

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ORDOVICIAN-SILURIAN VOLCANOGENIC MASSIVE SULFIDE DEPOSITS
ON SOUTHERN PRINCE OF WALES ISLAND AND THE BARRIER ISLANDS,
SOUTHEASTERN ALASKA

by

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INTRODUCTION

Several pyritic massive sulfide deposits have been recognized in an Ordovician-Silurian volcano-plutonic complex in the southern Prince of Wales Island region (Fig. 1). These deposits have been studied as part of a U.S. Geological Survey-California Institute of Technology investigation into the geologic and mineralization history of southern Prince of Wales Island (south of 55° North Latitude; Fig. 1). This report describes the geologic setting of the deposits and presents preliminary chemical analyses of the mineralization.

GEOLOGIC SETTING

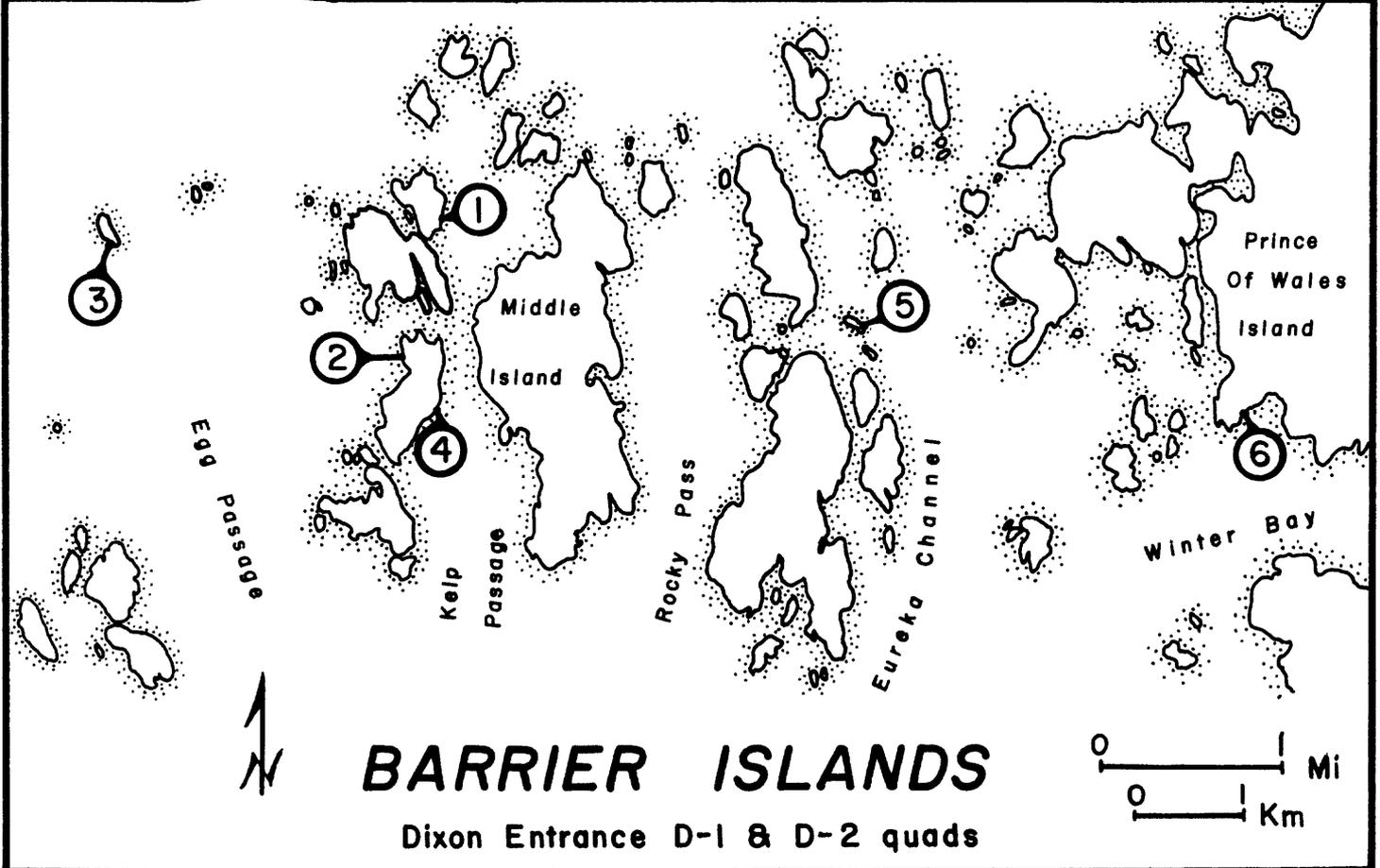
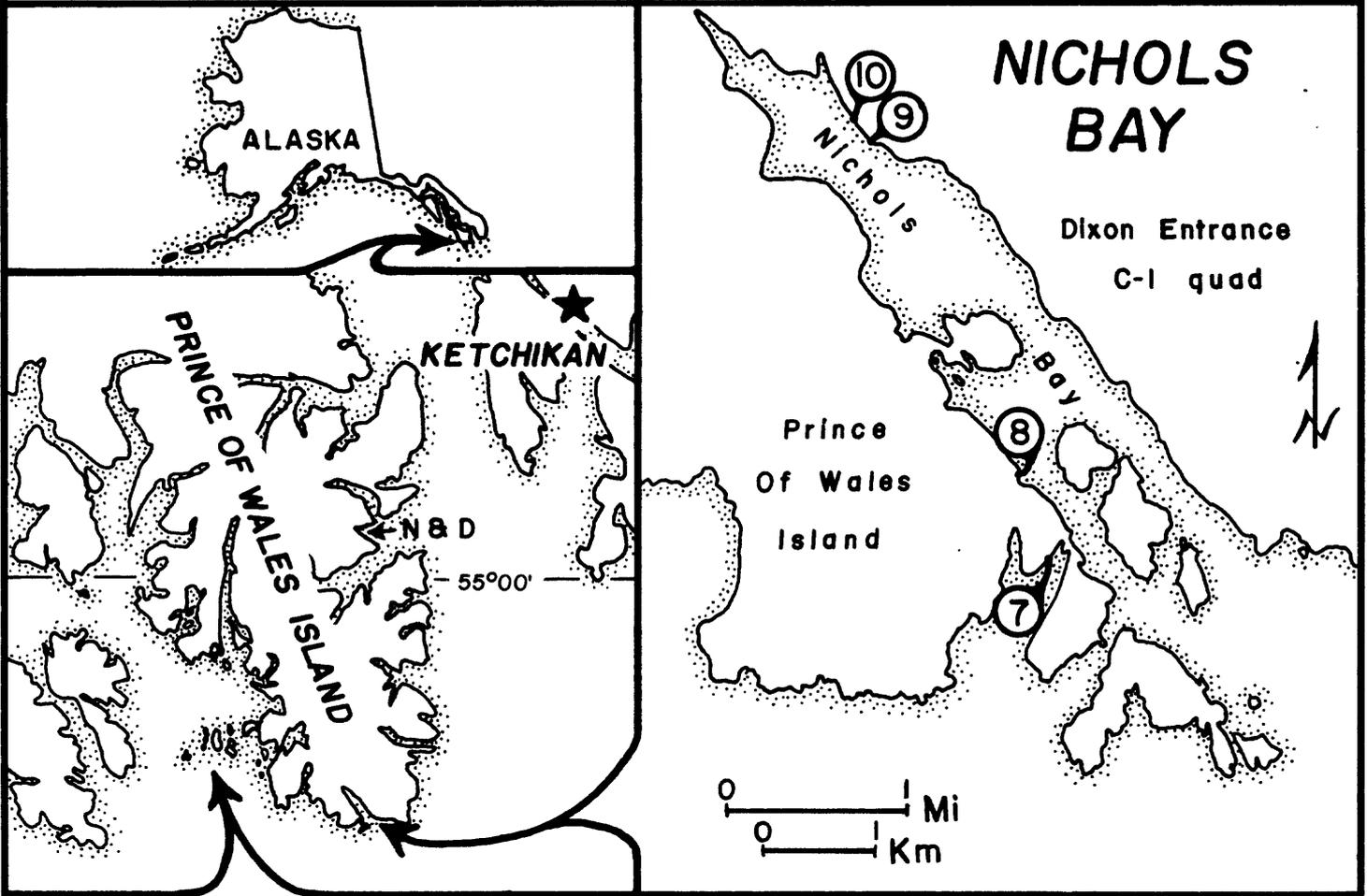
Southern Prince of Wales Island is underlain by pre-Middle Ordovician metamorphic rocks of the Wales Group, an Ordovician-Silurian complex of sedimentary, volcanic and plutonic rocks, Devonian clastic strata, and granitic plutons of probable Cretaceous age. The Ordovician-Silurian complex includes primarily dioritic to trondhjemitic plutons on the east side of the island, and interstratified marine sedimentary and intermediate-to silicic-composition volcanic rocks to the west. Although Buddington and Chapin (1929) and MacKevett (1963) inferred that these sedimentary and volcanic rocks were a lower part of the Devonian section and that the plutonic rocks were Cretaceous in age, K/Ar analyses of the plutonic rocks have subsequently yielded Ordovician-Silurian ages (Lanphere and others, 1964; Turner and others, 1977), and Ordovician conodonts and graptolites have been recovered from the marine strata (Eberlein and others, 1983).

