

GEOHERMAL ENERGY

Drilling near Mt. Meager and
Mt. Cayley Volcanic Centres - 1977

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A drilling programme, as part of the research into geothermal resources in the Garibaldi Volcanic Belt, was first proposed and discussed at the meeting of the Geothermal Coordinating Group in Victoria on 20 January 1977. Possible objectives of a drilling programme were as follows:

1. Examine further crustal temperature in the area surrounding Meager Mountain, where geothermal exploration is proceeding;
2. Search for thermal anomalies close to centres of recent volcanism within the Garibaldi Volcanic Belt;
3. Distinguish between the line of young volcanic centres of the Garibaldi chain and the line of the Lillooet Valley with its hot springs, as the controlling factor in the geothermal resource potential;
4. Support the magneto-telluric measurements made along the line from Britannia to D'Arcy and to examine the thermal character of observed crustal differences on this profile;
5. To improve the poor heat-flow coverage of this area in order to facilitate the interpretation of the Canadian cordillera in terms of present and past crustal structure and movement.

These aims are presented in approximate order of gradation from direct energy exploration to crustal geothermics. None is totally independent of the others. In judging the relative merits of these objectives it must be remembered that:

1. The funds for this work are provided for the purpose of energy research and development;
2. The short-term need of the geothermal energy programme is the demonstration of the existence of geothermal resources in the western cordillera.
3. The long-term need of the geothermal energy programme is the understanding of crustal structure and processes in the context of the Canadian Pacific margin, in order to be able to detect and assess all of our geothermal potential.

The selected drilling programme

After much discussion it was decided to concentrate on objectives 1 and 2. Objectives 5 and 3 will be satisfied to some extent, but objective 4 will not be satisfied.

Drilling will be confined to two areas: the Lillooet Valley immediately to the southeast of Pebble Creek and the Squamish Valley near the confluence of the Squamish and Elaho Rivers. The first area is near Mt. Meager and the second is near Mt. Cayley, two young volcanic centres of the Garibaldi chain. The first area is also in the line of the Lillooet Valley.

The Lillooet Valley area is at the closest point to Mt. Meager that can be reached by existing roads. It is within the area in which resistivity and self-potential anomalies have been found. It is possible that useful resources are located in this area, but it is not considered to be probable. It is much more likely that we shall encounter marginal hot water or a non-convecting situation that is representative of the stable thermal pattern just outside a volcanic anomaly. The Spanish area is close to Mt. Cayley and the probability of meeting hot water is considered to be less than at Mt. Meager. This should give a good indication of the thermal nature of the volcanic belt.

This drilling programme is conceived as a necessary preliminary to a deeper hole, much nearer to the youngest eruptive centre, to be drilled during 1978.

The Lillooet Valley area will be drilled first, and the initial mobilisation should take place either on the Labour Day weekend or the following weekend. The reason for using weekends will be discussed under Logistic concerns.

Drilling will be in AX size, yielding a hole slightly under 5 cm (2 in.) in diameter and a core of about 3 cm (1¼ in.) in diameter. Full core will be taken for geological examination and measurement of thermal and other physical properties.

At least two holes will be drilled in each area. Individual sites are separated by a few kilometers and have been selected on the basis of geological merit and logistic ease, as described below. Dramatic differences in thermal character between sites within one area is not expected, but could be of great value if found. The purpose of multiple sites is to reduce the risk of worthless results due to subsurface water flow and difficulties in drilling. The intended depth of drilling is 200 m (700 ft.), but decisions may be made at the time of drilling to continue to greater depth or to terminate a hole at a shallower depth, depending on the results being obtained and the difficulties being encountered. It will be necessary to maintain a scientist at the site to make these decisions.

There is a definite risk of encountering moving water, the path of which will probably be changed by drilling, in each hole. The temperature of this water will mask the temperature of the undisturbed rock around the hole, but the water itself will be of interest if it is hot. In order to minimise the risk of disturbance to temperature patterns, temperature measurements will be taken throughout the total length of the hole each evening after drilling has stopped and again in the morning before drilling starts. In this way relatively undisturbed temperatures may be obtained in sections of hole that will later contain moving water.

If water is encountered, the depth to which drilling should continue and the desirability of attempting to stop the flow will be decided by the scientist at the site. Samples of any water flowing to surface will be collected and analysed, and down-hole samples may be needed.

If no water is encountered and a good temperature gradient is established it may be desirable to drill beyond 200 m (700 ft.) if significantly better information may be obtained. Alternatively, the presence of successive fractures containing hot water may prompt a continuation of drilling. It is impossible to predict all the possible combinations of temperature, water flow and drilling difficulties that may be encountered.

Choice of sites

The choice of sites was limited by the requirements of:

1. access by existing logging road;
2. the ability to collar into or very close to bedrock;
3. the availability of adequate water within a few hundred yards;

Logging road systems tend to consist of a main access road along the valley bottom with tributary roads along side valleys and on the flanks of the mountains. Erosion processes have ensured that the valley sides are well covered by detrital fans and talus piles, and that valley bottoms are covered by river-deposited silts and gravels. The thickness of these deposits is unknown. The friable rocks of the main volcanic centres are particularly subject to erosion, so that overburden is plentiful in their vicinity. It is surprisingly difficult to find sites meeting the above criteria. The chosen sites are located on the granitic rocks of the Coast Plutonic Complex and are marked on the attached maps.

Details of the chosen sites are as follows:

Lillooet No, 1 - rock is cut by road building as the road climbs to the southeast of Pebble Creek. A small stream flows down the rock face and across the road. There is room to place the drill off the road next to the stream. This site is estimated to be 100 m (300 ft.) above the valley floor.

