

PRELIMINARY REPORT ON THE GEOPHYSICAL SURVEY AT ‘EZBET RUSHDI/TELL EL-DAB’A IN SPRING 2004

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In 1996 the first successful test was performed in Qantir-Pirameses by Helmut Becker and Jörg Fassbinder to prove the benefit of fast and non-intrusive subsurface investigation in order to map the remnants of the old capital of Ramesses II.¹ The contrast in magnetic susceptibility and/or magnetisation of sundried mudbrick walls and surrounding mud was sufficient for the detection by sensitive magnetometers (Fig.1).² Since this first test many campaigns of magnetometry covered meanwhile an area of some 1.3 km² and uncovered a wealth of information about districts, streets, channels, temples, houses of the Rameside capital.

The magnetic prospection in Tell el-Dab’a started in 1999 and 2000 by Tomek Herbich in ‘Ezbet Helmi, continued by Christian Schweitzer in 2001 and 2002 by Tomek Herbich and Christian Schweitzer in ‘Ezbet Helmi, Hatman, Mehesin, Khatana and south of ‘Ezbet Rushdi. Surveying and coordination have been provided by Josef Dorner, then second director of the Austrian Archaeological Institute in Cairo. During

the campaigns 1999 to 2001 a fluxgate gradiometer FM 36 (GEOSCAN Research, England) has been used. For the survey in 2002 in Rushdi-S a method based on a high-resolution caesium-magnetometer SM-4/4G ‘special’ was applied. This method was developed by Helmut Becker and Jörg Fassbinder from the Bavarian State Office for Protection of Historical Monuments, Munich, and applied in surveying Piramesse. Compared to fluxgate gradiometers it provides a larger penetration depth to detect also deep seated archeological structures. The use of two sensors instead of one sensor for the FM 36 allows a daily coverage of one hectare and even better in difficult terrain. The caesium magnetometer was reused for the Rushdi-N survey.

The results of these endeavours were part-published in preliminary reports, mainly relating to the palace area of ‘Ezbet Helmi³ where geomagnetic prospection proved to be the only way to understand large architectural structures and their relationship with the surrounding settlement. This was done by collating what tradition-

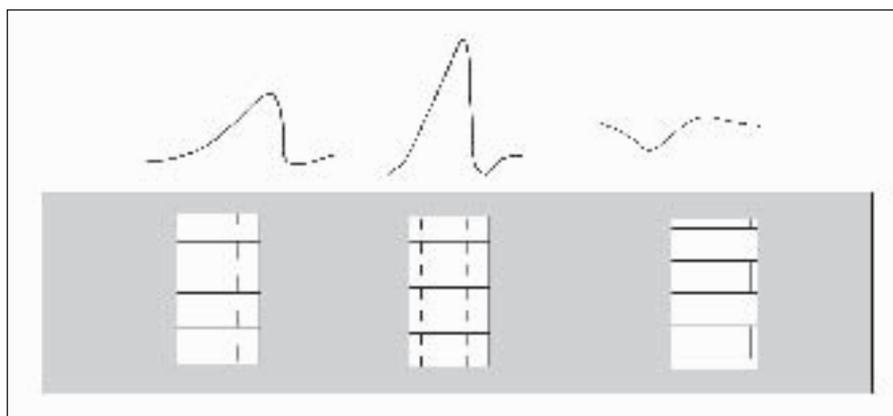


Fig. 1 Contrast in magnetic susceptibility of sundried mudbrick walls and surrounding mudbrick

¹ PUSCH, BECKER/FASSBINDER 1999a, b.

² The driving force of the magnetic prospection method is the earth’s magnetic field which induces a magnetization effect for near-surface bodies. These magnetized bodies are apt to cause a local magnetic anomaly, the scale of which depends mainly on the magnetic suscep-

tibility, volume and depth of the body. Highly sensitive magnetometers can help log the smallest changes in this range of anomalies as well as help plot archaeological structures and objects like ditches, stone structures, kilns and fireplaces.

³ BIETAK/ DORNER/JÁNOSI 2001.



