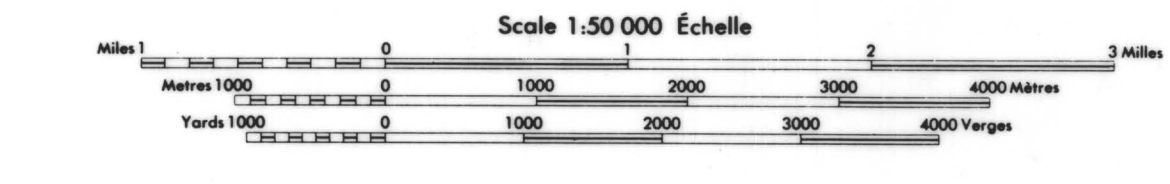


PROVINCE OF BRITISH COLUMBIA
 Ministry of Energy, Mines and Petroleum Resources
 GEOLOGICAL SURVEY BRANCH
 OPEN FILE 1988-8
**GEOLOGY OF THE DUNCAN AND
 CHEMAINUS RIVER AREA**
 NTS 92B/13 AND 92C/16E



Geology by N.W.D. Massey, S.J. Friday, P.E. Terrier
 and T.E. Potts, 1987
 Compilation by N.W.D. Massey

This map includes data compiled from maps and reports from the following sources:
 Allen, C. and Rowing, P. 1979. Mount Baker Property, SEREM Ltd.; B.C. Ministry of Energy, Mines and Petroleum Resources, Assessment Report 7875.
 Britton, R. 1984. Chemainus Project, Geology of the Oak Group, ESSO Resources Canada Ltd.; B.C. Ministry of Energy, Mines and Petroleum Resources, Assessment Report 12379.
 Eastwood, G.E.P. 1984. Geology of the Mount Richards area, Vancouver Island, British Columbia; B.C. Ministry of Energy, Mines and Petroleum Resources, Preliminary Map 42.
 Fyles, J.T. 1985. Geology of the Cowichan Lake area, Vancouver Island, British Columbia; B.C. Ministry of Energy, Mines and Petroleum Resources, Bulletin 37.
 Garrett, G.L. 1986. In: Blackwelder, D.W., Kapusta, J.D., and McLaughlin, A.D., Assessment report for drilling and geological mapping on Lars Group I and Lars Group II Alumin Corporation and Laramie Resources Ltd.; B.C. Ministry of Energy, Mines and Petroleum Resources, FARM Report 12175.
 Hanson, W.P. 1976. Stratigraphy and sedimentology of the Cretaceous Nanaimo Group, Salt Spring Island, British Columbia; Unpublished Ph.D. thesis, Oregon State University.
 Holland, G.L. 1984. JIM Property, Ulan Mines Ltd.; B.C. Ministry of Energy, Mines and Petroleum Resources, Assessment Report 12788.
 Korten, K.J. 1987. Structure, petrology and tectonic history of Pre-Cretaceous rocks in the southwestern Gulf Islands, British Columbia; Unpublished M.S. thesis, University of Washington.
 Leblond, D.V. 1985. Mt. Sicker Project, Lieberman Option, Corporation Falconbridge Copper (Minova Inc.); B.C. Ministry of Energy, Mines and Petroleum Resources, Assessment Report 13007.
 Malabar, D.G. and Hendrickson, G. 1985. Salt Spring Island, Kidd Creek Mines Ltd., 1985, B.C. Ministry of Energy, Mines and Petroleum Resources, Assessment Report 13006.
 plus unpublished material from T. England, G.J. Yorath, G. Allen and Falconbridge Ltd.

- LEGEND**
- INTRUSIVE ROCKS**
- H** MINOR INTRUSIONS (Tertiary): hornblende-feldspar porphyry
- EARLY TO MIDDLE JURASSIC**
- Ji** ISLAND INTRUSIONS: diorite, granodiorite, quartz diorite (all with abundant enstatite, apatite)
- LATE TRIASSIC**
- Ti** SILLS AND DYKES: diabase and gabbro (coeval with Karmutsen Formation)
- LATE DEVONIAN**
- PS** SALTSpring INTRUSIONS: granodiorite and feldspar porphyry (S), quartz-feldspar porphyry (Q)
- VOLCANIC AND SEDIMENTARY ROCKS**
- UPPER CRETACEOUS**
- NANAIMO GROUP**
- Kcd** CEDAR DISTRICT FORMATION: argillite, siltstone
 - Ke** EXTENSION PROTECTION FORMATION: boulder and pebble conglomerate, sandstone
 - Kh** HASLAM FORMATION: argillite, siltstone, shale and minor sandstone
 - Kc** COMCK FORMATION: boulder and pebble conglomerate, sandstone and minor siltstone
- LOWER JURASSIC**
- Jb** BONANZA GROUP: feldspar basalt, andesite, dacite, tuff, and/or tuff, crystal tuff, tuff and breccia, with minor argillite and sandstone
- UPPER TRIASSIC**
- VANCOUVER GROUP**
- Tip** PARSON BAY FORMATION: laminated siltstone, argillite, tuff, faggy and dolomitic limestone
 - Tq** QUATERSO FORMATION: massive and bedded micrite, bioclastic micrite, laminated lutaceous argillite and siltstone, hyaloclastite with limestone clasts
 - Tk** KARMUTSEN FORMATION: pillowed and massive basaltic flows, hyaloclastite and hyaloclastite breccia
- MIDDLE DEVONIAN TO LOWER PERMIAN**
- SICKER GROUP**
- PSmm** MOUNT MARK FORMATION: crinoidal limestone, bedded limestone, marble, chert, cherty argillite and siltstone
 - PSc** CAMERON RIVER FORMATION: ribbon chert, cherty tuff, argillite, argillite, intercalated thin bedded sandstone, siltstone and argillite, epistatic sandstone, conglomerate
 - PSm** McLAUGHLIN RIDGE FORMATION: thick bedded tuffite and tuff, tuffite, feldspar-crystal tuff, heterolithic tuff and breccia, quartz-feldspar crystal tuff, rhyolite, dacite, laminated tuff, paper and chert
 - PSn** NITINAT FORMATION: pyroxene-feldspar phytic agglomerate, breccia and tuff, tuff, massive and pillowed flows, massive tuffite and tuff, tuffite, dacite, laminated tuff, paper and chert
- SYMBOLS**
- Geological contact (defined, approximate, transitional)
 - Limit of drift covered area
 - Bedding (horizontal, inclined, overturned)
 - Bedding estimated from pillows (inclined)
 - Schistosity and cleavage (indicated, vertical)
 - Lithiation (inclination indicated)
 - Axis of minor folds (plunge indicated)
 - Fault (defined, approximate)
 - Thrust fault (defined, approximate, assumed) (both indicate without side with dip indicated)
 - Anticline (with plunge indicated)
 - Syncline (with plunge indicated)



