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R E P O R T

GEOPHYSICAL PROSPECTING OF PREHISTORIC SETTLEMENT
PROMAHON - TOPOLNICA

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In September 2002, a research team of the Archaeometry Laboratory consisting of Dr. Mihail Georgiev and Kiril Velkovski conducted additional geophysical exploration of a prehistoric settlement Promahon - Toplnitza. The prospecting are part of complex archaeological studies organised by Archaeological Museum in Kavala.

1. GENERAL KNOWLEDGE ABOUT THE SITE

The archaeological site Promahon- Toplnioca is located at the eastern foothills of the Belasica mountain, along the right side of valley of Struma river. The terrain in the neighborhood of the prehistoric settlement is divided by the Greece-Bulgarian boundary. The nearest greece village is Neo Petrici, far off about 15 km. The whole area of the settlement is approximately 50 dka.

2. GEOLOGICAL AND ARCHAEOLOGICAL CONDITIONS

The archaeological site overlies a positive relief structure, 300-400 m long and about 150 m wide. It can be look at as a fragment from an old non-flooded river terrace. The altitude is between 75 m and 85 m.

The described structure is enlarged to the west, the slope is increased and passes into a slope of the Belasica mountain. The plain is an younger non-flooded terrace of the Struma river to the north, the east and the south

According to preliminary information, the following layers and materials build up a geological section in the region:

- the superficial humus layer consists of a black humus clay, embraces a lot of organic and plant materials and rock pieces. It is 0.15-0.20 m thick;
- the layer of anthropogenic nature consists of clayey materials containing an abundance of ceramic and rock fragments and stones. The thickness of that layer is about 1.5 m;
- the clayey layer consists of clay, rock pieces and gravels obtained from different way - the weathering of the bedrock, the erosion of the mountain slopes, as well as alluvial materials from the river terrace;
- the geological foundation (bedrock) build up of metamorphic rocks: mica shales and gneisses.

The eastern part of the ancient settlement was explored through archaeological excavations, while the rest of its outlines have not been specified.

The present measurements were carry out very close to the archaeological excavations and the interpretation of the results is getting more complicated.

3. GEOPHYSICAL METHODS

The electrical methods were used for geophysical investigations of the ancient settlement. The apparent resistivity of the environment was determined by investigations of the parameters of an artificial electric field. The measurements were performed using resistivity-meter EPG-5. The method was applied in two modifications:

3.1. Electrical profiling (profiling) - according to that method the apparent resistivity of the environment was investigated to constant depth. The profiling was applied for searching and locating a zones in high apparent resistivity, caused by accumulations from stones or ceramic materials, remains from walls or old constructions.

The measurements were performed by four-electrode configuration by three different sizes - A1M1N1B, A2M1N2B and A3M1N3B.

3.2. Electrical sounding (sounding) - according to that method the apparent resistivity of the environment was investigated in one point to a different depth. The sounding was applied to determination a depth to horizontal or slight slope surfaces, divided layers with different apparent resistivity.

The measurements were performed in three points located western from square IZ using three-electrode configurations – AnM0.5N and B in infinity.

4. INVESTIGATED AREAS

Using a profiling method were investigated three areas from the prehistoric settlement (figure 1):

4.1. Area 1

- The area 1 is located at 0.5 m western from the archaeological excavations (Squares IST and IZ).
- 8 profiles with North-South direction and length 23 m;
- profile separation 0,5 and 1 m;
- measurement points separation 1 m;
- prospected area 140 m²

4.2. Area 2

The area 2 is located at 0.5 m northern from the archaeological excavations (Squares IST, I and IF).

- 6 profiles with West-East direction and length 23 m;
- profile separation 0.5 and 1 m;
- measurement points separation 1 m;
- prospected area 100 m²

4.3. Area 3

The area 3 is located at 0.5 m south-western from the archaeological excavations (Squares IZ, IA and IB).

- 6 profiles with West-East direction and length 20 m;
- profile separation 1 m;
- measurement points separation 1 m;
- prospected area 100 m²

5. RESULTS OF THE GEOPHYSICAL PROSPECTING

The results by the profiling measurements are presented like contour maps of the apparent resistivity (Figures 2, 3 and 4). According these maps are able to study the distribution of the high resistivity zone. This zone is located in western and southern part of the studied area against the squares IZ, IST, I and IF. The width of the zone is about 3.5-4 m and the depth is more than 3.5 m. The apparent resistivity in the southern part of the area is approximately equal to the resistivity of the surrounding soils.

