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Tepe Ghabristan: A Chalcolithic Tell Buried in Alluvium

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Abstract

The chalcolithic tell of Ghabristan in NW Iran is now buried by alluvium and a magnetometer survey of the tell and its surroundings was undertaken to reveal any features under this cover. After the abandonment of the tell in the late third millennium BC it was used as an Iron Age cemetery by inhabitants of the neighbouring tell of Sagzabad. The magnetometer data show a related irregularly shaped channel that is also considered to be of Iron Age date. Its shallow burial depth, compared with the thick sedimentary layers underneath, indicates a considerable slowdown of alluviation rates in the 2nd millennium BC, possibly related to environmental changes. The survey also found evidence for undisturbed buried building remains, most likely associated with copper workshops.

Introduction

The geography of Iran is characterised by high mountain ranges that enclose plains of varying sizes, climate and cultural history. Most of these plateaus are covered by colluvial and alluvial deposits from the surrounding mountains, which can be either arid or fertile, depending on the regional climate. The Qazvin Plain forms the north-western part of the Central Iranian Plateau, being bounded in the south by the Ramond Mountains and in the north by the Elborz Mountains (see Figure 1). Since prehistoric times downwash from the mountains has led to considerable deposition in the plain. The fine textured alluvial soil is fertile and when irrigated, extensive agriculture can be sustained. Even some dry-farming has been reported (Malek Shahmirzadi 1977: 29), which may also have been practised in prehistoric times. Important trade and communication routes crossed through the Qazvin plain, most prominently the Silk Road in east – west direction, but north – south links from the Caspian Sea to Rudbar and Manjil were also important (Neghaban 1977).

In the southern Qazvin Plain, 132 km west of Tehran and 52 km south of Qazvin, lies the 'Sagzabad Cluster' consisting of three prehistoric tells, located within 2 km of each other and apparently forming a settlement sequence. These are the tells of Zagheh (early chalcolithic, 6th and 5th millennium BC), Ghabristan (late chalcolithic, 4th millennium BC) and Sagzabad (Iron Age, 2nd millennium BC). Excavations in the 1970s (Majidzadeh 1977; Malekzadeh 1977) have shown that the lowest levels of the oldest tells lie considerably below the current ground surface. At Zagheh the virgin soil, which is earlier than 6th millennium BC, is 6 m below the current level while the top of the mound, dating from the 5th millennium BC, is 0.5 m above it. Even at Sagzabad about 5 m of alluvium seem to have been deposited since the 3rd millennium BC (Malek Shahmirzadi 1977: 35). Although the details of the alluvial sequence are still unknown, a simplified section through the three tells and the presumed alluvial deposits can be constructed from this information (Figure 2).

It was initially reported that “the archaeological strata in these three mounds complete each other” and that “Ghabristan was occupied when Zagheh was deserted” (Neghaban 1977), but their relationship was not further explored. Recent radiocarbon dating (Fazeli *et al.* 2005) has revealed indications for a shift of occupation from Zagheh to Ghabristan without much overlap at around 4200 BC (occupation in Zagheh from 5370-5070 BC to 4460-4240 BC, in Ghabristan from 4200 BC to 3200-3000 BC). However, the site of Sagzabad seems to have been occupied only from 2100 BC onwards, leaving a gap of 900 years since the apparent abandonment of Ghabristan. This seems to confirm an overall trend, since so far no early- or middle Bronze Age sites have been found in the rest of the Qazvin and Tehran Plain (Coningham *et al.* 2004) either. Earlier reports stated (Neghaban 1977) that archaeological layers of the late second millennium BC were found both at Ghabristan and Sagzabad and may be related to the use of Ghabristan as a burial ground for Sagzabad. Since then, alluviation has slowed down so that the Iron Age graves around Ghabristan are only about 1.5 m below the current ground level.

