BC
Ministry of Energy, Mines and Petroleum Resources

1895 - 1995
100 YEARS OF GEOLOGICAL SURVEYING

Geological Survey Branch

**OPEN FILE 1995-21**

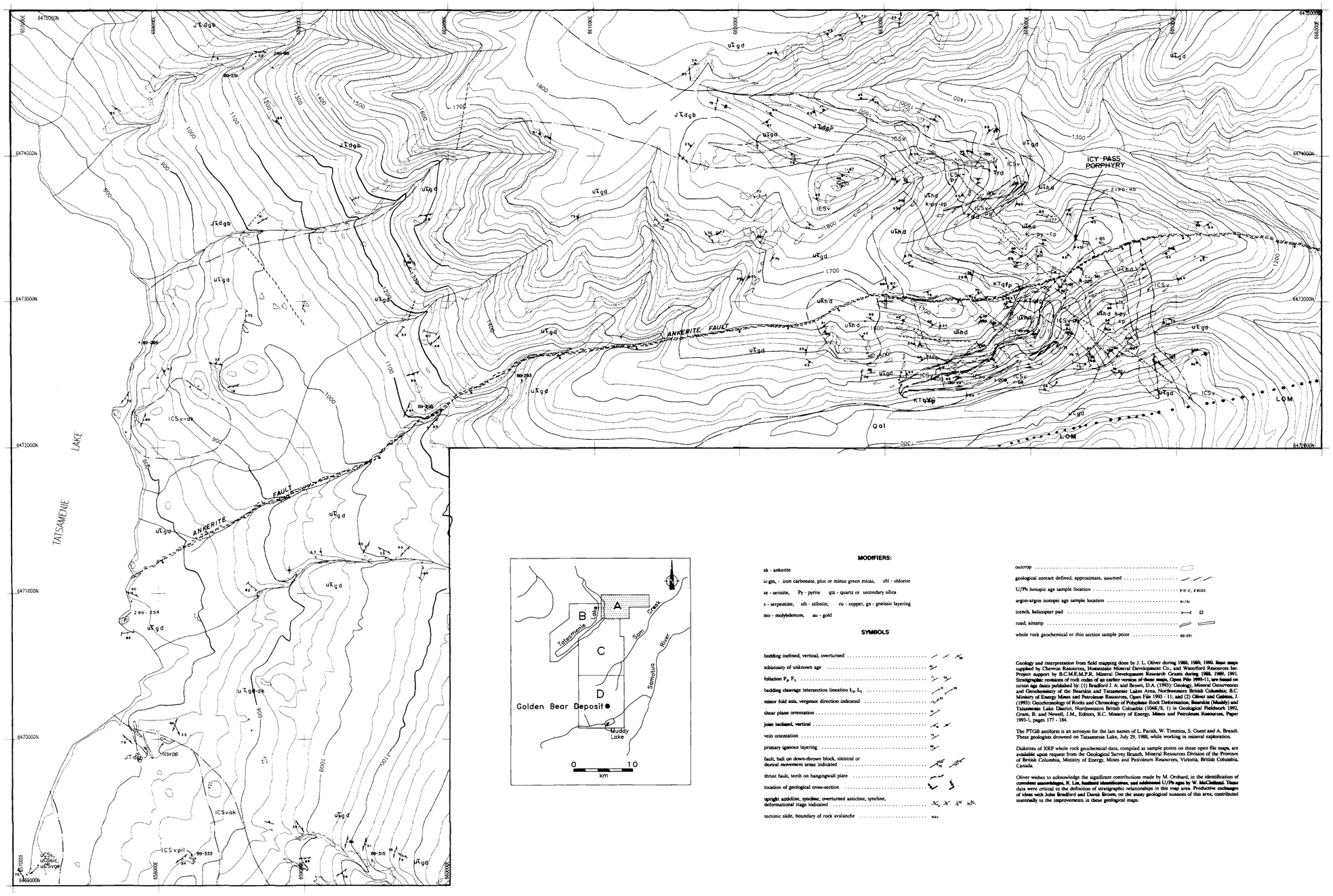
Sheet A of 4

# GEOLOGY OF THE MUDDY LAKE, TATSAMENIE LAKE DISTRICT, NORTHWESTERN B. C.

**NTS 104K/1 and 104K/8**

**By Jim L. Oliver**

0 1
Kilometre







## MODIFIERS:

ak - ankerite

ic-gm, - iron carbonate, plus or minus green micas, chl - chlorite

se - sericite, Py - pyrite qtz - quartz or secondary silica

s - serpentine, stb - stibnite, cu - copper, gn - gneissic layering

mo - molybdenum, au - gold

## SYMBOLS

bedding inclined, vertical, overturned

schistosity of unknown age

foliation $F_2$, $F_3$

bedding cleavage intersection lineation $L_2$, $L_3$

minor fold axis, vergence direction indicated

shear plane orientation

joint inclined, vertical

vein orientation

primary igneous layering

fault, ball on down-thrown block, sinistral or dextral movement sense indicated

thrust fault, teeth on hangingwall plate

location of geological cross-section

upright anticline, syncline, overturned anticline, syncline, deformational stage indicated

tectonic slide, boundary of rock avalanche — rav

outcrop

geological contact defined, approximate, assumed

U/Pb isotopic age sample location — z10-2, z scss

argon-argon isotopic age sample location — Ar/Ar

trench, helicopter pad

road, airstrip

whole rock geochemical or thin section sample point — 89-251

Geology and interpretation from field mapping done by J. L. Oliver during 1988, 1989, 1990. Base maps supplied by Chevron Resources, Homestake Mineral Development Co., and Waterford Resources Inc. Project support by B.C.M.E.M.P.R. Mineral Development Research Grants during 1988, 1989, 1991. Stratigraphic revisions of rock codes of an earlier version of these maps, Open File 1995-11, are based on zircon age dates published by: (1) Bradford J. A. and Brown, D.A. (1993): Geology, Mineral Occurrences and Geochemistry of the Bearskin and Tatsamenie Lakes Area, Northwestern British Columbia; B.C. Ministry of Energy Mines and Petroleum Resources, Open File 1993 - 11; and (2) Oliver and Gabites, J. (1993): Geochronology of Rocks and Chronology of Polyphase Rock Deformation, Bearskin (Muddy) and Tatsamenie Lake District, Northwestern British Columbia (104K/8, 1) in Geological Fieldwork 1992, Grant, B. and Newell, J.M., Editors, B.C. Ministry of Energy, Mines and Petroleum Resources, Paper 1993-1, pages 177 - 184.