The sedimentary and volcanic members in this complex are generally correlative with the Lower Ordovician-Lower Silurian Descon Formation on northwestern Prince of Wales Island (Eberlein and Churkin, 1970). The main difference in stratigraphy between these two areas is the presence of silicic volcanic rocks on southern Prince of Wales Island. In the study area these silicic volcanic rocks occur as flow and pyroclastic breccias that reach several hundred meters in thickness, and as 1- to 3-m-thick tuffs. These silicic volcanic rocks are interbedded with siliceous black slate, ferruginous dolomite and a fragmental, less-silicic volcanic rock that is generally the host for the massive sulfide deposits. The predominant volcanic rocks in the Ordovician-Silurian complex are andesitic to basaltic pillow flows, pillow breccia and pyroclastic breccia.

A regional unconformity separates the Ordovician-Silurian complex from overlying Devonian fluvial and marine clastic strata. This unconformity records Late Silurian-Early Devonian uplift and erosion, followed by deposition in subsiding basins during Early and Middle Devonian time (Gehrels and others, 1983).

Ordovician through Devonian rocks on southern Prince of Wales Island are juxtaposed against greenschist and amphibolite facies rocks of the Wales Group along a regional low-angle fault (Herreid and others, 1978; Redman, 1981). Although protoliths for the Wales Group metamorphic rocks were similar to lithologies in the Ordovician-Silurian sedimentary and volcanic complex, the Wales Group is readily distinguished by its penetrative syn-metamorphic flattening and stretching fabric, and post-metamorphic,

Figure 1 **SAMPLE LOCALITY MAP**



Dixon Entrance D-1 & D-2 quads

generally asymmetric folds. The primary relationship between the Wales Group and the Ordovician-Silurian rocks is not yet known, but a K/Ar isochron (Turner and others, 1977) and preliminary U/Pb age data suggest that the main metamorphism and deformation in the Wales Group occurred about 475 million years ago. The Wales Group, the Ordovician through Devonian rocks, and locally the fault that separates them, are all intruded by granitic plutons of probable Cretaceous age (Herreid and others, 1978; Redman, 1981). We therefore infer that the thrust fault moved after Middle Devonian and prior to Cretaceous(?) time.

DESCRIPTION OF THE DEPOSITS

The massive sulfide deposits described in this report occur in the Barrier Islands, which is in the South Prince of Wales Wilderness, and in the Nichols Bay area of Prince of Wales Island (Fig. 1). In the Barrier Islands the deposits are associated with fragmental volcanic rocks that appear to have compositions between the intermediate and the silicic volcanic rocks. The composition of these fragmental volcanic host-rocks will be referred to as silicic-intermediate in this report. At several localities, the sulfide minerals occur in <5-cm-thick layers or rinds around 5- to 20-cm-long fragments in this silicic-intermediate volcanic rock. The elongate shape and interlocking nature of the fragments, combined with the presence of calcite-filled amygdules in the interior of the fragments, suggests that they may be flattened pillows. Massive sulfide minerals also form <5-cm-thick layers in siliceous black slate and in silicic volcanic rocks.

In Nichols Bay the sulfide minerals occur as stratiform layers interbedded with quartz-rich graywacke and silicic volcanic rocks, and as thin layers and lenses in the volcanic rocks. Chapin (1918, p. 67) reports that several chalcopyrite-bearing prospects in the northeastern Nichols Bay area were worked in the early 1900's.

The association of these sulfide deposits with the interlayered silicic volcanic and marine sedimentary rocks suggests that the deposits are of the syngenetic submarine volcanic (exhalative) type. Some deposits have subsequently undergone low-grade metamorphism that has resulted in variable amounts of remobilization or reconcentration of the sulfide and gangue minerals.

At each of the deposits, samples were collected from the most sulfide-rich horizon, the same horizon where it lacked sulfides (for background), and any other sulfide-bearing or altered rocks. These samples were analyzed by S. Sutley and J.D. Hoffman of the U.S.G.S. using semi-quantitative spectrographic and atomic absorption techniques. The geologic setting and mineralogy of the deposits is described briefly below, and the analytical data for the samples are given in Table 1.

