SAQQARA GEOPHYSICAL SURVEY PROJECT

PRELIMINARY REPORT

2006

GLASGOW MUSEUMS
GLASGOW CITY COUNCIL
20 TRONGATE, GLASGOW G1 5ES
SCOTLAND

SAQQARA GEOPHYSICAL SURVEY PROJECT 2006

Elizabeth Bettles, Jon Dittmer, Elizabeth Jones,
Ian Mathieson and Campbell Price

Abstract: An interim report on the work carried out during the 2006 season covering the use of the model 256 Geoscan Gradiometer equipment to test previous geophysical results and record archaeological features on the north side of the Serapeum leading to the 1st Dynasty tombs above Abu Sir village. Two test pits were excavated to inspect the pavement and north wall of the Serapeum Way.

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Ian J Mathieson

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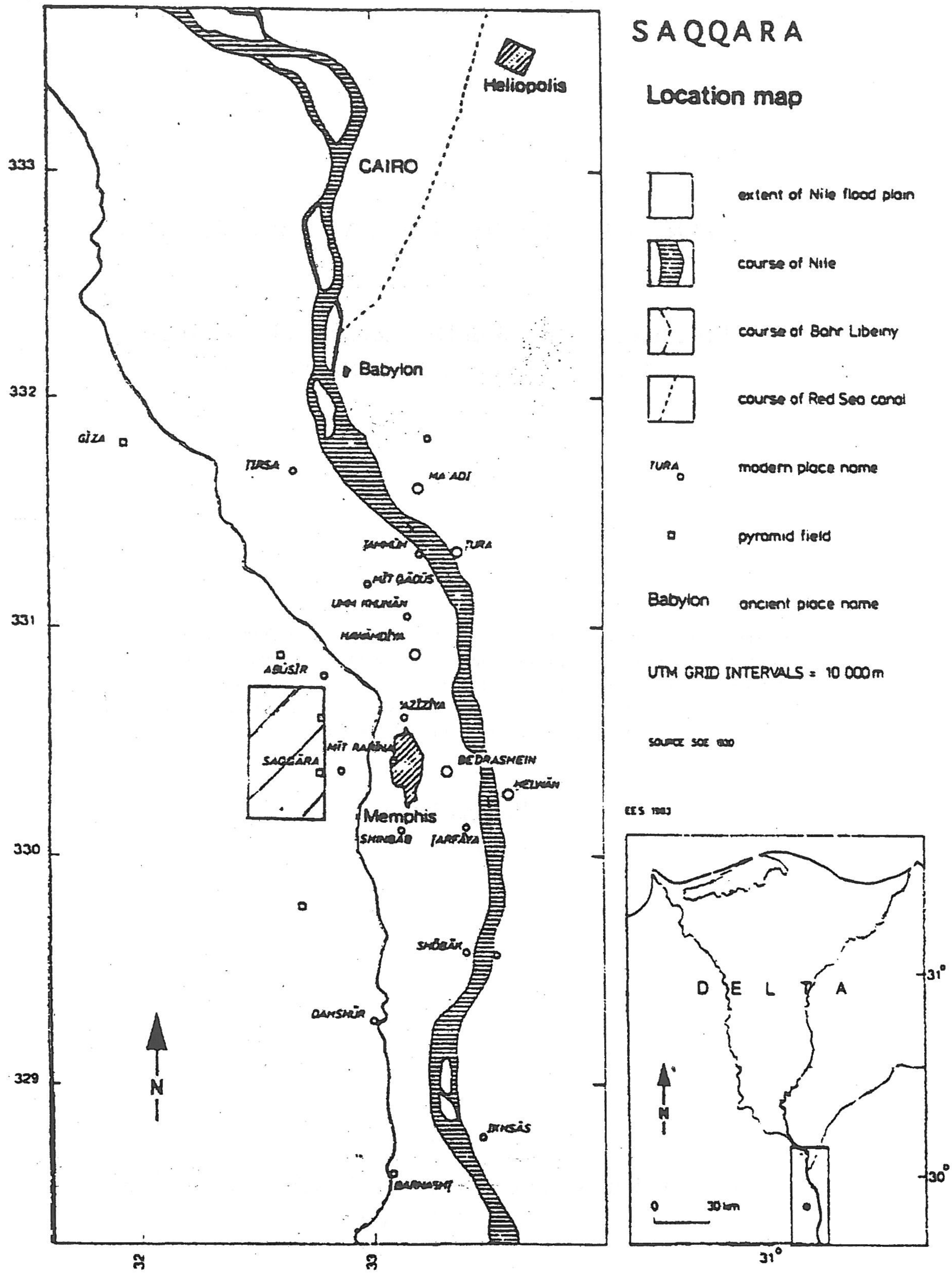
SAQQARA
Location map
extent of Nile flood plain
course of Nile
course of Bahr Libeiny
course of Red Sea canal
TURA
modern place name
pyramid field
Babylon
ancient place name
UTM GRID INTERVALS = 10 000 m
Heliopolis
CAIRO
Babylon
Memphis
GIZA
TIRSA
MA'ADI
TURA
ABUSIR
SAQQARA
BEDRASHEIN
HELWAN
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D E L T A
30 km
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THE SAQQARA GEOPHYSICAL SURVEY PROJECT

PRELIMINARY REPORT OF THE SAQQARA SURVEY PROJECT 2006

By Elizabeth Bettles, Jon Dittmer, Elizabeth Jones, Campbell Price, Ian Mathieson

The aims of the Saqqara Geophysical Survey Project have been:

a) To produce an up-to-date archaeological and subsurface geophysical map of an interesting and relatively little-studied area of Saqqara, the great necropolis of Memphis, this was the major city of Egypt from c.3000 BC to Hellenistic times. The area concerned comprises the Gisr el-Mudir 'the Great Enclosure' in the south; the structures lying to the west of the mastabas of Ptah-Hotep known as the L-shaped enclosure; the Serapeum and its dependencies; part of the Archaic necropolis; and the Sacred Animal Necropolis complex near the village of Abusir in the north.

b) To adapt and combine a series of well-known geophysical techniques to the special problems of plotting large monuments, cemeteries, catacombs and natural features in desert conditions where unexcavated and previously excavated monuments are buried either under drift-sand or under the dumps of former excavations. These techniques incorporate resistivity survey, electro-magnetic impulse profiling, ground conductivity, proton magnetometer survey, sonic profiling, field inspection, archival research and test-excavation (for descriptions see 1992/3 Report pp. 1-4).[1]

The Glasgow Museums, Scotland, acknowledge with gratitude the help and co-operation of the Supreme Council for Antiquities with whose permission the Museum's work is carried out; the Chairman Dr Zahi Hawass, Mr Magdy El Ghandour at the Secretariat, at Saqqara, the General Director of Antiquities, Mr Ibrahim Sulaiman, the Director, Hasama el Shami and the Chief Inspector Sabri Farag, the inspector appointed to the Project, Madam Wahiba Saleh Ahmed.

The September – November 2006 season was undertaken with the generous financial support of grants from the Museums of Glasgow, The Friends of the Museums of Glasgow, Egyptology Scotland, The Gerald Avery Wainwright Fund, The Russell Trust, The Binks Trust, and The Harris Trust, private and corporate donors.

The Glasgow Museums of Scotland field team comprised Ian Mathieson-field director, Dr Jon Dittmer-geophysicist, Dr Elizabeth Bettles-Egyptologist, Miss Elizabeth Jones-archaeologist, Mr Campbell Price-archaeologist. The 2006 season opened on 15th September and continued until 20th October.

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[1] See I. J. Mathieson et al., *JEA* 85 (1999), 21-43.

Previous fieldwork carried out by the project - 1990 through 2006.

During the 1990 season resistivity work was completed along the length of the concession area and four of the proposed cross-sections covering the large enclosure known as the Gisr el-Mudir were surveyed. In 1991 the complete concession area was field-walked and all visible surface indications of structures and old excavations were located for inclusion on the base maps. Work was completed in 1992 on the observation of the resistivity data covering the southern two-thirds of the original concession area, from the northern access road to the Serapeum to the southern limit of the concession, some 100m south of the southern boundary of the Gisr el-Mudir[2]. In 1993 sondage trenches were opened on anomalies in the southwest corner of the Gisr-el-Mudir to confirm the structures the resistivity data had shown at these points. A mud-brick platform was discovered inside the enclosure at the SW corner and the construction of the enclosure walls was investigated (1993 Report, Map Sheet 1, A7 & A8). In the 1994 season sondage trenches were opened to confirm the geophysical findings on profiles taken over the North Wall (1994 Report, Map Sheet 1, GMNWXS2). The construction of the wall was found to extend to the North with a buttress formation on the North face. Several graves were found on the South side of the wall, one of which had a stela of the Persian period deposited in the sub-structure (Reports 1990 - 1994)[3].

