

THE THERMAE BOREHOLES OF VALKENBURG A/D GEUL SOUTH-LIMBURG, THE NETHERLANDS : GENERAL INFORMATION

by

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(4 figures)

Between 28 november 1985 and 7 november 1986 three boreholes for thermal water have been drilled on the estate «t Hooght» at the Cauberg, Valkenburg a/d Geul (South-Limburg, the Netherlands) (figures 1 & 2). These wells were an initiative of Messrs. M.A.M. Jaspars, physical therapist in Maastricht, and M.H.W. Verschuur, physical therapist in Geulle and Berg en Terblijt, who proposed to establish an ultramodern thermal spa that will meet twentieth century standards. For this reason the name «THERMAE 2000» was chosen for this challenging project.

The estate «t Hooght» is situated on top of the southern flank of the Geul Valley with a beautiful view over the archaic landscape of South-Limburg. It is located along the Cauberg Road that climbs the valley flanks from the center of Valkenburg to the plateau and connects this tourist center with Maastricht (fig. 3). The estate consists of an idyllic park with a wealth of old exotic trees.

The boreholes yielded representative sections through the Upper Cretaceous strata underlying a

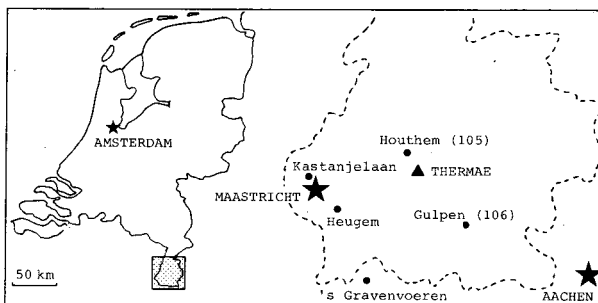


Figure 1 - Location of the Thermae boreholes in South-Limburg. Also indicated are the locations of five other boreholes which have penetrated the Dinantian subsurface and which are mentioned elsewhere in the text.