The first phase of a geoarchaeological landscape project therefore concentrated on the tell of Ghabristan. The excavations in the 1970s had revealed structural remains of some of the tell’s buildings, including rooms that were interpreted as a pottery workshop (Majidzadeh 1977), as well as a pre-Bronze Age copper workshop (approx. 4600-3700 BC). The excavations yielded crucibles, molds, a tuyere, some sort of furnace, and a deep bowl with more than twenty kilograms of copper ore in small pieces (Matthews & Fazeli 2004).

Due to the large amount of alluvial deposits, the former tell is now hardly recognisable and the surrounding agricultural landscape has merged with the site. In recent years, a large number of the Iron Age graves were looted, leaving a crater-landscape amidst the alluvial plane (Figure 3). A magnetometer survey was instigated to delineate the Iron Age cemetery on the tell and its surroundings, and to test whether any other buried features could be detected.

Geophysical Survey

The area investigated in the spring of 2004 includes the tell site itself as well as some of the surrounding fields, overall covering an extent of 6 ha. It can be subdivided into three major zones:

- agricultural areas which were planted with serial crops; ploughed areas; and bare ground,
- parts of the Iron Age cemetery where looters dug robber pits and
- areas of the 1970s excavations, with deep trenches or stripped topsoil.

Agriculture is currently sustained through controlled irrigation and several narrow channels, approximately 0.5 m wide, crossed the survey area.

In total 89 grids of 20 m $\times$ 20 m were surveyed with a Geoscan Research FM36 fluxgate gradiometer, recording measurements every 0.25 m along traverses that were 1 m apart while walking only in one direction (west to east) to achieve the best possible results. Consequently, only minimal data processing was required (‘Zero Mean Grid’ for background subtraction).

The overall results of this magnetometer survey are presented in Figure 4, which clearly shows the modern irrigation channels as linear features in the data. The following interpretation of these results focuses on five areas (A-E), outlined with boxes in Figure 4.

Since the topsoil magnetic susceptibility of the site is relatively high (about $\chi = 180 \times 10^{-8}\ m^3\ kg^{-1}$), disturbances of the topsoil cause magnetic anomalies, as is evident from the clear anomalies of the soil-cut irrigation channels. It was therefore decided to undertake a detailed study of the magnetic signals produced by the robber pits that cover a large part of the tell and are up to 1-1.5 m deep. The detailed mapping of pits in a 20 m $\times$ 20 m grid (Area A, see Figure 5) shows the direct correlation between each robber pit and a distinct negative magnetic anomaly of approximately –8 nT, due to the missing magnetic soil. The data show very few other detectable anomalies in this area and it was subsequently decided to only survey a small part of this looted graveyard (see Figure 4).

Based on these findings it was possible to interpret data recorded in the transition zone from the looted area in the south to the agricultural area in the north. The broken line in Figure 6 shows the boundary between these zones as it was recorded during the survey. The negative anomalies in the north (Anomalies B) are very similar in appearance and distribution to the visible robber pits in the south. They are slightly broader and weaker (approximately –6 nT), since they are buried under the topsoil layer. They are hence interpreted as excavations, most likely for graves, and it is reasonable to assume that this area is a continuation of the Iron Age cemetery.

In the west of the survey area (Areas C, see Figure 4), in agricultural land outside of the disturbed zone, further distinct negative anomalies were found, similar to those identified in Area B. Although they are less clear and not as well clustered, it is assumed that these are also related to graves from the Iron Age cemetery.

The overall survey plot (Figure 4) shows many anomalies (either positive or negative) that form linear segments, very similar to the modern irrigation channels. It can hence be assumed that they are part of previous irrigation systems. Although it is impossible to assign a date to them, it is noticeable that most are as straight as the modern channels.

A notable exception is a segment of positive magnetic data that has a more irregular shape (Anomaly D in Figure 6) and this may indicate that it is caused by a channel, which was constructed earlier. At its southern end it is intersected by some of the negative anomalies identified in Area B (Anomaly B1) and it must therefore be roughly contemporary with these, or older. If these anomalies are related to Iron Age graves, as argued above, then this channel has to be also from around the 2nd millennium BC. To further test the nature of this anomaly a small trench was dug across it (Trench D, Figure 6).