Province of British Columbia
Ministry of Energy, Mines and Petroleum Resources



Energy, Mines and Resources Canada
Énergie, Mines et Ressources Canada

THIS PROJECT IS A CONTRIBUTION TO THE CANADA/BRITISH COLUMBIA
MINERAL DEVELOPMENT AGREEMENT, 1985-1990

PROVINCE OF BRITISH COLUMBIA
MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES
OPEN FILE MAP 1988/8

GEOLOGY OF THE CHEMAINUS RIVER AND DUNCAN AREA
NTS 92C/16 AND 92B/13

Geology by N. W. D. Massey, S. J. Friday, P. E. Tercier
and T. E. Potter, 1987.

Compilation by N. W. D. Massey

LEGEND FOR SHEETS 3 - 9

INTRUSIVE ROCKS

AGE UNCERTAIN

MINOR INTRUSIONS

- D dacite, rhyolite dykes (post-Late Triassic)
- F feldspar, quartz-feldspar porphyry (Jurassic or ?Paleozoic)
- H hornblende-feldspar porphyry (Jurassic or ?Tertiary)

EARLY TO MIDDLE JURASSIC

ISLAND INTRUSIONS

- a aplite
- b mafic dykes
- d diorite, gabbro
- g granodiorite
- n granodiorite with abundant mafic xenoliths
- q quartz diorite

LATE TRIASSIC

SILLS AND DYKES (COEVAL WITH KARMUTSEN FORMATION)

- i diabase, gabbro and flower gabbro

LATE DEVONIAN

SALTSPRING INTRUSIONS

- P feldspar porphyry
- Q quartz porphyry, quartz-feldspar porphyry
- S granodiorite, microgranodiorite

VOLCANIC AND SEDIMENTARY ROCKS

UPPER CRETACEOUS

NANAIMO GROUP

KNcd CEDAR DISTRICT FORMATION

- a argillite, shale
- s sandstone
- t siltstone

KNe EXTENSION-PROTECTION FORMATION

- b boulder conglomerate
- g granule conglomerate
- p pebble conglomerate
- s sandstone, pebbly sandstone
- t siltstone

KNh HASLAM FORMATION

- a argillite, shale
- t siltstone
- s sandstone

KNc COMOX FORMATION

- b boulder conglomerate
- g granule conglomerate
- p pebble conglomerate
- s sandstone, pebbly sandstone
- t siltstone

UPPER TRIASSIC

VANCOUVER GROUP

Rk KARMUTSEN FORMATION

- b pillow breccia
- g glomeroporphyritic flows
- h hyaloclastite, hyaloclastite breccia
- i diabase, gabbro dykes and sills
- m massive flows
- p pillowed flows
- t laminated tuff, tuffaceous argillite, argillite

MIDDLE DEVONIAN TO LOWER PERMIAN

SICKER GROUP

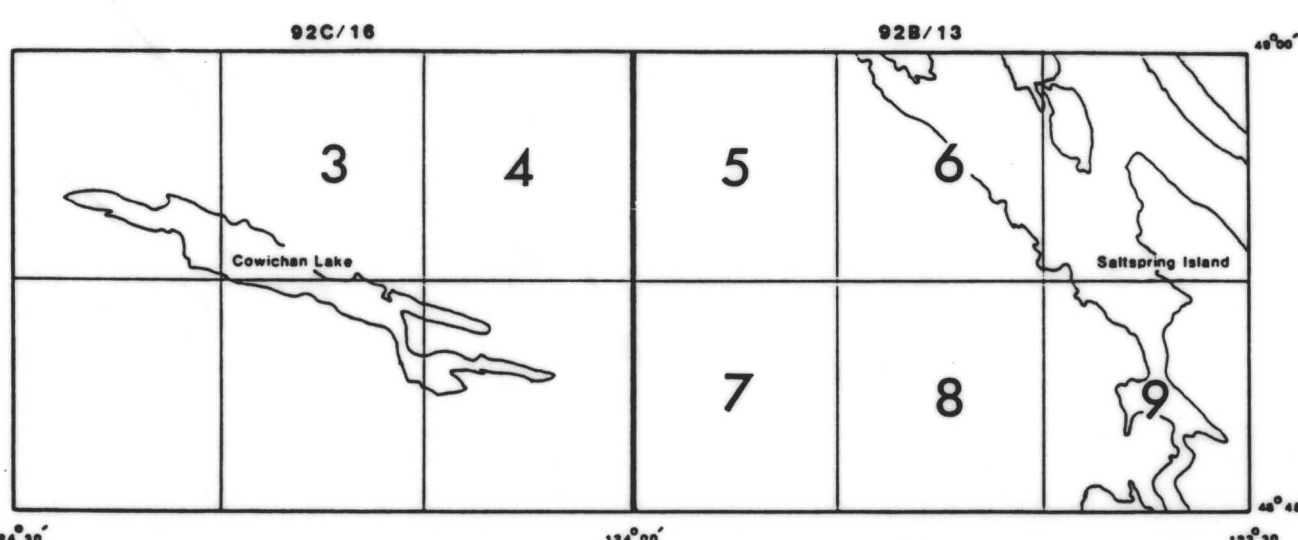
PSmm MOUNT MARK FORMATION

- c chert
- j limestone, crinoidal limestone, bedded limestone, marble
- t intercalated thinly bedded sandstone, siltstone, argillite

