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SITE MANAGEMENT PLANNING AT MUSAWWARAT ES-SUFRA, SUDAN: CONDITION ASSESSMENTS, CONSERVATION AND REHABILITATION MEASURES, AND THE DEVELOPMENT OF A FIRST VISITOR GUIDANCE SYSTEM

INTRODUCTION

Archaeological heritage sites in Sudan are characterised by their under-development. This ranges from basic visitor facilities to on-site interpretation and guidance systems. The often 'unkempt' state of sites reflects the absence or the lack of implementation of comprehensive site management plans including condition assessments and maintenance protocols. This is also true for archaeological sites that are part of Sudan's two World Heritage entries, the serial properties of 'Gebel Barkal and the Sites of the Napatan Region' (listed since 2003) and the 'Archaeological Sites of the Island of Meroe' (listed since 2011).³ At Musawwarat es-Sufra, one of the components of the 'Island of Meroe' World Heritage property, conservation-restoration and other maintenance measures have been undertaken over the years mainly as an ad-hoc reaction to the deterioration of the built structures and the impact of the growing number of visitors to the site.

Since the mid-2000s, a more proactive attempt had been undertaken to conserve and restore parts of the Great Enclosure, the main monument at Musawwarat.⁴ This approach aimed at helping visitors to better understand the labyrinthine character of the building complex with its multiple courtyards, corridors, ramps and rooms by restoring some of its walls and doorways. It was hoped that tourists would recognise ancient paths and follow these during their visit to the Great Enclosure, instead of climbing over and walking on collapsed walls, thus further

destabilising the fabric of the sandstone blocks which form the site's main building material. However, funding was only available on a short-term basis, which meant that a comprehensive conservation and interpretation strategy could not be developed and sustained for the site of Musawwarat.

With the arrival of multi-year funding through the Qatar-Sudan Archaeological Project (QSAP) in late 2013, the Archaeological Mission to Musawwarat es-Sufra is now addressing the need for the development of an overall preservation and presentation strategy regarding the Great Enclosure as well as other structures in the valley of Musawwarat. The protection of the site as well as its public presentation must be proactive and systematic rather than reactive and ad-hoc. Accordingly, the development of the foundations of a comprehensive site management plan was a major objective during the first season of QSAP-funded work in October/November 2013 and January to April 2014.⁵ Firstly, a survey assessing the current physical condition of various site components was conducted. While most of the built structures in the valley were visited and visually examined, the condition survey proper focussed on the Great Enclosure, which was mapped in some detail. Secondly, benchmark data on visitor behaviour and experience at the Great Enclosure was gathered during a one-month tourist study involving the GPS-tracking of tourists as they proceeded through the complex monument. Exit interviews were also carried out to complement the GPS-tracking data. Thirdly, as an initial step in terms of visitor management, the outline of a first, expandable guidance system was developed for the

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3 See Kleinitz 2013.

4 Scheibner and Mucha 2006, 2007, 2008, 2009.

5 All work was undertaken in close cooperation with the National Corporation for Antiquities and Museums (NCAM), whose director, Dr. Abdelrahman Ali Mohamed, and site inspector, Zaroog Mohamed Bakri, are sincerely thanked for their support. Apart from Sudanese and foreign specialists, up to 60 local workmen were involved in making the first QSAP field season a success.



Fig. 1: Donkeys searching for shadow in the Great Enclosure (photograph: Cornelia Kleinitz)

Great Enclosure. Fourthly, tasks necessary for the speedy implementation of the initial visitor guidance system were identified and preparatory work was undertaken along the proposed core visitor route. Consequently, consolidation-restoration measures were proposed, which primarily focus on those parts of the Great Enclosure that are planned to be presented to the public. Additional, urgent measures were undertaken when necessary.

ASSESSING THE CONDITION OF MONUMENTS IN THE VALLEY OF MUSAWWARAT⁶

In the course of a condition survey, the main archaeological features of the valley of Musawwarat, such as various types of buildings, monumental water reservoirs (hafayir, sing. hafir) and quarries were visited. Their condition was visually assessed, in some cases mapped. When required, conservation approaches were discussed and appropriate measures identified. The main findings of this survey are as follows for the structures located in the three sections of the site,

⁶ In October/November 2013 participants of the condition survey were: Claudia Näser, Cornelia Kleinitz, Thomas Scheibner, Ralf Miltenberger and Michael Flache. In January 2014 participants were: Claudia Näser, Cornelia Kleinitz, Claudia Bührg, Sebastian Speiser and Tobias Flache.