Figure 1

PLAN OF GEOPHYSICAL MEASUREMENTS

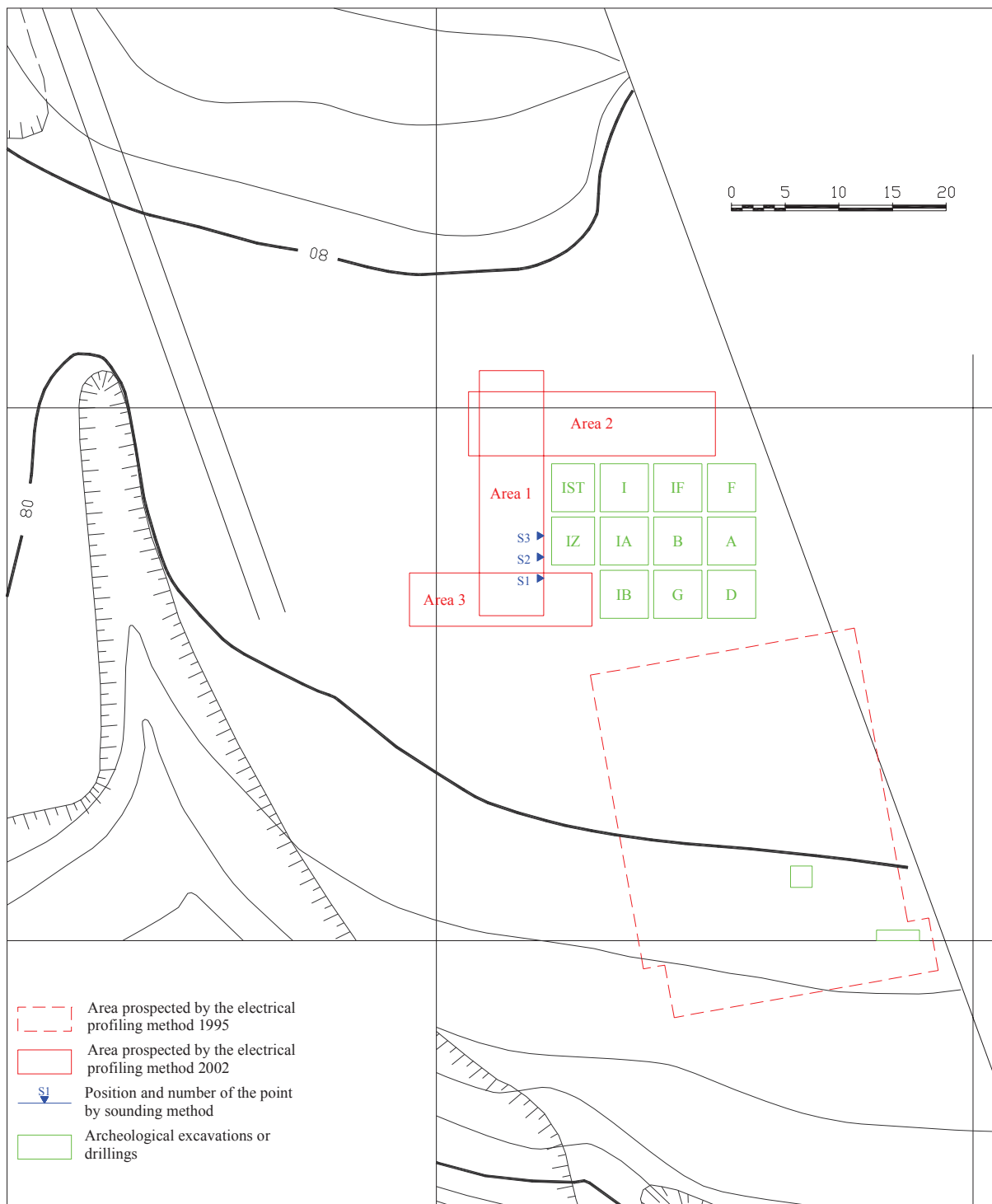
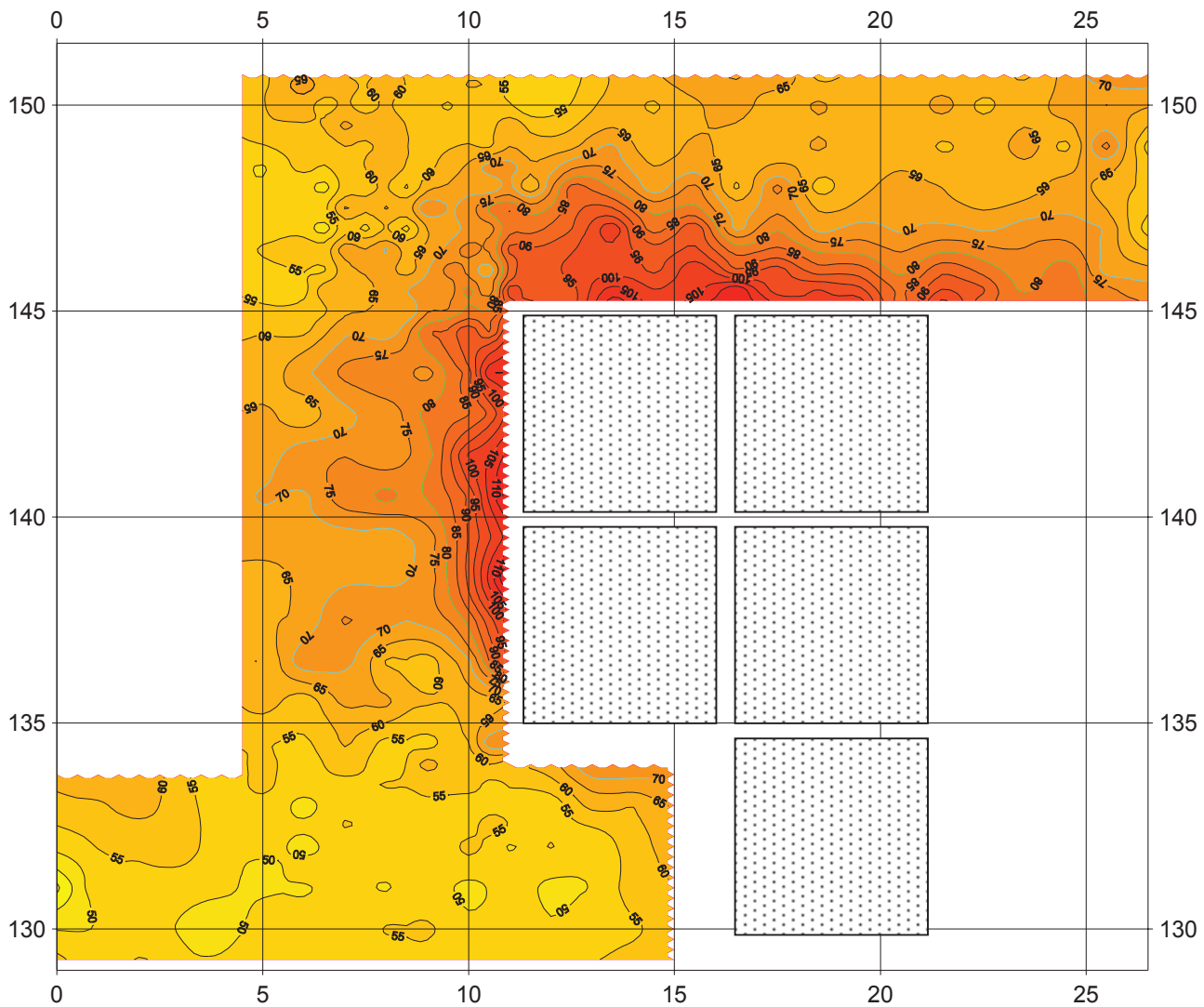