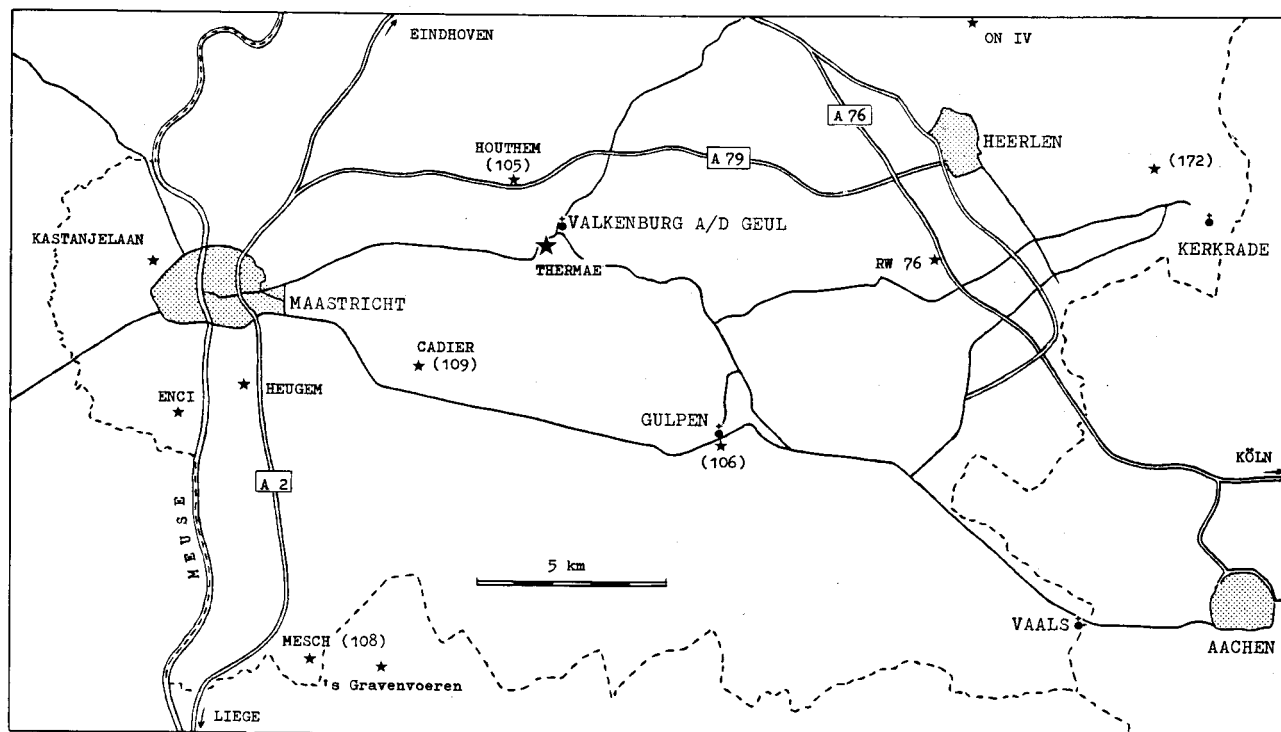


Figure 2 - Location of the Thermae boreholes in South-Limburg. Also indicated are the locations of other boreholes and outcrops which are mentioned elsewhere in the text and figures.

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relatively thin Tertiary overburden and ended twice in the Upper Visean rocks. The drilling was carried out by Grondboorbedrijf R. Gruner (Sittard) with a Wirth-L3 equipment. The drilling crew was formed by Messrs. Willem Visscher, Gerrit Jansen, Rein Hoorn and Theo van de Veeke.

Use was made of rotary-air-lift and rotary straight-flush systems. Details on borehole diameter, casing, cementations and emplacement of filters are shown in figure 4.

Two bit types have been applied for drilling the Cretaceous and Dinantian sequence. Ordinary roller bits proved to be the most appropriate tools for drilling the Cretaceous chalk, clay and sand, as well as the Dinantian paleosol and shales. Jet bits («Warzenmeissel») have yielded positive results in drilling some extremely hard and tough silicified Cretaceous chalk with flint intercalations as well as the frequently silicified Dinantian carbonates. In order to obtain reliable samples the holes were thoroughly flushed each time when a sample had been taken (usually each metre or every 2 metres). This method has yielded excellent cutting samples with little or no contamination from higher levels.

For the geological interpretation a small portion of each sample has been washed, sieved and studied at the well site. The bulk of the samples was transported to the Natuurhistorisch Museum Maastricht, where about one kilogram of each sample was washed and sieved for further analysis. The remainder has been stored in the museum for future special investigations. A set of samples from the first well, Thermae 2000, has been deposited in the Geologisch Bureau Heerlen. Distribution of samples to other institutions in Aachen, Heerlen, Konstanz, Liège and Louvain-la-Neuve was coordinated by the Natuurhistorisch Museum Maastricht.

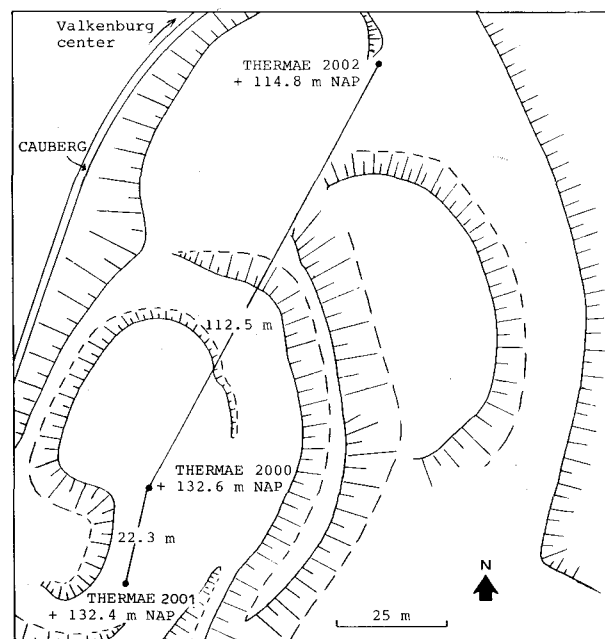


Figure 3 - Location of the Thermae boreholes in the estate «t Hooght» along the Cauberg Road immediately south of the center of Valkenburg a/d Geul.

