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## **Statement**

By the Jess-E EOOD consulting company hired to study the hydrogeological conditions in the Rozino Deposit Investment Proposal area with the idea that the study should be used by a team of experts assessing the environmental impacts of mine development and mining.

This Statement was prepared on the basis of the information available on the web pages of the Ministry of Regional Development and Public Works, the Ministry of Environment and Waters, the East Aegean Basin Directorate, and other publicly available information about water

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- the completed detailed geological, hydrogeological and seismic studies in the Tintyava property of the Rozino deposit in the Ivaylovgrad Municipality, Haskovo District, Ivaylovgrad Municipality
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- A report from the ‘Study of transboundary groundwater bodies between Bulgaria and Greece BG-GR GWB’ Project;

According to Bulgaria’s adopted nomination, the groundwater bodies in the Rozino Deposit investment proposal are attached with a ground water body (GBW) with code BG3G000PtPg049 - Fissure Water – the Eastern Rhodopean Complex.

The following bodies have been nominated during the initial delineation of groundwater body aquifers in the area: GBW-BG3G00000Pt046 - Fissure water in Proterozoan Gneiss, Gneis-Schists, Migmatites, and GBW-BG3G00000Pg028 - Fissure water in Paleogenic Sediments and Volcanoes. (East Aegean Basin Directorate, River Basin Management Plan 2010-2015, Section 1, Attachments 1-6 and 1.7). Upon completion of the ‘Study of transboundary groundwater bodies between Bulgaria and Greece BG-GRGW’ project, 8 of the initially defined GWBs, including GBW-BG3G00000Pt046 and GBW-BG3G00000Pg028, were united and nominated as GBW BG3G000PtPg049 (East Aegean Basin Directorate - River Basin Management Plan 2016-2021, Section 1, Attachments . 23 and 24).

The ground water circulates exclusively along mechanical disturbances such as fissures and tectonic discontinuities in those virtually water-tight lithological types. The non-uniform water-bearing capacity of these rock formations is determined by rock geology and lithology and, most of all, by irregular jointing.

The lithological types comprising GBW BG3G000PtPg049 are, from the hydrogeological perspective, highly water tight and explain the low abundance of water in this GBW. This GBW is among Bulgaria’s most deficient in ground water, its rate of runoff being  $<0.5 \text{ l/s/km}^2$ . This explains the lack of water abstraction facilities built into the Palaeogenic sediments and in the metamorphics in the studied area.

Alluvial deposits comprising boulders, inequigranular rubble and sand in varying ratios have formed along the Byala reka river in the studied region. Pore water flows through these deposits and are in

direct hydraulic connection with the Byala reka river and its tributaries. These flows are outside the BG3G000000Q010 - Pore Water in Quaternary - Arda River groundwater body. Having unsustained areas, these bodies are not nominated as a delineated groundwater body and are not included in the List of Groundwater Bodies in the East Aegean Region.

### **Hydrogeological conditions**

From the regional perspective, the averaged values of certain parameters of the lithology types in GWB BG3G000PtPg049, which have been determined mainly through exploration for ores and minerals, water engineering construction and other economic activities, are as follows:

- porosity 1-2%, filtration ratio 0,0001-1 m/24h, seepage percentage below 8 %, GWB thickness between several meters to scores of meters.

#### **Groundwater in the Palaeogene rocks and in the Metamorphous basement**

The geological formations are represented by a metamorphous basement and a Palaeogene sediment complex. The metamorphics comprise a varied range of migmatites, serpentines, amphibolites, marbles, gneisses and granites. The Palaeogene sediment complex includes breccias and conglomerates, coarse grained to silty sandstones, marls and coal shales. The groundwater in the studied IP area are classified as fissure water and the water accumulated in the Palaeogene sediments in the studied area recharged mainly via fractures and tectonic discontinuities from adjacent horizons and via the metamorphous rocks. Combined with very low rock filtration ratios, the highly rugged terrain allows for very little recharging through seepage.

Groundwater table is found at depths between 31.33 and 4.82 m. below the surface and generally follow the landscape line. The groundwater drains mainly to south-southeast, toward the Byala Reka River floodplain.

The filtration parameters of the water saturation rocks are very low, the filtration ratio varying between  $2.11 \times 10^{-7}$  and  $2.13 \times 10^{-9}$  m/sec, and the conductivity ranging between 0.02 and 0.069 m<sup>2</sup>/24 h.

The water flowing into GWB BG3G000PtPg049 is fresh, with mineralization of <1 g/l, and are neutral (pH 7.02 – 7.65). The chemical analyses show lower concentrations of the studied parameters as compared to the quality standard set forth in Regulation 1 of October 10, 2007.

#### **Groundwater in the alluvial deposits in the Byala Reka River floodplain**

The alluvial deposits are represented by boulders, inequigranular rubble and sand in varying ratios, and include sandy-clayey lenses and interlayers. Their depth exceeds 5 - 6 m. in some parts.

The water levels in the monitored workings in the studied area vary between 0.04 and 4.24 m. from the surface. The groundwater is in direct hydraulic connection to the water of the Byala and the Arpa dere rivers.