I (west), II (centre) and III (east). Only those monuments that require urgent intervention are listed here:

Great Enclosure (I A)⁷

At Musawwarat's main monument, the Great Enclosure, a thorough condition assessment was undertaken to create a reliable and quantifiable basis for site monitoring as well as for decisions on current and future protection and conservation work. The condition of and damage to the monument's extensive sandstone walls, which all together amount to nearly five km in length, was assessed and the findings meticulously noted on large-scale detailed maps of the building structure. This work was completed for the entirety of the Great Enclosure, only the southeastern part of the Central Terrace remains to be surveyed. The condition survey resulted in the identification and definition of different symptoms, causes and levels of damage, and the formulation of damage categories.

The main natural causes for damage are water intrusion, insolation weathering through tempera-

⁷ Detailed condition mapping at the Great Enclosure was undertaken in October/November 2013 by Thomas Scheibner, assisted by Ralf Miltenberger and Michael Flache.



Fig. 2: View over the southern part of the Great Enclosure towards the Small Enclosure (I B) and the kom of debris from the excavation of the latter monument in the 1960s (photograph: Claudia Näser)

ture change, corrasion (i.e. abrasion) through aeolian sand erosion as well as pressure relief. Missing capstones are the main reason for the loss of bond and the collapse of walls, which allow rain water to seep into the walls and destabilise their filling of earth mortar and rubble stones. Rain water also destroys the structure of the sandstone blocks by the mobilisation of soluble materials. Desquamation effects (i.e. the flaking of the outer block surfaces), are caused by daily temperature changes, whereas exfoliation along the block edges is caused by pressure relief. Other mechanical damage is mainly caused by animals, primarily goats and donkeys, and to a lesser extent by visitors (fig. 1).

Altogether, there is no part of the Great Enclosure that is not affected by various types of damage, which were classed into three damage categories according to their severity. The distribution and degree of damage mainly depends on exposure to wind and sand, and the state of preservation of the tops of the walls. Most endangered are walls which still stand to a considerable height but feature open wall tops, e.g. temple, terrace and corridor walls, but also high courtyard enclosures. Low or collapsed walls as well as sandstone blocks in the lower parts of standing walls are primarily affected by soil moisture and corrasion. As an immediate measure that

does not significantly alter the ruined appearance of the walls, covering open wall tops with an appropriately coloured layer of lime mortar can prevent further deterioration of the walls due to rain water seepage (for this and further mitigation measures see below). To prevent further deterioration from animal action the monument needs to be urgently fenced (see below).

During the condition survey it was further noted that the numerous block repositories and spoil heaps which dot the perimeter of the Great Enclosure (and other parts of the site) make it often difficult to establish which features are ancient structures and which features are the result and debris of archaeological intervention (fig. 2). A concerted effort is needed for the rehabilitation of the perimeter of the monument.

Small Enclosure (I B)

Deterioration of the walls of this monument (see fig. 3), which is located immediately to the south of the Great Enclosure and is preserved to a few block layers above ground, is today brought about primarily by animal action i.e. roaming donkeys and goats. To prevent further damage, the remains of the building should also be fenced urgently.



Fig. 3: The Small Enclosure (I B) south of the Great Enclosure (photograph: Cornelia Kleinitz)

Smallest Enclosure (I C)

This inconspicuous monument is located in the immediate vicinity of the present tourist police station to the south of the Great Enclosure. It is only preserved at and below ground level and therefore in danger of not being recognised as an ancient structure. The tourist police, for example, had installed a pole and a barrel on its walls for gaining a better telephone signal (fig. 4). The Smallest Enclosure should also be fenced to avoid 1) its misuse and 2) cars driving over it. It should also receive interpretive signage to mark it as an ancient monument.

Small Hafir (I E)

The Small Hafir, one of the ancient water reservoirs at the site, has in the past been misused by tourists as a convenient campground with a scenic view of the Great Enclosure. While it is generally in a good condition, the Small Hafir should also receive interpretive signage to mark it as an ancient monument and to raise awareness for its preservation.