Figure 2

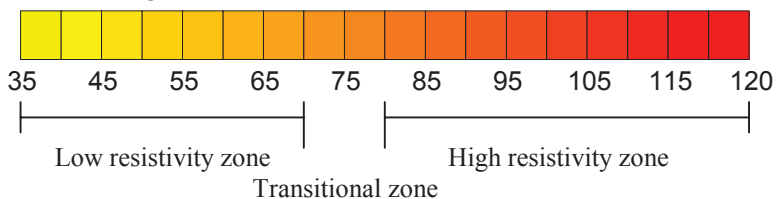
CONTOUR MAP OF APPARENT RESISTIVITY

Configuration A1M1N1B - sensibility up to 1.00 m



Relative coordinate system

Colour range scale R_o [Ohm.m.]



Zone with low content of stones

Zones with increased content of stones

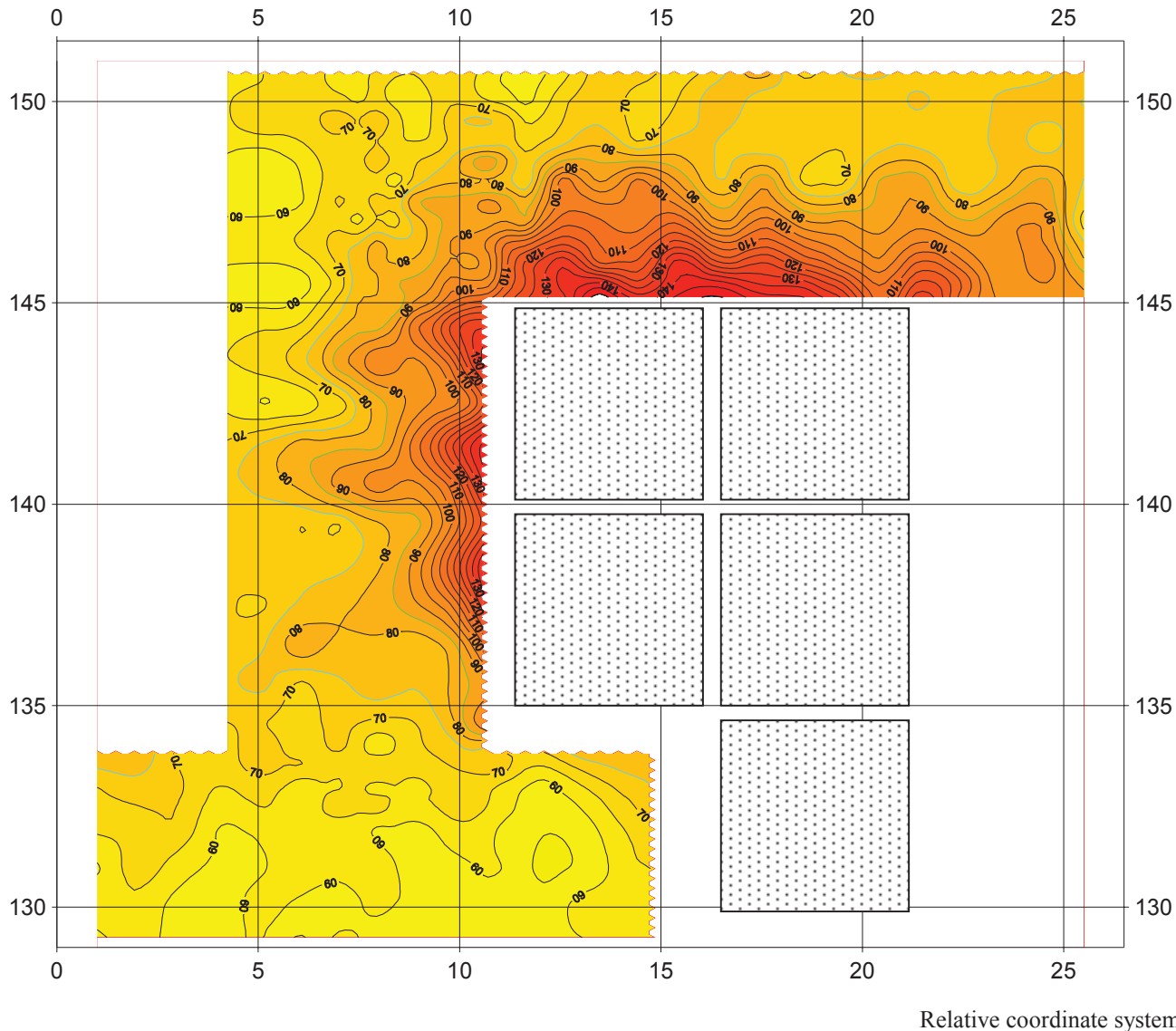
Excavation squares:



Figure 3

CONTOUR MAP OF APPARENT RESISTIVITY

Configuration A2M1N2B - sensibility up to 1.75 m



Colour range scale R_o [Ohm.m.]