This excavation (Figure 7) clearly showed that the anomaly was caused by a channel that had been re-worked several times: the initial flat bottomed channel was flooded leaving it filled with gravel and silt; it was then re-cut with a deeper gully at its eastern side; this re-cut channel subsequently silted up and was again flooded and buried under a thick layer of gravel, on top of which the modern topsoil has formed. The bottom of the initial channel is about 0.7 m below the current surface. Such depth is broadly compatible with the Iron Age graves, which are dug to about 1-1.5 m below the current ground level. The susceptibility contrast between the silted fill and the alluvial matrix was found to be approximately $\Delta\chi = 200 \times 10^{-8}\ m^3\ kg^{-1}$, which explains the pronounced anomaly in the magnetometer data.

Just west of the large excavation trenches of the 1970s, topsoil had been removed and the magnetometer survey was hence closer to possible buried features. The positive magnetic anomalies in the northern part of Area E (Figure 8, Anomalies E) have a rectilinear appearance aligned WNW – ESE. They are similar to the buildings uncovered in the 1970s excavations and can hence be interpreted as buried building remains. To the NE of this anomaly complex lie two large (approximately 5 m diameter) negative anomalies (Anomalies E1) and to the SE one strong positive (+75 nT) anomaly (Anomaly E2). Especially the latter seems to be caused by thermoremanent magnetisation and it is hence possible that the structural remains may be associated with copper metalworking, similar to that identified in some of the excavated buildings.

To the south of this identified complex in Area E, further positive anomalies can be seen although they are less distinct. Some are curvilinear and others localised. The latter are mainly related to dense pottery scatters on the ground.

Conclusions

The settlement sequence of the Sagzabad Cluster is intriguing, in particular the apparent hiatus between the abandonment of Ghabristan and the use of Sagzabad (Fazeli *et al.* 2005). These tells were built in an alluvial environment characterised by considerable deposition rates and two of them are now buried by alluvium. Such environmental factors inevitably impacted on settlement practice (Weiss *et al.* 1993) and for a fuller archaeological analysis of changes in past habitation at the Sagzabad Cluster a better understanding of the temporal relationship between cultural and alluvial sequences is required. Although geophysical surveys are fast and provide detailed information about the spatial layout of buried remains, they cannot give direct dating evidence. In this survey of the area around Ghabristan, however, it was possible to gather circumstantial data to construct an archaeological model for some of the past developments.

The magnetometer data revealed clusters of negative anomalies (Areas B and C), which are interpreted as being additional parts of the Iron Age cemetery. In Area D an irregularly shaped channel is intersected by some of the pit-like anomalies of Area B and can hence be assumed to be contemporary with them or older. The test trench dug across this channel (Figure 7) showed that it was cut into alluvium, which suggests that the anomalies in Areas B and C were also excavated into sedimentary deposits covering the flanks of the tell. This implies that alluviation had already buried Ghabristan by about the 2nd millennium BC when the cemetery was in use. It is possible that this alluviation led to the establishment of the new settlement at Sagzabad, a tell that even now stands proud of the alluvial plain. From the 4th to the 2nd millennium BC, approximately 5 m of alluvium were deposited at Ghabristan, followed by only about 1.5 m in the subsequent four millennia. Further investigations are needed to link this slowdown of deposition (from roughly 2.5 mm a^{-1} to 0.4 mm a^{-1}) with possible environmental changes (Bar-Matthews *et al.* 1998; Lucke *et al.* 2005; Weiss *et al.* 1993). As stated above, there appears to be a settlement hiatus in the Iranian Plateau during the early- to middle Bronze Age and further investigations at the Sagzabad Cluster may shed more light on this period of Iranian prehistory. The most important question is whether the apparent demise of society is linked to a system collapse or to sever environmental changes. The geophysical findings show that the alluviation history of these three neighbouring tells may hold important clues.

