular massive sulphide bodies occur within marine basalts and calcareous clastic sediments deposited in an extensional environment, commonly atop platformal carbonate or clastic strata. | Windy Craggy is the best (proximal) example in the immediate area; occurrences at Mt. Henry Clay are probably more distal equivalents. Greens Creek mine in Alaska (150 km SE) is believed to be hosted by correlative Upper Triassic strata. |

[1] BCGS Mineral Profile Number

Scale 1:50 000

0 1 2 3 4 5 kilometres




BC Ministry of Energy, Mines and Petroleum Resources

Geological Survey Branch

# MINERAL POTENTIAL MAP 1993-5
**(sheet 2 of 4)**

# MINERAL POTENTIAL OF THE SURVEY LAKE MAP SHEET

**NTS 114P/14**

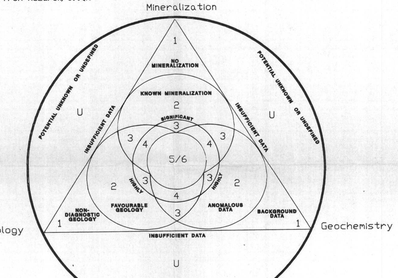

**BY M.T. SMITH AND M.G. MIHALYNUK**


## INTRODUCTION

The geology of the Survey Lake map area is extremely diverse, spanning at least 500 million years of Earth history and possibly more than one terrane. The southwestern part of the map area is underlain primarily by lower Paleozoic limestone and argillite, which have low potential for hosting mineral deposits. However, reconnaissance lithogeochemical results suggest that some of the numerous Tertiary faults in the area may host significant mineralization. Tertiary sedimentary rocks are also present in this area, and host coal seams. The northwestern part of the map area is underlain by complexly faulted sedimentary and volcanic rocks. This area is rated as moderate to high potential due to the presence of coarse placer gold and copper in Sheep Creek, and numerous polymetallic vein showings and prospects to the south on the adjoining map sheet (114P15, 114P10N).

## CLASSIFICATION OF MINERAL POTENTIAL

(Modified from McLaren, 1990).




## QUALITATIVE DESCRIPTIONS OF METALLIC MINERAL POTENTIAL CLASSIFICATIONS

| Class | Mineral Potential | Description |
|---|---|---|
| 6 | Extremely High | Known deposits (developed prospects) with significant identified resources in the ground. Very favourable supporting data from all applicable areas; very high degree of confidence in designation. Continued exploration highly probable; potential for mine development is high. |
| 5 | Very High | Known prospects, developed prospects, past producing mines (with undefined resources in the ground) in highly favourable geological environment. Very good supporting data from all three criteria, high degree of confidence in designation. Future exploration expected. |
| 4 | High | Known or indicated resources in highly favourable geological environment. Very good supporting geological and geochemical data. Resources or deposits not necessarily identified; however, positive indications that deposit forming processes were active in the area. Moderate to high degree of confidence in designation. Future exploration expected. |
| 3 | Moderate | Favourable geological environment for resource occurrence. Very favourable geological data from one or more criteria; but significant occurrences lacking. Moderate degree of confidence in designation. Future exploration likely, particularly if near an area of higher designation. Good potential for upgrading classification. |
| 2 | Moderate | Moderately favourable environment for resource accumulation as indicated by one line of evidence (ie. favourable geology, mineralization or anomalous geochemistry with no other supporting data). Areas generally lack sufficient prospecting to identify resources. Moderate to low degree of confidence in designation. Future reconnaissance exploration to be expected. Good potential for upgrading classification. |
| 1 | Low | Current data indicates that the existence of resources is unlikely. Moderate to high degree of confidence in designation. Future exploration for deposit types considered is unlikely. |
| U | Unknown | Current data is either outdated or insufficiently detailed for a reasoned determination of mineral potential. High degree of confidence in designation. Future exploration could occur in parts of the area. |

▼ Highly anomalous single element lithogeochemical anomaly

▼ Highly anomalous multiple element lithogeochemical anomaly

● Showing (with MINFILE# and commodities, where applicable)

⊗ Past producer (with MINFILE# and commodities)

ANOMALOUS THRESHOLDS

| | | | | |
|---|---|---|---|---|
| Cu | 104 ppm | Pb | 30 ppm | |
| Zn | 181 ppm | Sb | 6.2 ppm | |
| As | 64 ppm | Ag | 0.50 ppm | |
| Au | 26 ppb | | | |

## DEFINITION OF ANOMALOUS THRESHOLDS (RGS)

Unpublished Regional Geochemical Survey (RGS) stream sediment data was used to identify drainage basins with anomalous geochemistry. All samples with concentrations of one or more elements (Cu, Zn, Pb, Au, Ag, As, and Sb) at or above the 95th percentile are here defined as anomalous.

