



# The Qatari Mission for the Pyramids of Sudan – Archaeological Investigation, Conservation and Site Management at Meroe 2015/2016

*Alexandra Riedel, Mahmoud Suliman Bashir, Pawel Wolf, Murtada Bushara Mohamed and Cornelia Kleinitz<sup>1</sup>*

## The QMPS and Meroe – An Introduction

In 2014, Qatar Museums started the Qatari Mission for the Pyramids of Sudan (QMPS) directed by HE Sheikh Hassan bin Mohamed bin Ali Al-Thani (Vice Chair of Qatar Museums). Embedded in the framework of the Qatar-Sudan Archaeological Project (QSAP),<sup>2</sup> the QMPS is Qatar's own archaeological mission in Sudan. The mission's objectives comprise archaeological, architectural and culture-historical research on the royal pyramid necropolises of the Kingdom

of Kush as well as their preservation and presentation in accordance with international guidelines. A holistic approach to the sustainable development of the pyramid sites involves all stakeholder groups, including local communities. To achieve its goals, the QMPS closely cooperates with the National Corporation for Antiquities and Museums (NCAM) in Khartoum and the German Archaeological Institute (DAI) in Berlin.<sup>3</sup> Since 2014 an interdisciplinary team and an international expert network has been established in order to master the complex objectives of QMPS. Work concentrated on the royal pyramid cemeteries of Begrawiya North and South at Meroe, where two seasons of fieldwork between spring 2015 and spring 2016 have already yielded impressive results.

The pyramids of Meroe belong to one of the most important pre-Islamic sites of the Sudan and are its most prominent tourist attraction (Plate 1). Together with Meroe City, Musawwarat es-Sufra and Naqa, they have been recognised as part of a UNESCO World Heritage Site since 2011. The pyramid cemeteries of Meroe, Begrawiya North, South and West, comprise more than 100 royal and non-royal pyramids, many *mastabat* and tumulus graves, belonging to almost all rulers and many royal officials of the Kushite kingdom from the 3<sup>rd</sup> century BC until its end in the 4<sup>th</sup> century AD. It is not only the impressive architecture of the sandstone pyramids, originally measuring up to 30m in height, which makes this



*Plate 1. View of Begrawiya North, the northern royal cemetery of Meroe (© QMPS, Pawel Wolf, 2015).*

<sup>1</sup> With contributions by Janice Yellin and Jochen Hallof on the decoration of the burial chambers of pyramid Beg. S. 503.

<sup>2</sup> The Qatar-Sudan Archaeological Project is a joint initiative of Qatar and the Sudan with the objective of promoting the rich archaeological heritage in the Republic of the Sudan. For information on the Qatar-Sudan Archaeological Project and the Qatari Mission for the Pyramids of Sudan, see <http://www.qsap.org.qa/en/> 25.05.2016.

funerary landscape unique. It is also the relief decoration of the pyramid chapels, which represents the most comprehensive known iconographic programme of the Meroitic period,

<sup>3</sup> Project coordination and contact: Mahmoud Suliman Bashir (NCAM) and Alexandra Riedel (DAI).

as well as the associated subterranean burial chambers, which were occasionally painted and once held a large collection of grave goods.<sup>4</sup>

Modern documentation and research at the royal cemeteries of Meroe commenced with the re-discovery of these burial grounds by Frédéric Cailliaud in 1821. Subsequently, many travellers and several expeditions conducted valuable documentation work, such as the Royal Prussian Expedition directed by Carl Richard Lepsius in 1844 and the Chicago University Oriental Institute's photographic survey lead by James H. Breasted in 1906. Almost exactly a century after Cailliaud, George A. Reisner extensively excavated the cemeteries of Begrawiya North, South and West for the Harvard University and the Museum of Fine Arts, Boston between 1920 and 1923. Based on his excavations, Reisner developed the first archaeologically based chronology of Kushite rulers, which has remained the backbone of the Kushite history to this day, even though it has since been modified in detail (cf. Török 2015; Yellin 2015).

After Reisner's excavations, research recommenced in the 1950s with Steffen Wenig's iconographic study of the mortuary chapel reliefs of Begrawiya North (Wenig 2015). A comprehensive programme for the documentation and preservation of the pyramid cemeteries of Meroe was initiated in 1975 by Negm ed-Din Mohammed Sherif, then director of the Sudan Antiquities Service, and directed by Friedrich W. Hinkel (Hinkel 2000). The importance and urgency of this work became evident with increasing sand erosion and a rise in numbers of visitors since the 1980s, both resulting in dramatic damage to the pyramidal superstructures and their chapels. Friedrich Hinkel undertook the meticulous architectural documentation of the monuments as well as the reconstruction of several pyramids and chapels. In addition, he launched an ambitious project called 'The Necropolises of Kush' together with Janice Yellin and Jochen Hallof, aiming at the publication of all existing data on the cemeteries. With the death of Friedrich Hinkel in 2007, however, all fieldwork came to a halt.

Research and conservation work at the royal cemeteries of Meroe was revived in 2014/2015 with the initiation of the QMPS. A basic project infrastructure was immediately established and work began on all key aspects of the mission's programme. In order to fill gaps in research and the existing documentation, and to provide a basis for further archaeological research, conservation and site management, main activities included:

1) the evaluation of previous records, particularly those in the Friedrich-Hinkel-Archive at the DAI in Berlin<sup>5</sup>

2) the large-scale documentation of the preserved monuments such as scanning of the pyramid superstructures, the mortuary chapels and their unique reliefs

3) a survey of ancient and modern graffiti

4) a geodetic and an archaeological reconnaissance survey

5) a non-invasive geophysical survey

6) an archaeological prospection in the area of the royal cemeteries

In that way, systematic and large-scale working strategies as well as modern high-tech methods were introduced into the fieldwork methodology at the site. Small finds as well as samples recovered will undergo archaeometric analyses and radiocarbon dating hopefully to yield scientifically based chronological data and new information. A highlight of the first project year was the re-excavation and comprehensive documentation of Queen Khennuwa's tomb below pyramid Beg. S. 503. Preservation work commenced by cataloguing and mapping types and patterns of damage with the aim of establishing a comprehensive conservation plan. The first site management steps comprised:

1) sand removal from selected parts of the Begrawiya North cemetery and a study of sand dune development and movement in the area

2) the renovation of the NCAM rest house constructed by Friedrich Hinkel

3) the development of a sustainable tourism concept for the World Heritage Site 'Island of Meroe'

Additionally, two sub-projects were integrated into the overall remit of QMPS:

1) the digitization of the Hinkel-Archive, which aims at opening access to Friedrich Hinkel's extensive documentation for research and cultural heritage preservation<sup>6</sup>

2) the installation of a large vegetation-belt in the vicinity of the royal cemeteries to reduce further sand accumulation and abrasion at the pyramids of Meroe<sup>7</sup>

## Archive Research and Documentation of the Monuments

The revival of work at the cemeteries of Meroe necessitated the establishment of research strategies that took account of the enormous amount of unpublished data in archives distributed all over the world, for example in Berlin, Khartoum and Boston; of unfinished publication projects; interrupted fieldwork; and particularly the increasing destruction of the sites by environmental and human impact during the last decades. To establish a sound base for future research, preservation and site management, these strategies comprised processing

<sup>4</sup> Unearthed almost a century ago by George Reisner and stored mainly in the Museum of Fine Arts in Boston, USA.

