Hydrodynamics of the chalk aquifer: a new hydrogeological experimental site of Beauvais (France)

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1 Introduction

The groundwater represents a major factor in the economical and social development in the northern part of France (Oise department, Picardie). In the last decade, industrial, agricultural activities and the development of the Beauvais-Tillé airport have continued to increase with an intense stress on the alluvial aquifer. So, environmental and water offices were led to search new and deepwater resources in the Picardie and to setup groundwater protection zones. The construction of a new hydrogeological experimental site in the campus of the "Institut Polytechnique LaSalle Beauvais" can help in making a groundwater policy.

2 Hydrogeological context of the experimental site (Beauvais, Picardie)

The principal aquifer in the Beauvais area is materialized by the Senonian chalk deposits.

Hydrogeophysical surveys were carried out within a new experimental site of Beauvais and its hydrogeological boreholes:

- ✓ Understand the groundwater recharge in the Cretaceous chalk formations;
- ✓ Monitoring the evolution of the hydrodynamic characteristics of the chalk aquifer;
- ✓ Understand the behavior, structure and the chalk aquifer functioning;
- ✓ Characterize the petrophysical parameters of the chalk aquifer.

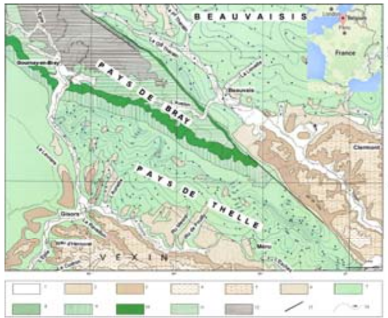

Figure 1. Geological map around Beauvais.

Figure 2. Hydrogeological wells of the hydrogeological experimental site of Beauvais.

3 Comprehension of the groundwater recharge

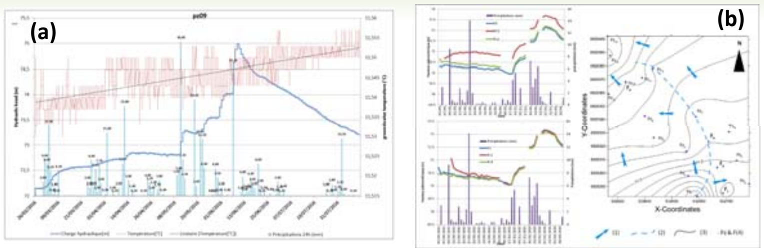

Figure 3. Monitoring evolution of the chalk groundwater aquifer : (a): results deduced from automatic diver (2016). (b): manual and daily evolution of piezometric /rainfall precipitation (9/2013 – 7/ 2014) and groundwater flow of the chalk aquifer : 1. Groundwater flow; 2. Dividing line; 3. Isopiez (m); 4. Piezometer (Pz) and well number (F).

4 Magnetic Resonance Sounding (MRS)

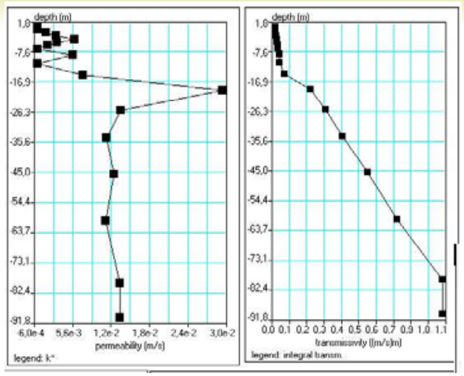

Figure 4. Hydraulic conductivity and transmissivity: MRS results (HESB).

❑ The transmissive nature of the chalk aquifer of the study area is materialized by the transmissivity that varied between 0.0015 and 0.45 m^2/s

❑ The vertical hydraulic conductivity is varied between 2.10^{-5} and 2.10^{-2} m/s

5 Well logging Scanning Electron Microscopy analysis

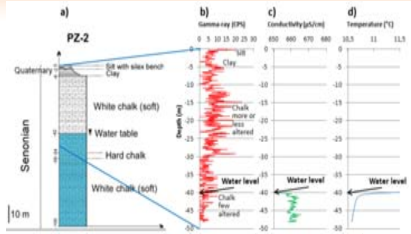

Figure 5. Gamma-ray, conductivity, and temperature log curves obtained in the well 2 (Pz2).

Figure 6. Aquifer formations and distribution of the chalk deposits deduced from the cuttings analysis.

6 Conclusions

Our hydrogeological investigations of the chalk aquifer will use :

❑ Pumping test in order to validate the hydrogeological characteristics (deduced from the MRS method),

❑ The groundwater modelling by using the Finites Elements Method (FEM) and CMA-ES (Covariance Matrix Adaptation Evolution Strategy) for transmissivity field identication.