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# LEGEND

### SUPRACRUSTAL ROCKS
### QUATERNARY

**Qal** Unconsolidated glacial drift and alluvium.

### MIOCENE

**Mvob** Pillowed and columnar jointed olivine basalt flows.

### JURASSIC - CRETACEOUS
(highly altered, non-foliated rocks of poorly constrained age, inklin?)

**JKshw** Buff to orange red weathering, strong ankeritic, heterolithic lithic wackes and lesser, thin limestone interbeds.

**JKsl** Medium to dark grey, well bedded, clastic rich limestones.

**JKvpil** Pillow basalts, non-foliated.

**JKpyx** Pyroxene rich mafic flows, non-foliated.

**JKsa** Interbedded argillites and ankeritic clastic rocks.

**JKcsv** Strongly carbonitized, ankeritic mafic volcanic and sedimentary rocks, lacking primary textural preservation.

**JKv** Undifferentiated mafic volcanics.

### TRIASSIC, STUHINI (?)
(narrow, fault bounded, sedimentary wedges)

**lmTsa** Thin bedded argillites, sheared, and commonly ankeritic.

**lmTsalc** Interbedded argillites, minor chert and dull grey, thin bedded limestones.

**lmTsavc** Well bedded, dark grey-green mafic volcaniclastic sediments with interbeds of argillite.

### PALEOZOIC, STIKINE ASSEMBLAGE
### PERMIAN

**PSsbch** Black, well bedded chert.

**PSsch** White, poorly bedded chert, may contain discontinuous dolomitic interbeds.

**PSscd** Pale buff-cream, to pink-cream, cherty dolomites, locally thin bedded, or with irregular silica mesh textures.

**PSsca** Calcareous argillite, fine grained black clastics, with lesser calcareous interbeds.

**PSssd** Siliceous dolomites, light grey to buff dolomitic limestone containing minor amorphous dark blue-grey to black cherty inclusions.

**PSsbcd** Crinoidal debris stones and dolostones, buff weathering thin bedded.

**PSsgl** Limestone, massive, thick bedded, light grey limestone.

### UPPER CARBONIFEROUS

**uCSvat** Calcareous, actinolite porphyroblastic, strongly foliated, mafic volcanics, likely of tuffaceous origin.

**uCSvqe** Quartz eye porphyroblastic tuffaceous volcanic rocks.

**uCSvft** Fine grained felsic volcanic ash and dust tuffs, strongly foliated and re-crystallized.

**uCSvsp** Siliceous phyllites, fine grained, moderately bedded buff-weathering siliceous phyllites of volcanic origin. May contain chloritic foliation surfaces.

**uCSslc** Buff-weathering limestones and intercalated fine grained clastic sediments. Clastic sediments may exceed 50% of the rock interval.

**uCSsl** Cream to buff-weathering limestones. Weak clastic component.

**uCSv** Undifferentiated volcanic rocks.

**uCSs** Undifferentiated sedimentary rocks.

### LOWER CARBONIFEROUS

**lCSvpil** Pillowed mafic flows, foliated and actinolite porphyroblastic.

**lCSvit** Well bedded, actinolite, plagioclase and quartz rich intermediate tuffaceous volcanics, strongly foliated.

**lCSscwt** Well bedded calcareous wackes, minor chert interbeds, and mafic tuffs, strongly foliated.

**lCSsac** Argillites and fine grained clastic sediments.

**lCSsch** Cream to black chert.

**lCSvpp** Foliated plagioclase and pyroxene porphyritic flows and tuffaceous mafic volcanics. Flow members are massive and lack preserved pillow structures.

**lCSsl** Intravolcanic white to cream limestone.

**lCSvmat** Bedded, fine grained mafic tuffs, crystal tuffs with minor limestone and felsic ash interbeds.

**lCSv** Undifferentiated volcanic rocks.

### INTRUSIVE ROCKS
### TERTIARY

**Tdd** Diabase dykes, fine grained dark green black dykes.

**Trd** Rhyolite dykes, cream weathering, aphanitic to sparsely quartz eye porphyritic felsic dykes.

### TERTIARY AND CRETACEOUS

**KTqfp** Quartz feldspar porphyritic dykes, light grey, feldspar, biotite and quartz porphyritic dykes.

**KTapg** Pegmatitic, orange weathering, sodium and potassium feldspar rich granitic dykes.

### JURASSIC to TRIASSIC
(intrusive rocks of poorly constrained age)

**Jgb** Gabbro, massive to weakly foliated, green black, medium grained, pyroxene and magnetite rich intrusions.

**Jum** Ultramafic, magnetite, clinopyroxene and lesser olivine, phyric intrusions: heavily serpentized (Jums) along major fault zones.