PScr CAMERON RIVER FORMATION

- c chert, cherty tuff
- g graphitic argillite +/- sulphides
- k lithic tuff, lithic tuffaceous sandstone
- l laminated tuff, cherty tuff
- o massive aphyric mafic flows or sills
- p jasper, hematite/magnetite chert iron formation
- r rhyolite, dacite sills
- s massive tuffaceous sandstone
- t intercalated thinly bedded sandstone, siltstone, argillite
- u epiclastic sandstone, granule and pebble conglomerate
- v siltstone, cherty siltstone
- w hornfelsed sediments
- y chlorite schist, talc-chlorite schist
- z phyllite

Index map for sheets 3-9



PSmr

MCLAUGHLIN RIDGE FORMATION

- a pyroxene crystal tuff, lapilli tuff
- b pyroxene rich volcanic breccia, agglomerate
- c chert, cherty tuff
- d felsic lapilli tuff, feldspar crystal lapilli tuff
- e felsic tuff, feldspar crystal tuff
- f intermediate to mafic feldspar crystal tuff, lapilli tuff
- g argillite, graphitic argillite ± sulphides
- h heterolithic conglomerate
- j quartz-feldspar crystal tuff, crystal lapilli tuff (may be quartz-feldspar porphyry in part)
- k lithic tuff, lithic tuffaceous sandstone
- l laminated tuff, cherty tuff
- m monolithic lapilli tuff, breccia
- n heterolithic lapilli tuff, breccia
- o massive aphyric mafic flows
- p jasper, hematite-magnetite chert iron formation
- q pyroxene porphyry (flows and intrusions)
- r rhyolite, dacite (flows and intrusions)
- s massive tuff, tuffaceous sandstone
- t intercalated thinly bedded sandstone, siltstone, argillite
- u epiclastic sandstone, granule and pebble conglomerate
- w hornfelsed sediment (?sandstone)
- y chlorite schist, talc-chlorite schist (protolith uncertain)
- z maroon and green phyllite (protolith uncertain)

PSn

NITINAT FORMATION

- a pyroxene crystal tuff, lapilli tuff
- b pyroxene rich volcanic breccia, agglomerate
- f feldspar crystal tuff, lapilli tuff
- h heterolithic conglomerate, breccia
- l laminated tuff, cherty tuff
- m monolithic lapilli tuff, breccia
- n heterolithic lapilli tuff, breccia
- o massive aphyric mafic flows
- p pillowed flows
- q pyroxene porphyry (flows and intrusions)
- r rhyolite, dacite (flows and intrusions)
- s massive tuff, tuffaceous sandstone
- t intercalated thinly bedded sandstone, siltstone, argillite
- u epiclastic sandstone, granule and pebble conglomerate

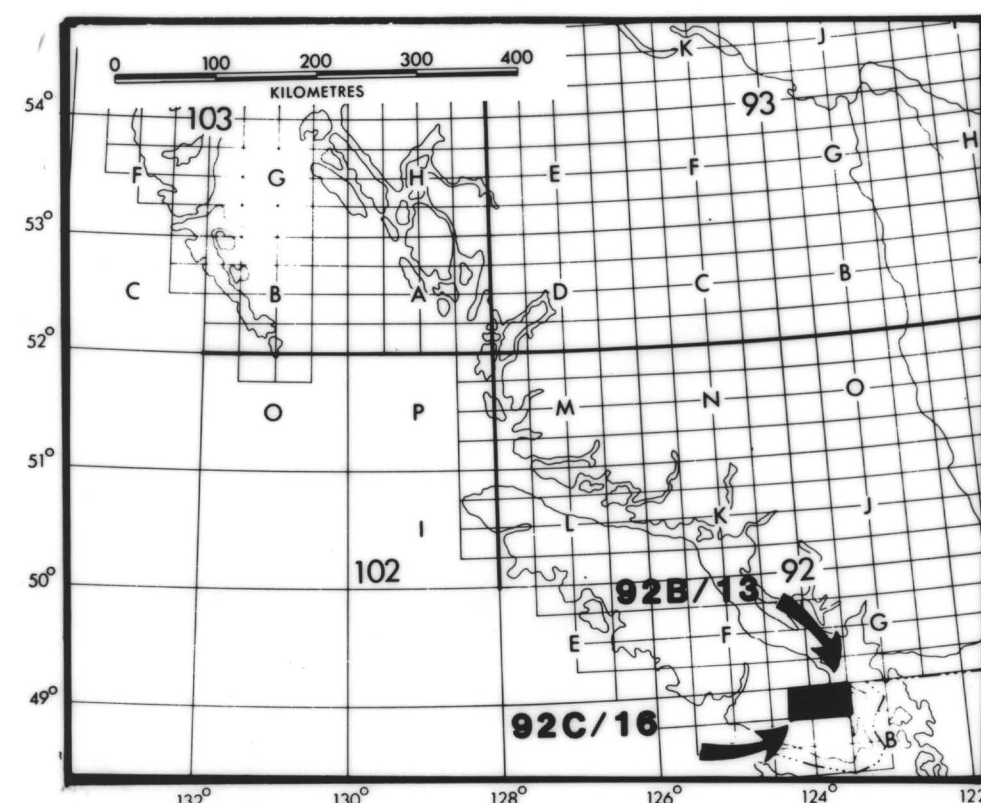
Notes:

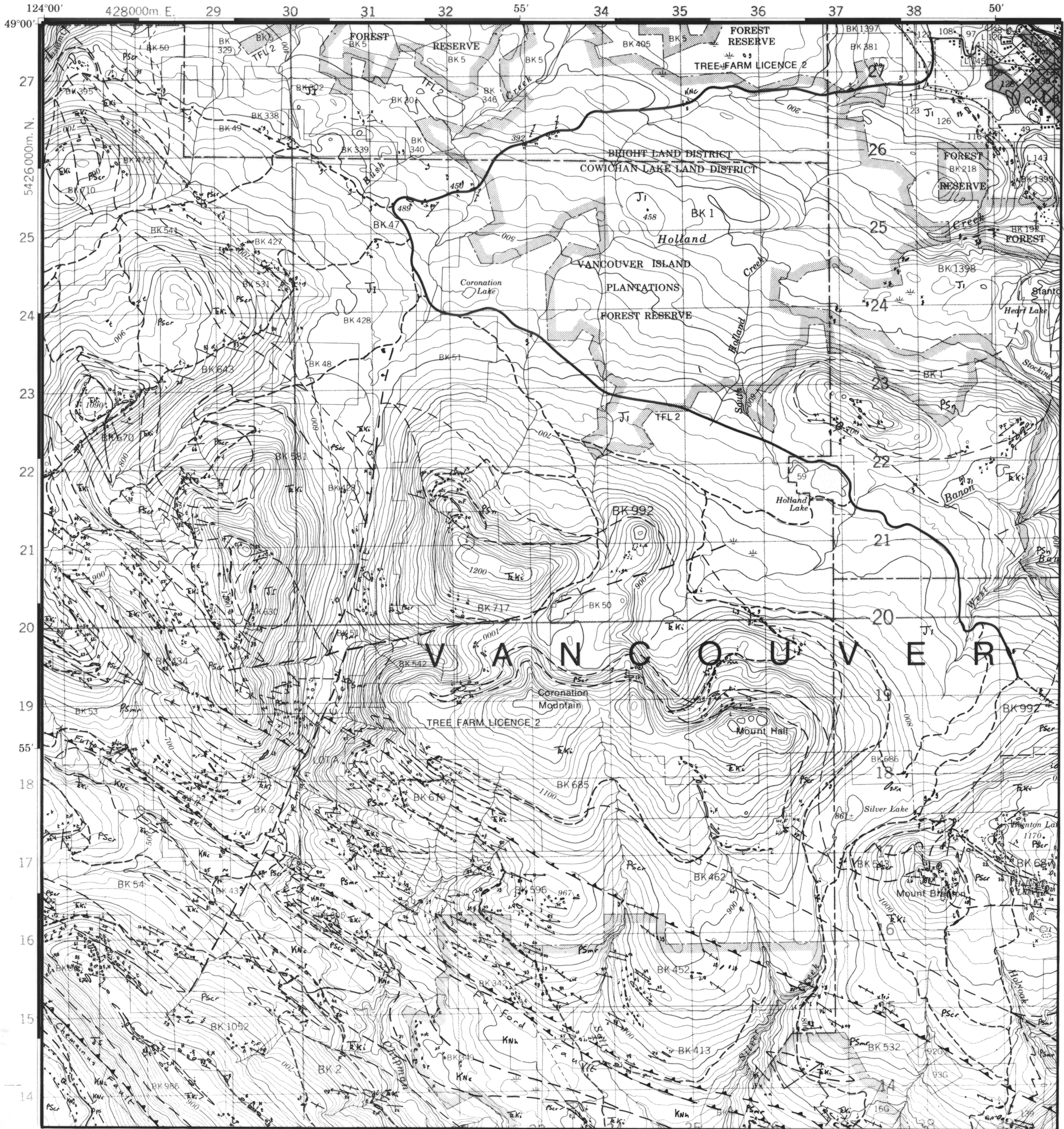
- a This is a field legend and applies to all seven 1:20 000 maps. Not all lithologies listed are present on each map.
- b Position in the legend of lithologies within each formation does not imply any age or stratigraphic relationship.
- c Where two or more lithologic codes are shown for an outcrop, the designated units are interbedded and are listed in approximate order of abundance. Where a comma is used to separate two or more lithologic codes, an intrusive relationship is implied.