BARRIER ISLANDS (Fig. 1)

LOCALITY 1 (82ABg001) Island at the northwest end of Kelp Passage.

Sulfide minerals occur in interbedded silicic-intermediate pillow-flows, pyroclastic breccia, and siliceous black slate. These units strike

N35°W and dip 80° NE, and are bounded on the northeast and southwest by intermediate-composition pillow breccia and flows. Mineralized horizons outcrop discontinuously for about 300 m along shore and may continue along strike to the northwest side of the island where similar sulfide-bearing rocks occur. The massive sulfides generally form 1- to 6-cm-thick rinds around the pillows, or occur as thin layers or pods in both the volcanic and sedimentary rocks.

- 1A: Massive pyrite and possibly arsenopyrite¹ in thin, discontinuous layers that are parallel to bedding in a quartz-rich sedimentary rock. The mineralized rock is a 2 m by 3 m lens enclosed in pillow breccia near the north end of the zone of mineralization.
- 1B: Pyrite-rich silicic-intermediate fragmental volcanic rock that forms a prominent 3 m by 10 m rusty weathering horizon near the north end of the mineralized zone. The fragments have calcite amygdules and a calcite-rich, tuffaceous(?) matrix, and are inferred to be pillow-breccia fragments.
- 1C: Massive pyrite and possibly arsenopyrite¹ that forms layers or rinds up to 6 cm thick around pillows. These rinds occur in a 1-m-wide by 10-m-long horizon that is parallel to the strike of the layering and a flattening of the pillows.
- 1D: Disseminated pyrite and possibly arsenopyrite¹ in a fairly massive rusty weathering layer adjacent to the pillows sampled at 1C.
- 1E: Interior of the pillow sampled at 1C. The pillows are generally about 10 cm long, slightly flattened, and have calcite-filled amygdules. Pyrite is sparsely disseminated throughout the pillows.
- 1F: Thin, discontinuous layers of massive pyrite in a laminated dark gray slate near the southeast tip of the island. The slate is a 3-m-wide interbed within the volcanic rocks.
- 1G: Massive pyrite (accompanied by microscopic traces of sphalerite) from the most prominent rusty weathering horizon at the south end of the zone of mineralization. The sulfides generally occur in layers up to 5 cm thick in a folded and deformed silicic-intermediate fragmental volcanic rock.

LOCALITY 2 (82ABg002) - Northwest side of the central island between Kelp and Egg Passages.

Sulfide minerals occur along this shoreline in a 5-m-thick by 50-m-long rusty weathering layer of silicic-intermediate volcanic rocks. The mineralized volcanic rocks are bounded on the west by a massive silicic flow and on the east by intermediate-composition pillow breccia and tuffaceous agglomerate. Layering and a faint foliation are oriented N18°W, 80° NE, and project south-southeast across the island to locality 4 where similar sulfide-bearing rocks are present. Thus, the strike length of the mineralized zone may be at least 700 m. Massive sulfide minerals at the north end of the mineralized layer occur as 2- to 4-cm-thick rinds around slightly flattened pillow-like fragments.

¹ Spectrographic analysis (Table 1) indicates that arsenopyrite is present.

- 2A: Massive fine-grained pyrite and arsenopyrite¹ form a 2- to 5-cm-thick layer that is parallel to the compositional layering. Alteration of this layer produces a prominent rusty weathering horizon.
- 2B: Disseminated pyrite and arsenopyrite¹ that forms up to 40% of a highly altered, yellow-orange weathering zone adjacent to the main massive sulfide layer (sample 2A). The foliated volcanic host-rock is rich in carbonate.
- 2C: Silicic-intermediate volcanic rock adjacent to the main sulfide-rich layer (sample 2A). The volcanic rock has angular pyroclastic(?) fragments in a carbonate-rich matrix, and contains sparsely disseminated pyrite.
- 2D: Silicic volcanic rock with sparsely disseminated pyrite and probably sphalerite² on the west side of the mineralized layer.

LOCALITY 3 (82ABg003) - Small island in the northwestern Barrier Islands.

Massive sulfide minerals occur in a silicic-intermediate volcanic rock interbedded with intermediate-composition flows. Mineralization occurs in a N54°W, 75°NE zone that is 5 m wide and at least 30 m long: a N10W, vertical fault truncates the northern end of the exposure. The sulfide minerals form well-developed pyrite-rich rinds around pillows or pillow fragments.