**Jdd** Strongly feldspar porphyritic, hornblende diorite dykes and stocks.

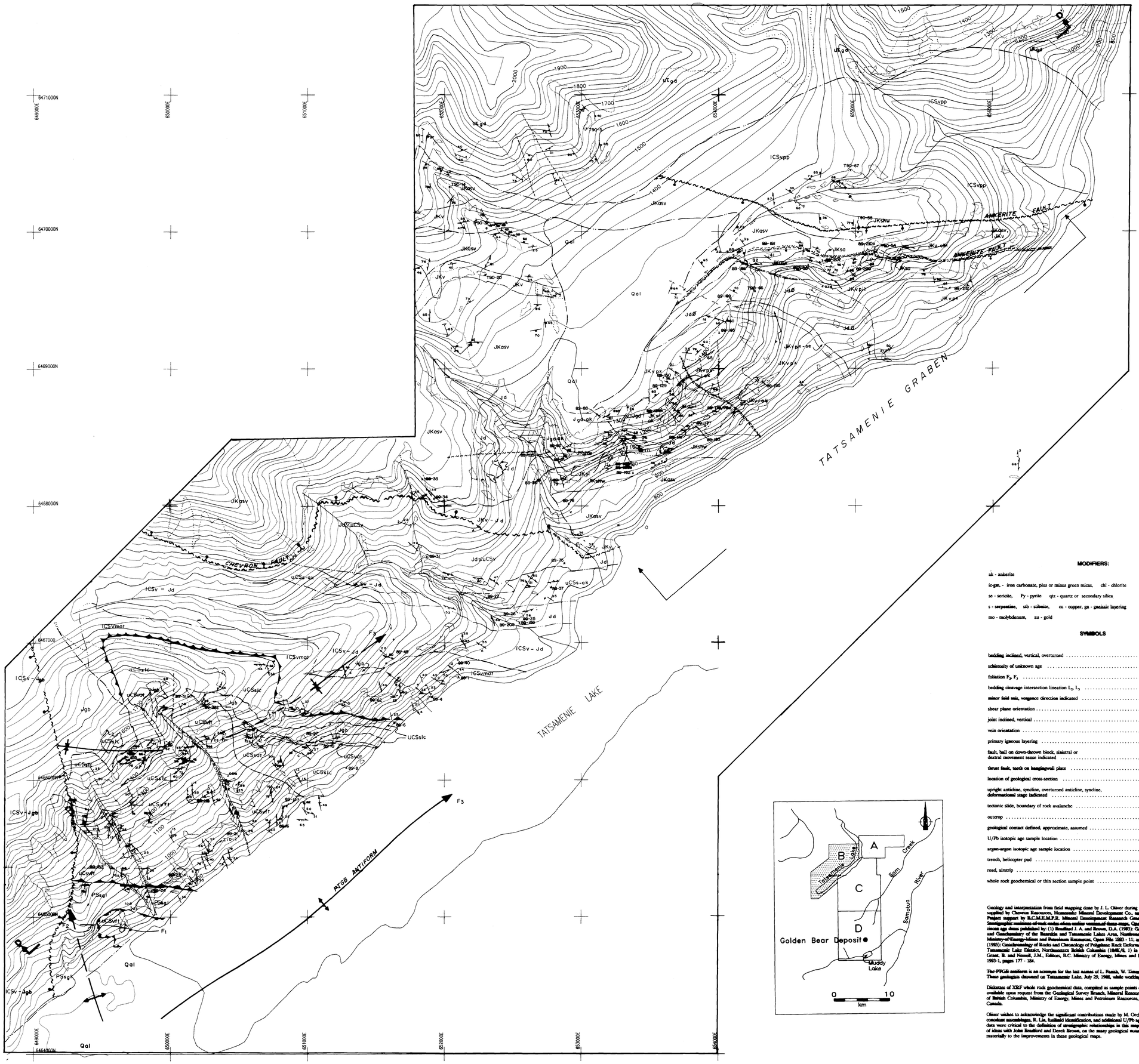
**Jd** Massive, to weakly foliated, hornblende and plagioclase rich diorites.

**JTdgb** Compositionally layered, to moderately foliated diorites and gabbroic intrusions. Gneissic textures locally developed.

### UPPER TRIASSIC

**uTgd** Pale pink-cream to cream-buff weathering, medium to coarse grained, granodiorite intrusions.

ak = ankeritic se = sericite







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1895 - 1995 100 YEARS OF GEOLOGICAL SURVEYING

Geological Survey Branch

**OPEN FILE 1995-21**

Sheet B of 4

# GEOLOGY OF THE MUDDY LAKE, TATSAMENIE LAKE DISTRICT, NORTHWESTERN B. C.

**NTS 104K/1 and 104K/8**

**By Jim L. Oliver**

0 1
Kilometre

## LEGEND

### SUPRACRUSTAL ROCKS
### QUATERNARY

| | |
|---|---|
| Qal | Unconsolidated glacial drift and alluvium. |

### MIOCENE

| | |
|---|---|
| Mvob | Pillowed and columnar jointed olivine basalt flows. |

### JURASSIC - CRETACEOUS
(highly altered, non-foliated rocks of poorly constrained age, inklin?)

| | |
|---|---|
| JKshw | Buff to orange red weathering, strong ankeritic, heterolithic lithic wackes and lesser, thin limestone interbeds. |
| JKsl | Medium to dark grey, well bedded, clastic rich limestones. |
| JKvpil | Pillow basalts, non-foliated. |
| JKpvyx | Pyroxene rich mafic flows, non-foliated. |
| JKsa | Interbedded argillites and ankeritic clastic rocks. |
| JKasv | Strongly carbonitized, ankeritic mafic volcanic and sedimentary rocks, lacking primary textural preservation. |
| JKv | Undifferentiated mafic volcanics. |

### TRIASSIC, STUHINI (?)
(narrow, fault bounded, sedimentary wedges)

| | |
|---|---|
| lmTsa | Thin bedded argillites, sheared, and commonly ankeritic. |
| lmTsak | Interbedded argillites, minor chert and dull grey, thin bedded limestones. |
| lmTsavc | Well bedded, dark grey-green mafic volcaniclastic sediments with interbeds of argillite. |