During 1995 further sondage trenches were opened (1995 Report, Map Sheet 1, A9-14), to inspect anomalies over the southwest corner of the monument where the inside corner was located and surveyed[4]. In 1996 electro-magnetic impulse equipment, kindly loaned by ERA Technology of Leatherhead, Surrey was used for the first time in Saqqara. Many scanning profiles were taken over existing resistivity surveys and the results confirmed the previous findings and gave a much-enhanced interpretation of the sub-surface conditions (Report 1996). In 1997 conductivity surveys were carried out using the Geonics EM 31 covering half of the Gisr el-Mudir and a portion of the L-shaped structure (Report 1997). In 1998 the conductivity survey of the Gisr el-Mudir was completed and several auger holes were drilled to determine the elevation of the bedrock. Sondage excavations examined the structure of the East Wall (Report 1998). In 1999 the project was fortunate to obtain the loan of Global Positioning Satellite equipment from The Natural Environment Research Council and surveyed all the main triangulation stations in the Saqqara area. The position of the South Wall of the Gisr el-Mudir and the southeast corner were located (Report 1999). In 2000 the Gradiometer was used for the first time and the results obtained showed this to be an ideal instrument for tracing mud brick structures. On the northern boundary of the L-shaped enclosure a line of rectangular anomalies was found and these formed the area for sondage excavation in 2001. In 2001 small sondages at the north side of three of the anomalies showed that they were probably temple casement foundations with entrance stairways on the north sides[5]. In 2002 the

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[2] See I. J. Mathieson and A. Tavares, *JEA* 79 (1993), 17-31.

[3] See I.J. Mathieson et al. *A Stela of the Persian period from Saqqara. JEA* 81 (1995), 23-41.

[4] See I.J. Mathieson et al. *The National Museums of Scotland Saqqara Survey Project 1993-1995. JEA* 83 (1997)

[5] Anthony Leahy & Ian Mathieson *Late Period temple platforms at Saqqara EA21*(2002)

project was sponsored by the Glasgow Museums and further geophysical findings showed more temple type structures and many tombs on the North side of the Serapeum and a study of the pottery from the 2001 sondage[6]. During 2003 the entrance to one of the northern temple sites was excavated and proved to be similar to the southern temples in pointing directly at the Serapeum site[7]. Geophysics was extended to the limit of the concession at the village of Abusir with many more tombs and structures located. A geological borehole survey was carried over the site of the assumed Lake of Abusir and showed that the lake had fluctuated between dry and wet conditions over the centuries. In 2004 the geophysical coverage was extended south towards the Step Pyramid and the ancient route of the burial of the Apis bulls, The Serapeum Way, was discovered along with attendant chapels and tombs. In 2005 the survey of Serapeum Way was completed from the Dromos to the tomb of Mereruka and extended north towards Abusir (Fig. 1 & Sheets 1-4).

The Objectives of the 2006 season under the sponsorship of Glasgow Museums were:

To continue the geophysical survey in the area north of the Serapeum Way, using the Geoscan Gradiometer instrument to measure the apparent influence of the surface material to a depth of approximately 5 metres.

To clarify our geophysics data by excavating test pits to measure the depth and thickness of the mud brick walls of the Serapeum Way.

To analyse a portion of the residues of beer jar NMS95GMWW(620)95-2 which was found in 1995.

Fieldwork

Geophysical field work: (Fig. 1, Sheets 1-4 & Plate 1), Jon Dittmer & Campbell Price

Following our extensive geophysical coverage of 2004 and 2005 and the discovery of many tomb structures, it was decided to extend this survey to the east and south covering areas of very disturbed ground where excavations during 1850 to 1960 had uncovered many structures but the results had not been accurately located and the structures were now covered by windblown sand and therefore lost to records.

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[6] C. Gallorini, 'Late Period and Ptolemaic Pottery from the Work of the Saqqara Geophysical Survey Project', in *Proceedings of the Ninth International Congress of Egyptologists - Actes du IX Congres International des Egyptologues*| 6-12 September 2004 Grenoble, Peeters, Louvain

[7] D. Lines, 'First Millenium BC Temple Structures at Saqqara from the Work of the Saqqara Geophysical Survey Project', in *Proceedings of the Ninth International Congress of Egyptologists - Actes du IX Congres International des Egyptologues*| 6-12 September 2004 Grenoble, Peeters, Louvain

Fig. 1 shows the present extent of the survey which has again discovered many new tombs and it is obvious that many of the structures are similar or join on to finds made by Quibell and Emery in the early 1900's[8].

We found several very large structures to the north of the Serapeum Way which have not been recorded previously and form part of a new complex of structures stretching across the east of the necropolis towards the 1st Dynasty tombs at the edge of the escarpment (Fig 1 & Sheet 4).

The geophysics team have surveyed a total of 199 x 30m squares and using our new FM256 gradiometer (Plate 1) producing the excellent results shown in Fig. 1 & Sheet 4. As the survey progressed towards the 1st Dynasty tombs it became apparent that there were more structures than had previously been observed many of which showed the characteristics of the early Dynasties. The FM256 with its fast downloading facility meant that the planned work for 2007 was completed this year and brings to an end the area of North Saqqara suitable for gradiometer exploration. We also recorded the position of the tomb of Kaem-mesu a new discovery being excavated by the SCA Saqqara office.

Serapeum Way

The team have excavated two test pits on the line of the north wall of the Serapeum Way.

Test pit 1 (Sheet 4; Plate 2)

Excavation Report: Elizabeth Jones

The geophysical surveys at Saqqara of 2004 and 2005 identified two parallel linear anomalies running in a westerly direction across the plateau. These anomalies are anticipated to demarcate the processional way leading towards the Serapeum (Fig. 2). In September 2006 a 5m x 5m test pit (Test Pit 1) was opened in square SR5 E30 to investigate the northernmost linear feature; to ascertain a method of construction, to document the state of preservation and to recover potentially datable material. Furthermore, the exact position of Test Pit 1 along the predicted northern edge of the processional way was guided by the appearance in the geophysical results of an additional small anomaly to the south of the main linear feature.

Prior to excavation, the surface of Test Pit 1 comprised deteriorated limestone flakes mixed with aeolian sand [Context (099)]. The surface was disturbed at the southern edge by a modern trackway, resulting in its compaction. Work began with the removal of this surface deposit. After 10 cms, fine particles of mud began to appear in the aeolian sand and there was an increase in the size of the limestone flakes. Pottery, bone and several faience beads were also recovered from this context (100).

At a depth of approximately 80 cms from the surface, the colour of the wind-blown deposit became significantly darker due to the presence of an increasing percentage of mud particles (101). Pottery and bone continued to be present at this depth, and a solid mud edge appeared in the north-eastern corner of the trench during the removal

[8] W. B. Emery, *Excavations at Saqqara. Great Tombs of the First Dynasty.* 3 vols. 1949-58 and J. E. Quibell, *Excavations at Saqqara 1912-1914* Service des Antiquites de L'Egypt.

of this context. Clearing the surrounding context (101) back from this edge revealed an unarticulated, compact mud surface (102). After completing the removal of (101) it was clear that this surface extended across the entire area of the test pit but had been cut into in several places. The initial edge that had appeared in the north-eastern corner of the test pit was a curved vertical cut (103) through (102) with no visible bottom. Two further cuts in (102), also vertical and without a base, were visible in the south-eastern corner of the trench (105) and the western edge (111) (Fig. 3).

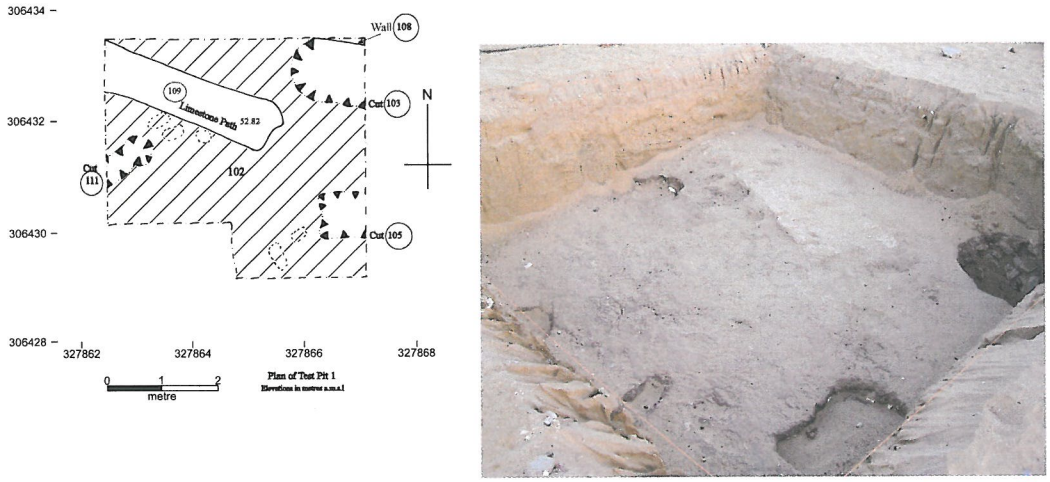

Fig. 3 Test Pit 1 Plan and photograph

Further cleaning of the upper surface of (102) revealed a linear limestone construction, 89 cm wide, running into the excavated area from the north-western corner of the test pit, in a NW-SE direction (109) 3.25 m in length.