<sup>5</sup> The East German architect Friedrich Wilhelm Hinkel (1925-2007) greatly contributed to NCAM's efforts of documenting and preserving Sudanese cultural heritage. Since 1975, his work was centred on the royal pyramids of Meroe. His academic legacy, one of the world's most comprehensive research archives on the archaeology of the Sudan, was

passed in 2009 by his heirs to the DAI in Berlin.

<sup>6</sup> Starting in 2014, the archive has been digitized and inventoried by Solveig Lawrenz, Martina Düntzer and their team, under the direction of Reinhard Förtsch and Friederike Fless at the DAI in Berlin.

<sup>7</sup> The project is currently under development by Neil Munro and his team.



archival materials in Berlin and the NCAM architects' archive in Khartoum,<sup>8</sup> reviving the collaboration with experts formerly engaged in the study of the pyramids in order to complete unfinished publication and fieldwork projects as well as initiating new field documentation since March 2015.

A survey grid was installed and airborne ortho-photographic images were produced to establish a geodetic and cartographic base for new site maps.<sup>9</sup> New site maps presently under development will incorporate George Reisner's excavation plans and data assembled by Friedrich Hinkel.<sup>10</sup> At the same time, a detailed documentation of the pyramids started with the laser-scanning of 28 pyramids and their chapels to create accurate 3D-models of these monuments with a medium resolution surface mesh and photo texture.<sup>11</sup> In addition, the preserved mortuary chapel reliefs were recorded with a structured light scanner and by high resolution ortho-photography.<sup>12</sup> The scan-resolution of 0.1–0.3mm for these detailed relief scans allows for high accuracy 3D-models, useable for conservation work as well as for museum presentation. All data will subsequently be merged with the archival material on the pyramids to form a complete set of architectural plans (Plate 2).

### Closing a Research Gap – The Graffiti Survey at the Pyramids and Chapels

Previous research and preservation efforts at the pyramids of Meroe have paid little attention to the thousands of inscriptional and pictorial graffiti, which had been incised into pyramid and chapel walls over a time span of more than two millennia. This omission is unfortunate, as accelerated sand erosion as well as hundreds of new graffiti made by today's visitors have had a detrimental effect on the preservation of these unique traces of diachronic site use, especially on the finely incised Meroitic graffiti. As the graffiti provide invaluable information on the changing use and perception of the Meroe funerary landscape over time, the QMPS launched the *Meroe Pyramids Graffiti Project*, which brings together archival material and new field research, aiming at the detailed documentation of the graffiti corpus.<sup>13</sup> To better understand the current threat to the preservation of the Meroe pyramids by damaging visitor behavior and to help develop counter

<sup>8</sup> The exploration of the architects' archive was started by Mohamed Elfath in 2015.

<sup>9</sup> By more than 20 concrete station points surveyed by precision phase differential GNSS in MSG14 UTM system; carried out by 'Stremke Archaeology', Bremen/Germany, and Taj es-Zir from NCAM, directed by Pawel Wolf.

<sup>10</sup> Carried out by Nicole Salamanek.

<sup>11</sup> Carried out by the team Zamani directed by Heinz Ruther, University of Cape Town/South Africa using Z+F 5010c laser scanner devices.

<sup>12</sup> The relief scans were undertaken by TrigonArt (Thomas Bauer and Mark Praus), Berlin/Germany; the high-resolution photographs were taken by Pawel Wolf.

<sup>13</sup> The graffiti project was developed and is headed by Cornelia Kleinitz as part of the conservation section of the QMPS, directed by Alexandra Riedel.

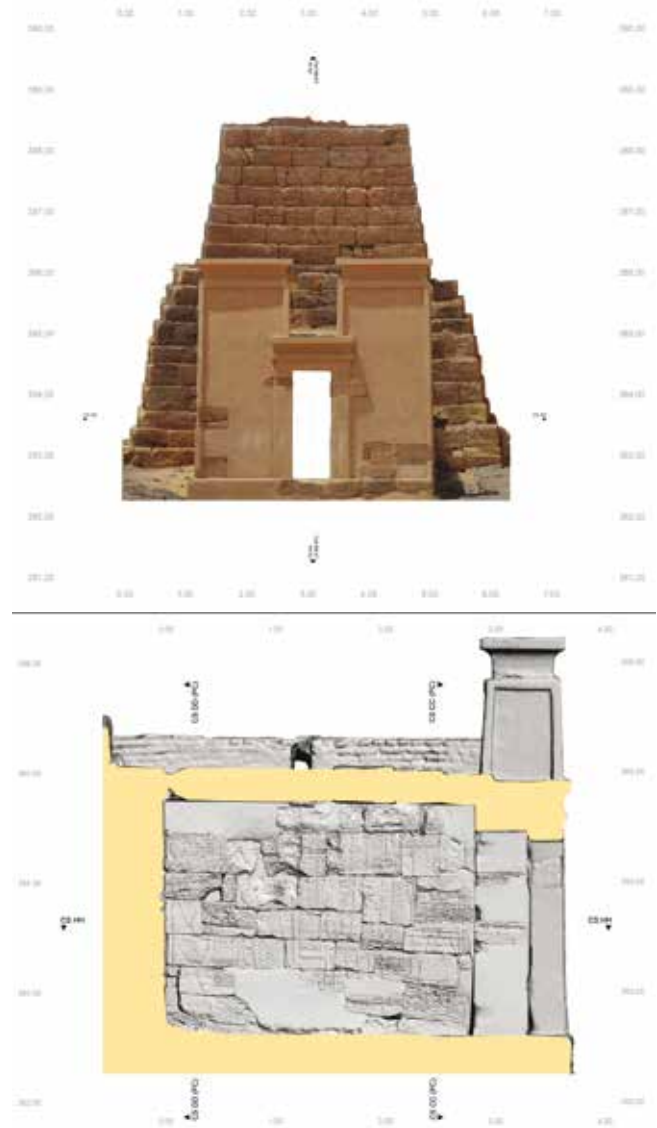


Plate 2. Two architectural plans of pyramid Beg. N. 1 made using ortho-projections of 3D-models (© QMPS, Zamani and TrigonArt, 2016).

measures, a project segment was devoted to investigating the modern graffiti at the pyramids, which were/are made by tourists as well as members of local communities.<sup>14</sup>

The graffiti project was initially based on extensive research in the Hinkel Archive, which contains hundreds of photographs of pyramid walls and individual blocks taken mainly in the 1980s and 1990s, a few hand copies of inscriptions and pictorial graffiti as well as drawings of pyramid elevations in which the location of some of the graffiti is marked.<sup>15</sup> The archive provides an invaluable source of information, as many of the graffiti that were clearly visible in Hinkel's photos and that are marked on his plans are today severely damaged or have entirely disappeared (Plate 3, cf. Plate 11).