Fig. 2 Wolfgang Müller and Michael Weissl setting out squares for the geophysical survey



Fig. 3 Christian Schweitzer during the geophysical survey at ‘Ezbet Rushdi

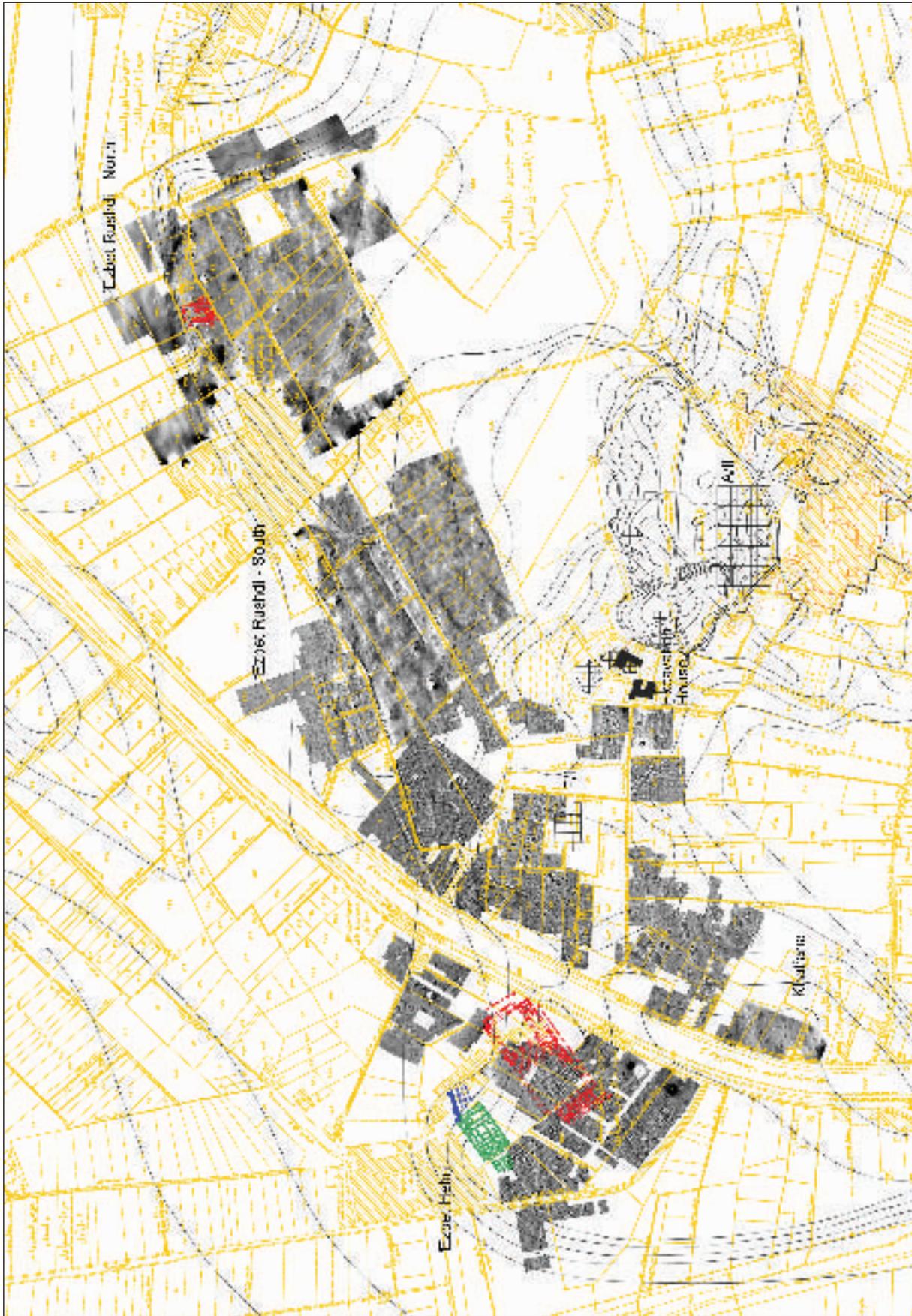


Fig. 4 General overview with the surveyed areas

ally had been mostly enigmatic results obtained from excavations with the new picture provided by geophysicists. In addition to ‘Ezbet Helmi, large areas of ancient Auaris have been investigated, but have yet to be published. There is a rather fragmentary look to the overall survey scheme because co-ordination with the landowners is not always possible. The patches of land that farmers own are generally smallholdings, which is why the team has been – and is still – confronted with a large number of land owners who tend to work their land in a highly individualistic way. Sometimes measurements are impossible because of completely inundated rice fields or because the harvest is postponed until the end of the campaign.⁴

As in previous years, the measuring period was moved to May, as this is the time wheat is harvested and large areas are available free-of-charge, no compensation being payable for crop loss caused. At any rate, the scheduled start-date had to be moved forward, following a field-survey, from the originally scheduled 26 May to the 5 May 2004 as – on the later date – arable land areas could no longer be set foot on owing to crop-sowings.