No other anomaly in the survey area had a similar shape to the channel in Area D and there is hence no clear evidence that it forms part of an irrigation ‘system’. Nevertheless, the discovery of such a channel is highly significant as it is linked to ancient land use patterns. In addition to such archaeological results the survey has shown how information about the temporal sequence of buried features can be obtained from careful investigation of intersecting geophysical anomalies.

The anomalies in Area E can be interpreted as buried structural remains, possibly linked to metalworking. They show that underneath the current land surface, despite the illicit excavations, undisturbed building remains can still be found.

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Figures

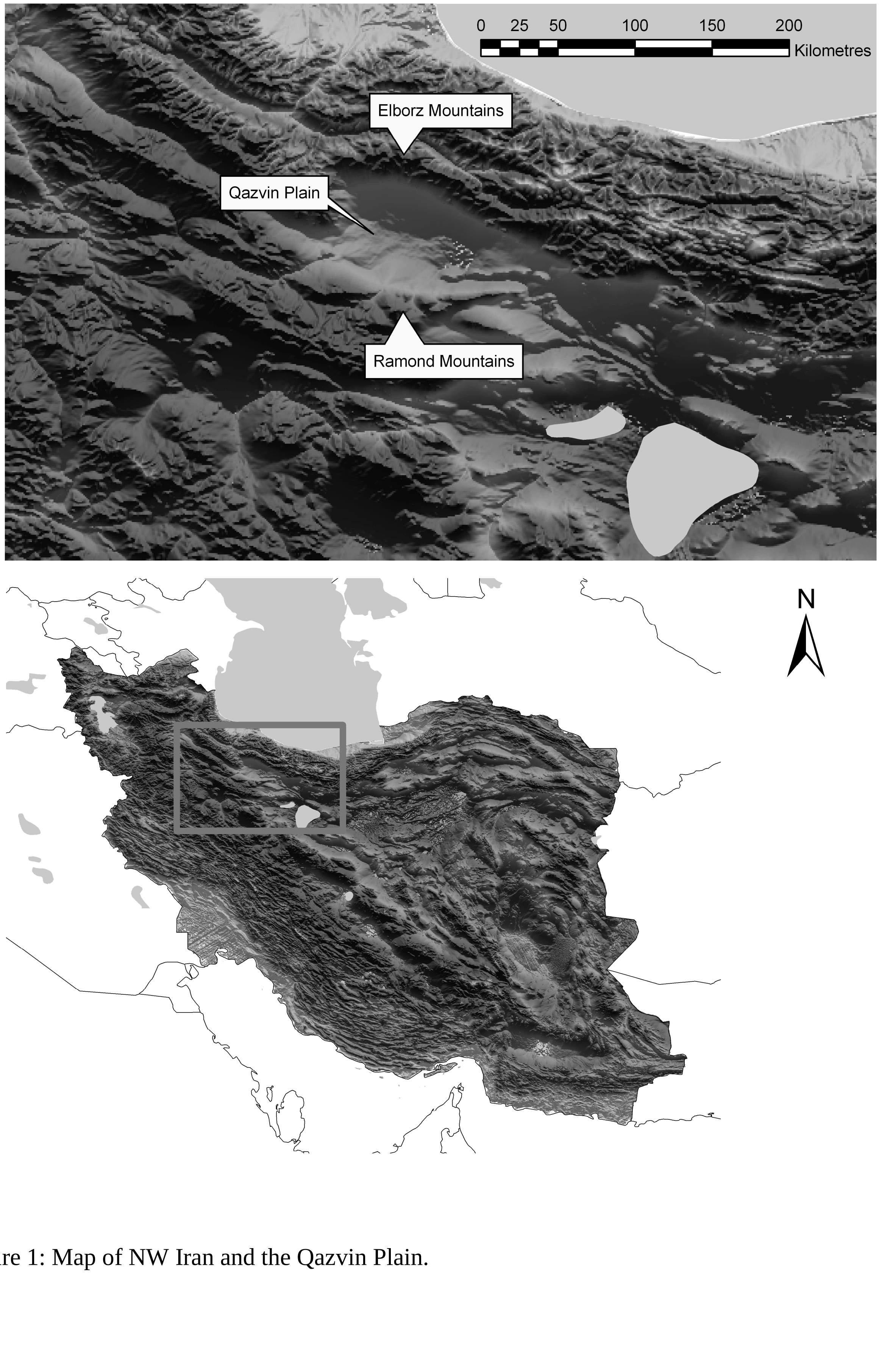

Figure 1: Map of NW Iran and the Qazvin Plain.