<sup>14</sup> Fieldwork was in the hands of Hassan Mustafa Alkhidir (University of Shendi).

<sup>15</sup> Archival research was undertaken by Dina Serova, Cornelia Kleinitz and Franziska Lehmann.



Plate 3. Horned altar for burning offerings depicted on the pylon of pyramid Beg. N. 9. The graffiti is now completely destroyed (© DAI, Archive Friedrich W. Hinkel, F-MF-sw-R653-06, Friedrich W. Hinkel, 1982).

Having been compiled into a graffiti catalogue, the archival material was supplemented with new field data. The recording methodology was based on the documentation of graffiti entities in their exact location on the monument, acknowledging that the positioning of the graffiti provides important contextual information on graffiti making, significance and usage (cf. Kleinitz 2014). Taking the individual block ‘canvas’ as a point of reference, blocks and their graffiti were photographed, measured, drawn and described, including their state of preservation.<sup>16</sup> In addition to standard digital photography, a large selection of walls and block surfaces was photogrammetrically documented using ‘Structure-from-Motion’, while structured light scanning was applied to a small selection of exceptional graffiti. Medium or high-resolution 3D-models as well as ortho-photographic images were calculated and rendered as required.<sup>17</sup> The graffiti were classified on the basis of an expandable hierarchical motif thesaurus; they were initially grouped into three main categories (inscriptions, pictorial graffiti and markings) and subsequently assigned to numerous sub-categories.

Field recording focused on the Begrawiya North cemetery, which contains the largest number of ancient as well as modern graffiti, but a selection of graffiti from Begrawiya South

was also documented.<sup>18</sup> A first evaluation of the corpus of material shows that Meroitic graffiti, made at a time when the cemeteries were actively used, contain quite a number of references to the royal funerary context, among them depictions that seem to mirror elements of chapel reliefs. This, together with the presence of what appear to be architectural drawings of pyramids on outer chapel walls poses the question as to what extent the walls of pyramids and chapels were occasionally utilized as convenient canvases during design and construction work in the cemeteries (cf. Hinkel 1982). Other pictorial graffiti of the Meroitic period include numerous anthropomorphic and zoomorphic motifs, as well as depictions of objects (cf. Plate 3) and a number of what is often referred to as ‘property marks’. The latter, as well as more than 30 Meroitic cursive inscriptions, among them unpublished inscriptional graffiti, will receive special attention during data analysis as they provide valuable chronological markers.<sup>19</sup>

Younger graffiti echo a world in which the Meroitic state had long disintegrated. Inscriptions of the Christian Medieval period, including numerous monograms, appear to reflect the re-definition of the pyramid cemeteries or parts thereof into Christian sacral spaces.<sup>20</sup> The graphic universes of the Medieval and post-Medieval periods, meanwhile, are dominated by depictions of camels, which were obviously attributed great symbolic value, as well as by possible ‘identity marks’ related to camel herding and ownership. Name inscriptions by ‘travellers’ of the 19<sup>th</sup> and 20<sup>th</sup> centuries as well as by contemporary visitors form the most recent ‘layers’ of graffiti at the pyramids of Meroe. Consistent with its main objectives the *Meroe Pyramids Graffiti Project* is in the process of compiling an overview of ancient and modern graffiti at the pyramids of Meroe, discussing the graffiti of a selection of pyramids in more depth and providing the base for comparisons of the Meroe pyramid graffiti with other graffiti corpora from the Meroitic world and beyond.

### Reconnaissance Survey and Geophysical Propection

A systematic and comprehensive surface documentation of the cemeteries and their surroundings was undertaken for the first time. Additionally, non-invasive geophysical technologies were employed in parts of the study area in an attempt to identify unknown subsurface structures for further investigation.

Covering 125ha, surface documentation assembled a site gazetteer comprising the Begrawiya North and South cemeteries, the Wadi Tarabil between them, as well as the hills to the east (Plate 4).<sup>21</sup> The 32 known and newly identi-

<sup>16</sup> Field documentation was undertaken by Cornelia Kleinitz, Franziska Lehmann, Elisabeth Lindinger and Dina Serova. In addition, a selection of exceptional graffiti were drawn and described in great detail with a focus on techniques of manufacture and principles of composition by Bogumil Pilarski and Saskia Büchner. Elisabeth Lindinger developed a Filemaker-database for the digital organization of the data.

<sup>17</sup> Digital photogrammetry was in the hands of Ole Fredrik Unhammer (University of Bergen), while structured light scanning was undertaken by TrigonArt (Thomas Bauer and Mark Praus), Berlin/Germany.

<sup>18</sup> A short preliminary campaign took place in October 2015, followed by a 5-week field season in February/March 2016.

<sup>19</sup> The Meroitic cursive inscriptions are worked on by Jochen Hallof (University of Würzburg).

<sup>20</sup> The Christian Medieval inscriptions are worked on by Alexandros Tsakos (University of Bergen).

