

SUMMARY

The Wyszków IG 1 borehole (total depth 2388.0 m), like the marker borehole of Tuszcz IG 1 as well as the Łochów IG 1 and Łochów IG 2 boreholes, was drilled in the 1960s and early 1970s. The drilling site was located in the western part of the Podlasie Depression, in the marginal zone of the East European Craton.

The purpose of the drilling programme was to provide geological information both about the sedimentary succession in the southern flank of the Mazury–Suwałki Elevation and about the extent of Permian deposits and pinchout of old-Palaeozoic formations in this area. Another research purpose of the drilling operations was to identify individual aquifers with particular regard to potential hydrocarbon reservoirs.

Using data acquired from all the boreholes, including information provided by the Wyszków IG 1 drilling, it was possible to determine the stratigraphy and facies variations within various depositional formations, dependent on their facies development at the edge of the Precambrian Platform.

However, in contrast to the above cited boreholes, the Wyszków IG 1 borehole has not fully achieved its original objectives due to a drill-stem failure and technical drilling problems which made it impossible to run geophysical logs down to the borehole bottom and to perform drill stem tests.

This volume presents both investigations carried out during drilling operations and the newest results of stratigraphical, petrographical, sedimentological, tectonic and geochemical studies conducted on the basis of modern research methods with reference to chronostratigraphic units recommended by the International Commission on Stratigraphy.

Below are given the most important results of geological investigations performed by individual specialists.

The oldest deposits drilled by the Wyszków IG 1 borehole at the depth of 2373.8–2388.0 m are gneisses and amphibolites of Proterozoic (probably Palaeoproterozoic) age. Data derived from a number of boreholes drilled in this area enabled both the reconstruction of the top surface of crystalline basement in the western part of the Podlasie Depression and the identification of petrographical and geochemical variability of Proterozoic rocks.

Tectonic studies show the occurrence of transpressional deformation (with subordinate sinistral component) locally in the Mazowsze region, as reported for the Wyszków amphibolites and amphibolite rocks from the environs of Tuszcz. There is no evidence suggesting a division of the Mazowsze region into the so-called fold zones and the Mazowsze granitoid massif. Tectonic studies indicate that all rocks from this area

were variably deformed, but probably during the same orogenic (tectonometamorphic) processes.

The top of Cambrian deposits determined from analyses of drill core samples is at the depth of 1854.5 m, whereas the base rests at 2373.3 m, so the thickness is 518.8 m. Depths to the intervals representing individual chronostratigraphic units (Series) of the Cambrian were determined from drill core samples and lithological and well log correlations to neighbouring boreholes drilled in the western part of the Podlasie Depression.

The Cambrian siliciclastic succession from the Wyszków IG 1 borehole situated in the Podlasie zone of the Lublin–Podlasie sedimentary basin represents a post-rift phase of its evolution. Lower and Middle Cambrian deposits were deposited in a shallow, open-marine, wave-dominated basin with insignificant influence of tides. Facies analysis, identification of facies associations and interpretation of depositional environments enabled recognition of three major depositional systems in the Cambrian section: beach, shoreface and offshore systems.

Depth-converted seismic profiles, run across the western part of the Podlasie Depression between Łochów IG 1 and Łochów IG 2 and between Warszawa and Wyszków, revealed a pinchout of Palaeozoic strata towards Wyszków.

Considering the thickness pattern and stratigraphic section for the Ordovician and Silurian in the neighbouring boreholes of the western part of the Podlasie Depression it should be assumed that a pinching out of old-Palaeozoic strata occurred at that time. Their thickness was subsequently reduced by erosion. The lithologic-stratigraphical section of the Wyszków IG 1 borehole confirmed the lack of Ordovician and Silurian deposits in this area, in contrast to the sections of boreholes drilled to the south and west.

Permian deposits are represented by a Zechstein succession directly overlying the Middle Cambrian. The Zechstein section is typical of a nearshore zone of the Zechstein basin in the Precambrian Platform. The Zechstein carbonate-evaporitic cyclothems show stratigraphic and thickness reduction and they are characterized by the predominance of carbonates with a contribution of terrigenous series. The topmost Zechstein is composed of sandstones of likely fluvial origin, which can represent a continental series of the uppermost Zechstein. The Zechstein/Lower Buntsandstein boundary is marked by the commencement of mudstone sedimentation indicating the onset of a new, transgressive stage of the basin development.

The Triassic stratigraphy of the Wyszaków IG 1 borehole was established and later revised on the basis of the analysis of geophysical data and by comparison with the research results from neighbouring boreholes. The Triassic stratigraphy includes mainly lithostratigraphic units typical of the central European basin.

Jurassic rocks occur immediately above the Norian claystones, indicating the presence of a sedimentary gap between the Triassic and Lower Jurassic deposits. The gap spans probably the entire Rhaetian section. The Jurassic succession is typical of the western part of the Podlasie Depression. The investigations also confirmed the presence of a sedimentary gap between the Lower and Middle Jurassic, spanning the Aalenian–Bajocian interval.

The Middle Jurassic succession contains shallow-marine clastics of Bathonian age and shallow-marine carbonates representing the uppermost Bathonian and the Callovian. A sedimentary continuity is observed between the Middle and Upper Jurassic deposits. The latter consist mostly of carbonate facies. Between the Jurassic and Lower Cretaceous, there is a stratigraphic gap comprising the uppermost ?Kimmeridgian–Lower Albian.

The Cretaceous succession, 575.0 m thick, is typical of this region of the Podlasie Depression. The lowermost 7.0 m is represented by Lower Cretaceous deposits of Mid-

dle–Upper Albian age. The rest, i.e. 568.0 m, is interpreted to represent the Upper Cretaceous section (Cenomanian–Maastrichtian). The Cretaceous sedimentary cycle terminates with 20.5 m thick Lower Palaeocene deposits. The lithology and stratigraphy is interpreted from investigations of drill cuttings, drill cores and correlation to neighbouring boreholes. Faunal determinations from drill core samples, largely of *Inoceramus* specimens, were also of much significance.

During drilling operations, no hydrocarbon shows were observed.

Organic matter studies indicate that the content of organic carbon and labile components in the rocks is low. An increased content of organic carbon is observed only in Lower Jurassic deposits. Bitumens from these rocks are epigenetic in relation to the host rocks. Compounds found in Middle Cambrian deposits show features of organic matter at the stage after hydrocarbon generation.

Due to a drill-stem failure that occurred at the depth of 2400.0 m, borehole geophysical measurements were run down to the depth of 1920.0 m. They allowed for determinations of petrophysical properties of rocks, thermal regime in the hole, including heat flow measurements, for identification of aquifers and interpretation of lithology of non-cored intervals.