In addition, the surface of (102) was not uniformly flat, there being three small indentations into it along the south edge of (109) and a further two indentations in the south eastern corner of the area. These shallow indentations ranged in size from c. 15 to c. 25 cm across, and were no more than 8 cm deep. Otherwise, the surface of (102) was reasonably consistent, showing no articulated mud bricks and incorporating very little pottery or other artefacts. The exception was a small, crude faience amulet recovered during the partial removal of the context in the north-eastern section.

Context (102) has thus been interpreted as a possible floor surface of the Serapeum Way. Based on this interpretation, the indentations identified above are perhaps to be understood as emplacements for small objects set into the surface of this floor. However, since no objects were directly associated with any of the indentations, this interpretation remains purely hypothetical.

The existence of cuts through the surface (102) afforded us the opportunity to investigate the deposits beneath the surface itself while minimising the destruction of the extant archaeology (indeed, it remains a possibility that these cuts are themselves the result of previous archaeological activity). Each of the three cuts identified was of a similar nature, being vertical cuts with clean edges and no visible base, filled with clean aeolian sand. The fill of each cut showed no identifiable residues and contained no artefacts. Nor was there any evidence of animal or human remains, allowing us to discount the possibility of them representing grave cuts. One possible interpretation

would connect the cuts and the indentations mentioned above: it is possible that larger objects – perhaps statuary – have been removed from emplacements in the surface (102), leaving robber cuts. Whether this removal was carried out in antiquity or in more recent times is impossible to establish at this time.

The edges of the cuts provided a view of context (102) in section as well as allowing investigation of the layers beneath it. Context (102) proved to be of varying depth, being c. 25cm deep where visible in cut (103) and c. 4cm deep at cut (111) (Fig. 4).

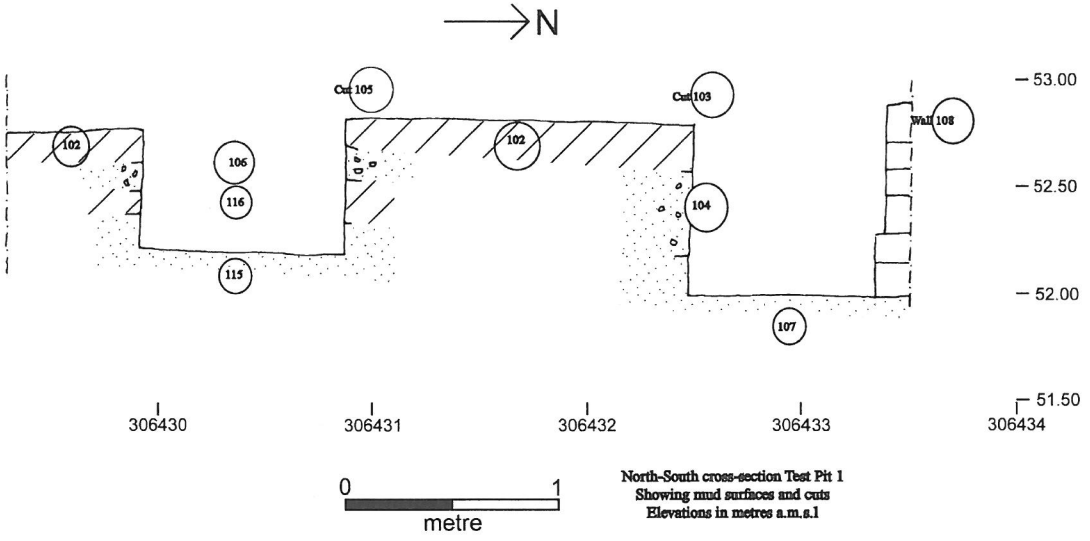

Fig. 4 North-South Section through Test Pit 1

In all three cuts, the layer immediately beneath (102) was a mixture of gravel and sand. At cut (103), this layer was numbered (104); at cut (105) it was numbered (107) and at cut (111) it was assigned number (112). These contexts (104), (107) and (112) are in fact likely to be the same context across the whole area, but this could not be proved without the complete removal and destruction of the mud surface.

Within the section of cut (105), the layer (107) was itself underlain by a second compact mud layer (116), which appears to be constructed on clean sand (115).

While the mud layer (116) was superficially similar to the main mud surface (102), this did not allow any confident inference of an extensive earlier floor surface, since its full extent could not be ascertained without the removal of the surface (102). It remains possible, particularly given the lack of a similar mud feature in cut (103), that (116) in fact represents a localised feature, perhaps relating to the construction of (102).

During the investigation and cleaning of cut (103), articulated mud brick courses appeared in the north east corner of the test pit, running at an oblique angle from the eastern edge to the northern edge, in such a way as to be almost entirely contained in the northern section of the excavation. The top of the uppermost course of this wall (108) was level with the top of the mud surface (102). The section of brickwork thus exposed contained six courses of mud bricks, in alternating courses of headers and

stretchers, with a thin application of mud mortar between adjoining bricks and courses (Fig. 5).

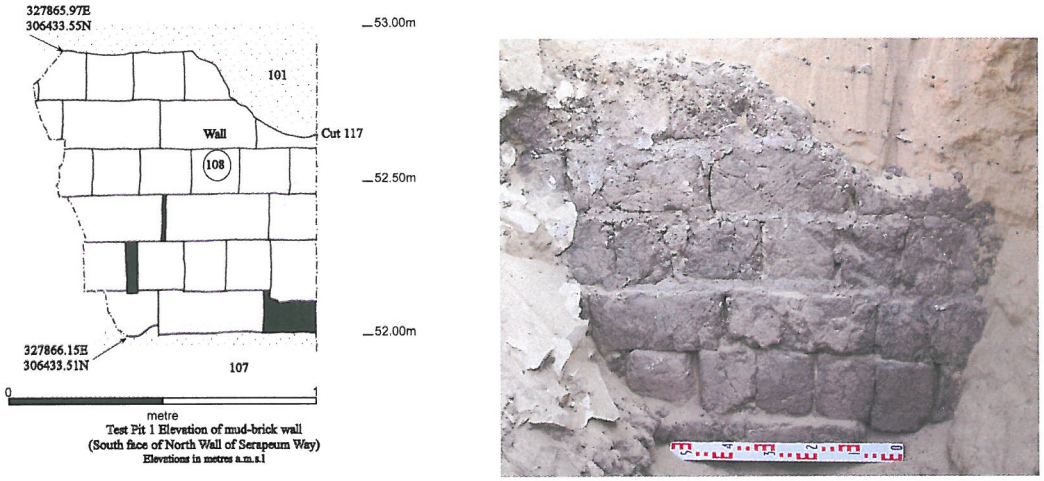

Fig. 5 Elevation of South face of North Wall of Serapeum Way

The uppermost course was laid as headers, each measuring 14 cm wide x 16 cm high. The second course from the top was laid as stretchers (32 cm wide x 16 cm high). The third course was identical to the first, but the stretchers of the fourth course were slightly larger than those used in course two, being 34 cm wide x 16 cm high. The lowest two courses protrude by 3 cm, and would appear to be the foundation courses of the wall – they were built upon clean sand (107). The fifth course was laid as headers (14 cm wide x 16 cm high as in courses 1 and 3). The lowest course contains stretchers of 34 cm wide x 14 cm high. The quality of construction in this section of wall appears to decline noticeably towards the lowest courses; there are gaps between bricks in the fifth course, where there is also the anomalous use of a larger header (18 cm high instead of 16), which hangs down into a sizeable gap in the sixth course. This gap in the lowest course seems to result from the omission of one whole brick. However, the angle and position at which the wall intersected the edge of the excavation prevented further investigation of this curiosity.

A section of the eastern end of the two uppermost courses of wall (108) has been cut away (= cut (117)), and the remaining incomplete portions of bricks have subsequently suffered deterioration. Drawing an analogy from the evidence from Test Pit 2 would suggest that this wall would, in its original condition, have been considerably higher and is probably the south face of the north wall of the Serapeum Way. There was no evidence of any plaster applied to any part of the wall face.