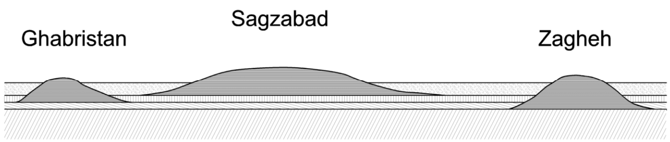

Figure 2: Diagrammatic section through the tells of Ghabristan, Sagzabad and Zagheh (from left); not to scale.

Figure 3: Looted Iron Age graves on the tell, surrounded by agriculture on the alluvial plane.

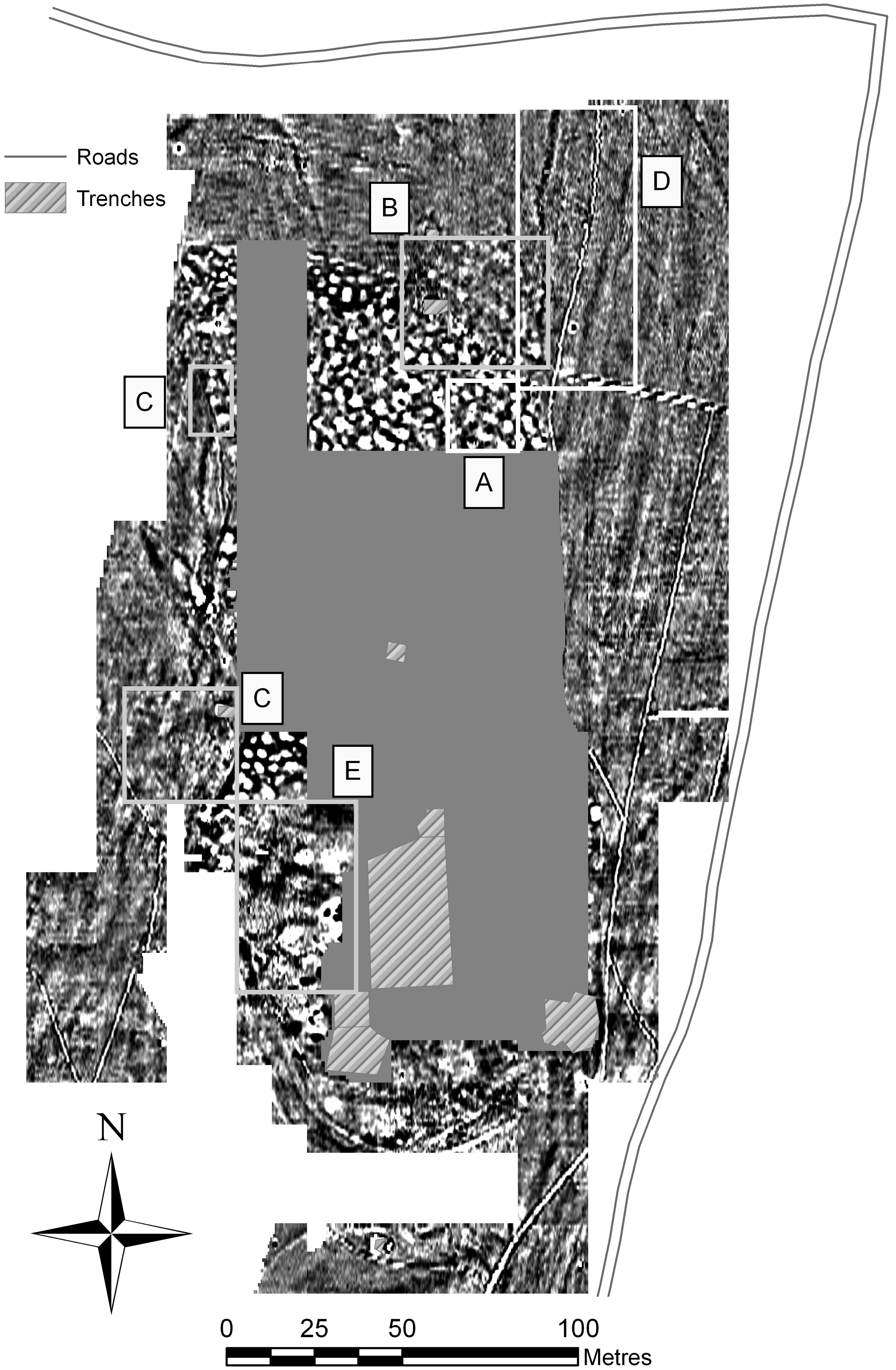

