British Columbia Geological Survey
Geological Fieldwork 1990

QUATSINO SOUND PROJECT
(92L/5, 6, 11, 12)

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KEYWORDS: Regional mapping, Quatsino Sound, Wrangellia, stratigraphy, mineral occurrences.

INTRODUCTION

The Quatsino Sound project is a five-year 1:50 000-scale regional mapping program in northern Vancouver Island, begun in 1990. The project area is centred upon Quatsino Sound and extends from Port Hardy in the north to Merry Widow Mountain in the south, and from the Benson River in the east to Holberg in the west. It comprises the Quatsino (92L/12) and Mahatta Creek (92L/5) map sheets and the western halves of the Port McNeil (92L/11) and Alice Lake (92L/6) sheets. Access throughout the area is generally good with an extensive network of public and logging roads. Logging activity continues to open up the area, particularly in the west. Shorelines of the inlets and many lakes are accessible in most areas by small boats, and water taxis serve some of the areas inaccessible by road.

Previous mapping in the Quatsino Sound area has been carried out by both provincial and federal government agencies beginning with the pioneering work of Dawson (1887). Studies of the geology and mineral deposits have included those of Gunning (1930), Jeffrey (1962), McCammon (1969) and Northcote (1969, 1971, 1973). The most recent published mapping is that of Muller *et al.* (1974).

In addition to geological studies, the project area has recently been covered by the 1:50 000 Vancouver Island aeromagnetic survey, and is within the 1988 Regional Geochemical Survey area (Matysek *et al.*, 1989).

REGIONAL GEOLOGY

The project area is part of the Wrangellia Terrane and has similar stratigraphy to both Vancouver Island and the Queen Charlotte Islands. It is underlain by a thick sequence of Upper Triassic and Lower Jurassic volcanic and sedimentary rocks, overlain by Cretaceous sediments (Figure 1-9-1). The following stratigraphic units have been recognized:

Vancouver Group – an Upper Triassic oceanic assemblage, related to submarine rifting or eruption of widespread flood-basalts, includes pillowed and massive flows (Karmutsen Formation), and is overlain by shallow-water platformal limestones and shales (Quatsino and Parson Bay formations).

Bonanza Group -- a Lower Jurassic calcalkaline volcanic assemblage developed in a continental arc on the Wrangellian basement of the western margin of Vancouver Island. It comprises a lower, marine sedimentary suite and an upper, marine to subaerial volcanic package.

Island Plutonic Suite – several stocks intrude the lower Mesozoic sequences. They vary in composition from gabbro to granodiorite and are coeval with the Bonanza Group volcanics.

Longarm Formation (Kyuquot Group) – marine clastic sediment wedges of Early Cretaceous age onlap onto the older basement.

Queen Charlotte Group – a Lower Cretaceous fluvial sequence that includes coaly intervals.

Nanaimo Group – Upper Cretaceous clastic sediments underlie the Suquash basin on the northeast margin of the project area. They are regarded as the northernmost extension of the Nanaimo Group.

Alert Bay Volcanics – Miocene mafic to felsic fore-arc volcanic and volcaniclastic rocks form a northeasterly trending chain across the southern part of the project area.

Muller *et al.* (1974) described the major structural architecture of northern Vancouver Island as being dominated by fault-bound blocks each with essentially homoclinal southwesterly dipping strata. The northeast-trending Brooks Peninsula fault zone is spatially associated with late Tertiary volcanics and has been interpreted as being related to the Miocene position of the Juan de Fuca Ridge, near the Brooks Peninsula (Riddihough, 1977; Armstrong *et al.*, 1985). The tectonics, age and sense of motion on most other faults in the area are not well constrained. Northwest-trending faults may result from a late Cretaceous or Tertiary dextral transpressive regime. The more westerly trending Holberg fault was interpreted by Muller *et al.* as being a sinistral strike-slip fault, possibly of mid-Cretaceous age, but could also be a thrust fault within the dextral transpressive regime (T.D.J. England, personal communication, 1990).