The linear limestone feature (109) was also briefly investigated, in order to attempt to understand its relationship with the floor surface (102). The partial removal of (102) immediately adjacent to (109) to create a sondage revealed that the latter was apparently a 'kerb' or 'pavement', constructed of large but irregular blocks of limestone, sitting one 'course' deep and set into the surface of SN102 (Fig. 6). The material from which (109) is constructed was found to be highly friable. As a result,

it was very difficult to identify any degree of articulation between individual blocks. This poor condition of the material would suggest that it had been weight-bearing, had been subjected to heavy wear and/or had been exposed to weathering. Attempts to clean the surface of this feature were futile due to the friable surface. One significant aspect of the feature is that its NW-SE axis was roughly parallel to the line of the wall (108).

Fig. 6 Limestone path and rubble support to wall

The creation of the sondage described above by the partial removal of the mud surface (102) also revealed a pile of angular, uninscribed limestone rubble (110) beneath (102) to the north of (109) and abutting the face of the mud brick wall (108) This deposit could not be excavated fully since its removal may have undermined the trench edge, and indeed the wall (108) itself. However, its existence beneath (102) and against the surface of the wall (108) would suggest that it was intended to provide structural support for the foundation courses of the wall.

The mud floor surface of the Serapeum Way exposed in this excavation (102) was constructed after the northern boundary wall (108), as is proved by the fact that (102) seals (110), which in turn abuts (108). The limestone 'pavement' (or 'kerb') was constructed after the mud surface (102) had been laid, and the indentations in (102) along its southern edge may have been used for the placement of small objects. The presence of the mud layer (116) in cut (105) would suggest a possible earlier surface for the processional way, however further investigation of this feature was not possible. The clean, vertical cuts through the surface ((103), (105) and (111)) suggest that (102) was also an interface for the placement of objects, possibly statuary, along the Way, and that these have subsequently been removed either by the actions of robbers or, possibly, of earlier archaeologists.

All pottery found in Test Pit 1 indicated a proposed date of construction for this area of the Serapeum Way of the Late Dynastic Period.

Test pit 2 (Sheet 4; Plate 3)

Excavation Report: Elizabeth Bettles

In October 2006 a sondage of 5 m square (Test Pit 2) was dug in square SR5 E30 to investigate the probability that the portion of wall discovered in Test Pit 1 continued to the west and to ascertain the extent and nature of the possible northern boundary wall along the processional way. An area was chosen where the gradiometer data indicated well-preserved remains.

Before we reached aeolian sand, we encountered a layer of mud-brick rubble, limestone fragments, pottery sherds and bone fragments in a sandy matrix [Context (120)]. In appearance this resembled rubble from a previous, undetermined but probably to the north excavation and lay up to a half a metre deep over the square. Once this was removed, plus 10 cms of aeolian sand (121), the top of a mud-brick wall (122) was exposed. This wall ran SE-NW across the sondage and measured up to 2.40m wide (Figs. 7 & 8, a & b).

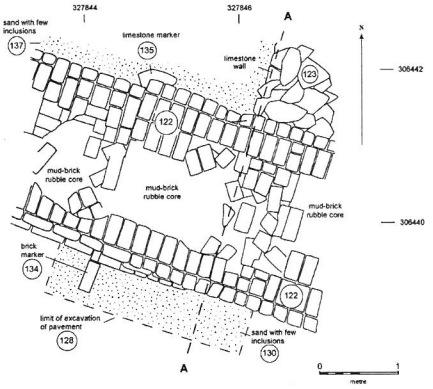

Fig. 7a Plan of Test Pit 2

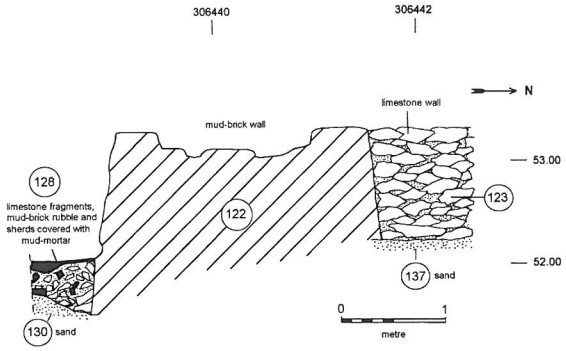

Fig. 7b N-S section across Test Pit 2

As we cleared the aeolian sand from the south face of wall (122) courses of mud-brick were revealed laid in alternating rows of headers, then stretchers. The faces of these bricks showed severe weathering. No plasterwork was extant. Twelve loose limestone fragments up to 45 cms long were found clustered randomly in the sand near the wall's face. These were of indeterminate function, and once removed, excavation of the sand continued until the upper seven courses of the mud-brick wall were exposed.

On the seventh course down, the faces of the bricks exhibited a linear indentation up to 12 cms high and c. 4 cms deep into the bricks (Fig. 8b). The smoothness of the surface of this indentation is consistent with erosion by water.

Fig. 8a Exposure of top of wall (122)

Fig. 8b South face of wall (122)

Directly beneath this feature a context abutted the face of the wall which comprised abundant chips of limestone mostly up to 15 cms long, some larger limestone fragments up to 35 cms, pieces of mud-brick, pottery sherds and complete bricks, all covered by a mud mortar varying between 4-15 cms in depth (Context 128) (Figs. 7b & 8b & Plate 3b). This context abutted the faces of four foundation courses of the mud-brick wall (122) to a depth of 46 cms. Half a metre away from the wall this context had thinned to depth of c. 26 cms., and then appeared to continue towards the south side of the excavation area. Often the larger fragments of limestone in context (128) had been positioned against the foundation courses of the mud-brick wall, as if affording extra support to the base of the wall. Likewise to create a firm base for (128), complete bricks were placed randomly at the base of context, resting on the sand (context 130) which lay below (128).

We interpret context (128) as a being the surface pavement of the Serapeum Way. From the limited area cleared, no indentations or marks were noted on this surface.

Several pottery sherds were recovered from the matrix of (128). These included part of a torch handle, lid and flat-based bowl (Figs. 9a & 9b). These were made from Nile silt, with the fabric of the lid featuring abundant organic inclusions. In form these pottery fragments resembled those which are noted at Saqqara and Elephantine in contexts dated by the excavators to the Late Dynastic period.[9]

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[9] *Torch handle* cf. G. Lecuyot, 2000, La céramique du mastaba d'Akhethotep à Saqqara: Observations préliminaries, *CCE,* 6, Fig. 2, BE.7., S.P. 29, p. 238;
Lid cf. French, P and Ghaly, H, 1991, Pottery chiefly of the Late Dynastic period by the Egyptian Antiquities Organisation at Saqqara, 1987, *CCE,* 2, No. 66, p. 115;
Flat-based bowl cf. Aston, D.A., 1999, *Elephantine XIX: Pottery from the Late New Kingdom to the Early Ptolemaic period.* No. 2183, pl. 79, p. 250 and 2324 on pl. 86, p. 268. Philipp von Zabern: Mainz.

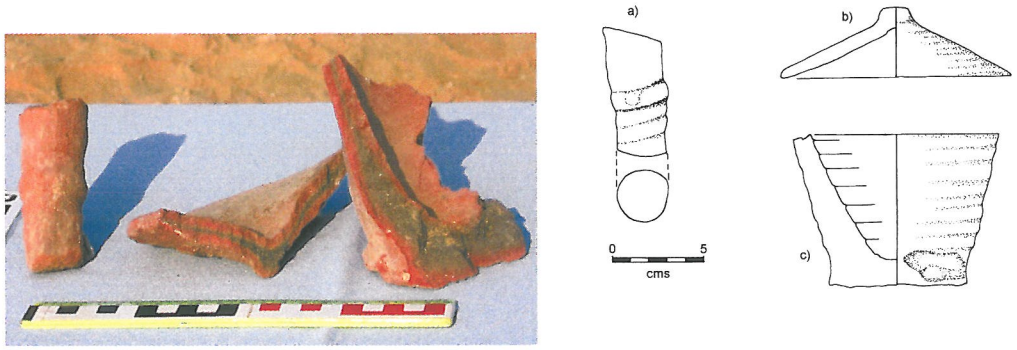


Fig. 9a & Fig. 9b Pottery from context (128)

Having been protected by the densely packed matrix of (128), the outer faces of the four foundation courses of wall (122) were well preserved (Fig. 8b& Plate 3b). When cleared of sand to the foundations, the south face of wall (122) revealed a slight batter inwards, plus several interesting features.

Firstly, at a point about 1.5m from the western end of the sondage, an apparent hiatus in wall construction occurred. The foundation courses abruptly projected southwards by about 18 cms while the upper courses to the west seemed to buckle (Fig. 10a). On the sand (130) at the base of the wall, at the point where the foundation courses projected, a complete brick lay neatly perpendicular to the wall (Fig. 10b).