- 3A: Pyrite accompanied by microscopic traces of sphalerite and possibly arsenopyrite¹ in rinds around pillows. The rinds are 2 to 5 cm thick and consist of massive and disseminated sulfide minerals in a quartz- and carbonate-rich matrix.
- 3B: Sulfide-poor core of the pillow sampled at 3A.

LOCALITY 4 (82ABg004) - West side of Kelp Passage.

Disseminated and massive sulfides occur in a silicic volcanic breccia which is interlayered with dark gray slate, ferruginous dolomite, and intermediate-composition flows and tuff. The silicic breccia has finely laminated angular fragments in a matrix of similar composition, and is inferred to be a pyroclastic breccia. The sulfide minerals occur as thin layers and lenses in a 1-m-wide by 10-m-long zone in the volcanic rocks. This mineralized horizon may be continuous with the deposit at locality 2, about 700 m to the north-northwest.

- 4A: Sparsely disseminated pyrite in the silicic breccia.
- 4B: Massive pyrite and a trace of arsenopyrite in a 1- to 5-cm-thick layer in the breccia. This layer is parallel to compositional layering and a faint flattening of the fragments.
- 4C: Ochre-weathering ferruginous dolomite. The dolomite forms a 1-m-wide layer of recrystallized fine-grained carbonate that was probably a limestone interbed within the volcanic rocks.

¹ Spectrographic analysis (Table 1) indicates that arsenopyrite is present.

² Spectrographic analysis (Table 1) indicates that sphalerite is present.

LOCALITY 5 (82ABg005) - Small island in the northwest part of Eureka Channel.

A sheared contact zone between quartz diorite to the south and silicic- to intermediate-composition volcanic rocks to the north is exposed on this island. The sulfide minerals occur as thin discontinuous layers in a sliver of silicic pyroclastic(?) breccia within this shear zone. J. Saleeby suggests that the silicic breccia may be a syn-volcanic intrusive along this shear zone, rather than an extrusive breccia.

- 5A: Discontinuous pyrite-rich layers that occur in a meter-wide zone in the silicic volcanic rock.
- 5B: Pyrite-bearing, rusty weathering volcanic rock. Spectrographic analysis (Table 1) indicates that arsenopyrite is present.

LOCALITY 6 (82ABg006) - Northwest shore of Winter Bay, eastern Barrier Islands.

A several-hundred-m-wide zone of variably mineralized dark gray slate and silicic volcanic breccia and tuff crops out along the north shore of Winter Bay. Disseminated pyrite is present in most of the section, and small pyrite-rich stringers occur in both the volcanic and sedimentary rocks. Several of these stringers form prominent rusty weathering exposures along the shoreline. The beds dip steeply and strike at a high angle to the shoreline, so the length of the mineralized zone is not known.

- 6A: Pyrite-rich pyroclastic breccia composed of 2- to 4-cm angular fragments in a matrix of similar composition.
- 6B: Sulfide-poor breccia adjacent to sulfide-rich zone at 6A.
- 6C: Rusty weathering gray-black slate that contains disseminated pyrite. The slate is a 1-m-thick interbed within the volcanic breccia.

NICHOLS BAY AREA (Fig. 1)

LOCALITY 7 (82ABg007) - South end of Nichols Bay.

Massive sulfides at this locality form 2- to 6-cm-thick lenses and discontinuous layers in a locally fragmental silicic volcanic rock. The zone that contains these layers is about 6 m wide, and forms a linear topographic depression along strike to the north-northwest. The mineralized volcanic rock is interbedded with intermediate-composition pillow breccia and massive flows. We suspect that the host-rock is a fragmental flow or pyroclastic breccia, although it could be a hypabyssal intrusive. Intermediate-composition dikes cut the mineralized zone.

- 7A: Medium-grained pyrite that forms up to 60% of a 2- to 6-cm thick layer within the silicic volcanic rock. The pyrite is accompanied by microscopic traces of sphalerite.
- 7B: Thin, pyrite-rich layer in the volcanic rocks. Microscopic traces of sphalerite are also present.

7C: Sulfide-poor silicic volcanic rock adjacent to the more sulfide-rich layer at 7A.

LOCALITY 8 (82ABg008) - Southern Nichols Bay.

Massive sulfides occur primarily as several-cm-thick layers in a fragmental silicic volcanic rock at this locality. Disseminated pyrite is also present in intermediate-composition flows with which the mineralized rocks are interbedded, and in a quartz-feldspar porphyry that intrudes the volcanic rocks. The massive sulfide is confined to a 10-m-wide zone that may be continuous with the occurrence at locality 7.