For the hydrogeological interpretation the conductivity of both the drill fluid and the groundwater from Upper Cretaceous and Dinantian aquifers has been regularly measured. Pumping tests have been performed on the unconfined Upper Cretaceous aquifer in Thermae 2001 and on the confined Dinantian aquifer in Thermae 2000 and Thermae 2002. Analysis of groundwater samples have been carried out by RWTH Aachen, Waterleidinglaboratorium Zuid (Breda) and Institut Fresenius (Tausenstein). Tritium analysis have been performed by the Hydro-Isotop-Labor (Attenkirchen near München).

Petrophysical rock properties have been measured by Dienst Grondwaterverkenning (DGV-TNO, Delft) in Thermae 2000 (only temperature for upper 282 m) and Thermae 2002 (temperature, Gamma Ray, Spontaneous Potential, Resistivity, Caliper), and by RWTH Aachen (temperature in Thermae 2002).

A preliminary report on pilot-hole Thermae 2000 has been published in June 1986 (Bless et al. 1986). Caving in the lower part of this well could not be stopped by repeated reaming. Therefore the PVC filter had to be placed at 294.6-344.0 m. This well is meant as stand-by in case some technical problems might arise in Thermae 2002.

The borehole Thermae 2001 will be used for fresh-water supply from the unconfined Upper Cretaceous aquifer for the cold-water swimming pools in the baths.

Thermae 2002 has been finished with a PVC filter at 340.0-381.5 m. Analysis of the thermal water from the confined Dinantian aquifer has been performed by Institut Fresenius. Thermal water from this well will be used in thermal baths and for the heating of the Thermae complex. The well is equipped with a Pleuger pump (NN86-6).

ACKNOWLEDGEMENTS

This report is not only the result of spontaneous multidisciplinary scientific cooperation between specialists of different institutes and nationalities. It is based as well on the skilful technical assistance of many, often anonymous, persons. I wish to express the sincere gratitude of all the authors of this volume to those who are mentioned hereafter and to the many others whose names have slipped into anonymity. As already stated above the Thermae 2000 project was a private initiative of Messrs. M.A.M. Jaspars and M.H.W. Verschuur who took the risk that the boreholes might have become a failure. Although these were meant as a low-budget project they have not only supported the geological and hydrogeological investigations in many ways, but they also made it possible that the results of these studies could be published immediately.

Grondboorbedrijf R. Gruner (Sittard) and its drilling crew offered every possible help in the collection of data and samples: the basis for further geological and hydrogeological studies. The hospitality of Willem Visscher and his collaborators at the well site will be remembered with pleasure.