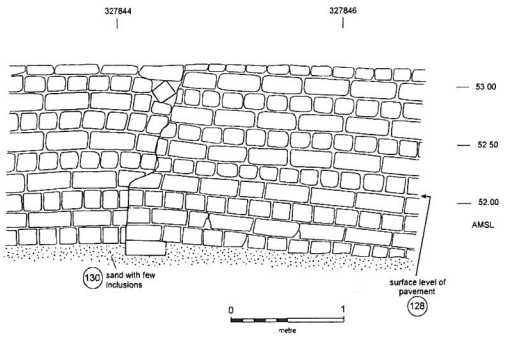


Fig. 10a Elevation of South face of wall (122)

Fig. 10b Projection & perpendicular brick

Even clearer evidence of a hiatus in wall construction was observed along the north face of wall (122). Opposite where the projection was noted on the south face, the north face of the wall also projected c.18 cms (Figs. 10b & 11b). Under the bricks forming this projection lay a large fragment of limestone of c.45 cms length over the sand beneath (Figs. 11a & 11b).

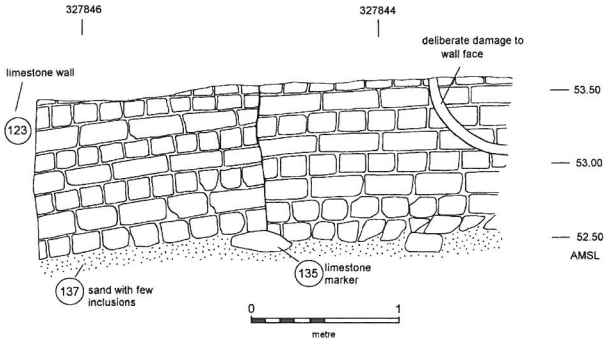


Fig. 11a Elevation of North face of wall

Fig. 11b Projection of wall

The height of the extant north face of wall (122) measured to a height of c.1m and comprised eight courses. This differed from the south face which measured c. 1.5m and consisted of eleven courses (Fig. 7b & 8b). Whether this difference was due to the north side of the wall resting on a rocky outcrop could not be investigated, as clearing the sand (137) from under the lowest foundation courses could not progress too far, for fear of wall collapse. When cleaning sand away from the top of wall (122) two areas of damage revealed how the wall had been constructed. The outer faces of the wall were lined with relatively good mud-brick, then the core was filled in with some good bricks but also a mixture of mud-brick rubble in mud-mortar (Figs. 7a & 12a).

The bricks used to make wall (122) were made with plentiful straw and included some sherds. A typical brick size measured 36 x 14 x 16 cms.

Fig. 12a Core of wall

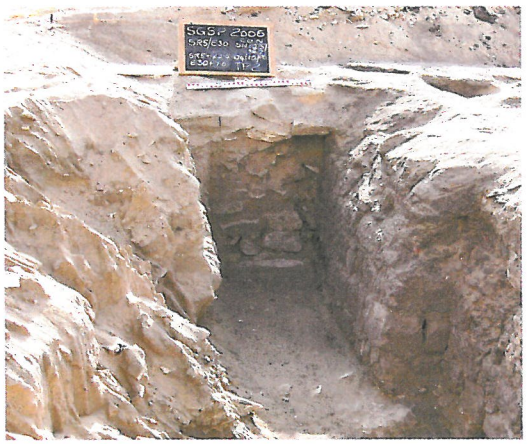


Fig. 12b Limestone wall (123)

Finally, when clearing the aeolian sand (127) from the NE corner of the sondage, a stone wall was exposed which abutted the bricks on the north face of wall (122) (Figs.7a, 7b & 12b). This stone wall (context 123) was constructed from the same level as the foundation courses of the mud-brick wall with undressed, loose fragments of limestone up to 50 cms in length. Presumably this belongs to a

monument to the SE of the sondage. As the stones abutted the north face of the mud-brick wall, it must be a later construction than wall (122).

Conclusions

The part of the northern boundary wall of the Serapeum Way uncovered in this sondage consists of a mud-brick wall (122) whose extant remains measure up to 1.50 high and up to 2.40m width. It was constructed with mud-brick outer facing and a mud-brick rubble core. From the worn remains it seems this part of the wall at least was not plastered.

This part of the wall was apparently built in sections. The work seems to have progressed from east to west, with western section abutting, or being added to, the end of the eastern section. The end of a section was denoted on each face by a marker such as a brick or large fragment of limestone which was laid on the sand at the base of the wall. Whether construction in sections is a feature of the whole length of this wall, how long each section might be, and whether the southern boundary wall of the Serapeum Way shows similar features, requires further excavation.

There may be a number of practical or religious reasons why the wall was built in sections. From a practical perspective it could be the result of the division of workmen into teams with the men working up to, or from, a specific point indicated by a marker in the sand.

The wall sections were not of consistent width. The one at the east end was 2.40 cm whereas the one to the west was 2.24 cm wide. Reasons for this difference in width are currently unclear.

The pavement for the Serapeum Way was probably constructed soon after the workmen had finished building wall (122). This is indicated by the pristine condition of the faces of the foundation courses on the south side of the wall, suggesting they were soon protected by the abutting pavement.

Apparently the pavement of the Serapeum Way was exposed to rain water for a long period, causing a smooth indentation into the surface of the bricks just above pavement level. This suggests the Serapeum Way was exposed to the elements with little or no roofing over it.

The proposed date of construction for the area of Serapeum Way excavated in this sondage is the Late Dynastic period. This is indicated by the forms of the diagnostic sherds recovered from the matrix of context (128).

Beer Jar Residue Analyses

To analyse a portion of the residues of beer jar NMS95GMWW(620)95-2 which was found in 1995 in the foundations of the west wall of the Gisr El Mudir enclosure.

After discussion with the Secretariat of the SCA it was proposed that once a detailed list of results expected from chemical and spectrographic study of the residues was presented it would be decided if this could be obtained from sources in Cairo or if not

available arrangements to be made for a representative of the SCA to accompany the material to the United Kingdom.

Conclusions

The geophysical survey was extended on the north side of the Serapeum to cover all the surface area suitable for Gradiometer work. We can now say that we have found or rediscovered the sub-surface signatures of most of the tombs and chapels reported by De Morgan and Mariette in 1882-1889[10] and Quibell and Emery in the 1900's What is interesting is that there appears to be many more features in this area than those recorded by the groups of excavators.

Our work this year has once again proved the value and accuracy of the geophysical and topographic surveys. The use of the gradiometer to delineate sub-surface features has been amply proved by the small-scale *sondage* trenches excavated in 2001, 2002, 2003 and this year 2006 to test the anomalies. In all cases the accuracy of the topographic survey has enabled the *sondage* to be opened exactly over the anomaly shown by the geophysical data. The saving of labour time and the ability to keep the excavation to strict size limits means the environmental damage is controlled and at the same time the archaeological interpretation of the site is enhanced.

