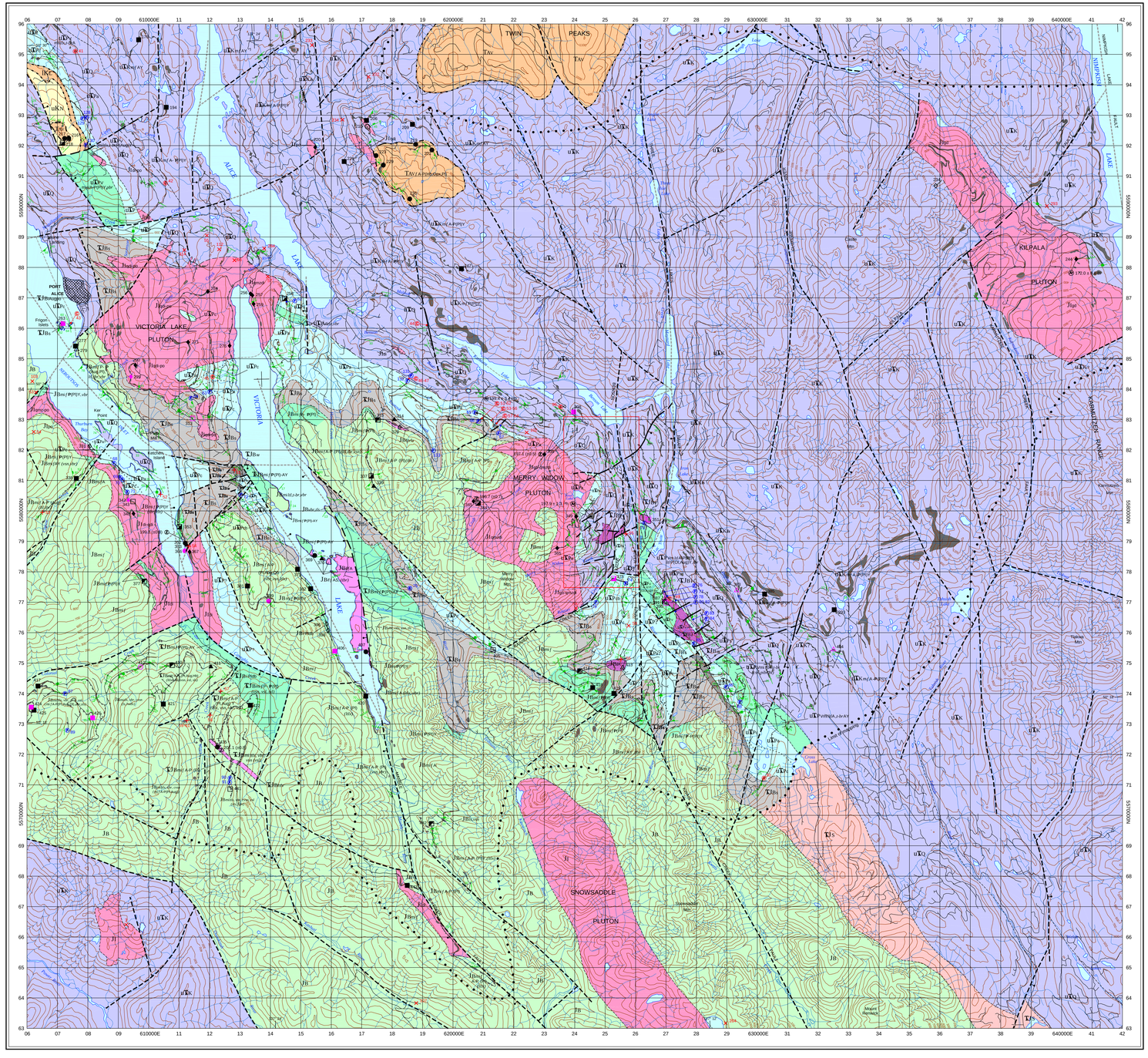


DRAFT COPY

Geological Survey Branch

GEOSCIENCE MAP 2000 - 7

GEOLOGY OF THE ALICE LAKE MAP AREA, NORTHERN VANCOUVER ISLAND

NTS 92L/6

G. T. NIXON, G. J. PAYIE, L. D. SNYDER, S. LONG, A. FINNIE, R. M. FRIEDMAN, D. A. ARCHIBALD, M. J. ORCHARD, T. TOZER, T. P. POULTON and J. W. HAGGART