<sup>21</sup> The survey was conducted by Björn Briewig, Nicole Salamanek and

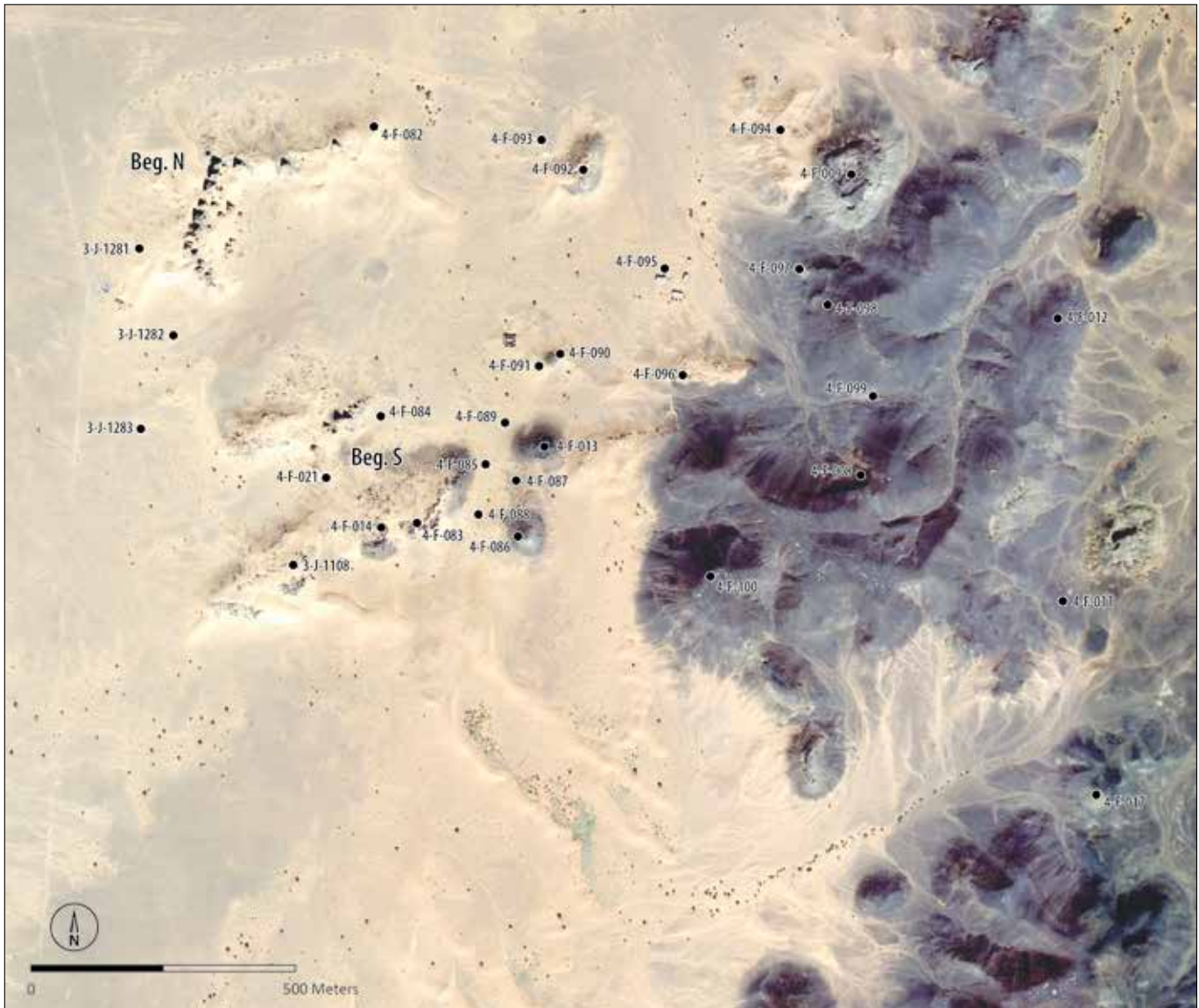


Plate 4. Map with the location of surveyed sites (© QMPS, Nicole Salamanek, 2015).

fied sites include 11 tumulus cemeteries, 9 occupation sites, 11 sandstone quarries as well as one potential ore mining place. These sites were assigned a site number according to the system introduced by Friedrich Hinkel (Hinkel and Mills 1977) and recorded by surface observation, airborne and ground photography. Most sites appear to date to the Kushite to Post-Meroitic periods, a few are Neolithic in date. Medieval sites are rare and Bronze Age sites of the 2<sup>nd</sup> millennium BC were not identified in the area. In their majority, the tumulus cemeteries were concentrated on the plateaus of Jebel Abu Sha'ar, Jebel Rassas and Jebel Hadjala to the east and south east of the pyramids. Several hitherto unrecorded tumuli were identified in the closer vicinity of the pyramids. While focus was laid on ancient archaeological remains, features that are more recent were also recorded, such as the remains of George Reisner's dig houses, the unfinished Wadi

Gerald Raab (Crazy Eye, Austria; [www.crazyeye.at](http://www.crazyeye.at)) under the supervision of Pawel Wolf in November-December 2015.

Tarabil Museum and the NCAM rest house. In addition, the team catalogued almost 150 features deriving from former archaeological and conservation activities, such as cleared tracks, dumps of George Reisner's excavations, loose block deposits and work areas associated with Friedrich Hinkel's reconstruction activities. Finally, corrections were made to George Reisner's general plan regarding the location of some pyramid tombs at the Begrawiya South cemetery.

Geophysical prospection was performed for the detection of yet unknown archaeological subsurface remains and to test the local practicability of Magnet Gradiometer survey (MGR), Ground Penetrating Radar (GPR) and Electrical Resistivity Imaging (ERI).<sup>22</sup> The MGR<sup>23</sup> covered a contiguous area of

<sup>22</sup> Conducted in March 2015 by two closely cooperating German and Sudanese teams supervised by Pawel Wolf: a team of Eastern Atlas, Berlin, directed by Burkart Ullrich, and a team from Dongola University, Faculty of Earth Sciences and Mining, directed by Mohamed Abdelwahab Mohamed Ali.

<sup>23</sup> Using an array of 10 Förster FEREX CON 650 gradiometer sen-

25ha in the large valley of the Wadi Tarabil between both cemeteries and included the northern part of the Begrawiya South cemetery (Plate 5). Already known archaeological features were fairly well identified even below a sand cover of up to several decimetres, while the majority of the magnetic

hill slopes of Begrawiya North, which are presently covered by large sand dunes, in the as yet unsurveyed eastern part of Wadi Tarabil and in the area to the north of the cemeteries. GPR<sup>24</sup> clearly located the staircase leading down to the tomb under pyramid Beg. S. 503 and thus confirmed the effective-