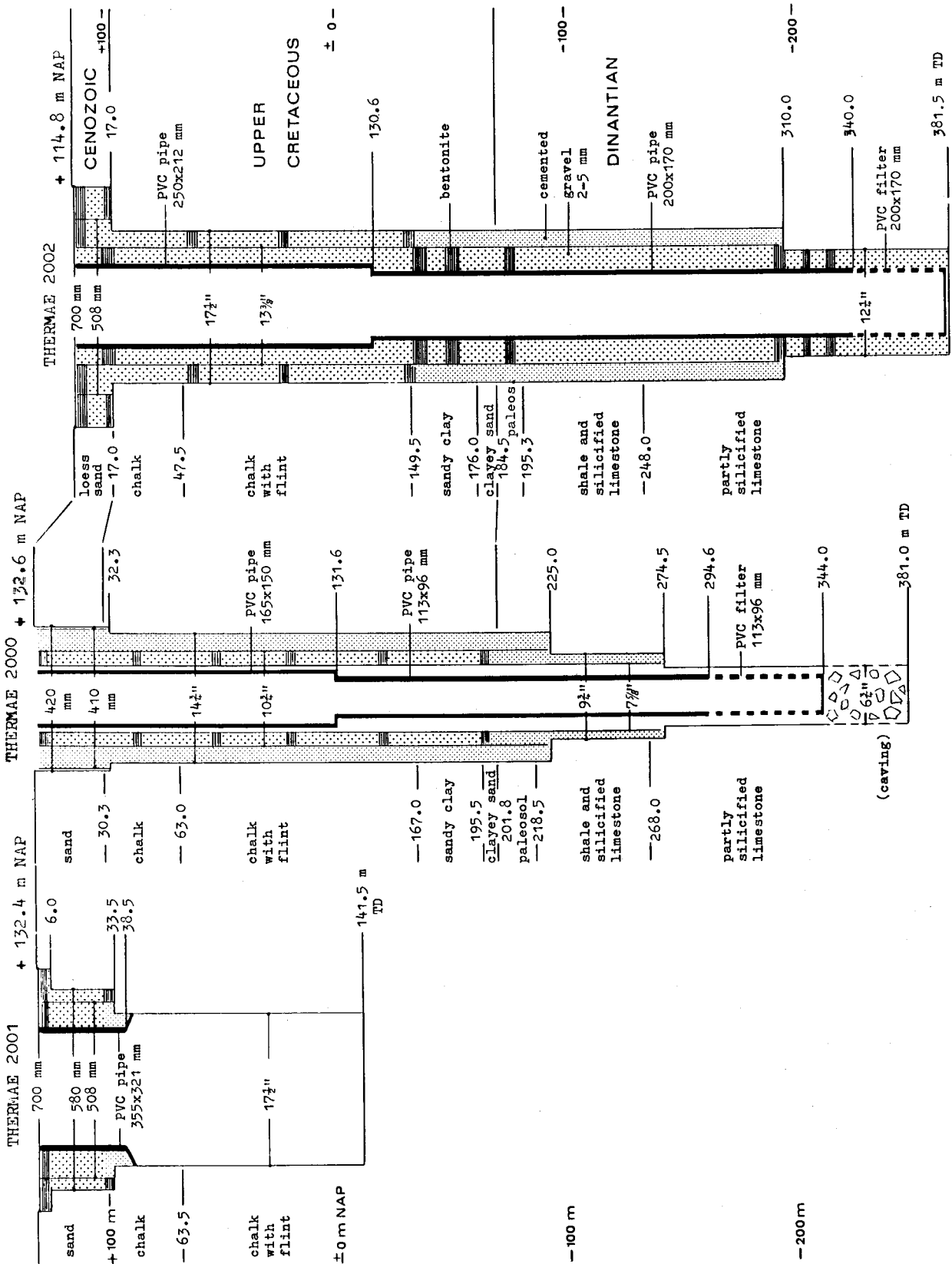


Figure 4 - Technical data of the Thermae boreholes.

Mr. Lou Boonen was responsible for the prompt preparation, storage and distribution of the 568 samples. Photographs have been made by a.o. Wim J. Felder (with the kind permission of Medtronic BV, Kerkrade), Philippe Bertrand, Dr. Rainer Gussone and Monika Wiechert, whereas drawings have been prepared by Chris Franssen.

Chemical analysis have been performed by Klaus Becker, Rolf Neef and Dr. Walter L. Plueger.

Thin sections were made by Thomas Derichs, Willi Grawinkel and Frans Wierinckx.

Martin Laloux (Louvain-la-Neuve) assisted in the determination of some Dinantian foraminifera.

REFERENCE

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