## REFERENCES


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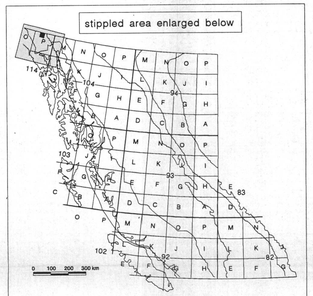
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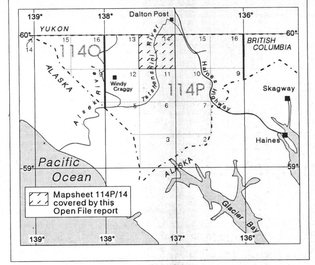
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## DEPOSIT MODELS

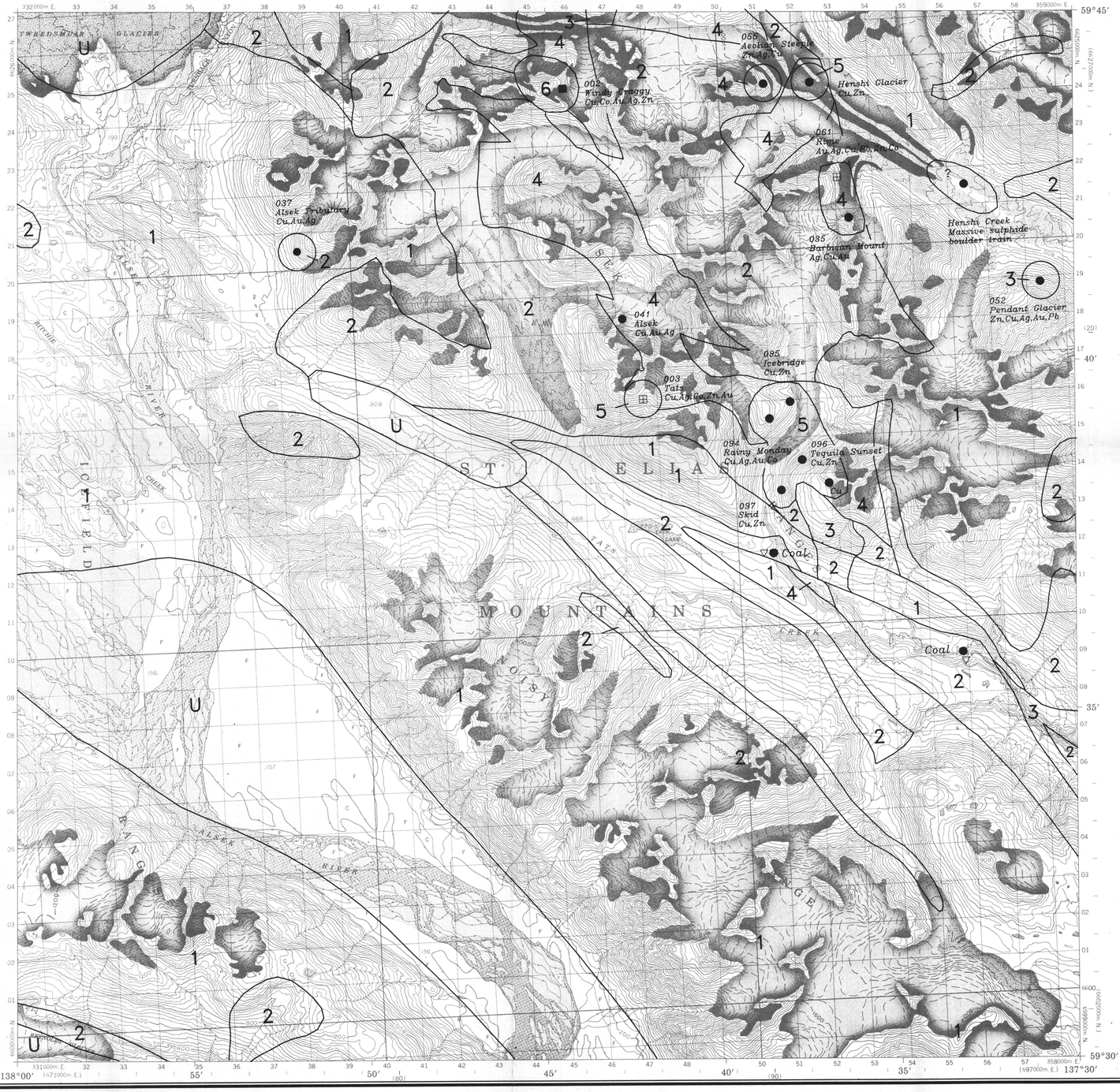
| Ref.[1] | Deposit Type | Commodities | Geological Indicators and Environment | Examples |
|---|---|---|---|---|
| K5 | Polymetallic veins | Ag, Pb, Zn, Au | Mineralized quartz carbonate veins are commonly related to shallow felsic intrusions. | Norm ( 540g/t Ag, 10.5% Pb); Humbird (Creek, South; Ag, Pb) |
| M2 | Pb-Zn-Ag Manto | Pb, Zn, Ag | Sulphide lenses, pipes and veins occur chiefly in carbonate host rocks that have undergone moderate deformation and are intruded by small plutons. | Humbird (Discovery, Ag, Pb, Zn). Despite large prospective areas of favorable geology, this type of mineralization is known at only two relatively restricted occurrences in the area. |
| N1 | Copper skarn | Cu, Au, Ag | Typically chalcopyrite in association with skarn gangue occurs where granitoids intrude continental margin carbonates. | Maid of Erin (2440 Cu, 1487 kg Ag); State of Montana (2t Cu, 14 kg Ag) are the only known past producers. Most copper skarn occurs in carbonates intruded by Oligocene granitoids in the Rainy Hollow area. |
| E2 | Carbonate-hosted Cu-Pb-Zn | Cu, Pb, Zn | Mineralization occurs in zones of high fluid-flow (breccia or karst) in fine-grained, massive to laminated, carbonaceous dolomite and shale deposited on passive or rifted continental platform or shelf environments. | None are recognized in this part of the Alexander terrane. |
| A | Coal | Coal | Minor accumulations in Early Tertiary pull-apart basins along major faults. Dominantly hosted by fine-grained clastic strata. | No indications of economic accumulations in the Alsek-Tatshenshini area. Calorimetric analysis of minor occurrences indicates high volatile bituminous A-B grade (≥ 7000 kcal/kg, approx. 12,800 BTU). |
| D1 | Basaltic copper | Cu | Mainly as native copper ± chalcopyrite and bornite accumulations in permeable zones within weakly metamorphosed Triassic basaltic sequences in an intracontinental or continental margin rift setting. | Very coarse Cu nuggets obtained from Squaw Creek placer gravels have no identified source, but are presumably from Wrangellian basalts. To the north, minor production is recorded from small basaltic copper deposits from the Nicolai greenstone (WR), now in Kluane National Park. |