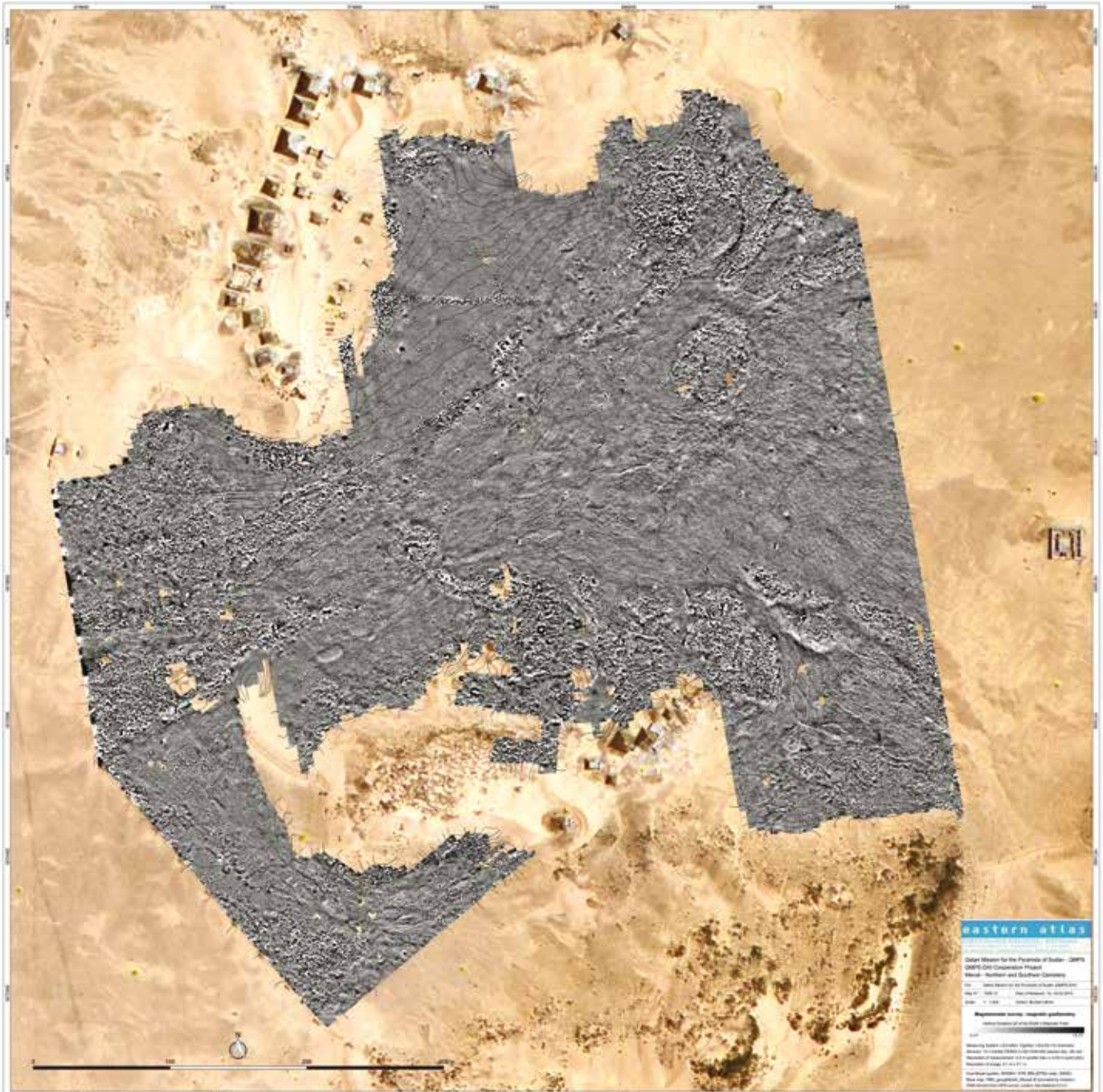


Plate 5. Magnetometer data plot of the surveyed area (© QMPS, Eastern Atlas, 2015).

anomalies traced beyond Begrawiya South proved to be of natural origin. Further archaeological features can thus be expected only along the edges of the necropolises on the

sensors mounted on a mobile, manpower-driven frame. A GPS was used for real time kinematic (RTK) positioning of the sensors providing a relative accuracy of 20mm of the magnetic data.

ness of the method in revealing backfilled grave shafts and robber trenches. A stronger GPR antenna might even be able to spot hitherto unknown burial chambers, but its use would result in less object resolution at the expected depth of the

<sup>24</sup> Using a GSSI SIR 300 system with 270 MHz antenna permitting reasonable reflection amplitudes for depths down to 1m.



chambers several metres below ground. ERI transects<sup>25</sup> in the Wadi Tarabil between the North and South cemeteries as well as at Begrawiya West aimed at the visualisation of the sub-ground geology and the verification of structures below a depth of 2m. They clearly illustrate the topsoils having a large range of resistivity values and *wadi* sediments overlaying the sandstone bedrock where low to medium resistivity values have been measured.

### Archaeological Propection

Test excavations aimed at establishing a new basis for further archaeological and historical research in and around the necropolises of Begrawiya North and South, as well as at closing gaps in research and documentation, such as in the case of the burial chambers of pyramid Beg. S. 503 (see below). More than two dozen test trenches were excavated in and around the necropolises of Begrawiya North and South to test specific spots with magnetic anomalies, to search for as yet unknown tombs or an assumed mortuary temple as well as to recover datable evidence from some of the burials beneath tumuli located during the reconnaissance survey.<sup>26</sup>

Immediately to the east of pyramid Beg. N. 22, George Reisner had discovered the double-chamber burial Beg. N. 56, which lacked a superstructure. The systematic investigation of the area (Plate 6) revealed an ancient descenary-shaped



Plate 6. Test excavation around pyramid Beg. N. 22 (© QMPS, Pawel Wolf, 2016).

trench of 8.5 x 1m cutting through the uppermost ferricrete sandstone strata some metres to the east of Beg. N. 56. Late Meroitic spade sherds recovered at 1m depth in the extremely hard subsoil suggest that this was the place of an abandoned tomb entrance or a robber trench. Immediately to the north of pyramid Beg. S. 1, the ground formations are suggestive of a spot that was prepared for a pyramid, but

<sup>25</sup> Using a Tigre32 system with an electrode distance of 2m.

<sup>26</sup> The excavations were conducted by Arch-Geo (Michal Sip and Iga Fabiszak), Poznań, Poland, who also carried out all surveying work at the site, under the direction of Pawel Wolf. Small finds and pottery from the excavations as well as from the reconnaissance survey were processed by Saskia Büchner, head of the finds office, and Bogumil Pilarski.

no traces of a descenary have been recognised in the test trenches to its east.

Two tumuli excavated at site 4-F-093 east of Begrawiya North and at site 4-F-094 north of the NCAM rest house revealed intact burials with skeletons in a crouched and extended position respectively, but they were devoid of grave goods. A test excavation at the large tumulus 4-F-021, measuring 5.5m in diameter, located on Jebel Terabiya immediately south of pyramid Beg. S. 10, revealed that it had been completely looted in the past. Palaeolithic artefacts recognised in some test trenches at the southern base of the hill on which Begrawiya North stands, but also Neolithic artefacts scattered elsewhere in the Wadi Tarabil, prove that the area of the royal cemeteries had already been occupied in prehistoric times.

In summary, the geophysical prospection and the archaeological soundings identified large areas void of archaeological remains and systematically delimited the areas of interest for future investigation. Many of the soundings confirmed the natural character of the magnetic anomalies recognised at specific loci by the MGR; others proved the absence of archaeological features at loci where surface observation promised hitherto unknown structures; remains of an assumed mortuary temple have not been identified. The above-mentioned examples demonstrate, however,

that intact tumulus graves and – albeit only a few – unexcavated archaeological remains do exist. They encourage further geophysical and archaeological tests within and around the royal necropolises. Larger contiguous areas for such examinations are the hill slopes of the burial grounds, especially east of Begrawiya North. These, however, are buried under debris and sand dunes measuring several metres in depth, impenetrable for present geophysical prospection methods. Therefore, the removal of the sand dunes is one of the most important tasks also from an archaeological

point of view. Another important future task is the clearing of areas already excavated by George Reisner in order to re-document previously recorded cemetery structures more thoroughly and, where applicable, with new methods.

### Re-excavation and Documentation at Beg. S. 503

A highlight of the archaeological fieldwork was the re-excavation and documentation of Queen Khennuwa's burial chambers under pyramid Beg. S. 503. Their epigraphical, iconographical and archaeological documentation demonstrated the potential of re-investigating the royal tombs of Meroe and closed an important research gap (Plate 7). According to a recent re-evaluation of the tomb's date,



Plate 7. Documentation work in the burial chambers of pyramid Beg. S. 503 (© QMPS, Pawel Wolf, 2016).

Khennuwa was probably buried in the late Napatan period (Hinkel and Yellin forthcoming). The well-preserved wall paintings and hieroglyphic texts qualify her tomb as one of the most significant burials in the royal cemeteries of Meroe. However, as George Reisner recorded the tomb in 1922 in a rather cursory fashion, copying just some of the hieroglyphic texts and taking very few photographs, large parts of its decoration and inscriptions remained unknown until today. It was, therefore, decided to re-excavate and to re-open the burial chambers for detailed documentation. Furthermore, the re-opening aimed at evaluating the possibility of exhibiting the chambers for tourism either *in situ* or as replicas in a site museum.