The survey of the magnetometer grid based on 40 m × 40 m tiles was conducted by Wolfgang Müller and Michael Weissl (Fig. 2). The prospection started 6 May and ended 15 May 2004 after 10 days of measurements covering 12.3 hectares (Fig. 3). The raw data recorded were processed with special programs and magnetograms produced.

Only the results of the cooperation with Ch. Schweitzer will be reported in this paper. Herbich’s work will be presented together with older results (Fig. 4).

The rapid growth of the village of ‘Ezbeth Rushdi was a major factor for the focus of this year’s work. A new mosque had been erected to the east of the village. Houses of simple construction are likely to follow in due course, thereby destroying valuable agricultural land and possibly archaeological remains. We decided to take meas-

urements up to the very fringe of the village in order to get information on future threats to antiquities.

The area measured lies to the NE of ‘Ezbet Rushdi and has been called “Rushdi North”.⁵ (Fig. 5). Excavations in Rushdi have been conducted by Sh. Adam in 1954⁶ and the Austrian Archaeological Institute in 1996.⁷ Adam found a temple of the Middle Kingdom and part of a palatial precinct. While the location of the palace was not documented by Adam, it was possible to re-excavate the temple which then became Tell el-Dab‘a Area R/I. The strategy behind the geophysical survey was to establish the location of Adam’s excavation and to check whether the temple of R/I belonged to a larger archaeological structure. The other top priority was to get additional topographical data concerning river-branches and turtlebacks.

J. Dorner set the framework for any kind of topographical and prospective work in Tell el Dab‘a with his reconstruction of the ancient landscape by means of core drillings.⁸ As most of his results could be verified by excavations and prospection i. e. in Qantir, his map of ancient Auaris and Piramesses was of fundamental importance for the setup of the geophysical work (Fig. 1). According to this map the bulk of the investigation site was plotted on an ancient peninsula, surrounded by the Pelusiac Branch of the Nile and on a number of partly flooded older branches.

This geological situation has been confirmed, the magnetic image clearly showing areas with little magnetic anomalies on the northern and southern fringe of Rushdi North. When comparing the map made by Dorner with the new results, there is a striking difference between the northern and the eastern “branch”. The northern branch shows large stripes with high magnetic (black) anomalies. There is a far more uniform appearance to the eastern branch showing lower magnetic activity, as it does. This seems to suggest different sedimentation processes and ties up well

⁴ In Qantir, if necessary, farmers got compensation payments for their harvest. Compensation politics of the ÖAI try to minimize damage to the harvest. Therefore payments are made in order to accelerate harvesting. Often farmers try to bargain for more compensation by postponing the harvest and transport of crops and chaff. Gaps in the measurement can’t always be avoided.

⁵ In 2002 Th. Herbich and Ch. Schweitzer started measurements to the South- West of ‘Ezbet Rushdi.

⁶ ADAM 1959: 207ff.

⁷ BIETAK/DORNER 1998; CZERNY 1998, 2001, 2002, in print.

⁸ Recently DORNER 1999.