GEOLOGY by G. T. NIXON, G. J. PAYIE and L. D. SNYDER (B. C. Geological Survey) S. LONG and A. FINNIE (University of Plymouth)

PALEONTOLOGY by M. J. ORCHARD, T. TOZER, T. P. POULTON and J. W. HAGGART (Geological Survey of Canada)

GEOCHRONOLOGY by R. M. FRIEDMAN (The University of British Columbia) D. A. ARCHIBALD (Queen's University)

SCALE 1 : 50 000

1 0 1 2 3 4

Kilometres

LAYERED ROCKS

TERTIARY

NEOGENE

ALERT BAY VOLCANICS

TAv — Basaltic to rhyolitic, aphanitic to porphyritic flows, flow domes and volcanic breccia and minor volcanic conglomerate (see table of abbreviations and nomenclature).

UPPER CRETACEOUS

CAMPANIAN TO 7MAASTRICHTIAN

NANAIMO GROUP EQUIVALENTS

uKN — Medium to coarse-grained arkosic to lithic wacke, pebble to cobble conglomerate, siltstone and minor coal. Locally fossiliferous.

LOWER CRETACEOUS

LATE VALANGINIAN TO BARREMIAN

LONGARM FORMATION EQUIVALENTS

lKL — Thinly bedded to massive sandstone, siltstone, mudstone and pebble conglomerate and minor coal.

UPPER TRIASSIC TO MIDDLE JURASSIC

BONANZA GROUP

HETTANGIAN (?RHAETIAN in part) TO MID-BAJOCIAN

"BONANZA VOLCANICS"

JB / TJB — JB basaltic to rhyolitic, predominantly subaerial lavas and pyroclastic rocks locally intercalated with marine to non-marine, coarse to fine-grained pyroclastic, epiclastic and sedimentary rocks. Subdivided according to composition and lithology (see table of abbreviations and nomenclature).

TJB, lithologies are probably ***Rhaetian Hettangian***

JBuf/JBsf — Predominantly felsic lavas and/or pyroclastic rocks or intermediate to felsic lavas and/or pyroclastic rocks.

HETTANGIAN (?RHAETIAN in part)

JBm/P(P) — Plagioclase-megacrystic basaltic lavas locally intercalated with, and laterally equivalent to, aphanitic flows near the base of the "Bonanza Volcanics".

RHAETIAN TO HETTANGIAN (?SINEMURIAN)

UNNAMED VOLCANICLASTIC-SEDIMENTARY STRATA

TJBs — Undivided sedimentary and volcaniclastic strata (predominantly submarine): grey-green, thin to very thickly bedded, calcareous to non-calcareous, intercalated volcanic breccia, sandstone, and siltstone, impure limestone, mafic to intermediate lithic-crystal tuff and reworked equivalents, and minor felsic lithic-crystal-vitric tuff, feldspathic wacke, shale and volcaniclastic debris-flow breccia.

TJBw — Medium grey-green, medium to coarse-grained, laminated to very thickly bedded, plagioclase-rich lithic wacke and minor pebbly sandstone, locally graded and cross-bedded, and channel-fill mass-flow breccia with rip-up clasts.

(LATE) LOWER NORIAN TO RHAETIAN

PARSON BAY FORMATION

uTKP — Undivided thin to medium bedded impure limestone, calcareous to non-calcareous mudstone, siltstone, and shale intercalated with fine-grained volcaniclastic rocks including tuff and debris-flow breccia.

uTKPc — Calcareous facies: medium to dark grey, laminated to medium bedded impure lime mudstone, calcareous to non-calcareous siltstone and mudstone with minor shale. Locally contains colonial coral horizons and thin interbeds of crystal-lithic wacke.

uTKPcb — Carbonaceous facies: black to dark grey, carbon-rich lithologies of the calcareous facies.

uTKPa — Arenaceous facies: grey-green, calcareous to non-calcareous volcanic sandstone and siltstone, mudstone and shale interbedded with variable proportions of impure limestone. Locally contains vitric, lithic and crystal tuff or reworked equivalents, volcaniclastic debris-flow breccia, and minor pebbly sandstone and conglomerate.

uTKPV — Volcanic rocks: predominantly basaltic lithic tuff and tuff-breccia of phreatomagmatic origin, lesser pillow lava, hyaloclastite, and interbedded water-washed equivalents (see table of abbreviations and nomenclature).

uTKPs — Siliciclastic facies: dark grey to grey-green, predominantly non-calcareous, laminated to medium-bedded shale, mudstone, siltstone, sandstone and minor thin impure limestone; locally contains volcaniclastic debris-flow breccia with limestone clasts.