### PALEOZOIC, STIKINE ASSEMBLAGE
### PERMIAN

| | |
|---|---|
| PSsbch | Black, well bedded chert. |
| PSsch | White, poorly bedded chert, may contain discontinuous dolomitic interbeds. |
| PSscd | Pale buff-cream, to pink-cream, cherty dolomites, locally thin bedded, or with irregular silica mesh textures. |
| PSsca | Calcareous argillite, fine grained black clastics, with lesser calcareous interbeds. |
| PSssd | Siliceous dolomites, light grey to buff dolomitic limestone containing minor amorphous dark blue-grey to black cherty inclusions. |
| PSsbcd | Crinoidal debris stones and dolostones, buff weathering thin bedded. |
| PSsgl | Limestone, massive, thick bedded, light grey limestone. |

### UPPER CARBONIFEROUS

| | |
|---|---|
| uCSvat | Calcareous, actinolite porphyroblastic, strongly foliated, mafic volcanics, likely of tuffaceous origin. |
| uCSvqe | Quartz eye porphyroblastic tuffaceous volcanic rocks. |
| uCSvf1 | Fine grained felsic volcanic ash and dust tuffs, strongly foliated and re-crystallized. |
| uCSvsp | Siliceous phyllites, fine grained, moderately bedded buff-weathering siliceous phyllites of volcanic origin. May contain chloritic foliation surfaces. |
| uCSslc | Buff-weathering limestones and intercalated fine grained clastic sediments. Clastic sediments may exceed 50% of the rock interval. |
| uCSsl | Cream to buff-weathering limestones. Weak clastic component. |
| uCSv | Undifferentiated volcanic rocks. |
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### LOWER CARBONIFEROUS

| | |
|---|---|
| lCSvpil | Pillowed mafic flows, foliated and actinolite porphyroblastic. |
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| lCSsl | Intravolcanic white to cream limestone. |
| lCSvmat | Bedded, fine grained mafic tuffs, crystal tuffs with minor limestone and felsic ash interbeds. |
| lCSv | Undifferentiated volcanic rocks. |

### INTRUSIVE ROCKS
### TERTIARY

| | |
|---|---|
| Tdd | Diabase dykes, fine grained dark green black dykes. |
| Trd | Rhyolite dykes, cream weathering, aphanitic to sparsely quartz eye porphyritic felsic dykes. |

### TERTIARY AND CRETACEOUS

| | |
|---|---|
| KTqfp | Quartz feldspar porphyritic dykes, light grey, feldspar, biotite and quartz porphyritic dykes. |
| KTapg | Pegmatitic, orange weathering, sodium and potassium feldspar rich granitic dykes. |

### JURASSIC to TRIASSIC
(intrusive rocks of poorly constrained age)

| | |
|---|---|
| Jgb | Gabbro, massive to weakly foliated, green black, medium grained, pyroxene and magnetite rich intrusions. |
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| Jdø | Strongly feldspar porphyritic, hornblende diorite dykes and stocks. |
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| JTdgb | Compositionally layered, to moderately foliated diorites and gabbroic intrusions. Gneissic textures locally developed. |

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### SYMBOLS

bedding inclined, vertical, overturned
schistosity of unknown age
foliation $F_2$, $F_3$
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minor fold axis, vergence direction indicated
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fault, ball on down-thrown block, sinistral or dextral movement sense indicated
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location of geological cross-section
upright anticline, syncline, overturned anticline, syncline, deformational stage indicated
tectonic slide, boundary of rock avalanche — RAV
outcrop
geological contact defined, approximate, assumed
U/Pb isotopic age sample location — ZID-2, 2 BCGS
argon-argon isotopic age sample location — Ar/Ar
trench, helicopter pad
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whole rock geochemical or thin section sample point — 89-251

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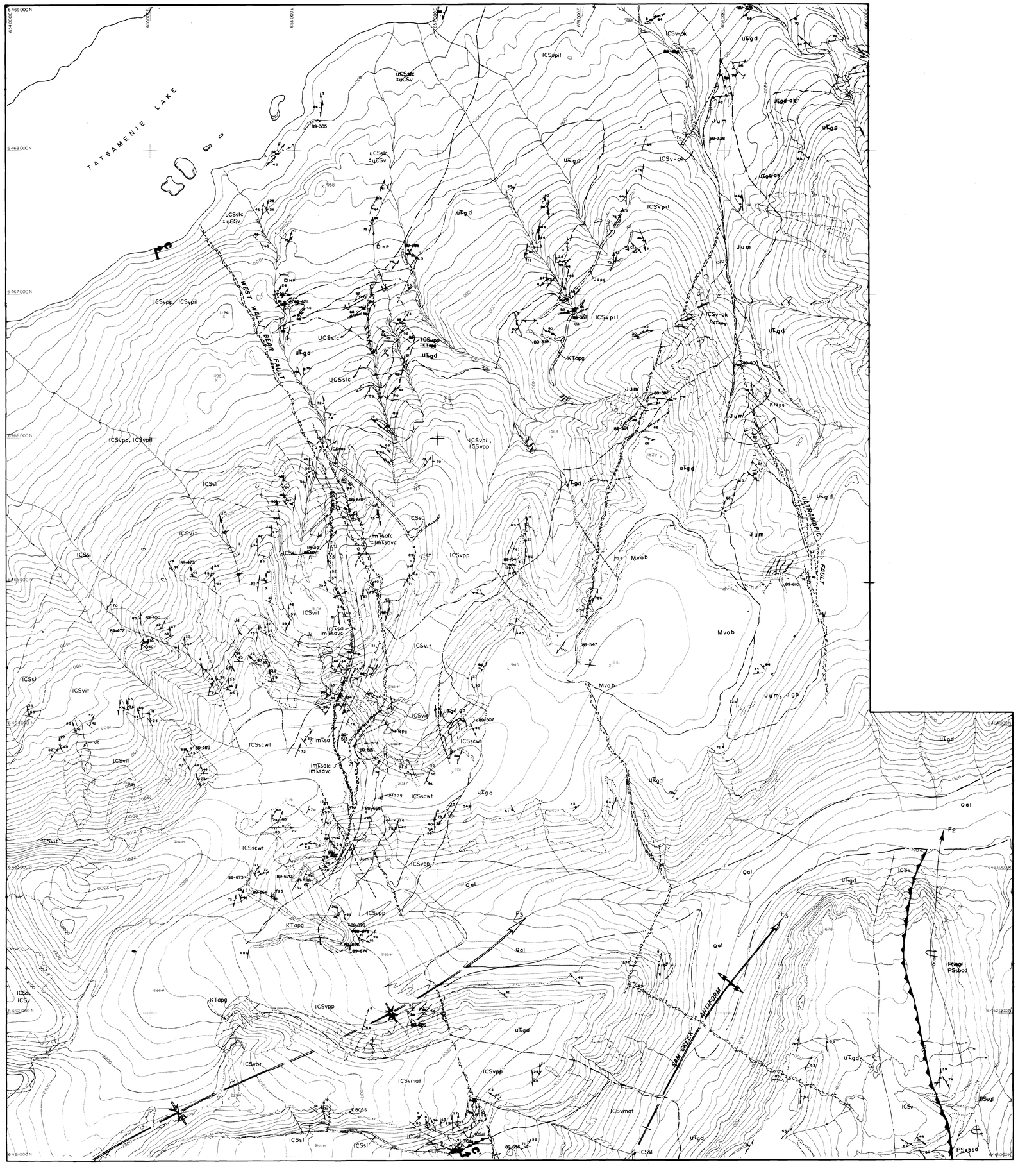