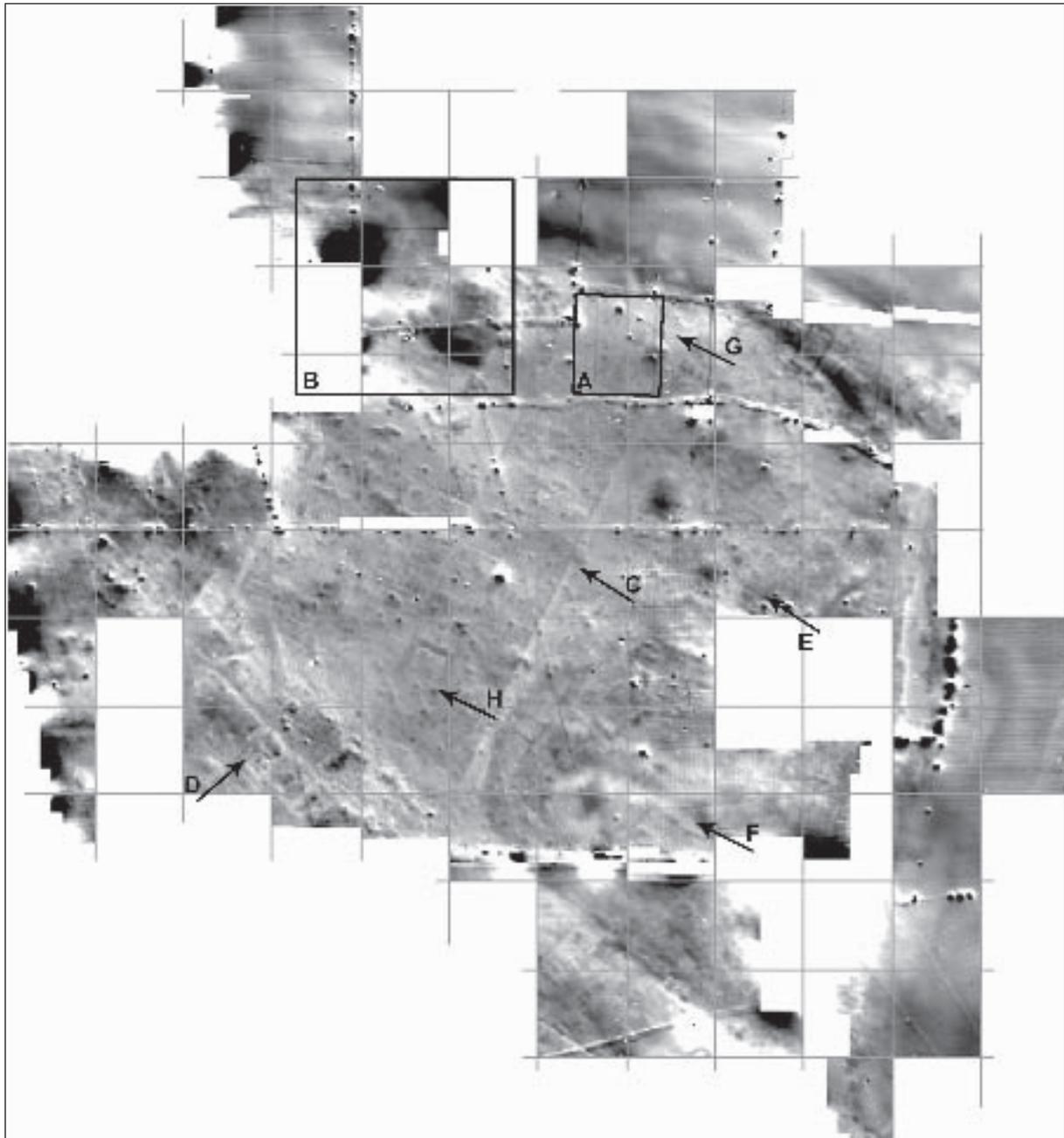


Fig. 5 Geophysical survey of Rushdi North

with the map showing coring results and depicting only the branch to the north as a genuine part of the Pelusiac branch. The branch to the East has been interpreted as an old branch, carrying water in ancient times only during the flood season. The positive anomaly that defines the border zone between water and land to the North may be the result of massive pottery deposits,⁹ possibly a

kind of fortification of the shoreline. The dotted black anomaly to the East is the result of a recent subterranean channel. Immediately to the west of this channel a large negative anomaly, partly up to 10 meters wide and clearly visible for a length of about 120 meters with a clearly visible and very pronounced dipole shadow, may be an old wall, again for coastline fortification.

⁹ Oral communication with J. Dorner. The drillings in this area produced a large amount of sherds.

The excavations of Adam and the Austrian Archaeological Institute can also be seen on the image: at R/I there is a number of telling squares (Fig. 5, Nr. A). There is nearly no trace of the temple itself. The area of Sh. Adam's excavation shows no clear vestiges of archaeological work (Fig. 5, Nr. B). There seems to be a rather disturbed zone west of R/I that is roughly rectangular in shape. The angle and scales of this anomaly tie up well with Dorner's map (Fig. 6) seeking to plot the position of the palace by reference to a large rectangular pit that was still visible into the late seventies but has vanished completely since then.¹⁰ The traditional assumption that there has to be some link between the temple and this palace precinct seems to be borne out by the proximity of both structures.