8A: 2- to 4-cm-thick layer of massive pyrite, accompanied by microscopic traces of sphalerite, in a highly altered, carbonate-rich silicic volcanic rock. Alteration from this layer forms a prominent rusty weathering zone.

8B: Disseminated pyrite in a massive volcanic rock adjacent to 8A.

8C: Disseminated pyrite in the quartz-feldspar porphyry intrusive.

LOCALITY 9 (82ABg009) - Northeast shore of Nichols Bay.

Several massive-sulfide-bearing layers occur in a sequence of interbedded graywacke, slate, and silicic volcanic rocks along the northeast shore of Nichols Bay. The main occurrence at this locality is a 3-m-wide layer in which massive pyrite and sphalerite form several-cm-thick layers that are similar to those in the surrounding graywacke. These sedimentary rocks are interbedded with silicic volcanic rocks and gray-black slate -- both of which contain disseminated pyrite and thin layers of massive sulfides. The sulfide-bearing horizons are generally parallel to N8°E, 75°SE bedding in the host rocks. An old shaft is present in the main massive sulfide layer, and Chapin (1918, p. 67) describes other prospects in this sequence of rocks in the northeastern part of Nichols Bay. Chapin described copper as the valuable metal in these deposits, but our analyses (Table 1) show that they also contain possibly significant amounts of zinc and silver. Little apparent work has been done on any of these prospects since they were visited by Chapin, although claims have been staked in the last decade. Samples were collected along a 12-m-long shoreline traverse across the main lode and adjoining sedimentary and volcanic rocks. Samples 9A through 9I are located from north to south along this traverse.

9A: Sparsely disseminated pyrite in silicic volcanic rock that crops out nearly continuously along the shoreline to locality 10.

9B: Disseminated pyrite and arsenopyrite¹ in a silicic volcanic rock adjacent to 9A.

9C: 1-m-wide pyrite- and sphalerite-bearing layer in the volcanic rocks.

9D: Layer of massive pyrite and disseminated sphalerite and arsenopyrite¹ in a rusty weathering layer adjacent to 9C.

¹
Spectrographic analysis (Table 1) indicates that arsenopyrite is present.

- 9E: Disseminated pyrite, sphalerite and arsenopyrite¹ in quartz-rich graywacke adjacent to the main lode.
- 9F,G, and H: Massive sulfides collected from different parts of the main lode. Pyrite and subordinate sphalerite and arsenopyrite¹ constitute about 90% of 1- to 3-cm-thick layers that are interbedded with thinner, quartz-rich layers.
- 9I: Fine-grained pyrite and arsenopyrite¹ disseminated through banded graywacke on the south side of the main lode.

LOCALITY 10 (82ABg010) - Northeast shore of Nichols Bay, 500 m north of locality 9.

Silicic volcanic rocks occur along this shore from locality 9 to at least a kilometer north of this locality. Discontinuous zones of disseminated and massive sulfides in these rocks may be similar to the mineralized zones at the Feickert claim described by Chapin (1918, p. 67).

- 10A: Disseminated pyrite and arsenopyrite¹, accompanied by microscopic traces of sphalerite, in rusty weathering, foliated, silicic volcanic rock.
- 10B: Disseminated pyrite in foliated silicic volcanic rock.

DISCUSSION

Field relationships and various age constraints suggest that the massive sulfide occurrences on southern Prince of Wales Island and the Barrier Islands are syngenetic mineral deposits in an Ordovician-Silurian volcano-plutonic complex. A similar origin has been proposed for some of the iron-copper deposits in Upper Ordovician-Lower Silurian andesitic volcanic rocks on east-central Prince of Wales Island (Eberlein and Churkin, 1976, p. 89).

Similar types of massive sulfide deposits have yielded significant quantities of copper from the Niblack Mine and the Dama Prospect ("N & D" on Fig. 1; Herreid, 1964), and occur at many other localities on south-central Prince of Wales Island (Herreid and others, 1978, Table 5). The metavolcanic and metasedimentary host-rocks at these mines and prospects, however, are thought to be part of the Wales Group rather than the Ordovician-Silurian complex (Eberlein and others, 1983; Redman, 1981, Fig. 1). Because the primary relationship between the Wales Group and the Ordovician-Silurian rocks is poorly constrained, we do not yet know whether the mineral deposits in the two packages of rocks are genetically related. Mapping and U/Pb geochronologic studies in progress may help discern the differences in geologic and mineralization history between these two assemblages. In either case, the massive sulfide deposits within the Ordovician-Silurian rocks in the southern Prince of Wales Island region appear to warrant additional investigation.