LOWER NORIAN TO HETTANGIAN OR SINEMURIAN)

TJs — Undivided strata of the Parson Bay Formation and overlying unnamed sedimentary and volcaniclastic rocks of the Bonanza Group outside the limit of mapping.

UPPER TRIASSIC

VANCOUVER GROUP

CARNIAN TO (LATE) LOWER NORIAN

QUATSINO FORMATION

uTKQ — Thinly bedded to massive lime mudstone; silica replacements common and rare chert nodules; rare laminated interbeds and oolitic layers; locally fossiliferous.

CARNIAN

KARMUTSEN FORMATION

uTKk / uTKKa — uTKk aphanitic to coarsely plagioclase-phyric, commonly amygdaloidal, subaerial basaltic lava flows with minor pillow basalt, pillow breccia and hyaloclastite (see table of abbreviations and nomenclature).

uTKKa thin horizons of pale grey limestone intercalated with Karmutsen basalt near the top of the succession.

INTRUSIVE ROCKS

EARLY TO MIDDLE JURASSIC

ISLAND PLUTONIC SUITE

JI — Medium to coarse-grained, equigranular granitoid rocks and porphyry; includes hornblende ± biotite-bearing gabbro (gb), diorite (di), quartz diorite (qdi), quartz monzodiorite (qmzdi), granodiorite (gd), and plagioclase hornblende and hornblende porphyry (po).

MINOR INTRUSIONS

JBu / TJBu — JBu subvolcanic aphanitic to porphyritic basaltic intrusions, locally columnar jointed or weakly layered; A, aphanitic, Augpo, augite porphyry; PlPo, coarsely plagioclase-phyric diabase, equivalent to plagioclase-megacrystic lavas occuring near the base of the "Bonanza Volcanics".

TJBu subvolcanic intrusions inferred to be ***Late Triassic*** or ***Early to Middle Jurassic*** in age.

ABBREVIATIONS AND NOMENCLATURE FOR VOLCANIC AND SEDIMENTARY ROCKS

JBxD — where x is composition, is lithology, and des/D is other descriptors listed below

JB — where undivided

Composition:

m mafic (basaltic)
i intermediate (andesitic)
f felsic (rhyolitic-rhyodacitic-dacitic)

A compositional range is compounded (e.g. , mafic to intermediate)

Epiclastic*		Pyroclastic		Other**	
Lithology:					
br	breccia	*pbr*	pyroclastic breccia	*f*	lava flow (includes flow breccia)
cg	conglomerate	*t-br*	tuff-breccia		
sn	sandstone	*lt*	lapilli-tuff	*pi*	pillow lava
sl	siltstone	*t*	tuff	*pbr*	pillow breccia
sh	shale				
md	mudstone				
ls	limestone				

Descriptors:

Prefixes:

v	volcanic [1]	*w*	welded	*h*	hyaloclastite
t	tuffaceous [2]				
s	silty / sandy				
a	argillaceous				
l	laharic				
c	calcareous				
d	debris flow				

Suffixes:

v	vitric			*Y*	amygdaloidal
c	crystal			*S*	laminar flowage structures [3]
l	lithic			*A*	aphanitic / fine-grained (<1mm)
				P	porphyritic (1-5mm)
				P	megacrystic (>5mm<15mm)
				Pl	plagioclase
				Aug	high-Ca clinopyroxene
				Ol	olivine
				Opx	orthopyroxene
				Hb	hornblende

Volcaniclastic nomenclature after Cass and Wright (1988)

* volcanic and/or nonvolcanic constituents ** includes autoclastic and quench-fragmented products

1 pyroclastic or epiclastic (non-genetic) 2 mixed epiclastic/pyroclastic (tuffites) 3 includes flow folds

(*xx, xbr*) parentheses denote minor lithologies

WHOLE - ROCK GEOCHEMISTRY LEGEND

Classification SiO_2 (wt %)	Basalt ≤53	Basaltic andesite >53 ≤57	Andesite >57 ≤63	Dacite/ Rhyodacite/ Rhyolite >63
Stratigraphy				
Least altered	■	◪	▲	●
Alkali metasomatized	■	◪	▲	●
Severely altered	■	◪	▲	●
Minor Intrusions				
Least altered	□	◪	△	○
Alkali metasomatized	□	◪	△	○
Severely altered	□	◪		

Island Plutonic Suite Class	Major Intrusion	Minor Intrusion
Least altered	◆	◇
Alkali metasomatized	◆	◇

References (for geology compiled outside the limit of mapping):

Roddick, J. A., and Muller, J. E. (1983): Geology Alert Bay - Cape Scott, British Columbia; *Geological Survey of Canada*Map 1552A.