The most striking feature of the area investigated is a settlement with a clearly defined border to the East (Fig. 5, Nr. C). This border seems to consist of a rather small and narrow wall and a street – up to 3.5 m wide – that runs exactly North-South and is clearly discernible for 240 meters. The present-day village and a massive disturbance contrive to bound off the settlement to the West, a large archaeological but obviously more recent structure to the South (Fig. 5, Nr. D).

This structure of more recent times runs ESE to WNW. At the moment, the way it can be interpreted is somewhat a matter of conjecture. It may be a street with houses North and South – or a massive fortification, consisting of several casemates – walls, bastions and even a gate. The most remarkable feature is that there is an elevation in the area surveyed. The present-day street between 'Ezbet Rushdi and the "manor" of Dr. Samir Bilbeisi shows an elevation of about 1 meter over the main area to the North. In spite of this tier, there is no survey discrepancy, the antique structures appearing of considerable height and very long history. As neither the Southern, Eastern nor Western boundaries to this structure are on this year's geophysical map, it will be reported in more detail after next year's work (it is planned to continue the prospection to the South and South-West).

To the East of the plotted settlement, agricultural work and possible more recent archaeological activity have produced a very homogeneous

geophysical appearance. Some structures seem to be the vestiges of an antique garden site (Fig. 5, Nr. E). A relatively regular structure to the immediate East of the settlement is aligned differently to the settlement (at an angle of about 7° between the Eastern wall and this structure). At the moment neither the stratigraphical relationship between it and the settlement, nor its function can be determined.

The most important result is, of course, the newly discovered settlement. Its chronology may be extrapolated to some extent from the excavations at R/I where two major phases have been discernible: the more recent phase seems to consist of the temple and some kind of settlement around it. The earlier phase did not show a temple at the same position, but small buildings, ostensibly workshops etc. They were organized in a rather regular way, but only the foundations with the lowest layers of mud-bricks have been preserved. The older settlement was built immediately on the surface of the gezira.

The temple was dated to the time of Sesostrius III, the older settlement to the early to middle Middle Kingdom.¹¹

The excavations can clearly be seen on the map (Fig. 5, Nr. A), stopping just 10 metres to the West of the boundary wall (Fig. 5, Nr. G). About 62 metres from the shoreline, this wall changes direction and heads slightly eastwards. This change is not linked to the excavations, but seems to be the result of the building of the temple. Then, 83 metres from the coastline, the settlement pattern becomes much clearer. This may be because of the shape of the gezira – or of excavation activity. Maybe the construction of the temple and palace or flooding damaged the structure nearer to the river branch. The settlement layout is "hippodamic" with orthogonal streets. The first two stripes, from the boundary – wall to 52 metres to the East, running exactly parallel to the boundary wall, consist of square insulae, about 26 × 26 metres. In the second stripe, near the southern boundary of the visible settlement, a structure with thick walls (about 6 m) is clearly visible (Fig. 5, Nr. H). The anomalies that can be interpreted as walls are based on negative inference, the sandy foundation-trench seeming to be the

¹⁰ Oral communication with J. Dorner.

¹¹ Oral communication with E. Czerny.

only vestige left of the building, possibly with several layers of sandy mud-bricks. The square structure fits exactly into one insula. The next insula to the North might be a courtyard with a pylon. The most interesting feature of this temple is the close resemblance it bears to the known temple of R/I and the fact that the temple of R/I too is situated in the second stripe. The stratigraphic situation of the settlement, as prospected, is of course purely hypothetical, the only indicators being supplied by the excavations in the temple area of R/I. The pivotal question seems to be whether the new settlement belongs to the temple of the late MK or to the older settlement of the early MK.

The surprisingly clear picture of the settlement pattern seems to imply that no younger activity happened in the area. There seems to be only one building phase. This – coupled with the fact that two temples in such close proximity would be rather improbable – supports the proposition that the newly discovered settlement belongs to the older stratum. Maybe only the

northern part was rebuilt in the later MK with the same settlement pattern as the older one. It seems to be possible to integrate the buildings of the older stratum of R/I into insulae of the prospected type. The insulae seem to be defined by small enclosure walls and streets between them. Further west, the insulae seem to be larger, the structure not so regular any more. The last visible NS street of the settlement is 129 metres to the West of the eastern boundary wall.

