of volcanic flows and pyroclastics. They are confined to the eastern ranges of the St. Elias where they form a discontinuous belt that trends northwesterly into the region underlain by Wrangell Lava in southern Alaska. Throughout most of the area the lavas are flat lying or gently tilted. They have, however, been involved in Neogene faulting, and particularly near the Shakwak fault zone, they are intensely shattered and folded.

Three stratigraphic sections were measured (Fig. 1). These reveal a complex alternation of acid, intermediate and basic lavas from many separate vents. Section 3, on Felsite Creek, is near the centre of an enormous pile of light coloured trachyte (?) that includes individual lava domes more than 1, 000 feet thick as well as numerous welded ash flows having a composite thickness of nearly 4, 000 feet. Six miles east of Felsite Creek, section 2 includes only one ash flow, 200 feet thick, which rests directly on pre-Tertiary basement and is overlain by more than 2, 000 feet of uniform basalt flows. Section 1, facing the north side of Steele Glacier, is predominantly basalt but the succession is interrupted by many layers of siliceous airfall pumice. This material commonly shows evidence of reworking and mixing with fine fluvial or lacustrine silt and sand. Most of these sedimentary layers contain coalified plant debris, broad leaf plant impressions and, locally, coal seams up to 14 inches thick.

In each of the measured sections there is a conspicuous absence of coarse clastic material intercalated with the flows. Rare layers of pebbles and cobbles include only clasts derived from Tertiary lavas whereas clasts of older rocks, which should be present if the central ranges were being uplifted, are absent. This suggests that the volcanic activity took place during a period of tectonic quiescence. The lavas appear to have poured out onto a gently sloping surface traversed by stagnant rivers and dotted with shallow lakes and peat bogs. The profound uplift that raised the St. Elias Mountains to their present elevation must post date eruption of the Tertiary lavas.

The Wrangell Lava of southern Alaska is described as predominantly andesite and basaltic andesite with minor basalt, dacite and rhyodacite (MacKevett, 1971). A preliminary scan of thin sections from rocks of the eastern St. Elias Mountains suggests that basalt is predominant and that all of the lavas are alkaline. Most of the basalt contains abundant olivine and strongly pigmented aphitic plates of titanaugite. The felsic rocks are commonly altered but two sections contain remnants of aegirine-augite. On this basis, the rocks are tentatively assigned to the alkali-olivine basalt, trachybasalt, trachyte, sodic rhyolite succession. If this is borne out by further work, it constitutes an important transition between contemporaneous calc-alkaline volcanism in the Aleutian chain and alkaline to peralkaline volcanism in northern British Columbia.

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14. GEOTHERMAL PROJECT

Project 730067

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This project was initiated in response to increasing interest in the use of geothermal energy to supplement diminishing reserves of fossil fuel. The geothermal potential of western Canada is impossible to assess on the basis of existing data. Several Quaternary volcanoes in British Columbia have produced lavas of an age and type commonly associated with hydrothermal fields elsewhere but no active fumeroles or boiling springs are known in Canada. This does not rule out the possibility that high temperature hydrothermal systems may exist at depth. Water leaking from such a system may be cooled and diluted as it rises and emerges at the surface as a warm spring. The chemistry of such water may reflect equilibrium with the enclosing rock at depth and hence may be used as a guide in estimating subsurface temperature.

During the 1973 field season approximately 50 thermal springs were sampled in British Columbia. Analyses for major trace elements as well as dissolved gasses are being made by the Geochemistry Section of the

Table 1

Element	Low Value	High Value	No. of Analyses
Na	2ppm	1100ppm	49
K	<5ppm	52ppm	49
Ca	<10ppm	370ppm	49
Mg	<1ppm	235ppm	49
As	<1ppb	38ppb	53
U	<0.02ppb	13ppb	53
Li	<10ppb	1280ppb	49
Mn	<5ppb	1900ppb	49
F	60ppb	8000ppb	45
Cl	<1.0ppb	1678ppb	49
CO_2	0.0ppm	59.6ppm	49
HCO_3	12.3ppm	2860ppm	49
SO_4	11ppm	480ppm	20
SiO_2	17ppm	424ppm	49

ppm - parts per million
ppb - parts per billion

Geological Survey of Canada. Preliminary data indicate a wide range of values for both major and trace elements (see Table 1). Carbon dioxide and nitrogen are the principal dissolved gasses in all springs. Nine springs contain significant H_2S, two of them more than 10,000 ppm. Of particular interest are several springs with more than 400 ppm dissolved SiO_2 which may indicate high subsurface temperature.[2]