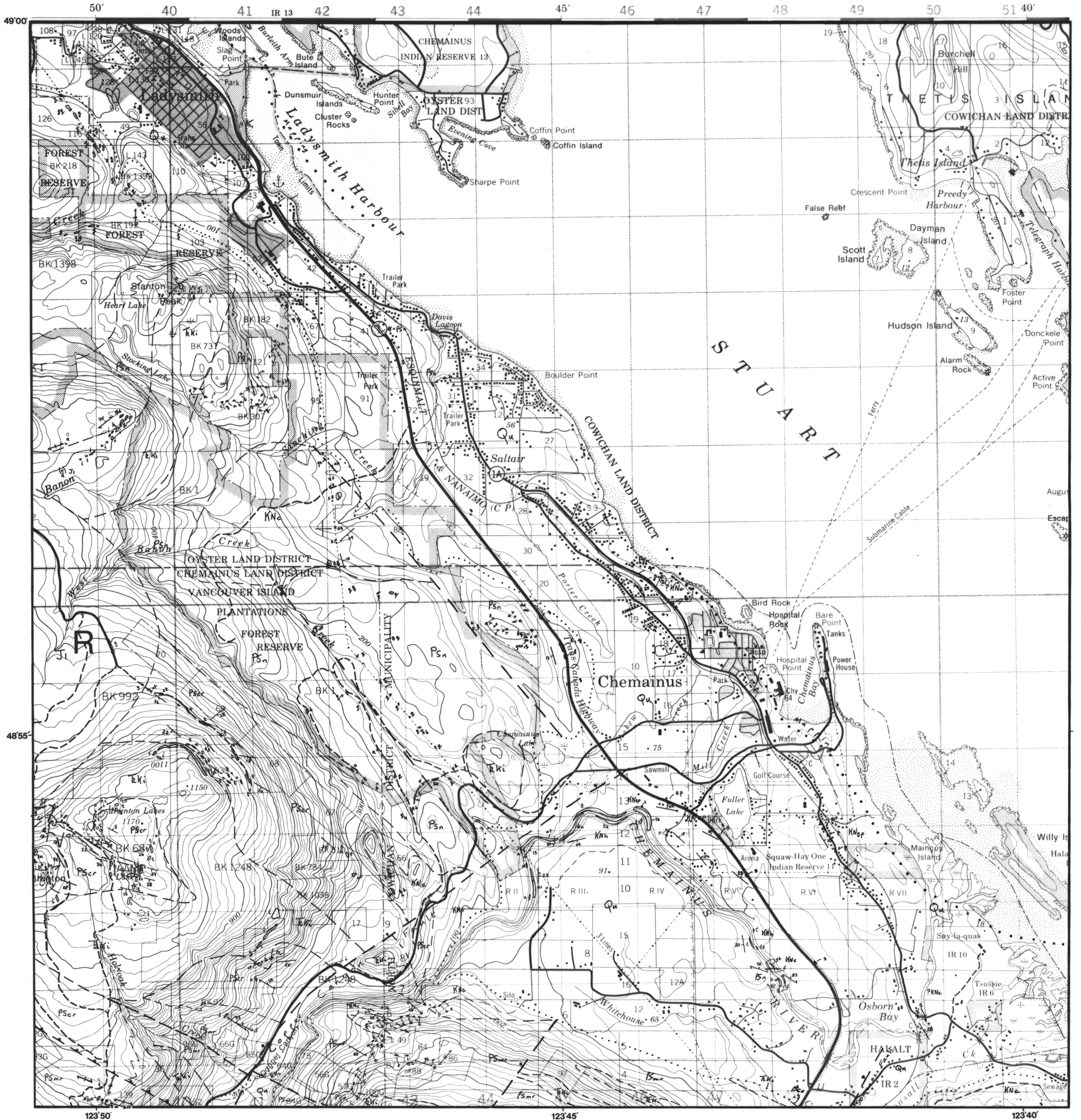
SYMBOLS

Geological contact (defined, approximate, transitional).....	
Limit of drift covered area.....	
Limit of mapping.....	
Fault (defined, approximate).....	
Thrust fault (defined, approximate, assumed) teeth indicate upthrust side with dip indicated.....	
Shearing and dip.....	
Bedding (horizontal, inclined, overturned).....	
Strike and dip of pillows, tops known.....	
Schistosity (inclined, vertical).....	
Lineation of unknown age	
S intersections.....	
Microrenulation.....	
Quartz eyes.....	
Axes of minor folds.....	
Anticline (with plunge indicated).....	
Syncline (with plunge indicated).....	
Fossil locality.....	

LOCATION MAP







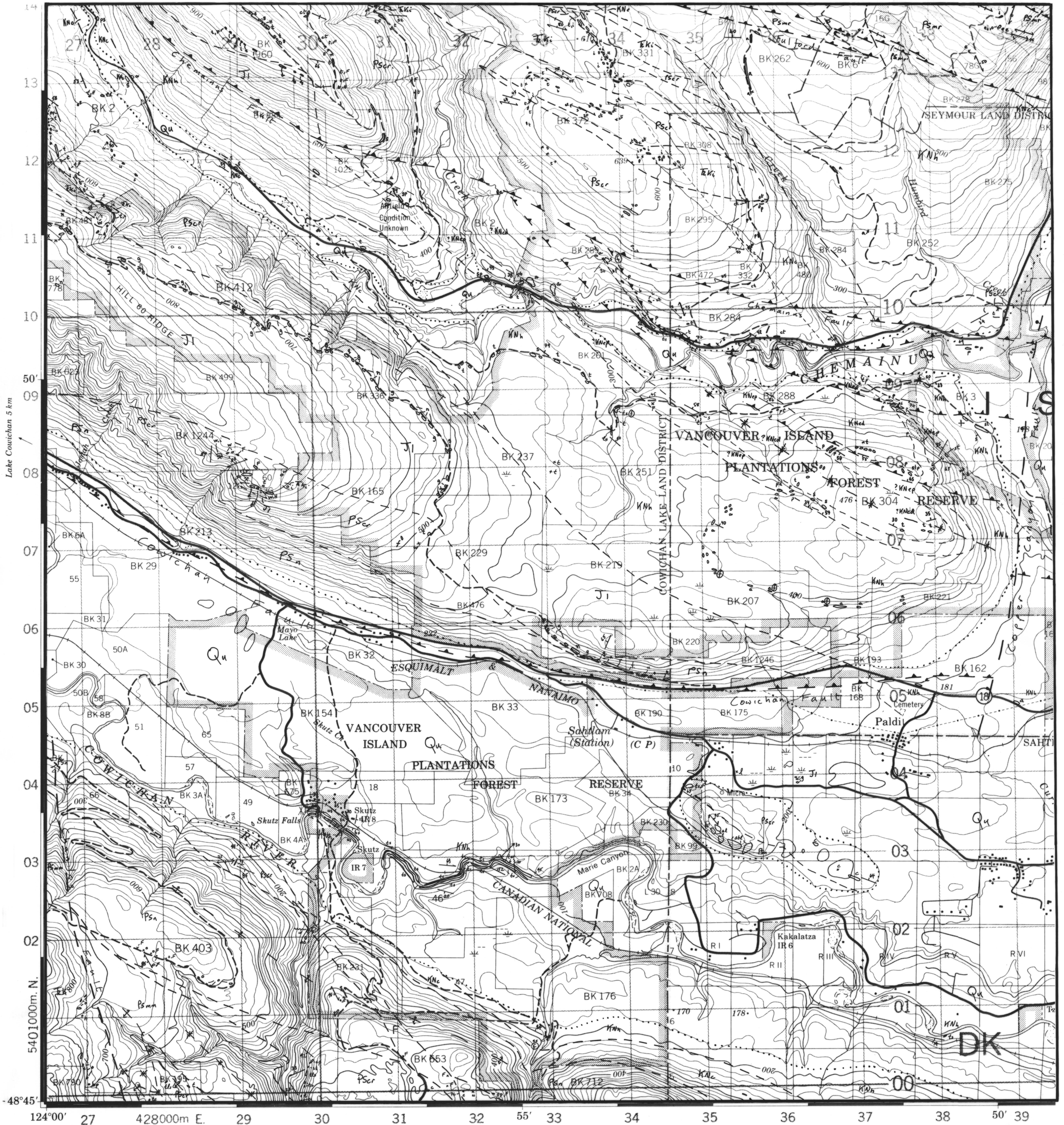
123°50'

123°45'

123°40'