This NS structure is very prominent. It may already be the western boundary of the settlement.

The geophysical prospection of 2004 has produced a surprising result: the second planned settlement after the settlement of F/I of the 1st Intermediate Period or very early MK.¹² These nuclei of the cultivation of the Eastern Nile Delta mark the beginning of what would then go on to become Auaris and finally Piramesse, adding to our knowledge of early Egyptian cities and temples of the MK.

Magnetometer prospection with a caesium magnetometer Smartmag SM-4/4G-‘special’

(SCINTREX Ltd., Concord, Ontario, Canada)

Data acquisition

- Duo sensor configuration in parallel mode (total field measurement)
- sensitivity +/- 0.01 nT
- registration rate 10 samples/s
- sensor distance to ground abt. 0.30 m
- survey grid dimensions 40*40m
- measurement in zig-zag mode

Processing sequence

- resample from ca.0.10m to 0.25 m along walking traverses
- eliminate the total field and extract local anomalies
(1. data averaging per survey grid; 2. subtract individual value from the mean)
- data editing, compose survey grids, provide smooth transitions at grid edges (desloping and edge matching)
- apply moderate high pass filter (filter length of 20 samples). In high pass filtered magnetograms small features will appear more accentuated, whereas long wave structures are attenuated.

Data display in gray shaded plots

- Normal polarity: black resp. white surplus resp. shortage in magnetization
- Inverse polarity: white resp. black surplus resp. shortage in magnetization

Applied software

- Proprietary software of the Bavarian State Office for Protection of Historical Monuments, Munich (Dr. Helmut Becker, Dr. Jörg Fassbinder)
- Geoplot 3.0, GEOSCAN Research Ltd., England
- Surfer 8.0, Golden Software, USA
- AdobePhotoshop6.0

¹² CZERNY 1999.

Bibliography

- ADAM, SH.
1959 Report on the Excavations of the Department of Antiquities at 'Ezbet Rushdi, *ASAE* 56, 207–226.
- BIETAK, M., DORNER, J., JÁNOSI, P.
2001 Ausgrabungen in dem Palastbezirk von Avaris. Vorbericht Tell el-Dab'a/'Ezbet Helmi 1993–2000 mit einem Beitrag von Angela von den Driesch und Joris Peters, *Ä&L* 11, 27–119.
- BIETAK, M., DORNER, J.
1998 Der Tempel und die Siedlung des Mittleren Reiches bei 'Ezbet Rushdi, Grabungsbericht 1996, mit Beiträgen von E. Czerny und T. Bagh, *Ä&L* 8, 9–49.
- CZERNY, E.
1998 Zur Keramik von 'Ezbet Rushdi (Stand Mai 1997), *Ä&L* 8, 41–46.
1999 *Tell el-Dab'a IX. Eine Plansiedlung des frühen Mittleren Reiches, mit einem Beitrag von J. Boessneck und A. von den Driesch*, UZK 15, Wien.
- 2001 Ein früher Beleg für *Hwt-w'rt* auf einem Siegelabdruck aus Tell el-Dab'a, *Ä&L* 11, 13–26.
- 2002 Egyptian pottery as a context for the early MB IIA painted pottery from 'Ezbet Rushdi, 133–142, in: M. BIETAK (ed.), *The Middle Bronze Age in the Levant. Proceedings of an International Conference on MB IIA Ceramic Material in Vienna 24th–26th of January 2001*, CChEM 3, Wien.
- in print A Middle Kingdom Settlement at 'Ezbet Rushdi in the Egyptian Nile Delta: Pottery and some Chronological Considerations, *Proceedings of the 2ICAANE*, Copenhagen.
- DORNER, J.
1999 Die Topographie von Piramesse, *Ä&L* 9, 77–83.
- PUSCH, E. B. /H. BECKER/ J. FASSBINDER
1999a Palast – Tempel – Auswärtiges Amt?, *Ä&L* 9, 135–154.
1999b Wohnen und Leben, *Ä&L* 9, 155–170.

