DEVOLUTION OF THE TAUHARA GEOTHERMAL SYSTEM

R.W. Henley

Geothermal Research Centre, Wairakei

The Tauhara geothermal system (fig. 1) underlies Taupo on the flank of the extinct Tauhara dacite volcano. The resistivity boundary shows that the field is connected with the Wairakei field 6 km away. The field has been explored with 4 deep wells, showing that the geology and geochemistry are similar to Wairakei although well TH3 encountered somewhat higher temperature and gas content.

Up to the mid-1960's natural activity consisted of boiling chloride springs (1200-1500 ppm Cl) beside the Waikato river, and dilute chloride springs (~500 ppm Cl) in the Terraces area, together with steam-heated waters and steaming ground in the N.E. Sarbutt (1964) reported the chemistry of these waters and showed the presence of a dilute sulphate-chloride mter in shallow domestic wells adjoining steaming ground areas. Silica contents reflect saturation with respect to amorphous silica derived from the surficial Taupo pumice. Figure 2 schematically shows the hydrology of the system at this stage. Flows of cold meteoric water in the surface zone adsorbed deep system steam to form hot steam-heated waters which became progressively diluted westwards. The deep steam flow may be localised by a structural high in the Huka Formation.

In the late 1960's and early 1970's Thompson (pers. comm.) and Dickinson (1975) noted increases in the area and intensity of steaming ground and public concern was developing over increases in the spring temperatures and apparent total heat flow of the field. Chloride springs beside the Waikato river disappeared and ware replaced by steaming ground and fumaroles. Concurrent decline in reservoir pressures at TH2 showed these changes to be related to the exploitation of Wairakei and similar changas in heat flow had occurred at Karapiti (Allis, 1978). Resurvey of spring and domestic well waters in 1978 showed that temperatures in the surface steam-heated aquifer had increased; for example the AC Spring increased from 43 to 70 °C, and Kathleen from 61 to 98 °C. Chloride was otherwise absent apart from the Terraces Springs where chloride decreases and temperature increases (70 to 86 °C) had occurred. Figure 2 illustrates the new hydrology of the system. Absence of samples during the intervening period has precluded an assessment of the history of these changes so that it is not known whether the activity bas passed through a maximum or whether it has progressively evolved to a new steady state. Establishment of a monitoring system is warranted to follow future trends, particularly if any industrial geothermal development is undertaken. Some attention is focussed on dangers inherent in monitoring using shut-in monitor wells; THM2, for example, is producing heavy water through a distillation process within casing!

Heat flow surveys and isotope data can be used to monitor changes in the flaw of high temperature steam into the flowing surface aquifer.