[1] BCGS Mineral Profile Number

**Scale 1:50 000**

0 1 2 3 4 5

kilometres




BC Ministry of Energy, Mines and Petroleum Resources

Geological Survey Branch

# MINERAL POTENTIAL MAP 1993-5
**(sheet 3 of 4)**

# MINERAL POTENTIAL OF THE TATS LAKE MAP SHEET

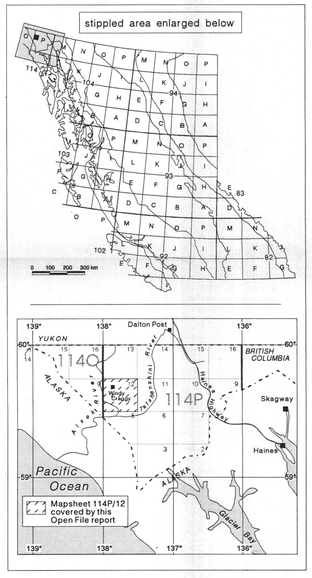
**NTS 114P/12**

**BY M.T. SMITH AND M.G. MIHALYNUK**

## INTRODUCTION

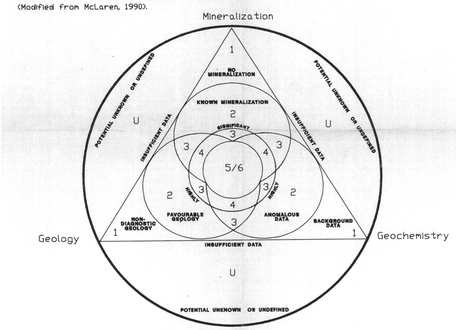
The Tats Lake map area consists of two distinct geologic domains. The southwestern half of the map area is underlain by two granodioritic to dioritic batholiths, and is not suspected to host significant mineral deposits. A significant portion of the northeastern half of the map area is underlain by Upper Triassic basalt and fine-grained sedimentary rocks of the Tats Group, which is host to the world-class Windy Craggy copper-cobalt VMS deposit. The presence of this deposit, as well as numerous other VMS showings in the area, testify to the extremely high mineral potential of this particular rock unit. Most of the rest of the northwestern half of the map sheet is underlain by Paleozoic limestone and sedimentary rocks of relatively low mineral potential. There is also potential for fault-related epithermal veins and coal, associated with minor Tertiary sedimentary rocks.

## LOCATION




## CLASSIFICATION OF MINERAL POTENTIAL

(Modified from McLaren, 1990).




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| 1 | Low | Current data indicates that the existence of resources is unlikely. Moderate to high degree of confidence in designation. Future exploration for deposit types considered is unlikely. |
| U | Unknown | Current data is either outdated or insufficiently detailed for a reasoned determination of mineral potential. High degree of confidence in designation. Future exploration could occur in parts of the area. |

LITHOGEOCHEMICAL SAMPLES

- ▽ Single element anomaly defined by anomalous value
- ▼ Multi-element anomaly defined by very anomalous values
- ● Showing
- ⊞ Prospect
- ■ Developed prospect

with MINFILE#, name, and commodities, where applicable

DEFINITION OF ANOMALOUS THRESHOLDS (RGS)

Unpublished Regional Geochemical Survey (RGS) stream sediment data was used to identify drainage basins with anomalous geochemistry. All samples with concentrations at or above the 95th percentile are here defined as anomalous.

ANOMALOUS THRESHOLDS

| | | | |
|---|---|---|---|
| Cu | 104 ppm | Pb | 30 ppm |
| Zn | 181 ppm | Sb | 6.2 ppm |
| As | 64 ppm | Ag | 0.50 ppm |
| Au | 26 ppb | | |

## DEPOSIT MODELS

| Ref.[1] | Deposit Type | Commodities | Geological Indicators and Environment | Examples |
|---|---|---|---|---|
| H3 | Sediment-hosted Cu-Co-Au (Besshi) | Cu, Zn, Pb, Au, Co, Ag | Tabular massive sulphide bodies occur within marine basalts and calcareous clastic sediments deposited in an extensional environment, commonly atop platformal carbonate or clastic strata. | Windy Craggy is the best (proximal) example in the immediate area; occurrences at Mt. Henry Clay are probably more distal equivalents. Greens Creek mine in Alaska (150 km SE) is believed to be hosted by correlative Upper Triassic strata. |
| K5 | Polymetallic veins | Ag, Pb, Zn, Au | Mineralized quartz carbonate veins are commonly related to shallow felsic intrusions. | Norm ( 540g/t Ag, 10.5% Pb); Humbird (Creek, South; Ag, Pb) |
| M2 | Pb-Zn-Ag Mantо | Pb, Zn, Ag | Sulphide lenses, pipes and veins occur chiefly in carbonate host rocks that have undergone moderate deformation and are intruded by small plutons. | Humbird (Discovery, Ag, Pb, Zn). Despite large prospective areas of favorable geology, this type of mineralization is known at only two relatively restricted occurrences in the area. |
| N1 | Copper skarn | Cu, Au, Ag | Typically chalcopyrite in association with skarn gangue occurs where granitoids intrude continental margin carbonates. | Maid of Erin (244t Cu, 1487 kg Ag); State of Montana (2t Cu, 14 kg Ag) are the only known past producers. Most copper skarn occurs in carbonates intruded by Oligocene granitoids in the Rainy Hollow area. |
| E2 | Carbonate-hosted Cu-Pb-Zn | Cu, Pb, Zn | Mineralization occurs in zones of high fluid-flow (breccia or karst) in fine-grained, massive to laminated, carbonaceous dolomite and shale deposited on passive or rifted continental platform or shelf environments. | None are recognized in this part of the Alexander terrane. |
| A | Coal | Coal | Minor accumulations in Early Tertiary pull-apart basins along major faults. Dominantly hosted by fine-grained clastic strata. | No indications of economic accumulations in the Alsek-Tatshenshini area. Calorimetric analysis of minor occurrences indicates high volatile bituminous A-B grade (≥ 7000 kcal/kg, approx. 12,800 BTU). |