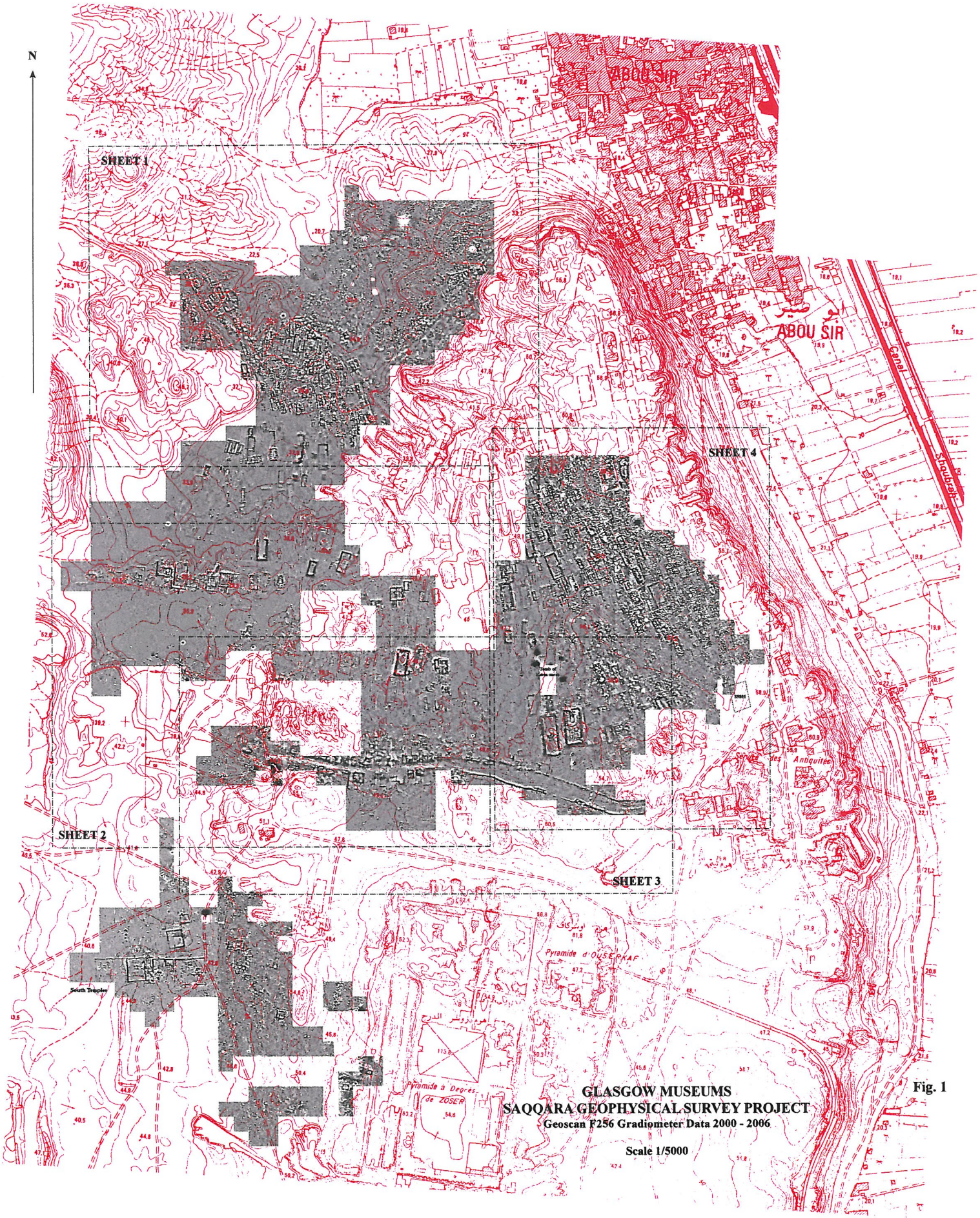
With the permission of the Supreme Council for Antiquities the Saqqara Geophysical Survey Project plan to continue the work through 2007-2010 and complete the geophysical survey of the concession with particular reference to the area between the Step Pyramid and the main access road to the east and as far south as the surface topography will allow the use of the gradiometer.

We also hope that permission will be granted to make some test pits to record and describe the construction details of mudbrick walls delineated by the geophysical results and to carry out scientific analysis of the beer jar contents.

Ian J Mathieson

Project Director

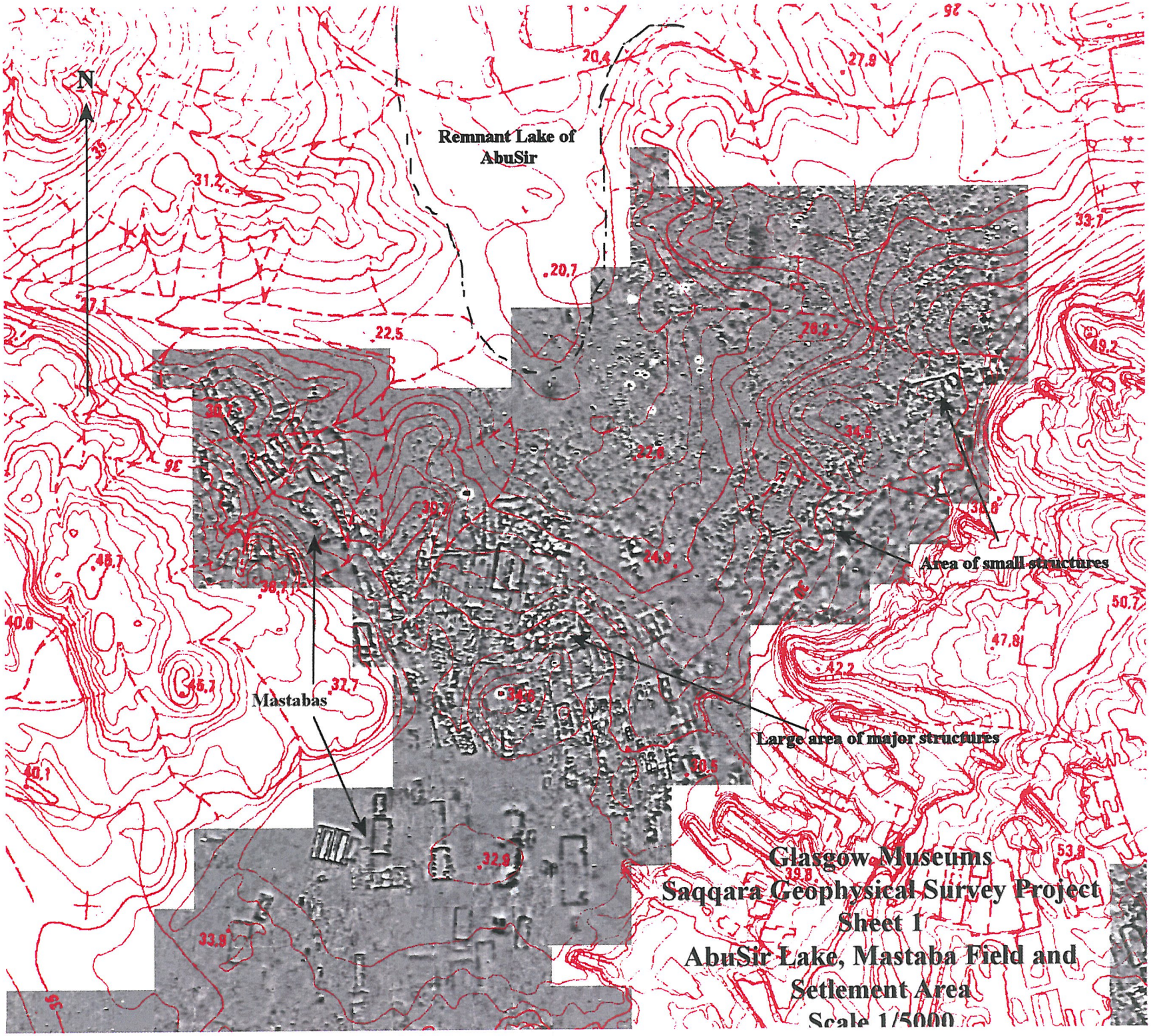
[10] A. E. Mariette, Les Mastabas de l'Ancien Empire. G. Maspero Paris, 1889. J. de Morgan, Carte de la Necropole Memphite. Cairo 1897

