

Distinction of water quality before drilling

Tatsuya Sumida[1]

[1] UT

<http://www.urbantone.co.jp/>

Drilling borehole for drinking water is often plagued with water quality problem. In an area, we could distinguish drilling points of good pure water from iron concentrated water zone by geological survey before starting drilling.

Geological brief overview

Aerial geomorphological feature is very gently rolling plane. Ground surface is covered with a few meters of soil. Only a few outcrops can be found.

Ancient metamorphic basement rocks lying underground consist of mainly Precambrian graphite mica schist and graphite psammitic schist. Partially hornblende-gneiss lies might be fault-bounded with schist. Highly weathered and decomposed strata overlie those basement rocks.

Major geological structure is considered to be North-South strike and high angle dip.

Water containing much iron distributes over this area. However, pure water exists in a limited extent.

Method

Geomorphology, vegetation, outcrops, dowsing, electro magnetic method (EM-34-3), vertical electric survey (VES) and any other information are integrated to interpret and choose drilling points. First, a simple map is drawn by observation of surface feature and dowsing. Second, horizontal survey is carried out with EM-34-3 to draw distribution of ground conductivity (apparent conductivity) and choose a few points. Third, VES shall be carried out to know vertical distribution of resistivity. Finally the most consistent data point shall be chosen to be drilled.

Result and conclusion

Total 12 villages are investigated. Those villages yielded so much iron water from first boreholes. Additional geological survey and attentive drilling operation result in success, pure water or very low concentration of iron, for all villages.

Survey and drilling result imply the aquifer morphology is long, thin and very narrow like waterway. It is several meters to a few tens of meters in width. Longer and thicker and wider waterway might be much better in terms of the pure water capacity. Those factors of the aquifer shape are subject to the geological structure. In most case, the pure water aquifer is around the boundary between quartz rich basement rock and decomposed zone. That limited zone might be able to sustain developed open fracture which can transport fresh pure water not to stagnate.

The survey centering on resistivity distribution could distinguish pure water aquifer from iron concentrated water aquifer.

Although we achieved pure water well, rising two issues should be solved. 1) The interpretation is not sufficient from viewpoints of geophysics, geochemistry etc. 2) Dowsing can not be well explained the mechanism though it shows interesting phenomena. Alternative geophysical equipment is required to know what those phenomena are and to be understood by public people. Polishing up this survey can contribute to water supply projects.