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MEAGER CREEK GEOTHERMAL PROSPECT, BRITISH COLUMBIA
1979 PROGRESS REPORT

J. Stauder
B. C. Hydro Power Authority
555 West Hastings Street
Vancouver, B. C. V6B 4T6

Abstract

The Meager Mountain Volcanic Complex, 150 km north of Vancouver, B.C. has been a target of geothermal exploration since 1974. The study has been carried out jointly by B.C. Hydro, Energy, Mines and Resources Canada and co-funded by the Provincial Ministry of Energy, Mines and Petroleum Resources. Results indicate presence of two geothermal reservoirs approximately 12 km apart (South - North) within permeable fractured quartz diorite basement complex at depths between 1000-2000 m. Drilled holes were completed in the South Reservoir area during 1979 and drilling results are compatible with earlier electrical resistivity surveys. The highest temperature recorded was 202°C at 367 m.

Recent Work (1979). The South Reservoir, as defined by the previous work, extends from No Good Creek on the west side to the eastern boundary which ends as an outflow plume feeding the Meager Creek hot springs. To the north, the reservoir continues toward Pylon Mountain dipping slightly under the volcanic complex. The southern boundary has not yet been defined. The total area of the South Reservoir is estimated between 8-10 square kilometres (Figure 2).

The 1979 program expanded on earlier data gathered in the Meager Creek area. The main objectives were to confirm resistivity and obtain deeper temperature data; to locate a site for potential flow test well; and to confirm the western boundary of the South Reservoir.

Three intermediate holes were completed with excellent temperature results (Figures 3-5). All holes were 9.6 cm in diameter with 6.3 cm core. The temperature gradients in our most successful hole M7-79D were between 200°C/km and 1500°C/km. The hole reached a maximum temperature of 202.2°C at 367 metres.

Drilling on two of the 1979 holes, M6-79D and M7-79D, was done by a modified Boyles 56A diamond drill rig with high mast and elevated steel platform to accommodate 3000 psi shaffer blow-out preventer (BOP) stack and rotating head. The drill is capable of boring a 10 cm diameter hole to a depth of 1600 metres. With further modifications this type of drilling equipment may play a major role in future geothermal exploration due to its cost effectiveness and portability.

A Boyles 37A without BOP equipment was used to drill M8-79D where temperatures were expected to be less than 100°C. Hole M7-79D, which has standing water at approximately 55 m below the surface, is lined with 5 cm pipe perforated along the lower 55 metres. Hole M6-79D was abandoned after technical difficulties made further drilling impractical. M8-79D is presently being extended.

Introduction. Geothermal exploration program at Meager Creek was initiated in 1974 by B.C. Hydro and Power Authority jointly with Energy, Mines and Resources Canada. The area is centered around a Pliocene to Recent volcanic complex which is located about 150 km north of Vancouver in the Garibaldi Volcanic Belt of the Coast Mountains of British Columbia. Limited access and geographical features restricted the exploration methods and the speed of progress.

Initial work partially identified two independent geothermal reservoirs - the South (or Meager Creek Reservoir) and North (or Pebble Creek Reservoir). The estimated surface area of the South and North Reservoir is approximately 20-30 square kilometres which could potentially represent a development of up to 1000 MW. Work from 1974-1978 has included dipole-dipole and pole-pole resistivity surveys, self-potential surveys, nine shallow and intermediate temperature gradient holes, detailed geologic mapping, geochemical and isotope studies, refraction seismic surveys, microseismic and magnetotelluric investigations. Results of the above studies have been published or are in preparation either by Energy, Mines and Resources Canada or B.C. Hydro.
Work on the North Reservoir during 1979 involved construction of an access road system including two river crossings. Dipole-dipole resistivity was also carried out to upgrade the resistivity information to a similar level as available on the South Reservoir. A total of 25 line-kilometres were surveyed identifying five major resistivity anomalies some of which would become future drilling targets. The Dipole-dipole resistivity is becoming the major geophysical exploration tool at Meager Creek. It is used for preliminary reservoir outline and is important in siting drilling targets. Temperature results in wells drilled to date appear to confirm the validity of the interpretation of resistivity surveys carried out in the Meager area. Other exploration methods which have been employed are temperature gradient drilling and profiling, self-potential surveys, geological mapping and geochemistry.