[1] BCGS Mineral Profile Number

## REFERENCES


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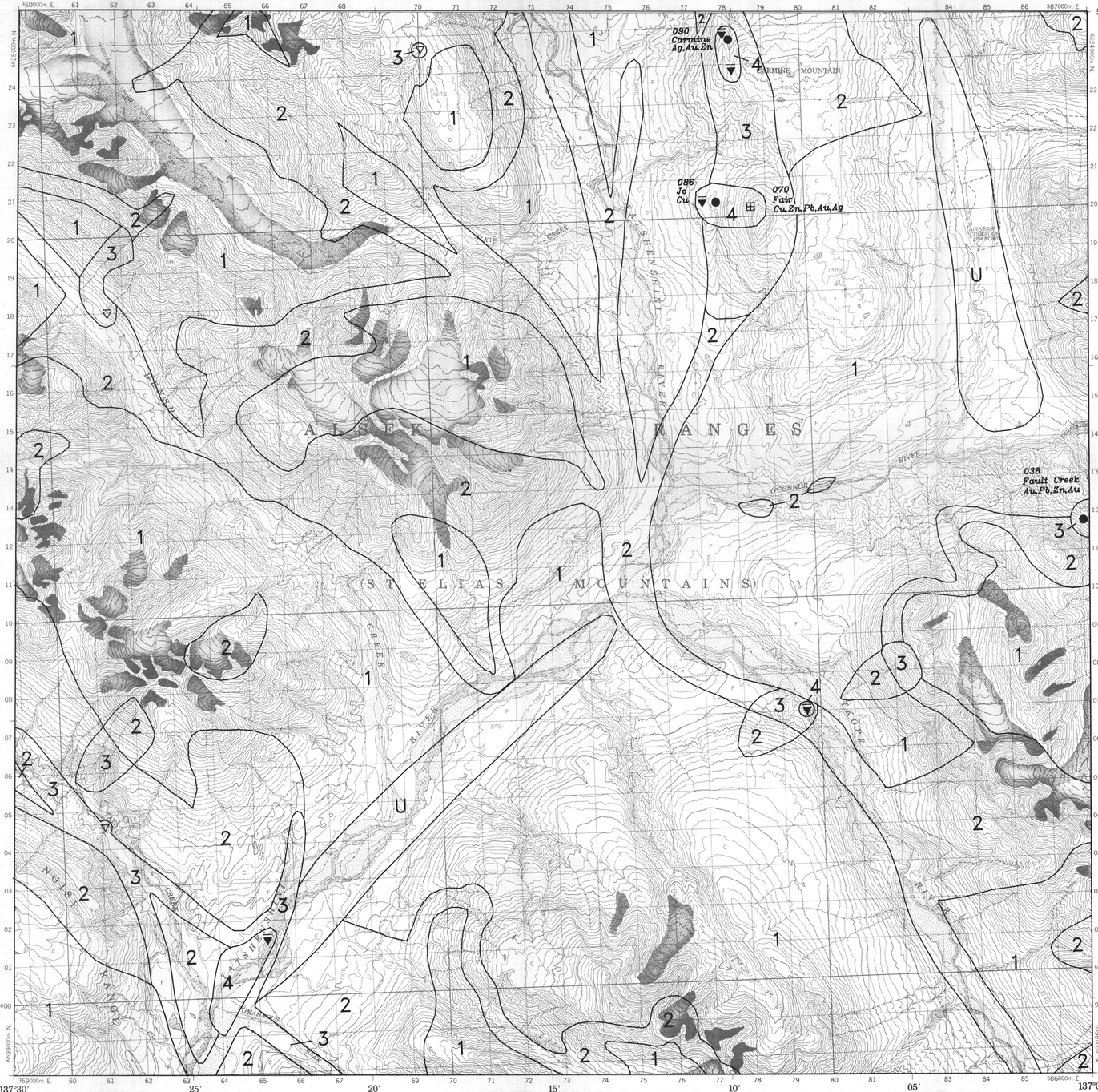
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Scale 1:50 000