ACKNOWLEDGEMENTS

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¹ Spectrographic analysis (Table 1) indicates that arsenopyrite is present.

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TABLE 1. Analyses of rock samples collected at localities shown in Figure 1

ANALYTICAL DATA (PPM). Analyses by J.D. Hoffman and S. Sutley of the U.S.G.S. Symbols: N=not detected at limit of detection (value shown in parentheses); L=detected, but below limit of determinability G=greater than value shown. Elements that were looked for but not detected include Bi, La, Nb, Sb, Sn, Th, and W (except 50 ppm La in samples 004 and 005A, and "L" of W in sample 009I). Values in parentheses at the top of each column are lower limits of detection.

Locality Number on Figure 1	U.S.G.S. Sample Number	SEMIQUANTITATIVE SPECTROGRAPHIC ANALYSES (in ppm)																	SAMPLE DESCRIPTION (sil-int = silicic-intermediate)														
		ATOMIC ABSORPTION ANALYSES																															
		Au	Zn	Ag	(.5)	As	(200)	B	(10)	Ba	(20)	Be	(1)	Cd	(20)	Co	(5)	Cr	(10)	Cu	(5)	Mo	(5)	Ni	Pb.	Sc	(100)	V	(10)	Y	(10)	Zn	(200)
1	82ABg001A	N(.05)	110	1	300	70	1500	L	1500	L	N	70	50	100	30	500	100	10	100	N	300	20	Sulfide-rich sedimentary rock										
	82ABg001B	N(.05)	110	0.5	L	300	1500	L	1500	L	N	100	50	50	30	200	20	15	150	N	200	20	Disseminated pyrite in sil-int breccia										
	82ABg001C	N(.05)	90	0.7	500	30	1000	L	1000	L	N	300	30	70	20	700	30	7	70	N	300	15	Massive sulfide rinds on pillows										
	82ABg001D	N(.05)	95	L	200	30	1000	N	1000	N	N	150	50	30	15	200	10	10	100	N	200	20	Sil-int volcanic rock adjoining 1C										
	82ABg001E	N(.05)	25	N	N	70	3000	L	3000	L	N	20	100	10	N	50	N	20	200	N	20	30	Interior of pillow with sulfide-rich rind										
	82ABg001F	N(.05)	510	L	N	30	65000	L	65000	L	1.5	20	50	100	30	70	20	15	300	N	500	50	Sulfide-rich layer in black slate										
	82ABg001G	N(.05)	140	0.5	L	20	1000	N	1000	N	N	70	30	70	50	150	50	7	100	L	L	10	Massive pyrite in sil-int breccia										
2	82ABg002A	.10	630	10	500	L	200	N	200	N	N	N	N	200	7	10	1000	N	150	L	15	500	30	Massive sulfide layer in sil-int volcanic rock									
	82ABg002B	.25	95	30	2000	L	2000	L	2000	L	N	20	70	10	50	500	20	N	150	L	L	15	15	Sulfide-poor volcanic rock adjacent to 2A									
	82ABg002C	N(.05)	55	1.5	L	100	5000	L	5000	L	1.5	30	200	100	N	50	20	30	N	200	N	30	30	30	Non-mineralized volcanic rock adjacent to 2A								
	82ABg002D	N(.05)	3500	5	N	L	2000	L	2000	L	20	N	N	100	15	L	1500	N	L	10	20	3000	50	50	Silicic volcanic rock adjacent to mineralized layer								
3	82ABg003A	N(.05)	20	1	300	L	150	L	150	L	N	30	30	150	70	150	70	20	N	150	L	20	20	20	Massive sulfide rind around sil-int pillow								
	82ABg003B	N(.05)	90	N	N	10	100	L	100	L	N	15	50	30	N	50	10	30	200	150	L	N	30	30	Core of pillow in 3A								
4	82ABg004A	N(.05)	35	N	N	L	70	L	70	L	N	N	N	20	N	5	15	L	N	N	20	N	70	70	Disseminated pyrite in silicic volcanic breccia								
	82ABg004B	N(.05)	30	N	N	L	70	L	70	L	N	N	L	5	N	N	70	N	L	L	L	15	N	30	Massive sulfide layer in silicic breccia								