Scale 1:20000





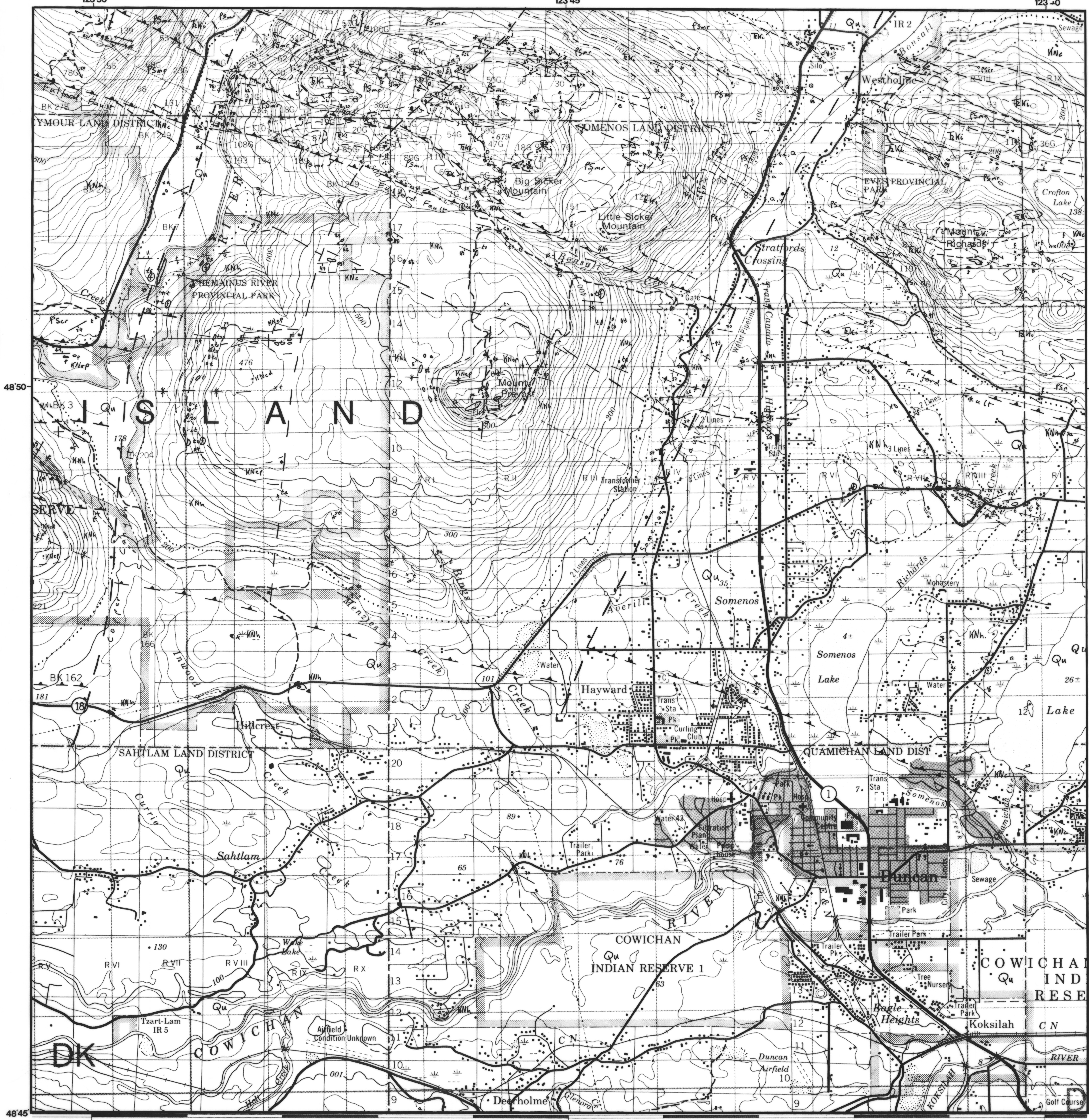
Lake Cowichan 5 km

5401000m. N.