50 60 70 80 90 100 110 120 130 140 150

Low resistivity zone

High resistivity zone

Transitional zone

Zone with low content of stones

Zones with increased content of stones

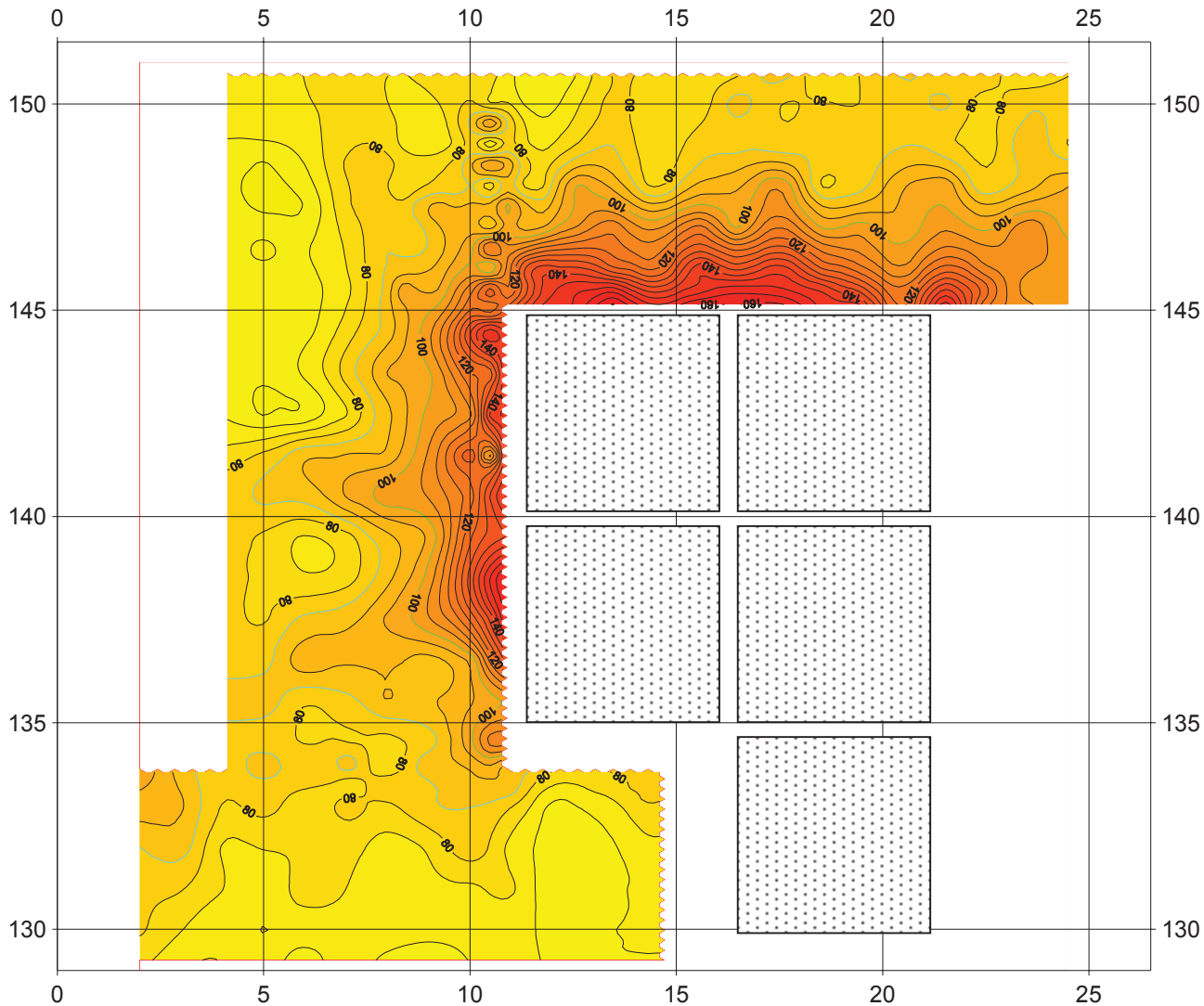
Excavation squares:



Figure 4

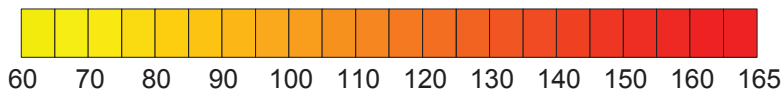
CONTOUR MAP OF APPARENT RESISTIVITY

Configuration A3M1N3B - sensibility up to 2.30 m



Relative coordinate system

Colour range scale R_o [Ohm.m]