ECONOMIC GEOLOGY

Known metal mineralization in the project area includes:

- Iron-copper-molbdenum-(?)gold skarns are hosted principally within limestone and limy tuffs in the upper Karmutsen and the Quatsino formations. Examples include the past-producing Merry Widow and Coast Copper mines.
- Copper-molybdenum porphyry stockworks are hosted by Bonanza Group volcanics intruded by several suites of Jurassic porphyry dikes. The Island Copper mine is presently producing, and exploration is in progress on the Expo and Red Dog properties north of Holberg Inlet.
- Lead-zinc mantos and replacement bodies are hosted by Quatsino and Parson Bay limestones. Examples include the H.P.H. showing near Nahwitti Lake.

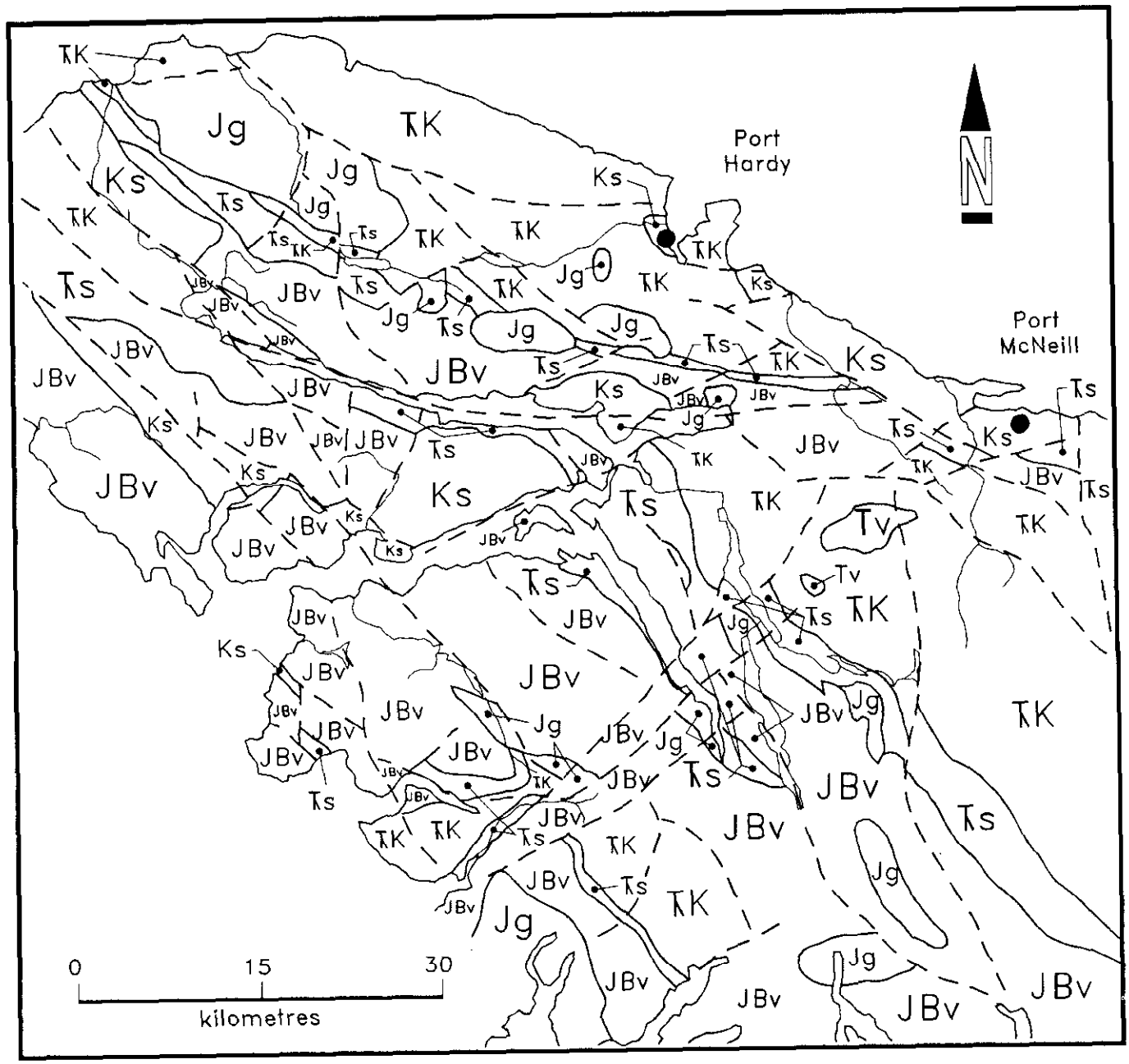

Figure 1-9-1: Simplified geological map of northern Vancouver Island (after Muller, 1974).

- Epithermal to mesothermal, shear-hosted quartz-carbonate veins containing gold, silver, arsenic, antimony and mercury are found in basalts and diabase of the Karmutsen Formation.

The porphyry, skarn and manto deposits appear to be interrelated in a major metallogenic system associated with an early Jurassic arc. Models of similar arc-related deposits suggest a potential for epithermal gold in Bonanza volcanics and possibly for Carlin-style gold in Parson Bay and Bonanza sediments (Panteleyev, 1986; Sillitoe and Bonham, 1990).

Alaskan equivalents of the Quatsino limestones are the host to stratiform copper deposits (Armstrong *et al.*, 1969; Armstrong and MacKevett, 1982); similar deposits have not yet been explored for on Vancouver Island. There is also an unknown potential for base metal massive sulphide deposits in the lower marine sections of the Bonanza Group.

Cretaceous sediments in the Coal Harbour area, and particularly the Suquash basin, are the host to historically important coal deposits. These coal deposits are no longer economically viable but they offer some potential for the recovery of coalbed methane. On the Queen Charlotte Islands, parts of the Lower Cretaceous sedimentary sequence have some potential as reservoir rock for petroleum, but source rocks are probably absent on Vancouver Island. White recrystallized limestone is currently quar-