Figure 4: Overview of results, highlighting Areas A-E that are discussed in the text. The data are displayed as clipped greyscale diagrams with a range of –5 nT to +5 nT (white to black, linear scale).

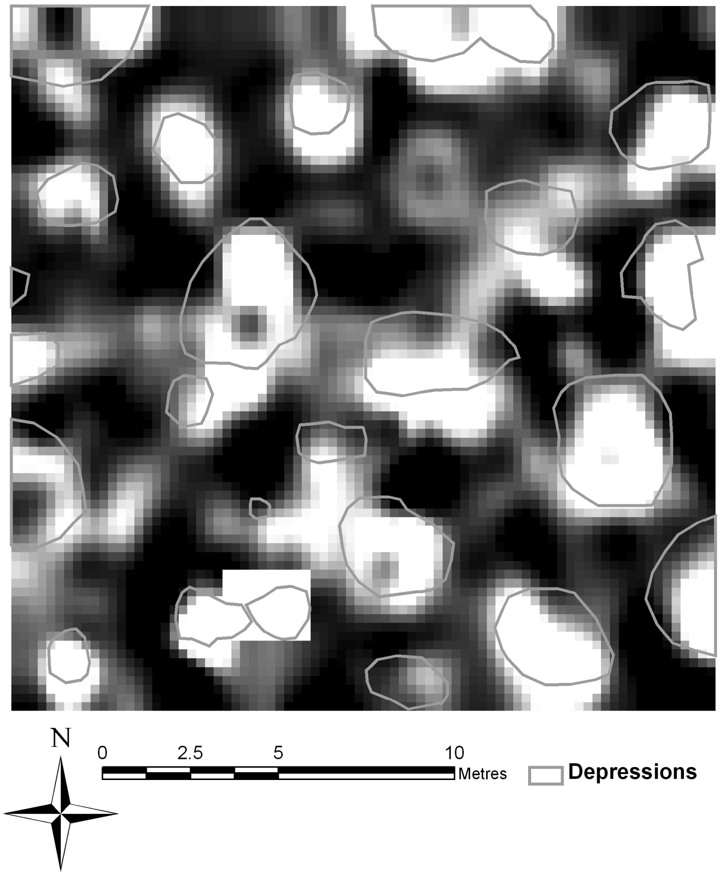

Figure 5: Area A (20 m × 20 m). The grey lines indicate the outlines of looted graves.