Lillooet No. 2 - by side of road at about mile 21.3, or alternatively at back of cleared space to the southeast. A creek crosses the road about 4/10 mile to the southeast, or the main river is about $\frac{1}{2}$ mile away through the bush.

Squamish No. 1 - quarried rock at side of disused spur road, about 200 yds. from junction with main logging road at mile 36. There is a small creek about 100 ft. from the road.

Squamish No. 2 - quarried rock at side of main logging road at about mile $37\frac{1}{2}$. Immediately adjacent to main river and about $\frac{1}{2}$ mile upstream from bridge to Elaho Valley.

One hole will be started at each of these sites and will be drilled to a depth of 200 m (700 ft.) or less depending on the condition encountered. Alternate sites will be chosen as required during the drilling of the first two sites of each area.

Logistic concerns

Access to all sites is by good logging roads. However, the Squamish Valley road is only open on weekends and on public holidays without special arrangement with Weldwood Ltd. On all roads travel during normal working hours is hazardous. It will be necessary to have the cooperation of the logging companies for the whole drilling programme. Mobilisation and moves should be at weekends whenever possible. The drillers should work a single 10 or 12 hour shift, arriving at the drill before normal trucking hours and leaving after trucking hours. The scientist making measurements will move mainly in the evening and early morning.

While drilling in the Lillooet Valley accommodation will be available at the camp of Nevin, Sadlier-Brown, Goodbrand Assoc. at the foot of Pebble Creek. Probable cost will be \$18 per day accommodation and board. Advance arrangement is necessary. No such camp exists in the Squamish Valley, and it will be necessary to set up a camp or commute from Cheekye or Brackendale.

Acknowledgments

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MAP 92 J II

SCALE APPROX

1:50,000

LILLOOET AREA

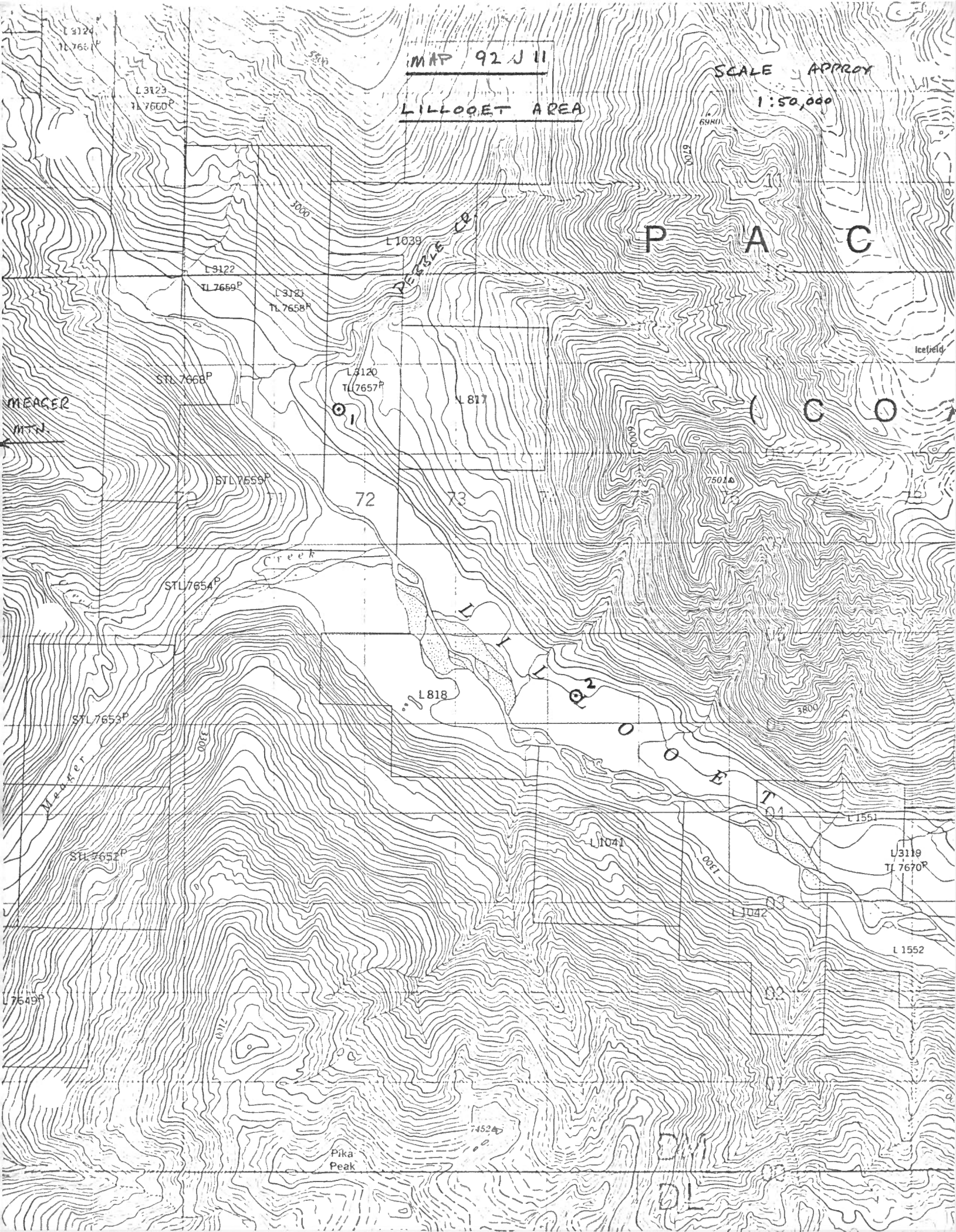
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SQUAMISH AREA