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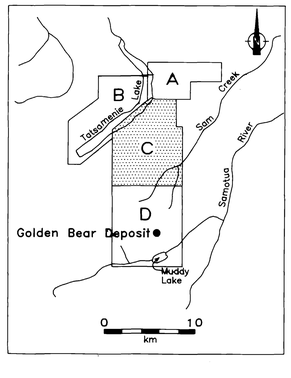


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WORLD CELEBRATION

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**OPEN FILE 1995-21**

Sheet C of 4

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**NTS 104K/1 and 104K/8**

**By Jim L. Oliver**

0 — 1 Kilometre

## LEGEND

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### QUATERNARY

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### LOWER CARBONIFEROUS

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### INTRUSIVE ROCKS
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(intrusive rocks of poorly constrained age)

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**JTdgb** Compositionally layered, to moderately foliated diorites and gabbroic intrusions. Gneissic textures locally developed.

### UPPER TRIASSIC

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Sheet D of 4


# GEOLOGY OF THE MUDDY LAKE, TATSAMENIE LAKE DISTRICT, NORTHWESTERN B. C.

**NTS 104K/1 and 104K/8**


**By Jim L. Oliver**


0 — 1
Kilometre

## LEGEND

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### QUATERNARY

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### JURASSIC - CRETACEOUS

(highly altered, non-foliated rocks of poorly constrained age, inkin?)

**JKshw** — Buff to orange red weathering, strong ankeritic, heterolithic lithic wackes and lesser, thin limestone interbeds.

**JKsl** — Medium to dark grey, well bedded, clastic rich limestones.

**JKvpil** — Pillow basalts, non-foliated.

**JKpvyx** — Pyroxene rich mafic flows, non-foliated.

**JKsa** — Interbedded argillites and ankeritic clastic rocks.

**JKasv** — Strongly carbonitized, ankeritic mafic volcanic and sedimentary rocks, lacking primary textural preservation.

**JKv** — Undifferentiated mafic volcanics.

### TRIASSIC, STUHINI (?)

(narrow, fault bounded, sedimentary wedges)

**lmTsa** — Thin bedded argillites, sheared, and commonly ankeritic.

**lmTsalc** — Interbedded argillites, minor chert and dull grey, thin bedded limestones.

**lmTsavc** — Well bedded, dark grey–green mafic volcaniclastic sediments with interbeds of argillite.

### PALEOZOIC, STIKINE ASSEMBLAGE
### PERMIAN

**PSsbch** — Black, well bedded chert.

**PSsch** — White, poorly bedded chert, may contain discontinuous dolomitic interbeds.

**PSscd** — Pale buff–cream, to pink–cream, cherty dolomites, locally thin bedded, or with irregular silica mesh textures.

**PSsca** — Calcareous argillite, fine grained black clastics, with lesser calcareous interbeds.

**PSssd** — Siliceous dolomites, light grey to buff dolomitic limestone containing minor amorphous dark blue–grey to black cherty inclusions.

**PSsbcd** — Crinoidal debris stones and dolostones, buff weathering thin bedded.

**PSsgl** — Limestone, massive, thick bedded, light grey limestone.

### UPPER CARBONIFEROUS

**uCSvat** — Calcareous, actinolite porphyroblastic, strongly foliated, mafic volcanics, likely of tuffaceous origin.

**uCSvqe** — Quartz eye porphyroblastic tuffaceous volcanic rocks.

**uCSvft** — Fine grained felsic volcanic ash and dust tuffs, strongly foliated and re–crystallized.

**uCSvsp** — Siliceous phyllites, fine grained, moderately bedded buff–weathering siliceous phyllites of volcanic origin. May contain chloritic foliation surfaces.

**uCSslc** — Buff–weathering limestones and intercalated fine grained clastic sediments. Clastic sediments may exceed 50% of the rock interval.

**uCSsl** — Cream to buff–weathering limestones. Weak clastic component.

**uCSv** — Undifferentiated volcanic rocks.

**uCSs** — Undifferentiated sedimentary rocks.

### LOWER CARBONIFEROUS

**lCSvpil** — Pillowed mafic flows, foliated and actinolite porphyroblastic.

**lCSvit** — Well bedded, actinolite, plagioclase and quartz rich intermediate tuffaceous volcanics, strongly foliated.

**lCSswt** — Well bedded calcareous wackes, minor chert interbeds, and mafic tuffs, strongly foliated.

**lCSssc** — Argillites and fine grained clastic sediments.

**lCSsch** — Cream to black chert.

**lCSvpp** — Foliated plagioclase and pyroxene porphyritic flows and tuffaceous mafic volcanics. Flow members are massive and lack preserved pillow structures.

