JAMES E. BROOKS
GEOLOGIST
7055 ARBOREAL DRIVE
DALLAS, TEXAS 75231
214/348-1055

6

GROUNDWATER IN ABYDOS AREA, EGYPT:
The Flooding of the Osireion

A

Report

By

James E. Brooks
and
Bahay Issawi

August 1992

GROUNDWATER IN ABYDOS AREA, EGYPT:
The Flooding of the Osireion

The study of the area near Abydos Temple reveals a thick and relatively complete Quaternary (to Pliocene) section unconformably overlying the Esna Shale (Early Tertiary). This section consists of sands (of varying size) interlayered with some gravels, silts and clays. The groundwater included in this section appears in the bottom of the Osireion south of the Temple. While less than a meter deep, the water's rise and fall is not predictable and greatly affects access to that portion of the Temple as well as being destructive to the enclosing rocks of the Temple.

The purpose of this study was to establish the source of the water in the Osireion and thus to better understand its movements. A detailed topographic contour map of Abydos and surrounding area did not exist and thus the movement of underground water, its origin and direction of flow could not be determined accurately. Such a map has now been constructed as a part of this project (Figure 1). This map shows a general decrease in ground surface elevation from south to north and that the level of water in the Osireion was just below 66 m above sea level in June 1992. Local wells dug south and west of the Temple by local persons are plotted on Figure 2 together with the elevations of the water table in these wells. Figure 2 also shows contours drawn on the water table in this area. This map clearly demonstrates a west-to-east sloping water table. To verify these observations and to extend them to the cultivated areas of the Nile Flood Plain, wells dug by the government in the area west and south of Belyana were also studied. The topography of the water table level in these government wells matches well with that based on the data obtained from the local wells in the immediate area of the Temple. Figure 3 is a contour map of the water table in the area based on both local and government wells. Following the

topography of the water table, groundwater in the area will flow from west to east. This of course implies that the desert was and is contributing water to the Nile Valley and, coincidentally, to the Osireion.

This interpretation appears to be unlikely, but an examination of the stratigraphic section (A-B-C location on Figure 1) demonstrates the feasibility of such an interpretation. The stratigraphic section along this line is shown on Figure 4 and is discussed in the paragraphs that follow.

A thick sand section known as the Qena Sand unconformably overlies the Esna Shale (bed rock). The Qena Sand appears to represent an ancient river channel fill, deposited during the late Pliocene and early Pleistocene in a channel cut in the Esna Shale by a major, probably north-flowing stream that pre-dated the present Nile. The thickness of this sand unit as revealed from the local dug wells slightly exceeds 70 m, whereas in the quarries near Qena (see Figure 5) it can reach up to 100 m. Other geologic reports from the area not surprisingly re-enforce the idea that the Qena is a channel fill that varies significantly in thickness (from as little as 20 m to at least 100 m). The sand is permeable and includes an appreciable amount of water sufficient to sustain an extensive cultivation northwest of the Temple.

The Qena Sand near the Abydos Temple is truncated by overlying silt lenses which appear to have been deposited as channel fill sediments by another river. Some evidence suggests that this stream was perpendicular to the north-south river which deposited the Qena Sand. This silt has a maximum thickness of 3 m at the middle part of the lens but tapers in both directions from the channel center to the point (more or less 50 m on either side of the axis of the channel) where it finally disappears. This pre-Nile silt lens crops out

near the Abydos Temple and is probably covered by thick alluvial wash west of the Temple. The two units (Qena Sand and pre-Nile silt) are separated by a thin, conglomerate layer. This conglomerate is of considerable geological significance since its constituent gravels show affinity with the present rocks of the Red Sea Hills (between the Nile Valley and the Red Sea). This suggests a fluvial connection between the Red Sea Hills and the area in question before the onset of the present Nile and re-enforces the concept of a west-flowing drainage preceding that of the present Nile but following the north-south drainage of the Qena Sand deposition.

The present Nile, of course, has incised its channel into the pre-Nile silt and the Qena Sand and has deposited its load of sediments in that channel to form the dark fertile soil of the present Nile Flood Plain. The groundwater now contained in the Qena Sand and pre-Nile silt must be viewed as "fossil water" derived primarily from the wadis draining the east side of the Western Desert during the period 5-10,000 y.b.p. and augmented more recently by the infrequent "flashflood" rainfall that now characterized the area. The activity of the desert wadis coming from the western scarp led to the formation of a thick mantle of wadi deposits covering older sediments.

Earlier ideas that the groundwater in the Abydos area is derived through infiltration from the Nile south of the Barrage (dam) (Figure 5) or below Qena appear not to be true. The level of water south of Nag' Hammadi Barrage is 65 m - whereas the water level in the Osireion varies from 65.7 to 66 m. In the local wells in the area of Abydos the water table is even higher than 66 m. Thus the hydrology related to the water table topography in that area makes the Nile an impossible source.

In summary, then, we believe that the water in the Osireion is a result of groundwater seepage from a confined aquifer i.e. the Qena Sand. The flow of this water is west-to-east and a saturated zone in the Qena Sand is its main source.

Field Study and Laboratory Analysis, Abydos Temple Project, 1992

The preceding analysis and interpretation of the groundwater problem at the Osireion behind the Abydos Temple is based on 8 days field study at the site by Drs. Brooks and Issawi. During that time a reconnaissance of the area was made, and detailed observations were made at the Osireion. It was determined that since no accurate detailed topographic map of the area existed, the first step in the project would be to create such a map. A working relationship with the faculties of Geology and Archaeology at Sohag University near the site were established. It was agreed that a graduate student (Mr. Adli Abd El Aziz Khalifa) from the faculty of Geology would work under the supervision of Issawi and Brooks to complete a detailed topographic study and produce a map. It was agreed that this project was to be completed by 31 May 1992. Further detailed analysis could not be undertaken until the topographic map was completed and the elevation of the water table in the several local wells in the vicinity of the Temple had been established in relationship to the elevation of the ground surface and in relation to mean sea level. During the period from the initial field study in early January until the topographic map was completed, Mr. Adli made one trip to Cairo to consult with Dr. Issawi in early March, and Dr. Issawi made a subsequent trip in late April and early May to the Abydos area to make a field inspection of the map and to consult with Mr. Adli about interpretation of the groundwater information that had been gathered in connection with the mapping. In June, Brooks and Issawi decided that it was important for Issawi to make a subsequent visit to the area for the purpose of making a final inspection of the map after it was completed and for the purpose of gathering further hydrologic information from the several government wells that have been dug in the flood plain of the Nile adjacent to the Abydos Temple. That work was completed in late June, and the several resulting drawings were prepared in draft form by Issawi together with interpretive notes and shipped to Brooks in Dallas for final analysis and report preparation. This was completed during August 1992.

James P. Brooks