0 1 2 3 4 5

kilometres




BC Ministry of Energy, Mines and Petroleum Resources

British Columbia Geological Survey

Geological Survey Branch

## MINERAL POTENTIAL MAP 1993-5
**(sheet 4 of 4)**

# MINERAL POTENTIAL OF THE CARMINE MOUNTAIN MAP SHEET

**NTS 114P/11**

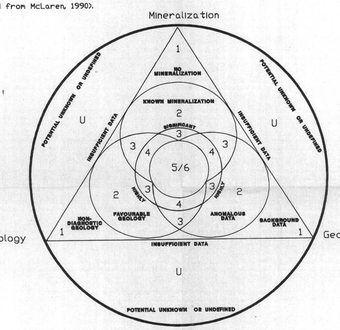

**BY M.T. SMITH AND M.G. MIHALYNUK**


### INTRODUCTION

The Carmine Mountain map area is underlain primarily by lower and middle Paleozoic limestone and sedimentary rocks of the Alexander Terrane, intruded by granodioritic to dioritic plutons of Jurassic to Cretaceous and Eocene age. With the exception of some small areas of skarn mineralization identified along the margins of these intrusive bodies, notably in relation to the Eocene intrusion, the potential for these rock types to host significant mineralization is interpreted to be relatively low. The extreme southwest corner of the map area is underlain by the Upper Triassic Tats Group, which has high potential for hosting VMS deposits. Several showings in the Carmine Mountain area may be related to 1) Triassic rocks of Tats Group age and affinity (VMS); 2) Tertiary felsic shallow intrusive rocks (epithermal veins); and/or 3) fault related epithermal veins. This area is thus given a moderate to high mineral potential rating.

### CLASSIFICATION OF MINERAL POTENTIAL

(Modified from McLaren, 1990).




### QUALITATIVE DESCRIPTIONS OF METALLIC MINERAL POTENTIAL CLASSIFICATIONS

| Class | Mineral Potential | Description |
|---|---|---|
| 6 | Extremely High | Known deposits (developed prospects) with significant identified resources in the ground. Very favourable supporting data from all applicable areas; very high degree of confidence in designation. Continued exploration highly probable; potential for mine development is high. |
| 5 | Very High | Known prospects, developed prospects, past producing mines (with undefined resources in the ground) in highly favourable geological environment. Very good supporting data from all three criteria; high degree of confidence in designation. Future exploration expected. |
| 4 | High | Known or indicated resources in highly favourable geological environment. Very good supporting geological and geochemical data. Resources or deposits not necessarily identified; however, positive indications that deposit forming processes were active in the area. Moderate to high degree of confidence in designation. Future exploration expected. |
| 3 | Moderate | Favourable geological environment for resource occurrence. Very favourable geological data from one or more criteria; but significant occurrences lacking. Moderate degree of confidence in designation. Future exploration likely, particularly if near an area of higher designation. Good potential for upgrading classification. |
| 2 | Moderate | Moderately favourable environment for resource accumulation as indicated by one line of evidence (ie. favourable geology, mineralization or anomalous geochemistry with no other supporting data). Areas generally lack sufficient prospecting to identify resources. Moderate to low degree of confidence in designation. Future reconnaissance exploration to be expected. Good potential for upgrading classification. |
| 1 | Low | Current data indicates that the existence of resources is unlikely. Moderate to high degree of confidence in designation. Future exploration for deposit types considered is unlikely. |
| U | Unknown | Current data is either outdated or insufficiently detailed for a reasoned determination of mineral potential. High degree of confidence in designation. Future exploration could occur in parts of the area. |