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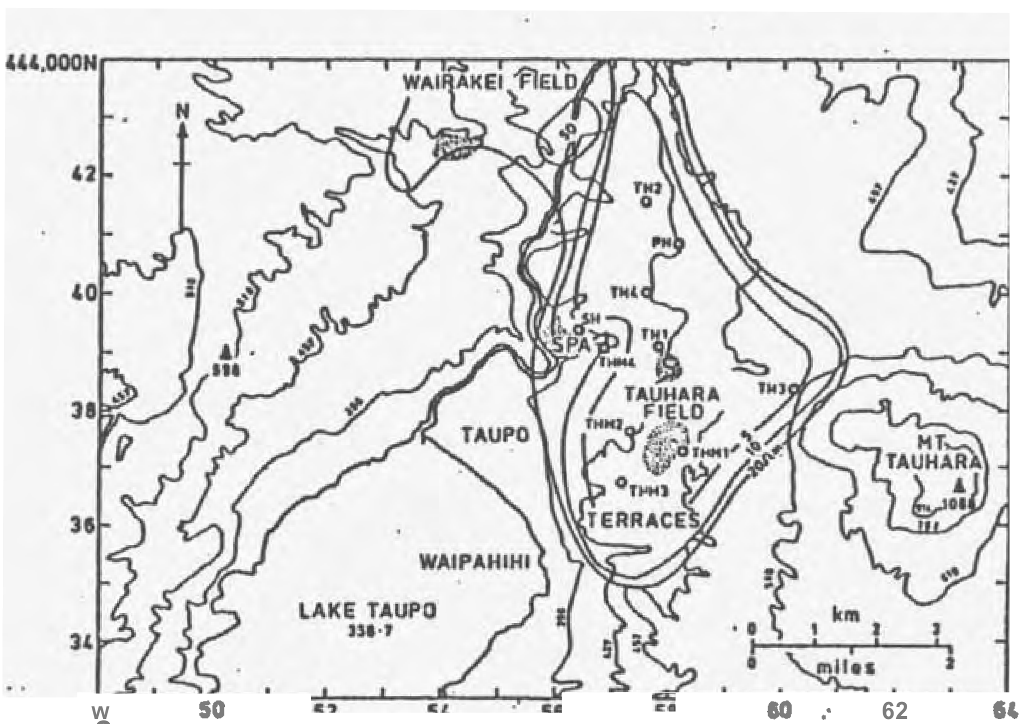
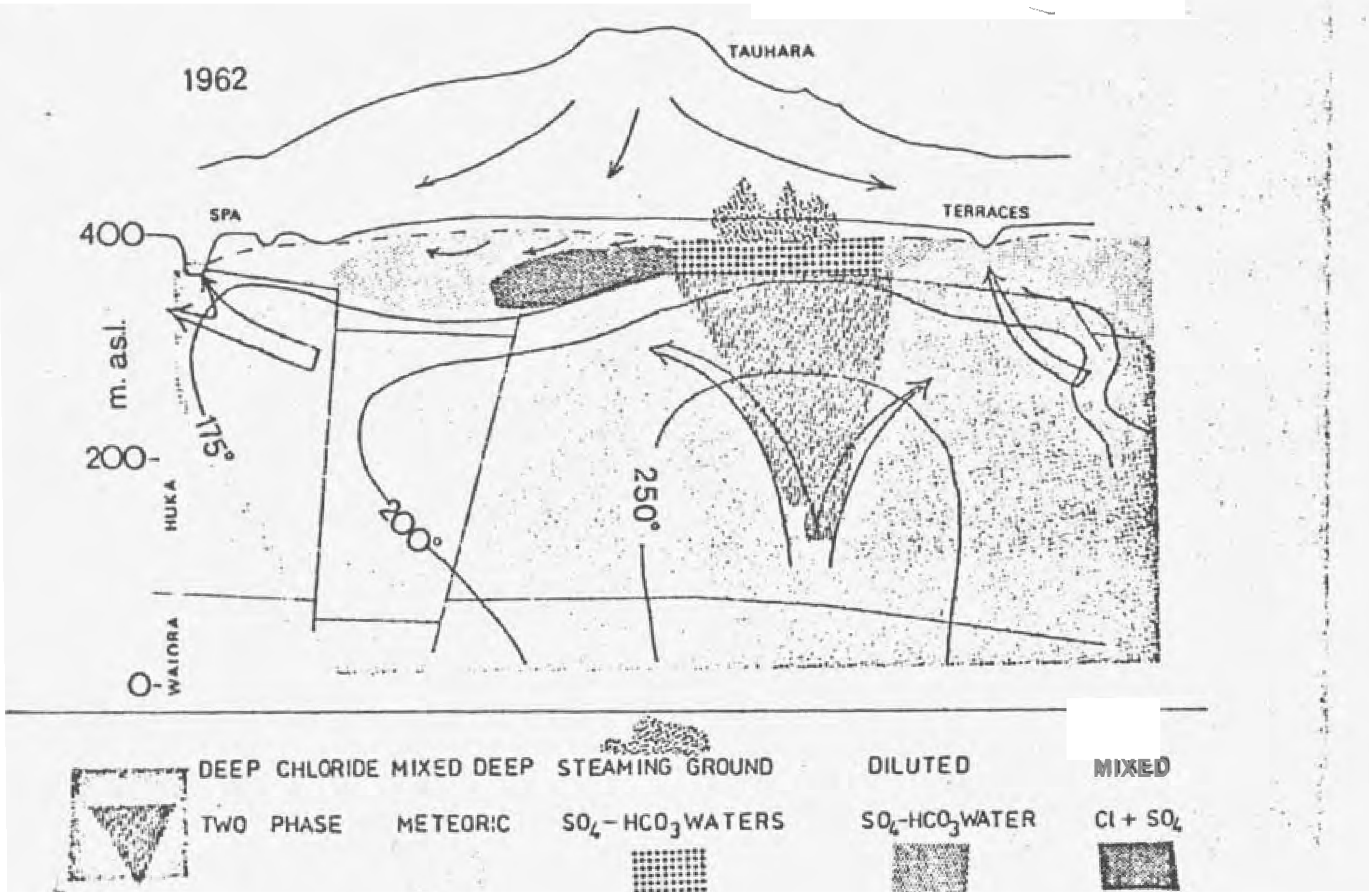
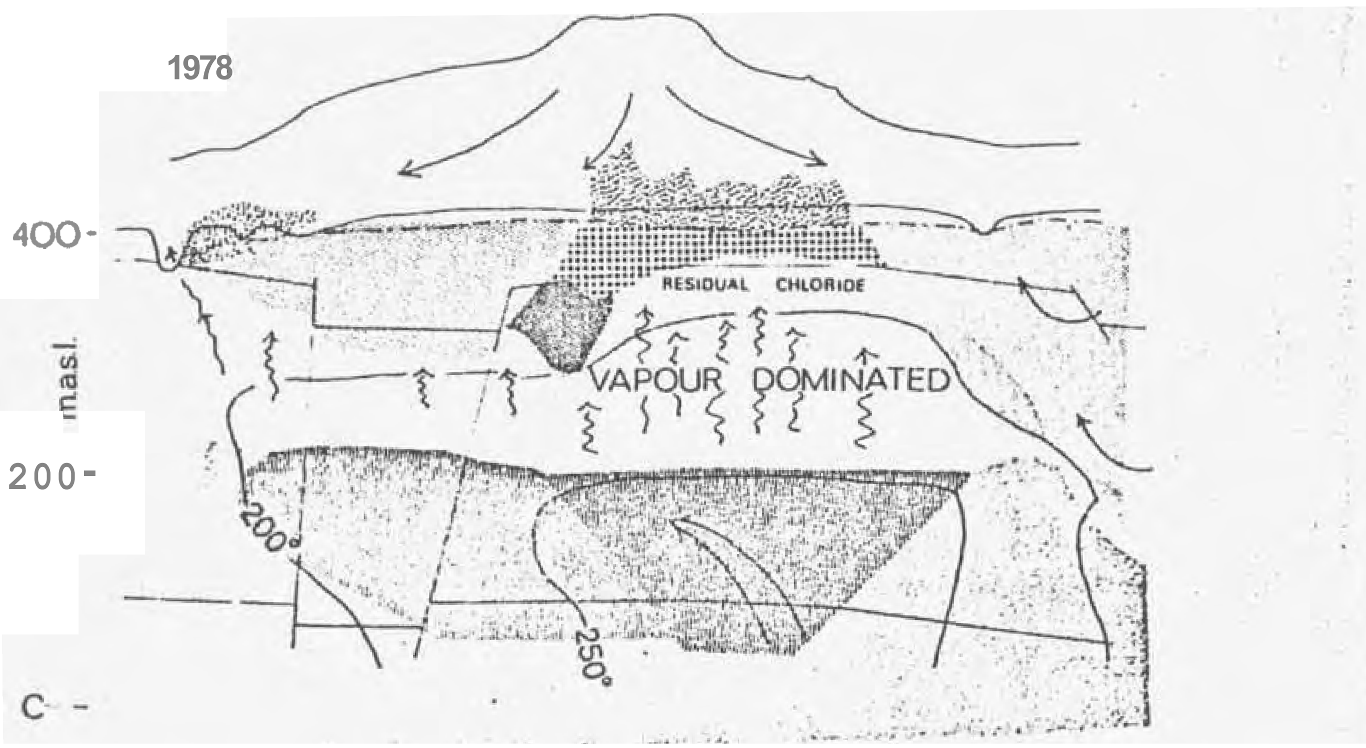


FIGURE 1.

Tauhara Geothermal Field; location of exploration and monitor wells, steaming ground (stippled) and resistivity boundary. Dilute near-neutral chloride springs occur at the Terraces while steaming ground has replaced the former boiling near-neutral chloride springs of the Spa. The AC and Kathleen Springs arm 200-300 metres south-east of THM4.


1962
TAUHARA
SPA
TERRACES
400
200
0
m. asl.
175°
200°
250°
HUKA
WAIORA
DEEP CHLORIDE TWO PHASE
MIXED DEEP METEORIC
STEAMING GROUND SO_4-HCO_3 WATERS
DILUTED SO_4-HCO_3 WATER
MIXED Cl + SO_4


1978
400
200
masl.
RESIDUAL CHLORIDE
VAPOUR DOMINATED
200°
250°