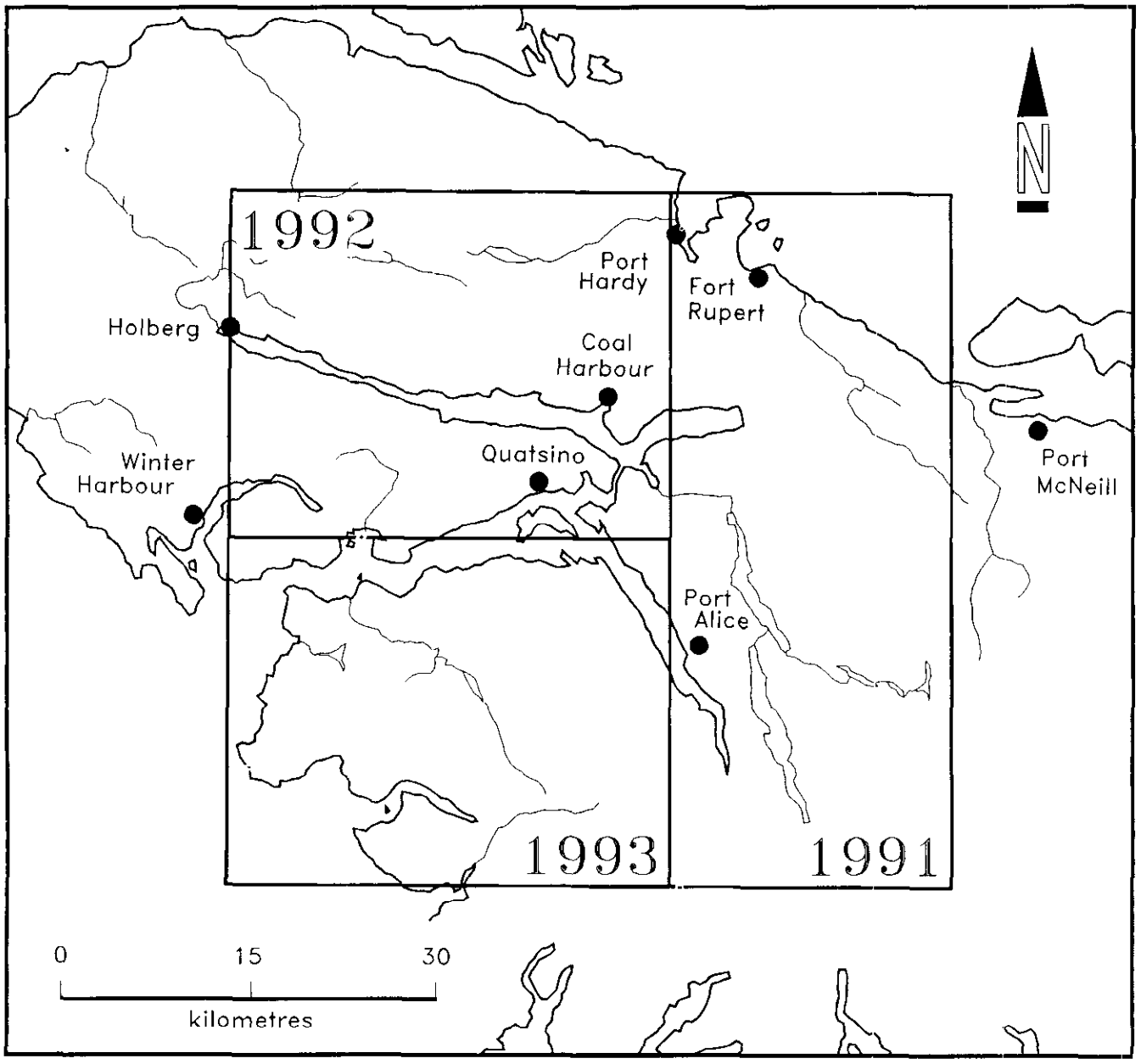

Figure 1-9-2: The location of the Quatsino Project. Proposed map areas are 1991 Benson River Area (92L/6W and 92L/11W), 1992 Quatsino (92L/12) and 1993 Mahatta Creek (92L/5).

ried from the Quatsino Formation near Benson Lake for use as fillers, road metal and other applications.

OBJECTIVES OF THE PROJECT

The 1990 field season was restricted to a four-week reconnaisance of the project area by the authors to obtain some familiarization with the region, its logistical problems, principal geologic units and mineral deposits. Full-scale fieldwork will begin in 1991 in the eastern part of the project area (Figure 1-9-2) and continue over the next three years. Apart from 1:50 000 regional geologic maps of the project area, it is also proposed to conduct further moss-mat stream-sediment sampling throughout the area to complement the 1988 Regional Geochemical Survey. D.M. Melville will also undertake thesis studies to characterize the alteration assemblages associated with the porphyry copper deposits of the Coal Harbour – Holberg area.

Several ancillary studies focused on specific topics will be undertaken during the course of the project, in cooperation with colleagues from provincial and federal governments and universities. These include a study of the sedimentology and biostratigraphy of the Triassic sediments, in collaboration with M.J. Orchard and E.T. Tozer of the Geological Survey of Canada and A. Desrochers of the University of Ottawa; and studies of the development and regional setting of the iron-copper-gold skarns in cooperation with G.E. Ray of this Ministry.

ACKNOWLEDGMENTS

The authors would like to acknowledge the help, support and encouragement for this project given by John Fleming (BHP-Utah Mines Ltd.), Peter Dasler (Daiwan Engineering Ltd.), Jim Laird, Paul Wilton, Gerry Ray, Tim England and staff of Western Forest Products Ltd., MacMillan-Bloedel Limited, Interfor and the British Columbia Ministry of Forests.

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