Temple II A

This small temple received a protective structure with a metal roof in 1995.⁸ Reed mats were fixed to the structure in order to limit wind and sand erosion; they had been renewed regularly. During the condition survey the usefulness of the reed cover as a wind and sand shield was discussed and found to be minimal. The reed cover was, therefore, not renewed (fig. 5). Conservation measures, which include the cleaning and consolidation of the wall reliefs, are urgently necessary at this temple. A quick inspection indicated that the reliefs appear to have suffered from the effects of (rain) water since their recovery, rather than from wind and sand erosion. This also questions the usefulness of the protective roof over the temple. Indeed, the roof may act as a sand and rain trap rather than protecting the temple. The covering also prevents the temple from being recognised as such in the landscape. Windblown sand should be removed from the monument every couple of years to prevent the storage of moisture and resulting damage to the reliefs. A protective lime mortar covering, similar to those of the Great Enclosure (see below), could protect the wall tops. The reliefs should be cleaned and

⁸ Fitzenreiter 1995; Wanning 1996.



Fig. 4: The Smallest Enclosure (I C) south of the Small and the Great Enclosures (photo-graph: Cornelia Kleinitz)



Fig. 5: Temple II A and its protective structure after the deterioration of its reed cover (photograph: Cornelia Kleinitz)



consolidated. Overall, Temple II A requires a thorough assessment of its state of preservation and of the effectiveness of the protection measures applied, such as its roofed protective structure.

Lion Temple (II C)

The temple, dedicated to the Meroitic lion god Ape-demak, collapsed in antiquity and was re-erected 45 years ago.⁹ Two recent expert evaluations of the condition of the temple focussed on the state of preservation of its wall reliefs as well as on possible causes for the cracks in its walls and moisture damage with particular attention paid to its roof construction.¹⁰ The condition assessments outlined necessary measures, which include the cleaning and subsequent conservation of the reliefs on the temple's exterior walls and the repair of the leaking roof. Due to a lack of funding, large-scale mitigation measures had to be postponed until now. In the 2013/14 field season, the current state of preservation of the temple was re-assessed and the first steps for ensuring its long-term preservation were determined. These include the management of rain water run-off for the protection of relief-decorated surfaces and the investigation and mitigation of potential problems with the overall construction of the temple and its roof.

The assessment and potential replacement of the present temple roof is planned as a major project component of the 2014/15 season, as is the investigation of the state of the temple foundations, particularly in the area of the pylons, as a possible source of cracks in the temple's northern and southern walls. From a conservation point of view, a 'sample axis' i.e. a 1.5m wide vertical wall section reaching from the ground to the roof, was selected and mapped with regard to patterns of damage. This gives a representative picture of the various types of degradation present on the monument. Most damage appears to have been caused by water, rather than sand erosion. Conservation treatment is planned to start on this 'sample axis'. The findings from this pilot study will form the basis for projecting the overall amount of time and resources needed to treat the entire monument.

Apart from the condition of the temple itself, the poor state of parts of the fence enclosing the monument and of the entrance gate was noted. The fence should be renewed as soon as possible. The explanatory sign close to the entrance gate had faded long ago and was removed later in the 2013/14 season.

Additionally, the usefulness of a modern stone wall 'sand trap' in the northwestern part of the temple was questioned,¹¹ as there is no sand accumulation visible around this wall. The wall gives the appearance of being part of the ancient building ensemble, which is not the case.

Great Hafir (II H)

An unsolved problem are the myriad dump heaps from the mechanical digging activities of the Sudan Civilisation Institute (2003, 2005 to 2006) in Musawwarat's largest ancient water reservoir, the Great Hafir. Heaps of deposits stretching along the flanks of the hafir, dot the valley of Musawwarat and the routes leading towards it.¹² The strong erosion of the hafir interior by runoff water was noted (fig. 6). Some remedial action was taken in respect to the heaps of hafir fill close to the Lion Temple (see below).