Other Work. Other related work included isotope studies, slope stability mapping, hydrology, meteorology and air quality studies. The results will be published in the near future.

Recommended 1980 Work The 1980 proposed work will expand on the 1979 results. The work is mainly designed to further define the South Reservoir boundaries and obtain a better understanding of the geothermal system. Also, there is a strong possibility of drilling a steam discovery well in 1980.

In the North Reservoir, the main thrust of the work will be to drill a network of temperature gradient holes to establish the relationship between low resistivity and high temperatures, similar to the work carried out on the South Reservoir.

References


FIGURE 1
LOCATION MAP
MEAGER CREEK GEOTHERMAL AREA
FIGURE 2
SUMMARY PLAN
RESISTIVITY & DIAMOND DRILL COVERAGE

LEGEND
- MEAGER VOLCANIC COMPLEX
  - Base of volcanic stratigraphy
  - Hot Springs

RESISTIVITY COVERAGE
- Pole-Pole method
  - (Yr. of survey indicated)
- Dipole-Dipole method
  - (Yr. of survey indicated)
DIAMOND DRILLING COVERAGE
- Location and Well Designation
  - M6-790
FIGURE 3
TEMPERATURE PROFILE AND GRAPHIC LOG
RESEARCH WELL MG-790 (79-H-1)
TEMPERATURE PROFILE AND GRAPHIC LOGS
RESEARCH WELL MB-79D (79-H-3)
<table>
<thead>
<tr>
<th>New Hole Designation</th>
<th>Old Hole Designation</th>
<th>Location</th>
<th>Date Collared (Drilled by)</th>
<th>Depth(m)</th>
<th>Overburden(m)</th>
<th>Maximum Temperature(°C)</th>
<th>SHT Gradient at Bottom (°C/km)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1-74D</td>
<td>74-H-1</td>
<td>South Reservoir Outflow Plume</td>
<td>Nov 74</td>
<td>347</td>
<td>124</td>
<td>68.9</td>
<td>27.7</td>
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</tr>
<tr>
<td>M2-75D</td>
<td>75-H-1</td>
<td>South Reservoir</td>
<td>Sept 75</td>
<td>91</td>
<td>11</td>
<td>15.4</td>
<td>112</td>
<td>- making water at 0.3 l/s</td>
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<tr>
<td>M3-75D</td>
<td>75-H-2</td>
<td>South Reservoir</td>
<td>Sept 75</td>
<td>87</td>
<td>65</td>
<td>35.0</td>
<td>365</td>
<td>- inclined at -70°</td>
</tr>
<tr>
<td>M4-75D</td>
<td>75-H-3</td>
<td>South Reservoir</td>
<td>Sept 75</td>
<td>60</td>
<td>12</td>
<td>20.8</td>
<td>289</td>
<td>- temperature inversion between 387 and 450m</td>
</tr>
<tr>
<td>L1-78D</td>
<td>78-H-1</td>
<td>North Lillooet Valley</td>
<td>Sept 78</td>
<td>603</td>
<td>47</td>
<td>102.8</td>
<td>211</td>
<td>- temperature inversion in bottom section</td>
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<tr>
<td>M5-78D</td>
<td>78-H-2</td>
<td>South Reservoir</td>
<td>Oct 78</td>
<td>250</td>
<td>250</td>
<td>103.7</td>
<td>n.a.</td>
<td>- temperature inversion in bottom section</td>
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<tr>
<td>M6-79D</td>
<td>79-H-1</td>
<td>South Reservoir</td>
<td>July 79</td>
<td>321</td>
<td>15.6</td>
<td>140.8</td>
<td>n.a.</td>
<td>- temperature inversion in mid section - near isothermal in bottom section</td>
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<td>M7-79D</td>
<td>79-H-2</td>
<td>South Reservoir</td>
<td>Oct 79</td>
<td>367</td>
<td>26</td>
<td>202.2</td>
<td>225</td>
<td>- gradient inflection near 300m</td>
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<tr>
<td>M8-79D</td>
<td>79-H-3</td>
<td>South Reservoir</td>
<td>Nov 79</td>
<td>290.4</td>
<td>10</td>
<td>26.8</td>
<td>156</td>
<td>- extension planned for 1980</td>
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