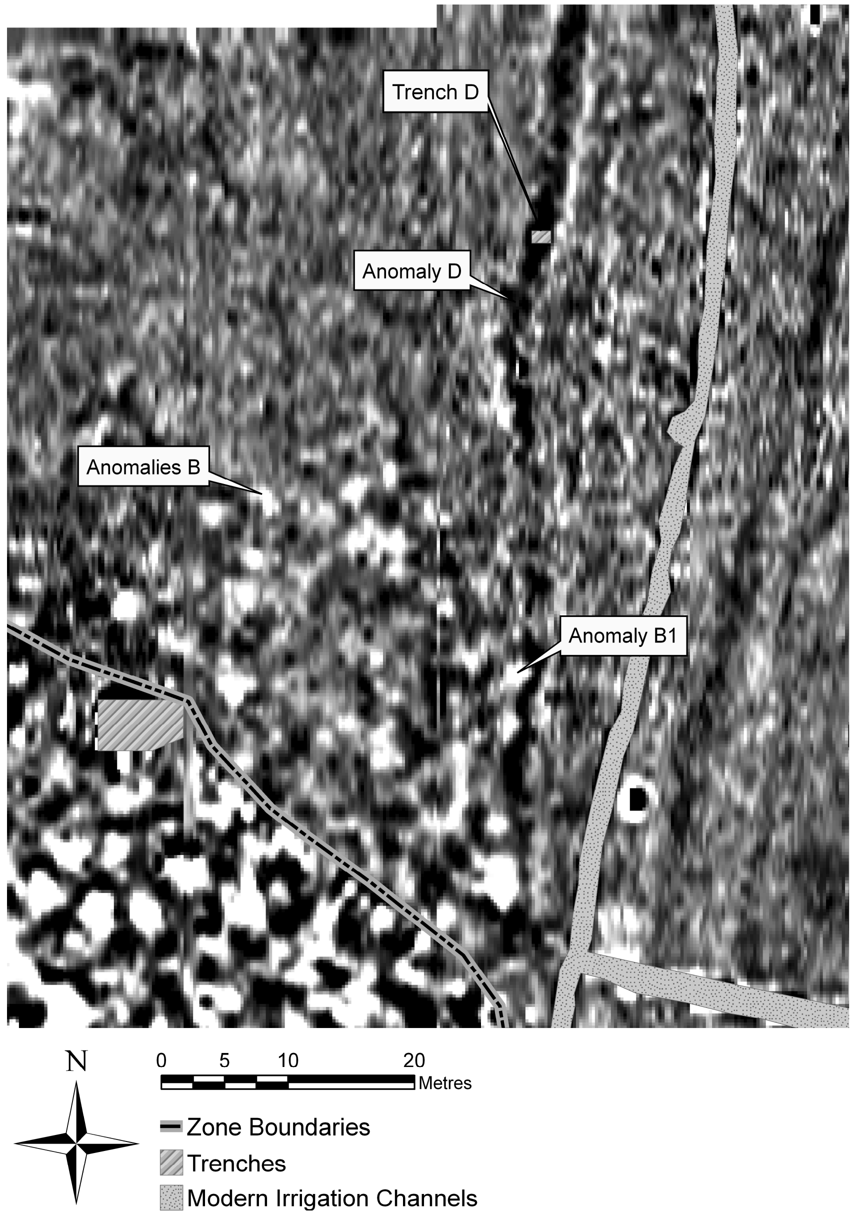

Figure 6: Areas B and D, showing possible graves in the agricultural area (Anomalies B) and an ancient channel (Anomaly D).

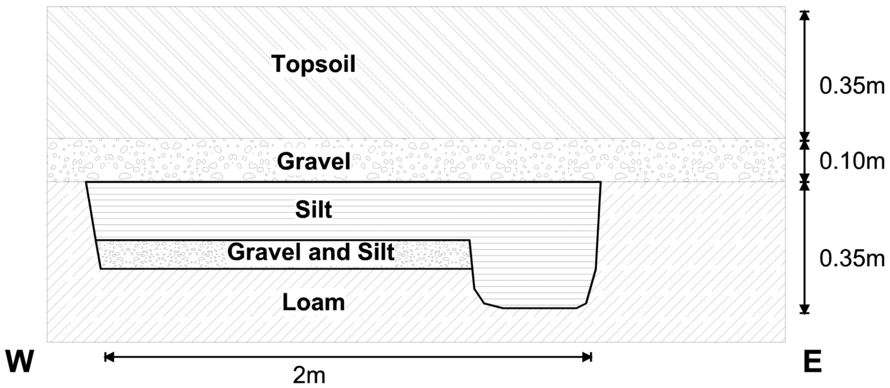

Figure 7: Sketch drawing of excavated channel in Trench D.