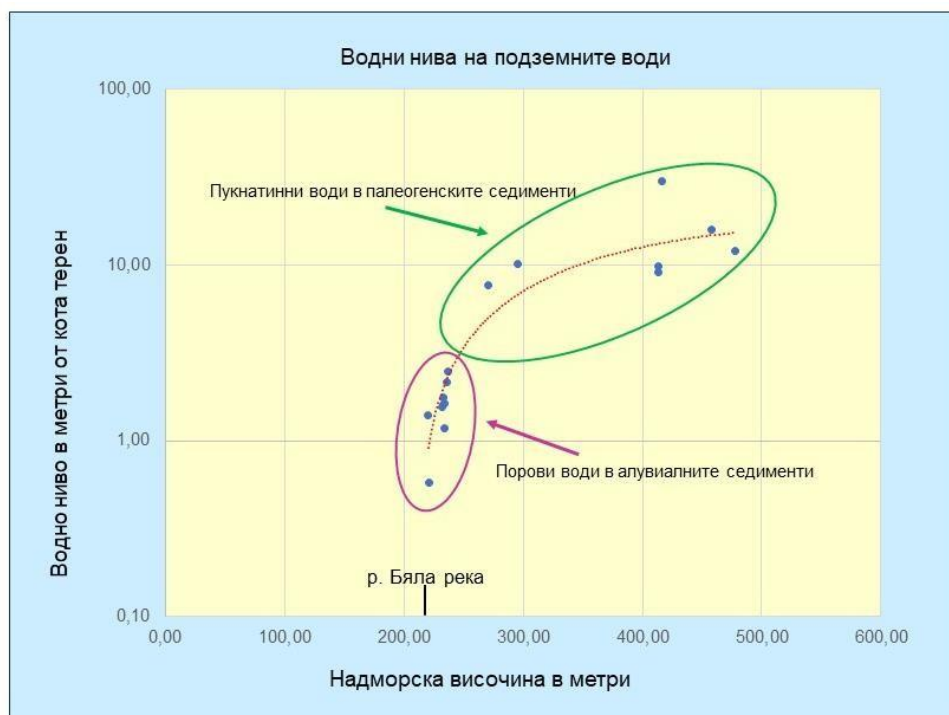
The filtration ratio of the alluvial deposits is  $1.5 \times 10^{-4}$  –  $5.8 \times 10^{-4}$  m/sec, and their transmissivity coefficient is 2.36 – 2.63 m<sup>2</sup>/ 24 h.

The water circulating in the alluvial deposits is fresh, with total mineralization of <1 g/l, neutral (pH 7.11 – 7.28), and with a comparatively constant chemical composition unaffected by human activity,

with good quality as compared to the standard set forth in Annex 1 to Regulation 1 of October 10, 2007.

As can be seen from the above facts, the ground water in the studied region of the Rozino Deposit IP feature the specifics of GWB BG3G000PtPg049. This water is fracture water and flow into water-tight rocks through their fractured zones. This explains the low groundwater flows. This water is connected mainly to the upper (more weathered and fractured) part of the geological formations and follow the topography, draining toward the local erosion base level, which in this case is the Byala Reka river floodplain and its tributaries.

The figure below presents a graph of water levels relative to the terrain level in the studied area of the IP, according to monitoring bore data. The trend outlines the direction of flow of groundwater toward the erosion base level of the Byala Reka river.



**The above allows the following conclusions:**

No data is present that can be used as the basis to identify a danger of transboundary pollution of surface and ground water.

No impact on surface water quality or quantity is expected. Water engineering facilities are to be constructed to manage water (drainage ditches, sumps) during the IP implementation in order to minimise and localise any water quality impacts. The IP will construct two consecutively situated reservoirs (the second one for non-contact, or conditionally clean, water) thus eliminating any likelihood of entry into water bodies of water separated by the IP.

**No discharging of waste water into water bodies or into the sewerage systems of urban areas is envisaged.** All collected water will be recirculated to the process circuits.

A hydrology study of water resources in surface water bodies has been carried out with regard to the supplying of water for the process. **The possibility for such water use without lowering the water quantities or disturbing the natural water inflows has been ascertained.** Water use will be made possible with a permit issued in accordance with the Water Act.

**No impacts on the quality or quantity of groundwater bodies are expected.**

Also, the hydrogeology study in the deposit area, **which will be submitted during the EIA process**, has established that the flow of groundwater is insubstantial. Given the design depth of the pit, **there is no reason to expect direct impacts on a groundwater body and to drinking water sources** with sanitary protection belt areas and use permits as required by the Water Act.

Experimental on-site blasting has been carried out to establish the blasting vibration impact. The measurement results obtained by specialized equipment have been used to prepare a Report on the 'Assessment of the Environmental Side Effects of Processing Blasting Works and Management of Such Effects within the Admissible Safe Levels for the Rozino Deposit, Ivaylovgrad Municipality, Haskovo District' **which will also be submitted during the EIA process.**

The analysis of the obtained results allow the conclusion that if the recommended maximum mass of explosive during one delay interval, no excess of vibration velocity at depth causing seismic impacts on ground water and on water sources may be expected and **the IP implementation will have no negative surface and ground water impacts.**

Sincerely,  
Dr. Emanuil  
Kozhuharov, Manager of  
Jes E EOOD

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