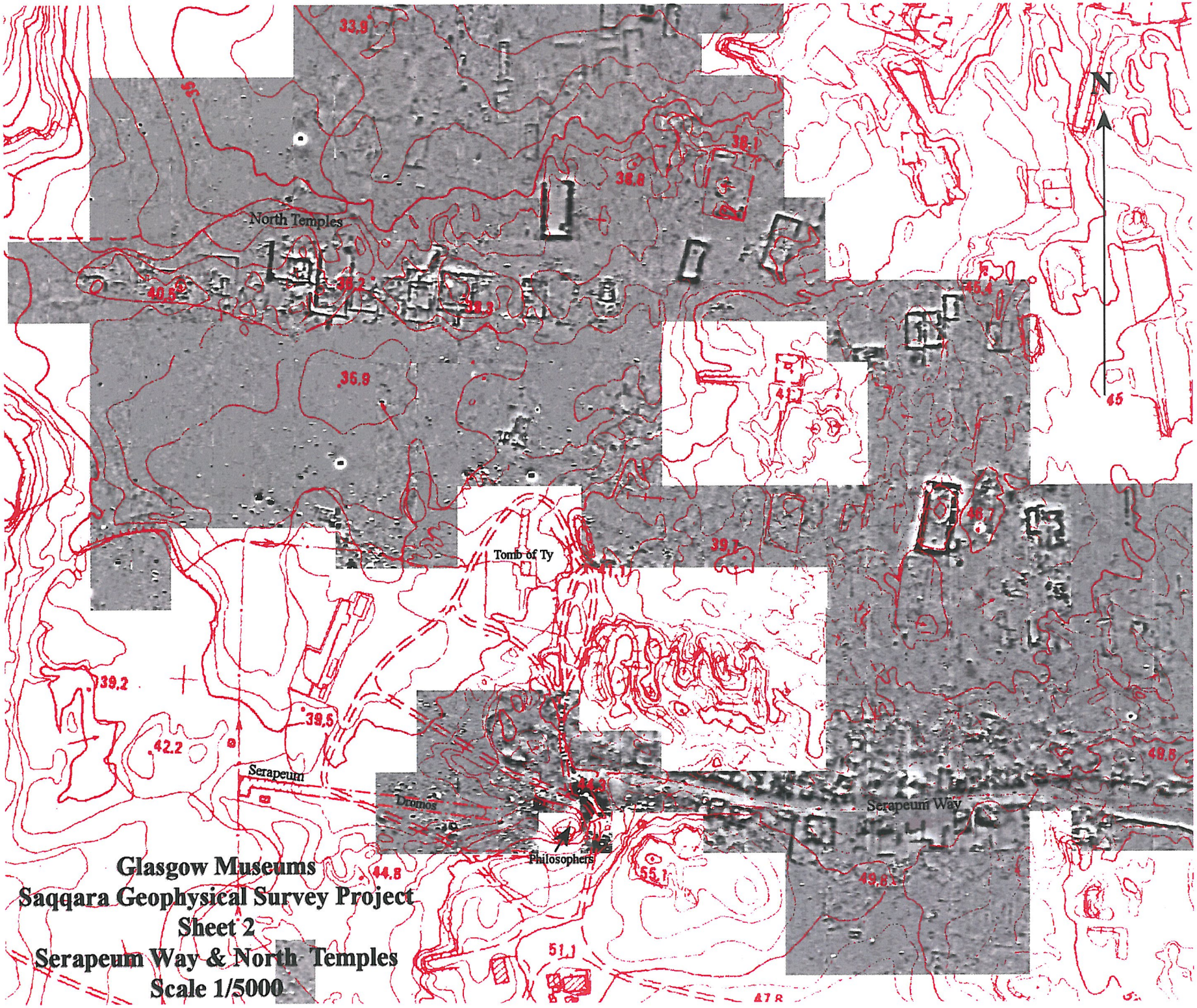


GLASGOW MUSEUMS
SAQQARA GEOPHYSICAL SURVEY PROJECT
Geoscan F256 Gradiometer Data 2000 - 2006

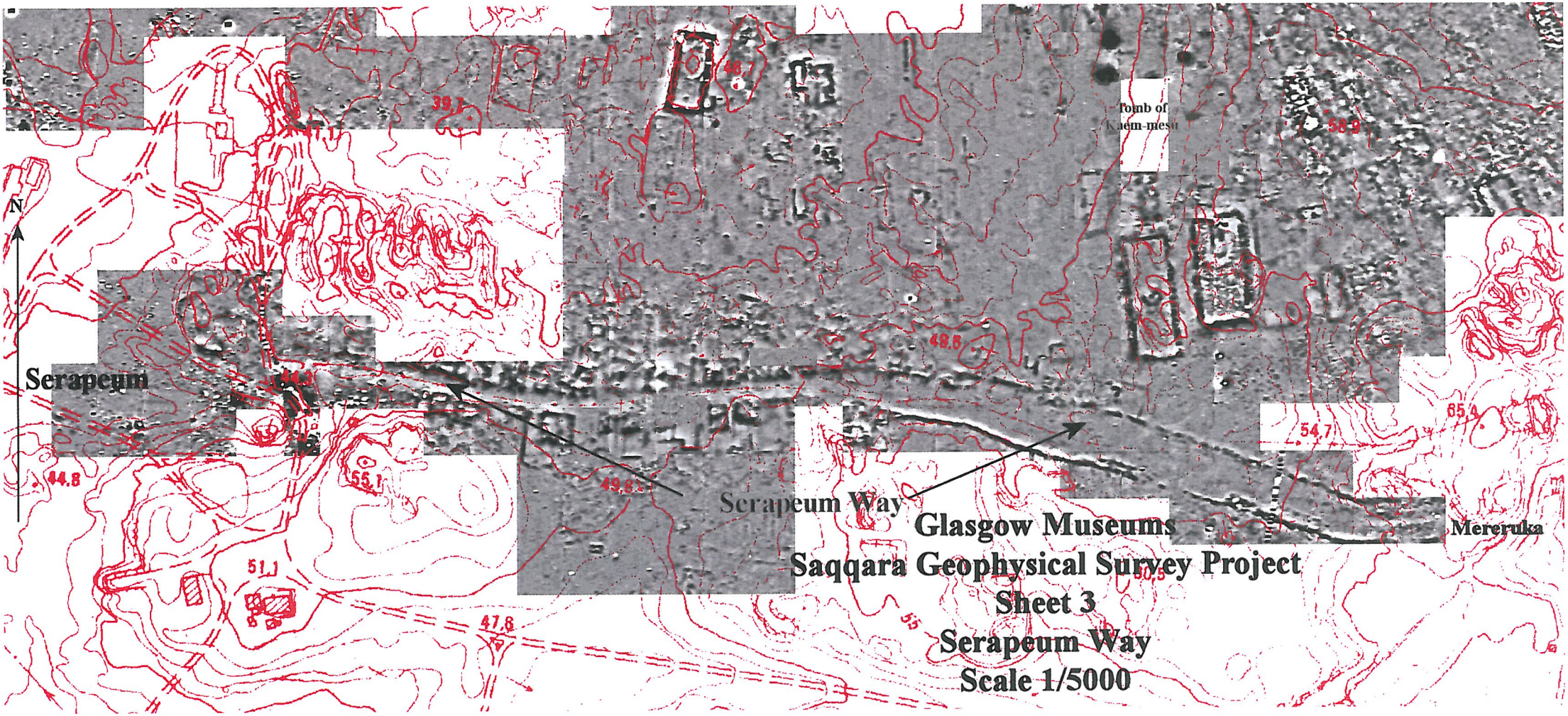
Scale 1/5000

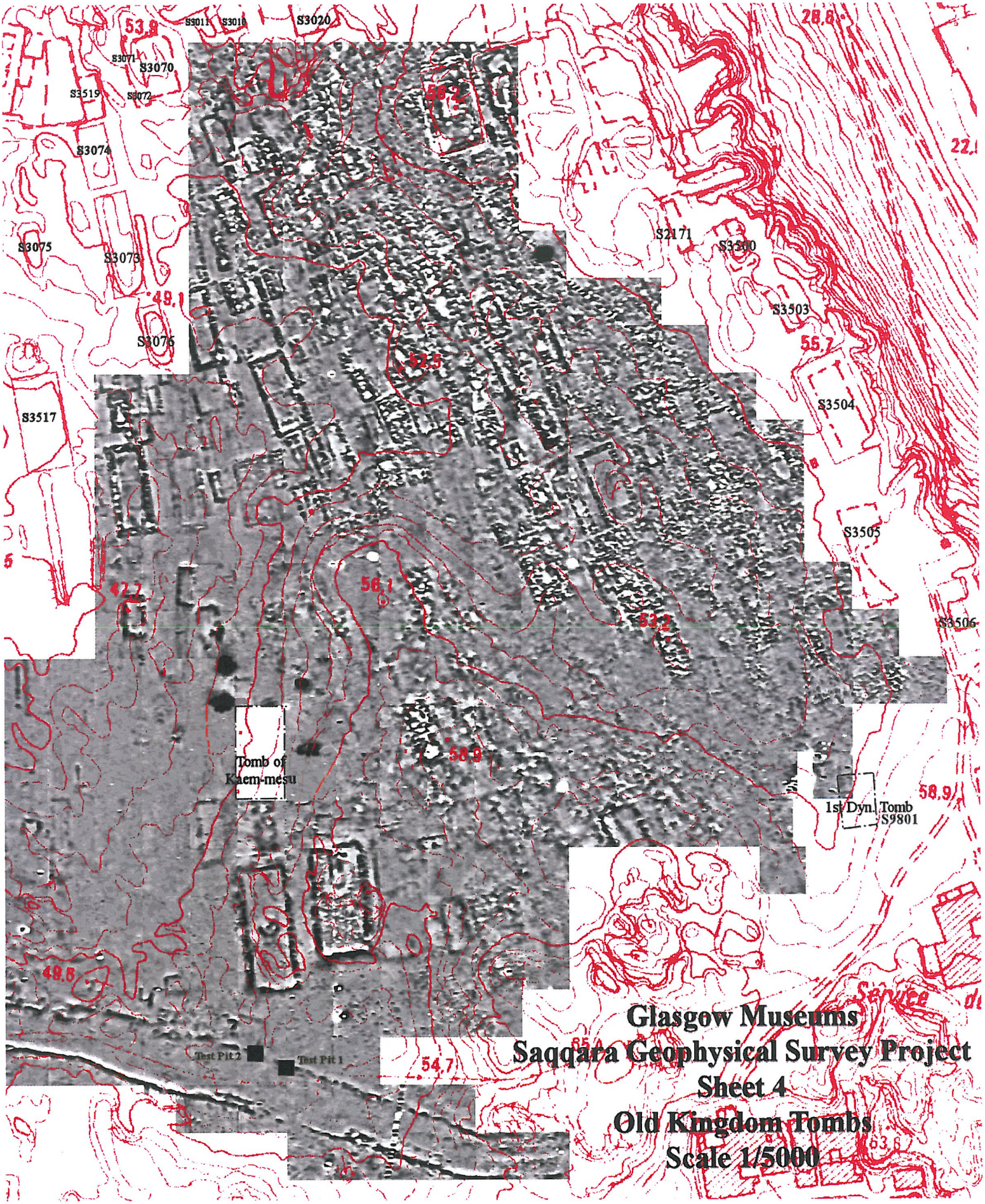
Fig. 1


N
Remnant Lake of AbuSir
Mastabas
Area of small structures
Large area of major structures
Glasgow Museums
Saqqara Geophysical Survey Project
Sheet 1
AbuSir Lake, Mastaba Field and Setlement Area
Scale 1/5000