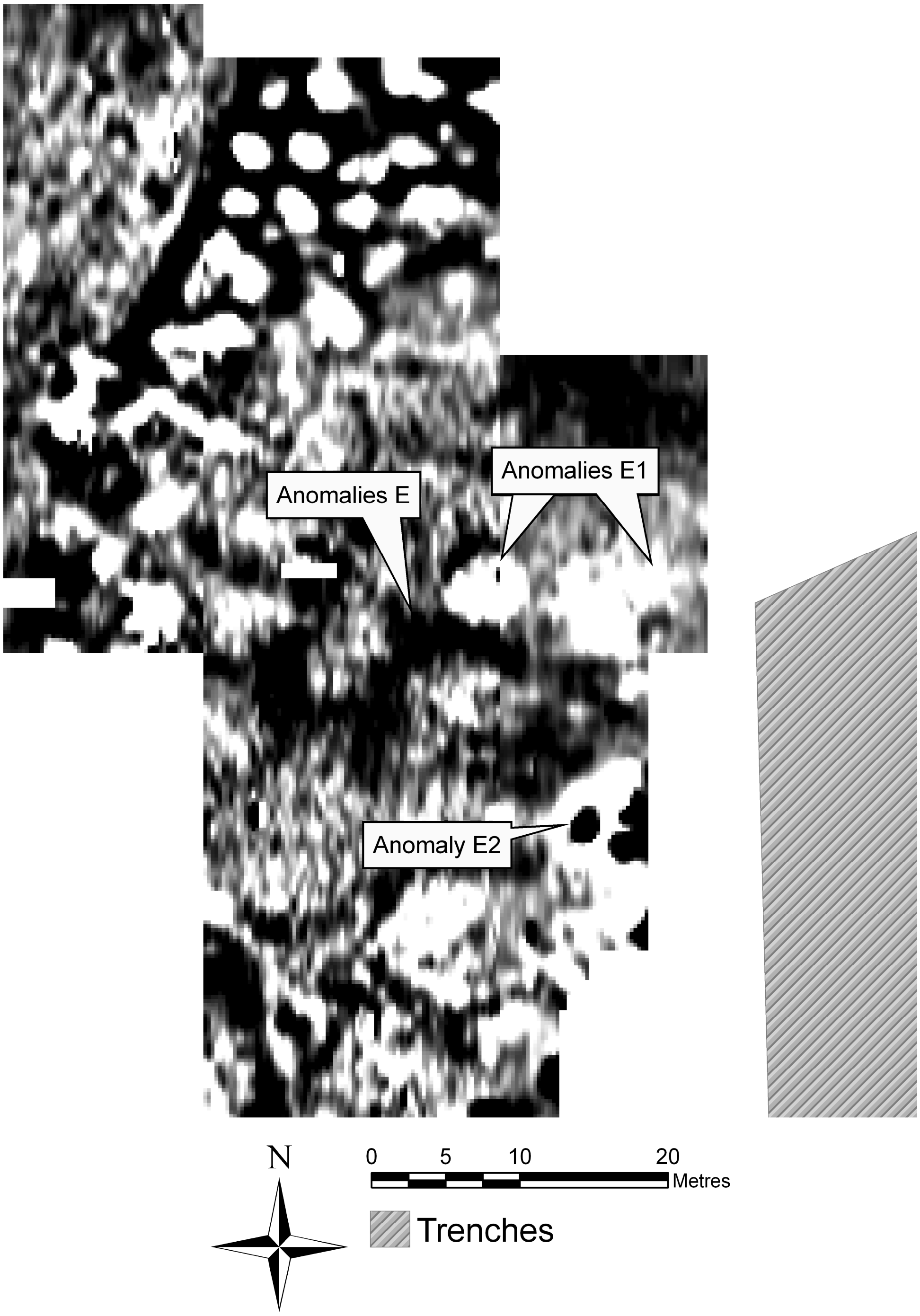

Figure 8: Area E with Anomaly E outlining buried building remains.