A staircase 12m long leads down to a landing in front of the tomb's entrance, which is located at a depth of 6m and which was decorated with the much-decayed remains of what may have been an unfinished cavetto cornice. The careful investigation of the two burial chambers yielded valuable insights in respect to the construction process and the organisation of the tomb interior,<sup>27</sup> while wood fragments and charcoal samples were

<sup>27</sup> For example, the well-preserved plastered and painted sandstone blocks of the coffin bench, which had been dismantled by grave robbers, remained.

recovered for species analysis and radiocarbon dating. The walls and ceilings of the burial chambers, which were hollowed out of the rock to form the shape of a vault, were plastered in their entirety and subsequently painted with hieroglyphic texts and pictorial motifs. Large sections of the texts and many of the images were documented for the first time. Plaster and paint were investigated by conservators who prepared a damage map to allow for conservation planning. Finally, the tomb's outer doorway was blocked and the descendary refilled to preserve the extraordinary well-preserved decoration until a concept for its conservation and presentation has been developed.<sup>28</sup>

The burial chambers offer a rare glimpse into the nature of late Napatan wall painting, providing rare information on style, techniques and the iconography of colour. In addition, they provide comparative material for the early Napatan painted burial chambers at el-Kurru. At Beg. S. 503, the hieroglyphic texts and accompanying pictorial scenes were painted on a sandy clay plaster, which may have been additionally bonded with gum arabic. The walls of the antechamber were whitewashed and painted with fully rendered polychrome figures and hieroglyphs (Plate 8). The walls in the burial chamber are, in contrast, entirely covered in black paint,



Plate 8. Western wall of the antechamber of Beg. S. 503 with representations of Isis and Nephthys (© QMPS, Pawel Wolf, 2016).

<sup>28</sup> The re-excavation and archaeological documentation of the tomb was conducted by Murtada Bushara and Pawel Wolf in January to March 2016. The texts and paintings were fully recorded using high-resolution ortho-photography by Pawel Wolf and SfM-based 3D-models by Ann-Li Rodenwaldt. Additional UV-light (dark light) photographs provided clearer images of vague sections of text and paintings. Detailed collations of texts and paintings were carried out by Ann-Li Rodenwaldt. The conservation-related activities were carried out by RaO (Restaurierung am Oberbaum), Berlin, Germany, directed by Jan Hamann. Janice Yellin and Jochen Hallof will analyse and publish the iconographic and epigraphic material.





turning them visually into the night sky of the underworld (Plate 9). They were painted with texts and linear calligraphic images in a golden yellow colour that imitates the sunlight essential for eternal life in the underworld.

The artist(s) were obviously skilled and experienced in



Plate 9. View into the burial chamber of Beg. S. 503 (© QMPS, Pawel Wolf, 2016).

decorating tombs with funerary texts and images and they had extensive access to archival material. On the northern and southern walls of the antechamber, panels depicting mummiform deities of the underworld alternate with text columns in Middle Egyptian through which the queen, who is identified with Osiris, was supplied with offerings. On the western wall Isis and Nephthys flank the doorway to the burial chamber and offer funerary bandages for the queen (cf. Plate 8). The decoration of the eastern wall of the antechamber had remained undocumented in the past. Here, male deities, of whom only the legs are preserved, flank the doorway. The ceiling of the antechamber, which has lost a good deal of its painted surface, displayed a figure of Nut over its entire length.

The burial chamber contains images of underworld deities and an 'astronomical text' that extends across the ceiling onto the northern and southern walls (cf. Plate 9). This 'astronomical ceiling' is attributable to the so-called Senmut-text family and follows a tradition contemporary with the 25<sup>th</sup> Dynasty tombs of Montuemhat and Petamenophis in Western Thebes. The upper part of the rear wall depicts the queen offering to Osiris on either side of a deep niche. As these texts were poorly visible in Reisner's photographs, they can only now be studied for the first time.

### Damage Documentation and Preventive Conservation

A major goal of the QMPS is the preservation of the royal necropolises and their monuments. Previous publications, for

instance by Friedrich Hinkel (Hinkel 2000) or the UNESCO World Heritage nomination file for the 'Island of Meroe' with the combined management plan for the serial nomination by Sami el-Masri,<sup>29</sup> point out that the site of Meroe is adversely affected by various climatic and manmade threats such as:

- 1) destruction caused by desertification (shifting sand dunes, sand erosion)
- 2) destruction by rain water (structural deterioration of pyramid and chapel walls)
- 3) salt crystallization
- 4) general degradation of construction materials
- 5) improper repairs
- 6) physical damage by visitors, animals and vehicles

Furthermore, the UNESCO/ICOMOS recommendations stress the general need for a co-ordinated conservation plan and an overall strategy with policies that follow international best practice examples and guidelines.

Considering these recommendations, the first project year of QMPS focused on the assessment of the threats

to the cemeteries at Meroe, accompanied by conservation tests and preventive preservation measures aiming at the development of a general conservation plan.<sup>30</sup> All types of damage at the royal pyramid cemeteries were identified in an overall catalogue using common international classification and terminology.<sup>31</sup> In addition, two pyramids with representative damage schemes (Beg. N. 2 and Beg. N. 9) were chosen for detailed damage cataloguing using ortho-projections of their 3D-models (Plate 10). A workflow was developed that can be applied to other pyramids in the future. Parallel to this detailed assessment, first conservation and preservation measures started:

- 1) a structural survey of the pyramids
- 2) the temporary fencing and signposting of highly endangered areas<sup>32</sup>
- 3) the renewal of chapel doors to minimise further sand abrasion of the chapel reliefs<sup>33</sup>

<sup>29</sup> For the nomination file of the 'Island of Meroe' and the Advisory Body Evaluation, see <http://whc.unesco.org/en/list/1336> 31.05.2016.

<sup>30</sup> The conservation section was directed by Alexandra Riedel; the general damage catalogue and a detailed damage mapping at Beg. N. 2 and Beg. N. 9 as well as the conservation tests were carried out by RaO (Restaurierung am Oberbaum), Berlin, Germany, directed by Jan Hamann.

<sup>31</sup> See the Illustrated Glossary on Stone Deterioration Patterns, recommended by ICOMOS.

<sup>32</sup> Conducted by Josef Steiner and Alexandra Riedel. The latter took care of the fencing and signposting.

<sup>33</sup> Carried out by a team of carpenters and workmen, supervised by Mahmoud Suliman Bashir.