Glasgow Museums
Saqqara Geophysical Survey Project
Sheet 2
Serapeum Way & North Temples
Scale 1/5000


N
Serapeum
Serapeum Way
Tomb of
Kaem-mesu
Mereruka
Glasgow Museums
Saqqara Geophysical Survey Project
Sheet 3
Serapeum Way
Scale 1/5000


S3011
S3010
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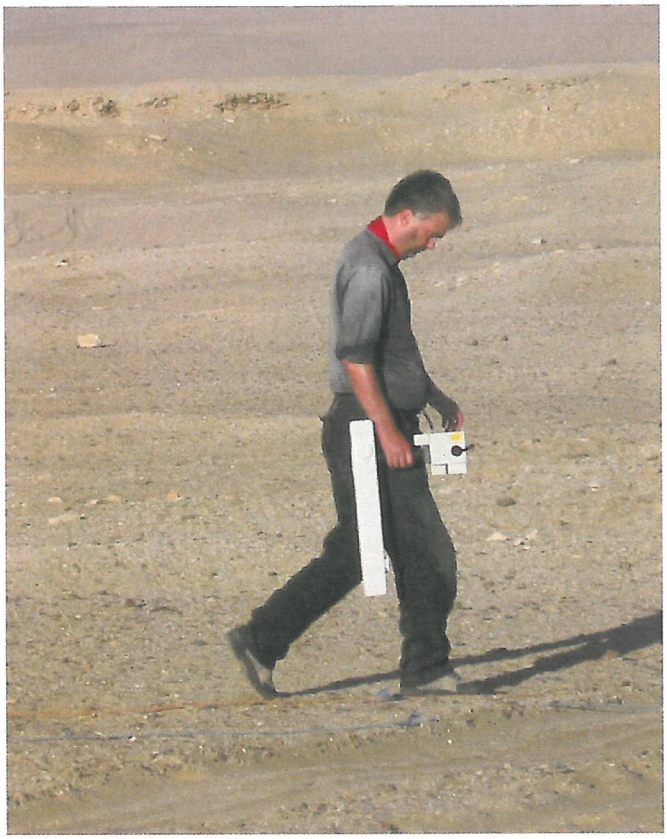
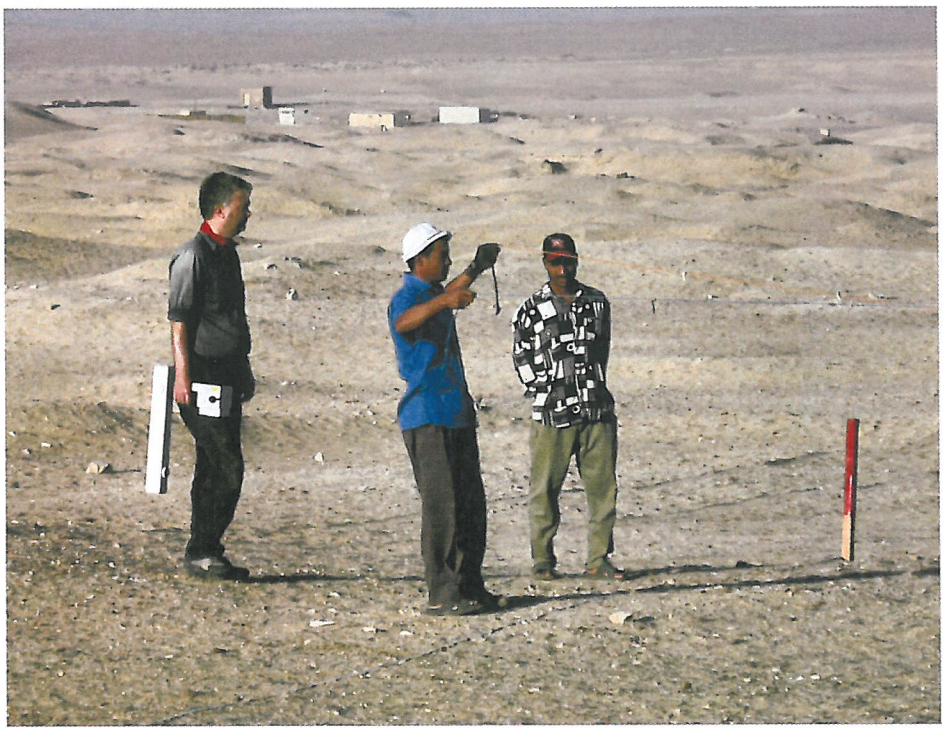
S3300
S3503
S3504
S3505
S3506
Tomb of Kaem-mesu
1st Dyn. Tomb S9801
Test Pit 2
Test Pit 1
Glasgow Museums
Saqqara Geophysical Survey Project
Sheet 4
Old Kingdom Tombs
Scale 1/5000



The FM256 Gradiometer in action



Laying out the one metre lines in the 30m square

Plate 1

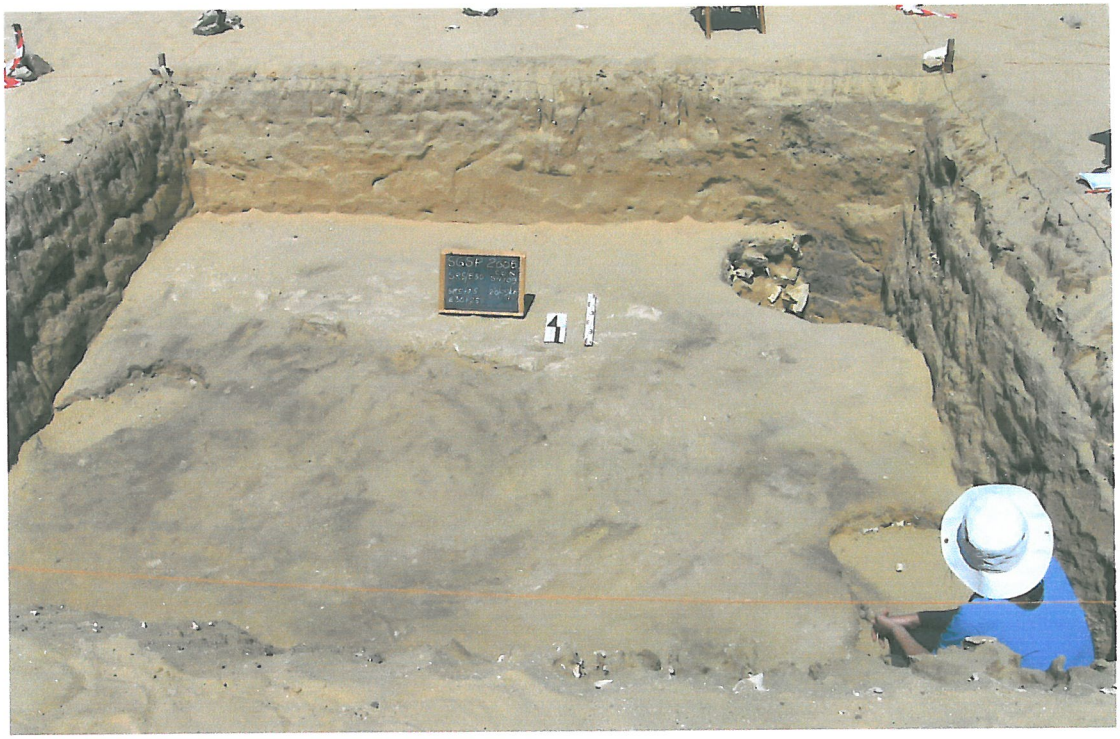


Plate 2a. Test Pit 1 showing pavement and north wall exposed in corner

Plate 2b. Test Pit 1 showing exposed foundation mud bricks of north wall

Plate 2

Plate 3a. Test Pit 2 General view

Plate 3b. Test Pit 2 Showing wall foundation courses and pavement cut through