Low resistivity zone

High resistivity zone

Transitional zone

Zone with low content of stones

Zones with increased content of stones

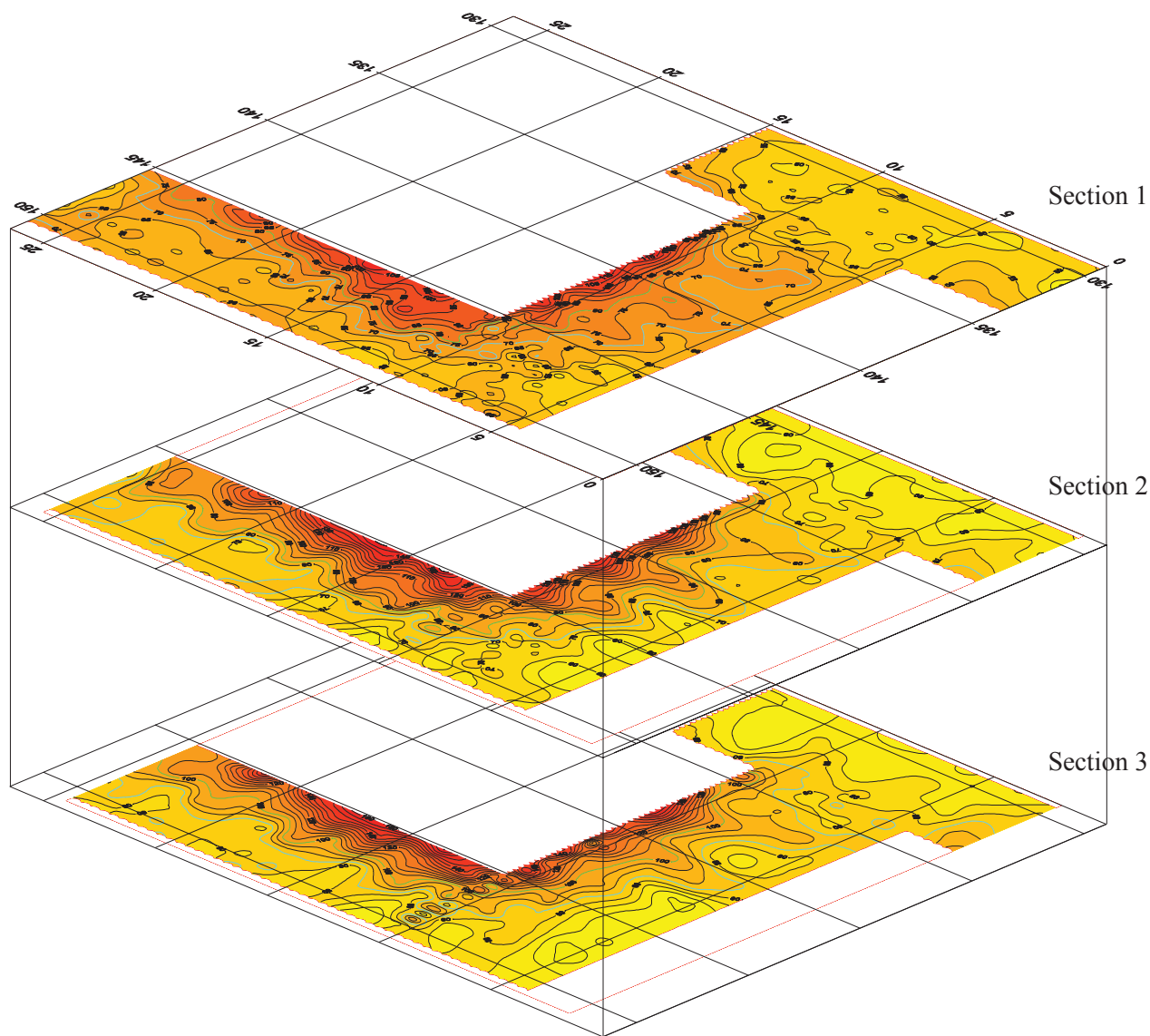
Excavation squares:



Figure 5

PSEUDO 3D BLOCK DIAGRAM OF THE RESULTS FROM THE ELECTRICAL MEASUREMENTS

View point: West-North side of the area



Depth scale:

Configuration A1M1N1B - sensibility up to 1.00 m section 1

Configuration A2M1N2B - sensibility up to 1.75 m section 2

Configuration A3M1N3B - sensibility up to 2.30 m section 3