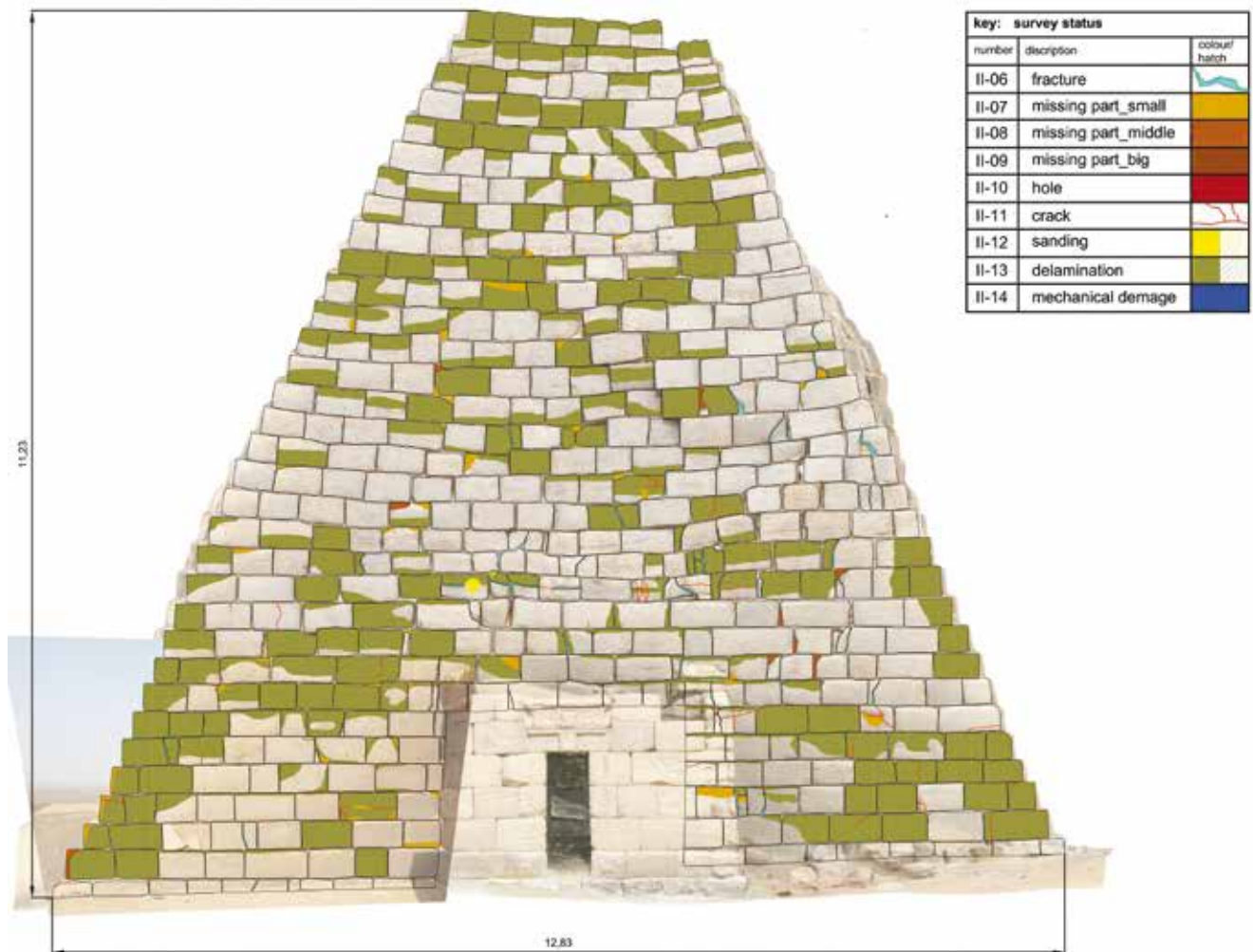


Plate 10. Detailed damage mapping at pyramid Beg. N. 9 using an ortho-projection of its 3D-model derived from laser scanning (© QMPS, Restaurierung am Oberbaum, Zamani, 2015).

4) testing of conservation methods at Beg. N. 2 to develop an adequate conservation procedure for the site

5) the removal of sand dunes near chapels and their reliefs as well as a study of the accumulation of dunes in and around the cemeteries

### Sand Removal and Assessment of Sand Dune Accumulation

The photographic records of the Chicago Oriental Institute's expedition in 1906 and of George Reisner's excavations in the 1920s show the ridges of Begrawiya North and South covered with stone rubble and debris, while the surrounding plains are overgrown with grass and bushes.<sup>34</sup> The present massive accumulation of sand dunes in the necropolises of Meroe only started in the 1960s and has become problematic since the 1980s, when windborne sand started causing the massively destructive abrasion of pyramid and chapel walls by destroying the hardened dark patina of the sandstone and

eroding its very soft inner stone material (Riedel 2015). This threat presently constitutes the fastest and most destructive impact on the Meroe pyramids, causing monuments that have withstood the elements for two millennia to disappear at an alarming rate (Plate 11).<sup>35</sup>

To address this issue, QMPS started a programme aiming to minimise sand abrasion at Begrawiya North in November 2015, including the removal of sand dunes around the pyramid chapels, the testing of various removal methods and the identification of suitable sand deposition areas (Plate 12). The removed sand was temporarily dumped in lower parts of the western and eastern hill slopes of the cemetery, where wind speeds are too low to return the sand to the upper pyramids' plateau and where the winter trade winds blow the sand out of the cemetery area (Plate 13). Notwithstanding such short-term achievements, the volume of the sand dunes by far exceeds all removal capacities and new sand dunes have again accumulated in many of the cleaned areas after only two or three months. Other measures such as the erec-

<sup>34</sup> See e.g. < <http://oi.uchicago.edu/collections/photographic-archives/1905-1907-breasted-expeditions-egypt-and-sudan/> 06.06.2016; Reisner 1923.

<sup>35</sup> In 1995 Friedrich Hinkel noticed that 90% of the chapel reliefs of Beg. N. 6 had eroded during a period of only six years (Hinkel 2000, 16).



Plate 11. The same pyramid corner in 1985 and 2015 demonstrating the tremendous damage to the monuments due to sand abrasion (left: © DAI, Archive Friedrich W. Hinkel, F-KB-sw-541-21, Friedrich W. Hinkel, 1985; right: © QMPS, Cornelia Kleinitz, 2015).

tion of temporary deflection walls were tested and proved efficient in minimising the intrusion of new sand. A low deflection wall erected for test purposes between pyramids Beg. N. 13 and 20 in the north of the cemetery redirected



Plate 12. Sand removal around the pyramid chapels of the Begrawiya North cemetery (© QMPS, Pawel Wolf, 2015).

the windblown sand eastward around the pyramids into the Wadi Tarabil. In addition, the manipulation of a large sand dune south of Beg. N. 20 by the digging of a deep trench through the dune established an artificial wind corridor, which caused the redirection of approximately 75% of newly incoming sands into one of the temporary dumping areas and at the same time it furthered the ‘natural’ erosion of the sand dune itself (cf. Plate 13).<sup>36</sup>

<sup>36</sup> Sand removal and the assessment of sand accumulation were conducted by Murtada Bushara, Pawel Wolf and Neil Munro.