**lCSsl** — Intravolcanic white to cream limestone.

**lCSvmat** — Bedded, fine grained mafic tuffs, crystal tuffs with minor limestone and felsic ash interbeds.

**lCSv** — Undifferentiated volcanic rocks.

### INTRUSIVE ROCKS
### TERTIARY

**Tdd** — Diabase dykes, fine grained dark green black dykes.

**Trd** — Rhyolite dykes, cream weathering, aphanitic to sparsely quartz eye porphyritic felsic dykes.

### TERTIARY AND CRETACEOUS

**KTqfp** — Quartz feldspar porphyritic dykes, light grey, feldspar, biotite and quartz porphyritic dykes.

**KTqpg** — Pegmatitic, orange weathering, sodium and potassium feldspar rich granitic dykes.

### JURASSIC to TRIASSIC

(intrusive rocks of poorly constrained age)

**Jgb** — Gabbro, massive to weakly foliated, green black, medium grained, pyroxene and magnetite rich intrusions.

**Jum** — Ultramafic, magnetite, clinopyroxene and lesser olivine, phyric intrusions: heavily serpentized (Jums) along major fault zones.

**Jdø** — Strongly feldspar porphyritic, hornblende diorite dykes and stocks.

**Jd** — Massive, to weakly foliated, hornblende and plagioclase rich diorites.

**JTdgb** — Compositionally layered, to moderately foliated diorites and gabbroic intrusions. Gneissic textures locally developed.

### UPPER TRIASSIC

**uTgd** — Pale pink–cream to cream–buff weathering, medium to coarse grained, granodiorite intrusions.

ak = ankeritic  se = sericite

### MODIFIERS:

ak - ankerite

ic-gm, - iron carbonate, plus or minus green micas, chl - chlorite

se - sericite, Py - pyrite qtz - quartz or secondary silica

s - serpentine, stb - stibnite, cu - copper, gn - gneissic layering

mo - molybdenum, au - gold

### SYMBOLS

bedding inclined, vertical, overturned

schistosity of unknown age

foliation $F_2$, $F_3$

bedding cleavage intersection lineation $L_2$, $L_3$

minor fold axis, vergence direction indicated

shear plane orientation

joint inclined, vertical

vein orientation

primary igneous layering

fault, ball on down-thrown block, sinistral or dextral movement sense indicated

thrust fault, teeth on hangingwall plate

location of geological cross-section

upright anticline, syncline, overturned anticline, syncline, deformational stage indicated

tectonic slide, boundary of rock avalanche — RAV

outcrop

geological contact defined, approximate, assumed

U/Pb isotopic age sample location — ZIO-2, # BC05

argon-argon isotopic age sample location — Ar/Ar

trench, helicopter pad

road, airstrip

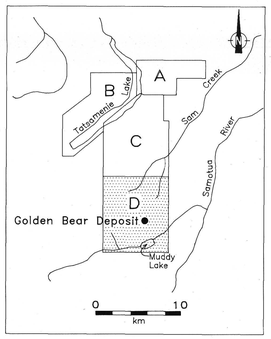
whole rock geochemical or thin section sample point — 89-251

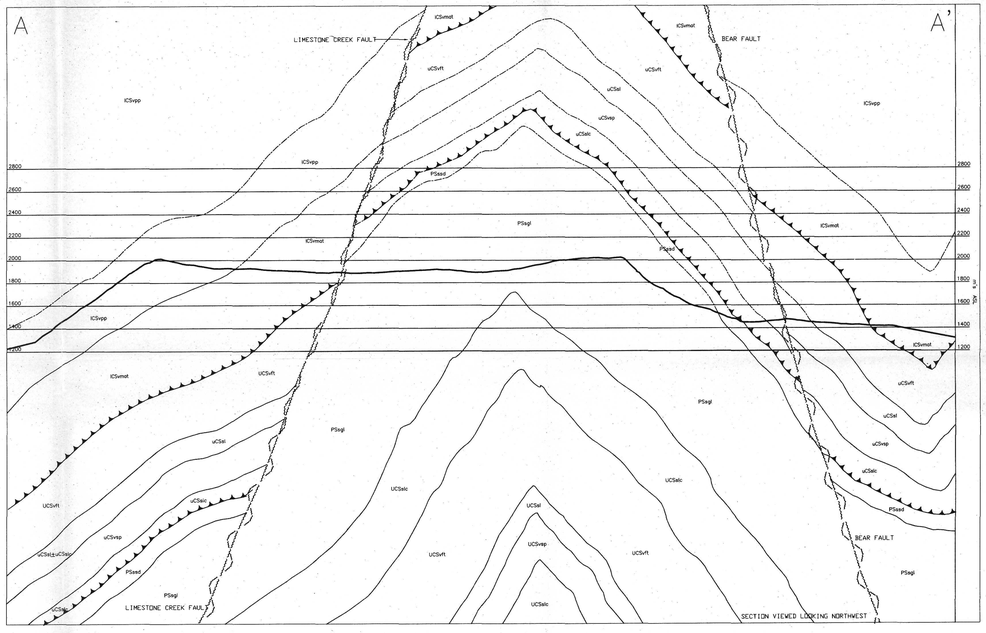
Geology and interpretation from field mapping done by J. L. Oliver during 1988, 1989, 1990. Base maps supplied by Chevron Resources, Homestake Mineral Development Co., and Waterford Resources Inc. Project support by B.C.M.E.M.P.R. Mineral Development Research Grants during 1988, 1989, 1991. Stratigraphic revisions of rock codes of an earlier version of these maps, Open File 1993-11, are based on zircon age dates published by: (1) Bradford J. A. and Brown, D.A. (1993): Geology, Mineral Occurrences and Geochemistry of the Bearskin and Tatsamenie Lakes Area, Northwestern British Columbia; B.C. Ministry of Energy Mines and Petroleum Resources, Open File 1993 - 11; and (2) Oliver and Gabites, J. (1993): Geochronology of Rocks and Chronology of Polyphase Rock Deformation, Bearskin (Muddy) and Tatsamenie Lake District, Northwestern British Columbia (104K/8, 1) in Geological Fieldwork 1992, Grant, B. and Newell, J.M., Editors, B.C. Ministry of Energy, Mines and Petroleum Resources, Paper 1993-1, pages 177 - 184.