124°00' 27 428000m E. 29 30 31 32 55' 33 34 35 36 37 38 50' 39

Scale 1:20000



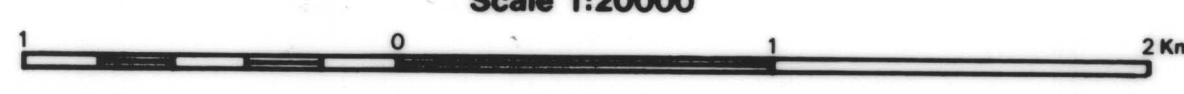


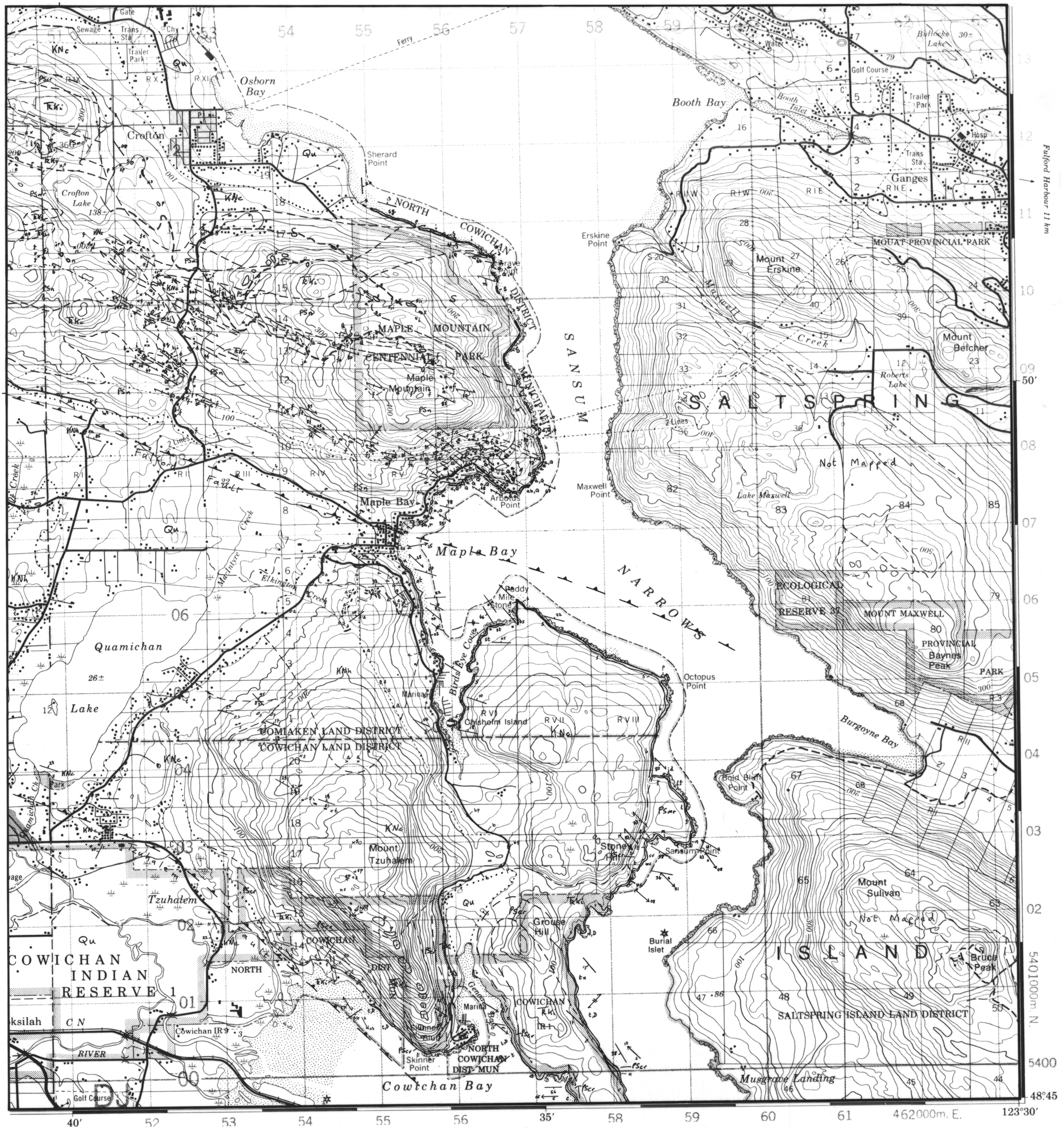
48°50'

48°45'

38 50' 39 40 41 42 43 44 45 46 47 48 49 50 40'

Scale 1:20000

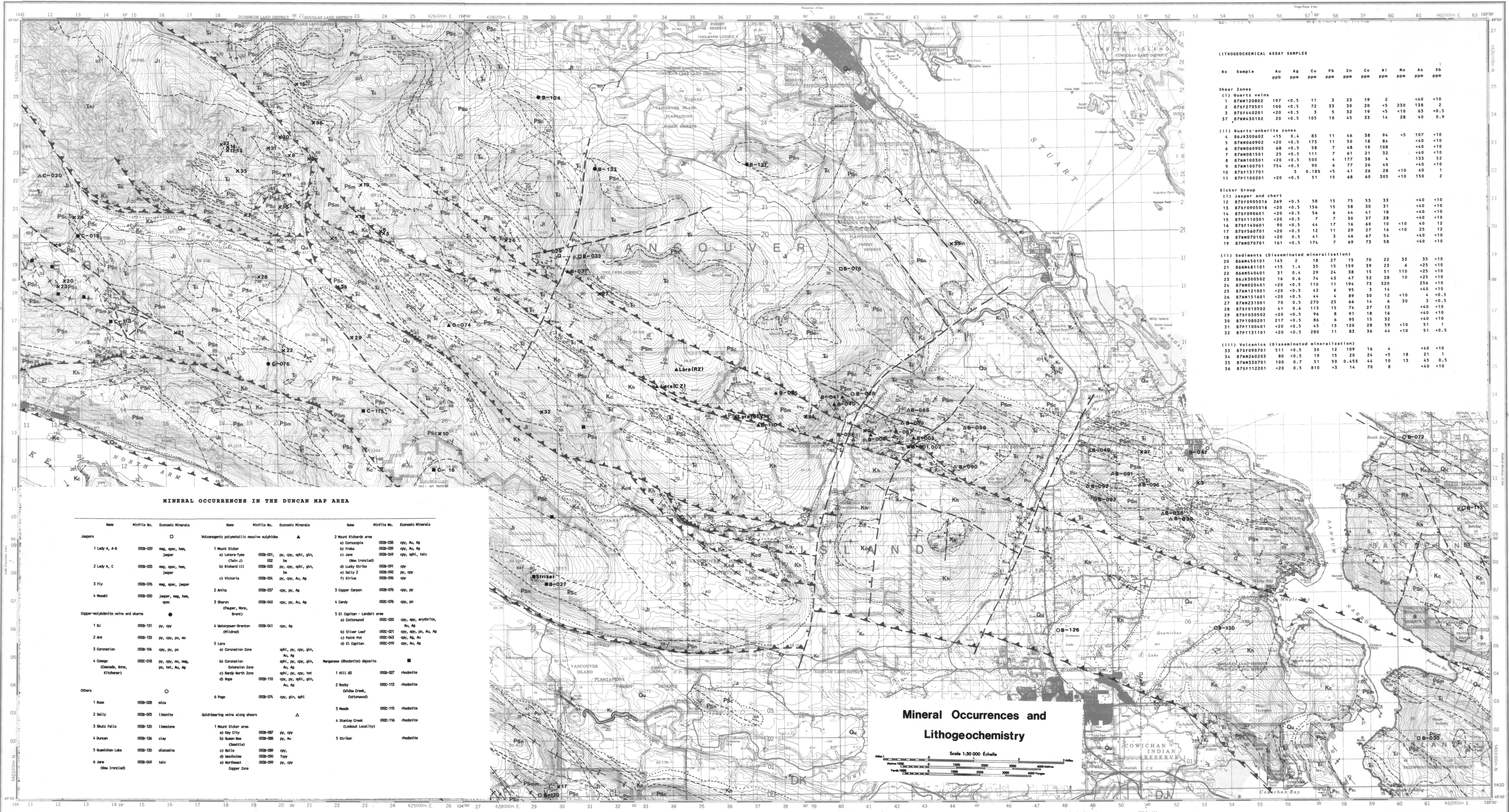




Fulford Harbour 11 km

5401000m. N.