	82ABg004C	N(.05)	20	N	N	L	200	L	200	L	1.5	N	N	N	L	N	L	L	N	500	20	10	N	30	30	Ferruginous dolomite adjacent to silicic breccia							
5	82ABg005A	N(.05)	60	2	N	10	1000	L	1000	L	N	150	20	300	30	700	30	5	N	30	20	200	20	20	Pyrite-rich layer in silicic breccia								
	82ABg005B	N(.05)	55	N	700	100	3000	L	3000	L	2	N	50	20	7	100	10	15	100	100	20	N	50	50	Sulfide-bearing silicic breccia								
6	82ABg006A	N(.05)	70	0.5	N	15	1500	L	1500	L	N	30	100	100	10	50	10	30	100	200	20	N	30	30	Sulfide-rich pyroclastic breccia								
	82ABg006B	N(.05)	35	N	N	L	500	L	500	L	N	20	50	30	N	30	15	20	200	150	15	N	20	20	Sulfide-poor breccia adjacent to 6A								
	82ABg006C	N(.05)	250	L	N	20	700	L	700	L	N	10	20	30	15	50	50	10	N	200	30	300	100	100	Disseminated pyrite in black slate								
7	82ABg007A	N(.05)	140	2	N	L	100	L	100	L	N	50	N	50	20	N	50	10	N	50	15	200	15	15	Sulfide-rich layer in silicic volcanic rock								
	82ABg007B	N(.05)	65	0.7	N	L	200	L	200	L	N	30	N	30	10	L	30	15	N	100	20	L	30	30	Sulfide-rich layer in silicic volcanic rock								
	82ABg007C	N(.05)	130	L	N	10	100	L	100	L	N	7	N	5	7	7	10	10	N	100	10	L	50	50	Disseminated pyrite in silicic volcanic rock								
8	82ABg008A	N(.05)	5	0.5	N	L	150	L	150	L	N	30	N	70	7	L	50	10	N	70	L	N	20	20	Massive sulfide in silicic volcanic rock								
	82ABg008B	N(.05)	85	N	N	10	200	L	200	L	N	20	15	10	N	15	10	15	N	150	15	N	30	30	Sulfide-poor rock adjacent to 8A								
	82ABg008C	N(.05)	50	N	N	L	150	L	150	L	N	20	15	10	N	10	L	15	150	100	15	N	50	50	Disseminated pyrite in quartz-feldspar porphyry								
9	82ABg009A	N(.05)	230	0.7	N	50	1500	L	1500	L	N	7	10	20	20	20	70	7	N	150	10	200	20	20	Disseminated sulfide in silicic volcanic rock								
	82ABg009B	N(.05)	110	5	300	30	700	L	700	L	N	15	15	50	7	20	50	7	100	100	20	L	15	15	Disseminated sulfide in silicic volcanic rock								
	82ABg009C	N(.05)	23000	30	N	L	150	L	150	L	500	10	20	100	30	15	500	10	150	200	50	G10000	10	10	Sulfide-rich silicic volcanic rock								
	82ABg009D	N(.05)	18000	15	300	10	500	L	500	L	100	50	30	500	7	20	1000	7	N	150	15	10000	20	20	Massive sulfide layer in silicic volcanic rock								
	82ABg009E	N(.05)	14000	10	200	10	300	L	300	L	150	15	70	20	15	30	300	15	N	200	20	10000	30	30	Disseminated sulfide in graywacke								
	82ABg009F	N(.05)	7000	10	200	L	L	L	L	L	50	L	10	100	N	20	200	L	N	30	L	5000	L	L	Massive sulfides in graywacke in main lode								
	82ABg009G	N(.05)	3800	5	700	L	L	L	L	L	20	N	L	30	L	15	100	N	N	50	10	2000	L	L	Massive sulfides in graywacke in main lode								
	82ABg009H	N(.05)	1500	3	3000	L	20	L	20	L	50	N	30	70	N	5	300	7	N	100	10	7000	15	15	Massive sulfides in graywacke in main lode								
	82ABg009I	N(.05)	60	0.7	300	100	700	L	700	L	N	20	100	50	7	70	100	15	N	150	15	N	30	30	Graywacke adjacent to main lode								
10	82ABg010A	N(.05)	160	1.5	200	30	150	L	150	L	N	20	15	70	10	50	100	10	L	100	10	200	20	20	Disseminated sulfide in silicic volcanic rock								
	82ABg010B	N(.05)	55	L	N	70	1000	L	1000	L	1.5	N	100	50	L	50	15	20	L	200	20	N	30	30	30	Disseminated sulfide in silicic volcanic rock							