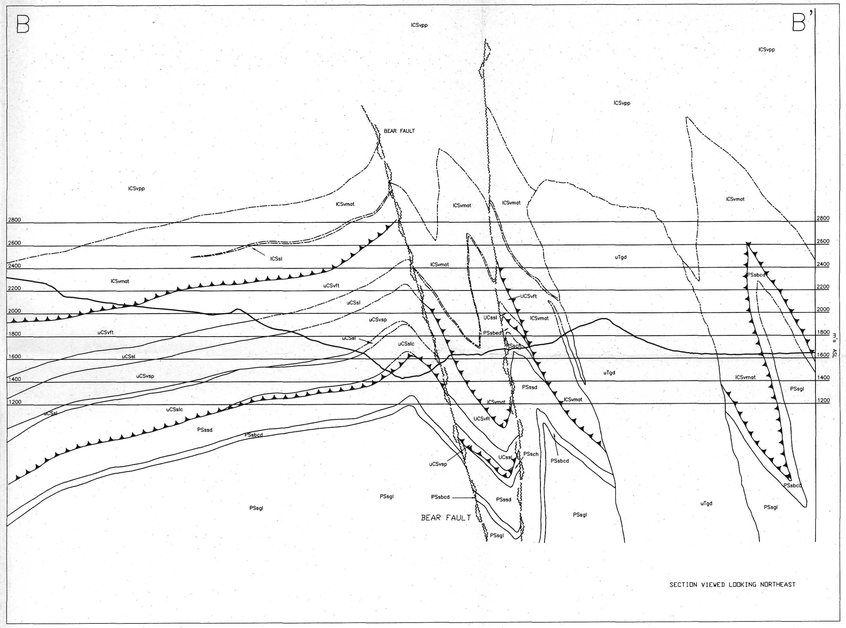
The PTGB antiform is an acronym for the last names of L. Parish, W. Timmins, S. Guest and A. Brandt. These geologists drowned on Tatsamenie Lake, July 29, 1988, while working in mineral exploration.

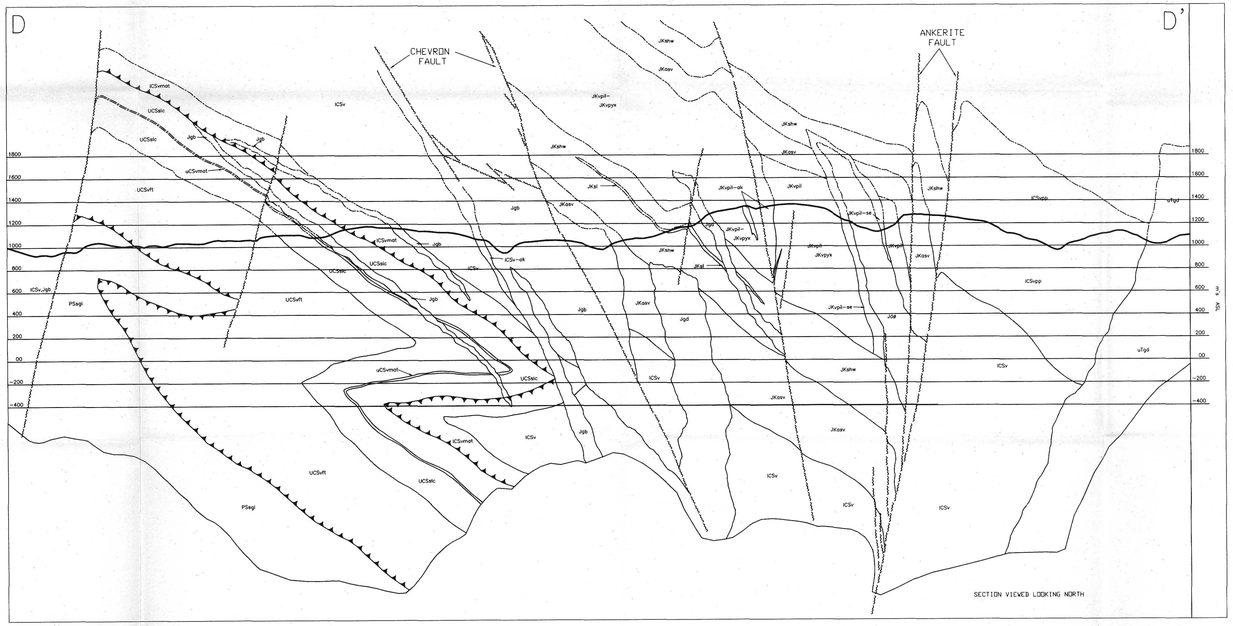
Diskettes of XRF whole rock geochemical data, compiled as sample points on these open file maps, are available upon request from the Geological Survey Branch, Mineral Resources Division of the Province of British Columbia, Ministry of Energy, Mines and Petroleum Resources, Victoria, British Columbia, Canada.


Oliver wishes to acknowledge the significant contributions made by M. Orchard, in the identification of conodont assemblages, R. Lin, fusilinid identification, and additional U/Pb ages by W. McClelland. These data were critical to the definition of stratigraphic relationships in this map area. Productive exchanges of ideas with John Bradford and Derek Brown, on the many geological nuances of this area, contributed materially to the improvements in these geological maps.