462000m. E. 123°30'



MINERAL OCCURRENCES IN THE DUNCAN MAP AREA

Name	Minifile No.	Economic Minerals	Name	Minifile No.	Economic Minerals	Name	Minifile No.	Economic Minerals
Jaspers		□	Volcanogenic polytextured massive sulphides	▲		2 Mount Richmond area	028-028	cpv, Au, Ag
1 Lady A, A-B	028-029	mpc, spc, hms, jasper	a) Comstock	028-029	cpv, Au, Ag	b) Trinka	028-029	cpv, Au, Ag
2 Lady A, C	028-033	mpc, spc, hms, jasper	c) Jane	028-049	cpv, sph, talc	d) Lucky Strike	028-091	cpv
3 Fly	028-076	mpc, spc, jasper	e) Sally 2	028-090	py, cpv	f) Sirtia	028-090	py, cpv
4 Heidi	028-080	jasper, mpc, hms, spc	2 Anita	028-037	cpv, py, Ag	3 Copper Canyon	028-076	cpv, py
Copper-molybdenite veins and dikes		●	3 Sharon	028-040	cpv, py, Au, Ag	4 Candy	028-076	cpv, py
1 BJ	028-131	py, cpv	5 El Capitan - Lambit area	028-020	cpv, sph, erythrite, Au, Ag	a) Cottonwood	028-020	cpv, sph, erythrite, Au, Ag
2 Avc	028-133	py, cpv, py, mo	b) Silver Leaf	028-021	cpv, py, Au, Ag	c) Paint me	028-043	cpv, Au, Ag
3 Corvation	028-104	cpv, py, py	d) El Capitan	028-079	cpv, Au, Ag			
4 Campo (Cascady, Arve, Etchewer)	028-018	py, cpv, mo, mpc, py, tet, Au, Ag	5 Lara					
Others		○	a) Corvation zone	sph, py, cpv, sph, Au, Ag	Margenase (Mordaitite) deposits			
1 Rose	028-028	mica	b) Extension zone	sph, py, cpv, sph, Au, Ag	1 Mill 40	028-027	rhodrite	
2 Sally	028-025	limonite	c) Bend North zone	sph, py, cpv, tet, Au, Ag	2 Rocky	028-113	rhodrite	
3 Skitz Falls	028-120	limestone	d) Rope	028-110	cpv, py, sph, sph, Au, Ag	3 Heidi	028-115	rhodrite
4 Duncan	028-126	clay	6 Pogo	028-074	cpv, sph, sph	4 Stanley Creek (Codyak Local?)	028-116	rhodrite
5 Quanchan Lake	028-130	dialactite			5 Striker		rhodrite	
6 Jane (New Inoclad)	028-049	talc						

LITHO-CHEMICAL ASSAY SAMPLES

No	Sample	Au	Ag	Cu	Pb	Zn	Co	Ni	Mo	Au	Ag	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb
Shear Zones																			
(i) Quartz veins																			
1	87NM120802	197	<0.5	11	3	23	19	2				<10							
2	87SF270501	100	<0.5	72	33	30	20	<5	230	138		<10							
3	87SF440201	<20	<0.5	3	5	32	19	<5	<10	63		<0.5							
37	87NM430102	20	<0.5	105	10	45	33	14	28	40		0.9							
(ii) quartz-ankerite zones																			
4	87NM030002	<15	0.4	83	11	46	38	94	<5	107		<10							
5	87NM060902	<20	<0.5	173	11	50	18	84		<40		<10							
6	87NM060903	68	<0.5	58	7	48	19	108		<40		<10							
7	87NM050501	25	<0.5	1111	7	61	21	32		<40		<10							
8	87NM100301	<20	<0.5	500	4	177	38	4		133		52							
9	87NM100701	754	<0.5	96	6	77	26	40		<40		<10							
10	87SF131701		8	0.18X	<5	41	26	28		<10		40							
11	87PF110201	<20	<0.5	51	15	68	60	305		<10		150							
Sicker Group																			
(i) Jasper and chert																			
12	87SF090501A	269	<0.5	58	15	75	53	33		<40		<10							
13	87SF090501B	<20	<0.5	156	15	58	30	31		<40		<10							
14	87SF090601	<20	<0.5	56	6	44	41	18		<40		<10							
15	87SF110301	<20	<0.5	7	7	30	37	28		<40		<10							
16	87SF140601	90	<0.5	44	17	16	60	10		<10		40							
17	87SF160701	<20	<0.5	12	11	29	27	16		<10		25							
18	87NM070102	<20	0.5	41	3	46	67	54		<40		<10							
19	87NM070701	161	<0.5	174	7	69	73	58		<40		<10							
(ii) Sediments (Disseminated mineralization)																			
20	86NM450101	145	2	18	27	15		70	22	33		35							
21	86NM450102	<15	1.4	35	15	159	39	23	6	<25		<10							
22	86NM450401	31	0.4	29	24	38	15	51	110	25		<10							
23	86JH300902	16	0.6	74	43	47	52	28	10	<25		<10							
24	87NM020401	<20	<0.5	110	11	194	73	320		250		<10							
25	87NM121001	<20	<0.5	42	6	95	3	14		<40		<10							
26	87NM151601	<20	<0.5	44	4	89	30	12		<10		4							
27	87NM231001	70	0.5	270	25	66	14	6	30	3		<0.5							
28	87SF010502	41	0.6	113	15	74	27	13		<40		<10							
29	87SF030502	<20	<0.5	96	8	91	18	16		<40		<10							
30	87SF080201	217	<0.5	86	6	95	15	32		<40		<10							
31	87PF110301	<20	<0.5	45	13	120	28	59		<10		51							
32	87PF131101	<20	<0.5	280	11	83	36	44		<10		51							
(iii) Volcanics (Disseminated mineralization)																			
33	87SF090701	511	<0.5	30	12	109	16	4		<40		<10							
34	87NM260203	80	<0.5	19	15	60	24	<5	18	21		1							
35	87NM230701	100	0.7	51	50	0.45X	44	10	13	45		0.5							
36	87SF112201	<20	0.5	810	<3	14	70	8		<40		<10							

Mineral Occurrences and Lithochemochemistry