Since the efforts described above can only be short-term solutions to a general problem, a study of the local sand accumulation processes was initiated. It comprises, amongst others, the measurement of wind speeds at various places and the establishment of sand traps to measure the volume and speed of sand accumulation. Furthermore, the monitoring of local sand movement at six-month intervals by airborne photography was initiated. Only a thorough investigation of local wind conditions can provide the basis for mid- and long-term measures. The planning of activities such as the fixing of palm leaves along the barbed wire fence surrounding the cemeteries or the installation of large vegetation-belts far to the north and south of the necropolises are the next important steps to provide an effective and long-lasting solution to minimise the threat that sand abrasion poses to the site.

### Site Management at Meroe

The absence of regular fieldwork at the pyramids of Meroe for more than a decade and the resulting neglect of the site and its infrastructure were obvious at the start of the QMPS. The NCAM rest house was in a state of disrepair. Most of the doors of the pyramid chapels installed by Friedrich Hinkel were broken or had vanished and visitor tracks were covered by sand dunes. Therefore, the QMPS and NCAM decided on a new overall site development approach while integrating existing ideas and reviving formerly unfinished activities. Besides the documentation of former work spots, block deposits and pathways in the framework of the reconnaissance survey (see above), the existing site infrastructure, equipment and construction materials left by Friedrich Hinkel were reviewed. The NCAM rest house with its storage facilities was rehabilitated in order to accommodate workgroups and expert teams as well as to create storerooms, offices and workshops, to facilitate, for example, conservation measures (Plate 14).<sup>37</sup> In addition, the protection of the site was improved by new fences and the safety of tourists enhanced by temporary closing and signposting dangerous areas.

To develop a general tourism concept, a ‘Sustainable Tourism Plan for Meroe including a Regional Approach to the Island of Meroe’<sup>38</sup> was initiated, which integrates all stakeholders and their various visions regarding tourism and its socio-economic benefits into one overall development plan. Until its completion and its step-by-step implementation, the QMPS will improve the situation at the site by necessary enhancements for visitors, guards and local vendors. For example, a second

<sup>37</sup> All these efforts were realized by a team of NCAM-workmen and directed by Mahmoud Suliman Bashir.

<sup>38</sup> Developed by Cultural Site Research and Management (CSRSM) under the direction of Douglas Comer, Baltimore, USA.

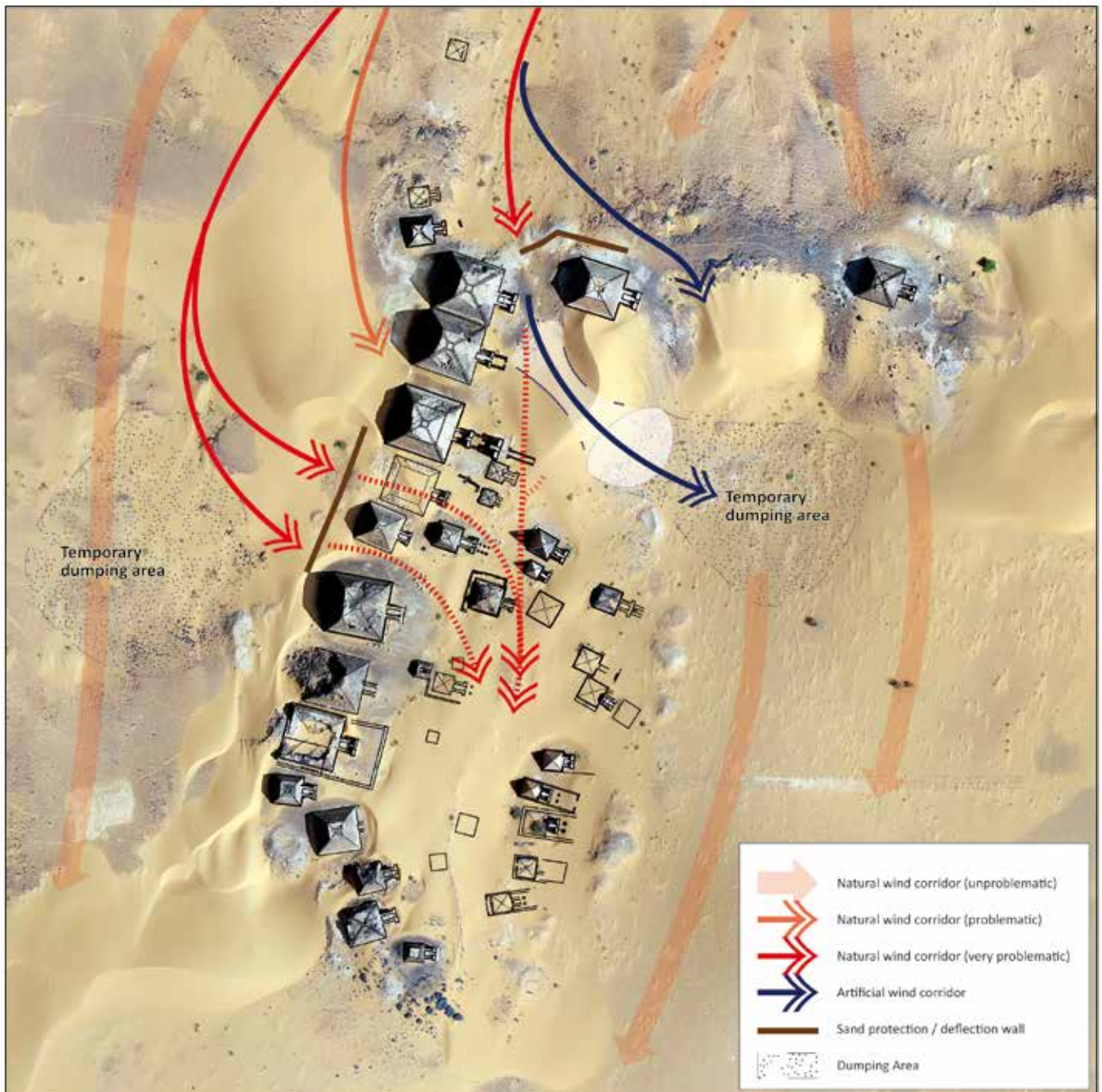


Plate 13. Map of Begrawiya North illustrating problematic wind and sand corridors during the winter months and the partially deflected wind corridors in November 2015 (© QMPS, using Hinkel 2000, fig. 2, Nicole Salamanek and Pavel Wolf 2016).

building with an exhibition room and other logistic facilities was constructed opposite the present entrance building of the site. Interpretation panels have been prepared to provide an introduction to the site and to set some rules relating to the behaviour of visitors that will help preserve the site for the future. It is planned that they will be on display by the start of the new tourist season.

Nevertheless, to develop the pyramid cemeteries at Meroe will take time. The general necessity of regular inspections, permanent ongoing conservation and development work at major sites like Meroe is essential for their preservation and

for sustainable tourism. Thus, in the long-term the QMPS aims at the installation of an overall maintenance programme for the pyramid cemeteries.

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Plate 14. Rehabilitation of the NCAM rest house  
(© QMPS, Mahmoud Suliman Basbir, 2015).

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