BC Ministry of Energy, Mines and Petroleum Resources

1895 - 1995 100 YEARS OF GEOLOGICAL SURVEYING

Geological Survey Branch

**OPEN FILE 1995-21**

CROSS SECTIONS

# GEOLOGY OF THE MUDDY LAKE, TATSAMENIE LAKE DISTRICT, NORTHWESTERN B. C.

**NTS 104K/1 and 104K/8**

**By Jim L. Oliver**

0 — 3 Kilometre

## LEGEND

### SUPRACRUSTAL ROCKS
### QUATERNARY

| | |
|---|---|
| Qal | Unconsolidated glacial drift and alluvium. |

### MIOCENE

| | |
|---|---|
| Mvcb | Pillowed and columnar jointed olivine basalt flows. |

### JURASSIC - CRETACEOUS
(highly altered, non-foliated rocks of poorly constrained age, Inklin?)

| | |
|---|---|
| JKsfw | Buff to orange red weathering, strong ankeritic, heterolithic lithic wackes and lesser, thin limestone interbeds. |
| JKsl | Medium to dark grey, well bedded, clastic rich limestones. |
| JKvpl | Pillow basalts, non-foliated. |
| JKpyx | Pyroxene rich mafic flows, non-foliated. |
| JKss | Interbedded argillites and ankeritic clastic rocks. |
| JKcsv | Strongly carbonitized, ankeritic mafic volcanic and sedimentary rocks, lacking primary textural preservation. |
| JKv | Undifferentiated mafic volcanics. |

### TRIASSIC, STUHINI (?)
(narrow, fault bounded, sedimentary wedges)

| | |
|---|---|
| TrsTss | Thin bedded argillites, sheared, and commonly ankeritic. |
| TrsTslc | Interbedded argillites, minor chert and dull grey, thin bedded limestones. |
| TrsTscv | Well bedded, dark gray–green mafic volcaniclastic sediments with interbeds of argillite. |

### PALEOZOIC, STIKINE ASSEMBLAGE
### PERMIAN

| | |
|---|---|
| PSsbch | Black, well bedded chert. |
| PSsch | White, poorly bedded chert, may contain discontinuous dolomitic interbeds. |
| PSscd | Pale buff–cream, to pink–cream, cherty dolomites, locally thin bedded, or with irregular silica mesh textures. |
| PSsca | Calcareous argillite, fine grained black clastics, with lesser calcareous interbeds. |
| PSssd | Siliceous dolomites, light grey to buff dolomitic limestone containing minor amorphous dark blue–grey to black cherty inclusions. |
| PSsbcd | Crinoidal debris stones and dolostones, buff weathering thin bedded. |
| PSsgl | Limestone, massive, thick bedded, light grey limestone. |

### UPPER CARBONIFEROUS

| | |
|---|---|
| uCSvpt | Calcareous, actinolite porphyroblastic, strongly foliated, mafic volcanics, likely of tuffaceous origin. |
| uCSvpq | Quartz eye porphyroblastic tuffaceous volcanic rocks. |
| uCSvft | Fine grained felsic volcanic ash and dust tuffs, strongly foliated and re–crystallized. |
| uCSvsg | Siliceous phyllites, fine grained, moderately bedded buff–weathering siliceous phyllites of volcanic origin. May contain chloritic foliation surfaces. |
| uCSslc | Buff–weathering limestones and intercalated fine grained clastic sediments. Clastic sediments may exceed 50% of the rock interval. |
| uCSsl | Cream to buff–weathering limestones. Weak clastic component. |
| uCSv | Undifferentiated volcanic rocks. |
| uCSs | Undifferentiated sedimentary rocks. |

### LOWER CARBONIFEROUS

| | |
|---|---|
| lCSvpl | Pillowed mafic flows, foliated and actinolite porphyroblastic. |
| lCSvt | Well bedded, actinolite, plagioclase and quartz rich intermediate tuffaceous volcanics, strongly foliated. |
| lCSscwt | Well bedded calcareous wackes, minor chert interbeds, and mafic tuffs, strongly foliated. |
| lCSsscl | Argillites and fine grained clastic sediments. |
| lCSsch | Cream to black chert. |
| lCSvpp | Foliated plagioclase and pyroxene porphyritic flows and tuffaceous mafic volcanics. Flow members are massive and lack preserved pillow structures. |
| lCSsl | Intravolcanic white to cream limestone. |
| lCSvmat | Bedded, fine grained mafic tuffs, crystal tuffs with minor limestone and felsic ash interbeds. |
| lCSv | Undifferentiated volcanic rocks. |

### INTRUSIVE ROCKS
### TERTIARY

| | |
|---|---|
| Tdd | Diabase dykes, fine grained dark green black dykes. |
| Trd | Rhyolite dykes, cream weathering, aphanitic to sparsely quartz eye porphyritic felsic dykes. |

### TERTIARY AND CRETACEOUS

| | |
|---|---|
| KTqfp | Quartz feldspar porphyritic dykes, light grey, feldspar, biotite and quartz porphyritic dykes. |
| KTpgq | Pegmatitic, orange weathering, sodium and potassium feldspar rich granitic dykes. |

### JURASSIC to TRIASSIC
(intrusive rocks of poorly constrained age)

| | |
|---|---|
| JTgb | Gabbro, massive to weakly foliated, green black, medium grained, pyroxene and magnetite rich intrusions. |
| JTum | Ultramafic, magnetite, clinopyroxene and lesser olivine, phyric intrusions: heavily serpentinized (Jum's) along major fault zones. |
| JTdd | Strongly feldspar porphyritic, hornblende diorite dykes and stocks. |
| JTd | Massive, to weakly foliated, hornblende and plagioclase rich diorites. |
| JTdgb | Compositionally layered, to moderately foliated diorites and gabbroic intrusions. Gneissic textures locally developed. |

### UPPER TRIASSIC

| | |
|---|---|
| uTgd | Pale pink–cream to cream–buff weathering, medium to coarse grained, granodiorite intrusions. |

ak = ankeritic  se = sericite

D:\TECKLA-AMONO Tue Mar 28 14:46:37 1995