Massey, N. W. D., Desjardins, P. J. and Grunsky, E. C. (1994): Geological Compilation, Vancouver Island, British Columbia (92B,C,E,F,G,K,L; 102I); *B.C. Ministry of Energy, Mines and Petroleum Resources* Open File 1994-6.

Base Map Information:

Base map has been produced from digital TRIM (Terrain Resource Inventory Management) 1:20 000 topographic database provided by the British Columbia Ministry of Environment, Lands and Parks.

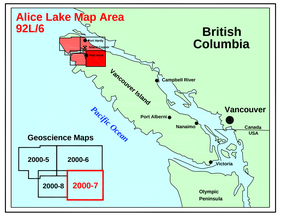
North American Datum (NAD) 1983. Universal Transverse Mercator Projection (Zone 9). Elevation in metres above mean sea level.

Recommended Citation:

Nixon, G. T., Payie, G. J., Snyder, L. D., Long, S., Finnie, A., Friedman, R. M., Archibald, D. A., Orchard, M. J., Tozer, T., Poulton, T. P. and Haggart, J. W. (2000): Geology of the Alice Lake Map Area, Northern Vancouver Island; *B.C. Ministry of Energy and Mines*Geoscience Map 2000-7.

Digital Cartography: Mainly by J. L. Armitage.

LOCATION MAP



MAP SYMBOLS

Geological contact:
- defined
- approximate
- inferred
- hidden
- facies boundary, inferred
- trace of thin stratigraphic unit

Unconformity:
- approximate
- inferred

High-angle fault (ball on downthrown side if known)
- defined
- approximate
- inferred
- hidden

Limit of mapping

Bedding (facing known: inclined)

Bedding (facing unknown: inclined)

Primary flowage structures in volcanic rocks (inclined)

Stylolite orientation

Dike (inclined, vertical,Tertiary)

Minor fault (inclined, vertical, with plunge and trend of slickenside striations)

Plunge and trend of minor fold axes (vergence unknown)

MINFILE locality (092L 010; Table 1)

Lithogeochemical assay locality (Table 2)

Macrofossil locality (Tables 3, 4)

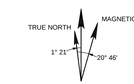
Conodont locality (Tables 5, 6)

U-Pb Zircon date (Ma ± 2σ; Table 8)

Ar^{39} - Ar^{40} mineral date (Ma ± 2σ ; Hb, hornblende; Ph, phlogopite; Table 9)

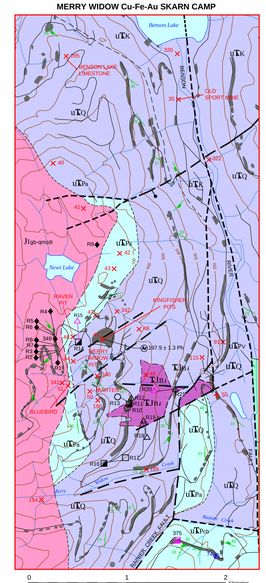
Whole-rock geochemistry locality (Tables 11, 13)
(see whole-rock geochemistry legend)

Outcrop examined (control)



Approximate mean magnetic declination 2000 for the centre of the map area: 20° 46'E decreasing annually 9.8' to 2005

MERRY WIDOW Cu-Fe-Au SKARN CAMP


Benson Lake
QUADRA/LANE LIMESTONE
OLD SPORT MINE
Nest Lake
RAVEN PIT
WHISPERER PITS
MERRY WIDOW
BLUEBIRD
Jgb-qmzm
uTKp
uTKQ
uTKk
JI
TJBu
JBu
Ph
Aug
Ol
Opx
Hb
Hbl
Bio
Ap
Py
Cpy
Mt
Sp
Gn
Sph
Cc
Qtz
Fld
Chl
Ser
Epi
Prh
Pmp
Lm
Ccp
Bn
Tr
Act
Tm
Zo
Cal
Gyp
Anh
Fluor
Sulphur
Native Cu
Native Au
Native Ag
Native Bi
Native Te
Native As
Native Sb
Native Sn
Native Pb
Native Zn
Native Fe
Native Mn
Native Cr
Native Ni
Native Co
Native Mo
Native W