LITHOGEOCHEMISTRY

- ▽ Single element anomaly defined by anomalous value
- ▽ Multiple element anomaly defined by anomalous values
- ▼ Single element anomaly defined by very anomalous value
- ▼ Multiple element anomaly defined by very anomalous values

ANOMALOUS THRESHOLDS (RGS)

| | | | |
|---|---|---|---|
| Cu | 104 ppm | Ag | 0.50 ppm |
| Pb | 30 ppm | Sb | 6.2 ppm |
| Zn | 181 ppm | As | 64 ppm |
| Au | 26 ppb | | |

● ⊞ Showing; prospect, with MINFILE#, name and commodities

### DEFINITION OF ANOMALOUS THRESHOLDS (RGS)

Unpublished Regional Geochemical Survey (RGS) stream sediment data was used to identify drainage basins with anomalous geochemistry. All samples with concentrations of one or more elements (Zn, Cu, Pb, Au, Ag, As, and Sb) at or above the 95th percentile are here defined as anomalous.

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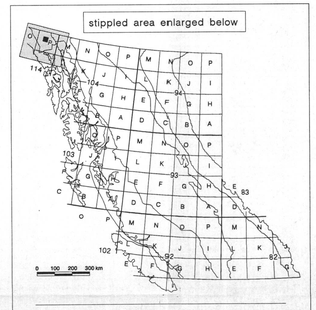
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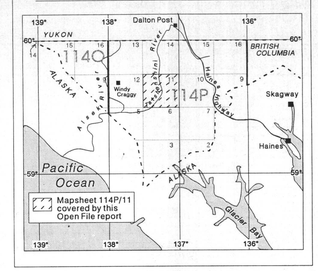
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### DEPOSIT MODELS

| Ref.[1] | Deposit Type | Commodities | Geological Indicators and Environment | Examples |
|---|---|---|---|---|
| K5 | Polymetallic veins | Ag, Pb, Zn, Au | Mineralized quartz carbonate veins are commonly related to shallow felsic intrusions. | Norm ( 540g/t Ag, 10.5% Pb); Humbird (Creek, South; Ag, Pb) |
| M2 | Pb-Zn-Ag Manto | Pb, Zn, Ag | Sulphide lenses, pipes and veins occur chiefly in carbonate host rocks that have undergone moderate deformation and are intruded by small plutons. | Humbird (Discovery, Ag, Pb, Zn). Despite large prospective areas of favorable geology, this type of mineralization is known at only two relatively restricted occurrences in the area. |
| N1 | Copper skarn | Cu, Au, Ag | Typically chalcopyrite in association with skarn gangue occurs where granitoids intrude continental margin carbonates. | Maid of Erin (244t Cu, 1487 kg Ag); State of Montana (2t Cu, 14 kg Ag) are the only known past producers. Most copper skarn occurs in carbonates intruded by Oligocene granitoids in the Rainy Hollow area. |
| E2 | Carbonate-hosted Cu-Pb-Zn | Cu, Pb, Zn | Mineralization occurs in zones of high fluid-flow (breccia or karst) in fine-grained, massive to laminated, carbonaceous dolomite and shale deposited on passive or rifted continental platform or shelf environments. | None are recognized in this part of the Alexander terrane. |
| H3 | Sediment-hosted Cu-Co-Au (Besshi) | Cu, Zn, Pb, Au, Co, Ag | Tabular massive sulphide bodies occur within marine basalts and calcareous clastic sediments deposited in an extensional environment, commonly atop platformal carbonate or clastic strata. | Windy Craggy is the best (proximal) example in the immediate area; occurrences at Mt. Henry Clay are probably more distal equivalents. Greens Creek mine in Alaska (150 km SE) is believed to be hosted by correlative Upper Triassic strata. |
| F4 | Marine evaporite gypsum | gypsum | Restricted, slowly subsiding, marginal marine basins of mainly Paleozoic and Mesozoic age | Gypsum occurs at many localities across the Alsek-Tatshenshini area. The O'Connor River deposit is the largest with 8.85 million tonnes of known reserves. |

[1] BCGS Mineral Profile Number

**Scale 1:50 000**

0 1 2 3 4 5

kilometres