STUDYING VISITOR BEHAVIOUR AND EXPERIENCE AT THE GREAT ENCLOSURE¹³

Research on tourism at Musawwarat was undertaken in order to gain benchmark data on visitor behaviour and experience at the Great Enclosure.¹⁴ The visitor study comprised the tracking of visitor movement through this complex monument on the basis of GPS units, which were handed to tourists when entering the site from the car park. The tracks were subsequently mapped in Google Earth and show how individual tourists as well as various types of groups navigate the labyrinthine building complex. Upon exiting the site, tourists were interviewed on the basis of structured questionnaires on how they experienced their site visit. In order to be able to contextualise site visitation, data was collected on the visitors themselves (e.g. nationality, age, profession), the type of visitor (individual Sudanese, foreign or expats; tour group foreign or expats; Sudanese student groups etc.), the number of visitors per group, the type of trip (day-tour or 2-day-tour from Khartoum, multi-day-tour through Sudan, field trip), the trip itinerary, the order of site visitation, the order of visitation of the monuments at Musawwarat itself, the presence or absence of a guide, and the informa-

11 Cf. Wenig 2002: 13.

12 See Scheibner 2005; Scheibner and Mucha 2006.

13 This study was undertaken by Cornelia Kleinitz in March and April 2014.

14 See Kleinitz 2014.

9 Hintze 1993.

10 Speiser 2007 and Herberg 2005; cf. also Wolff 1996.



Fig. 6: The Great Hafir's interior with erosion channels (photograph: Cornelia Kleinitz)

tion available to the visitors before and during site visitation (e.g. internet sources, guide books, guides). One aim was to establish what sets of knowledge and expectations visitors arrive with and what information they find or would wish to find at the site itself. While the exercise of tracking visitor movement across the site showed what apparent paths and 'hot spots' are attractive visual 'draws' for various kinds of visitors, the interview data added information on which 'stories' concerning the site visitors found most interesting and memorable. In addition to visitors, guides (including professional guides, archaeologists leading tours, interested 'enthusiasts') as well as owners and employees of tourist companies were interviewed on site and in Khartoum on their evaluation of, and approach to, Musawwarat as a tourist destination, and on their needs as 'handlers' of visitors to this remote site. Interviews were also undertaken with the guards of the Great Enclosure as well as the Lion Temple, who provided information on their daily experiences with visitors at Musawwarat, and on their wishes and needs for the future development of the site. The various elements of the visitor study will feed directly into site management planning at Musawwarat.

PLANNING A VISITOR GUIDANCE SYSTEM AT THE GREAT ENCLOSURE¹⁵

The management of visitors at Musawwarat forms an important aspect of site management planning. Hitherto, visitors explore the Great Enclosure unguided by warning signs and information panels, or demarcated visitor paths.¹⁶ Solely at the site museum, which the visitors reach only after traversing the site, a few explanatory panels exist. While this freedom of access is part of the visitor experience at the Great Enclosure, it also results in damage to the ancient walls by tourists climbing over and on top of walls for better views or photo opportunities, or in search of short-cuts on their way across the spatially complex site. A visitor guidance system will not only help to protect the site by laying out behavioural rules for visitors, but it will also enhance the visitor experience as it will lead visitors to attractive view and information points. Ideally, plans for a visitor guidance system at Musawwarat should be integrated with plans for the overall presentation of the 'Island of Meroe' World Heritage property.

¹⁵ Undertaken in January 2014 and led by Cornelia Kleinitz, Claudia Bührig and Claudia Näser.

¹⁶ See Kleinitz 2014.



Fig. 7: The proposed visitation route, stage 1 (graphics: Google Earth and Cornelia Kleinitz)

For the Great Enclosure, a logical visitation route was developed with a number of view and information ‘hot spots’, which are to be equipped with information panels in the coming seasons. The route focuses on the eastern and central parts of the building complex (Complexes 300, 100 and 500), with its northern and southern parts (Complexes 200 and 400) deliberately omitted from this route as they need to undergo further study and consolidation before being opened for visitation. Overall, the visitation route – which can be extended at a future point – is suggested to follow the ancient routing through the site starting at the likely main entrance to the Great Enclosure (from the east into courtyard 305), passing Temple 300, accessing the Central Terrace via ramp 119, circling the Central Temple and finally arriving at the site museum (fig. 7). While visitors can become aware of the labyrinthine character of the site on this route, the route means they will cross (and damage) as few of the ancient walls as possible.

Consolidation and restoration measures in preparation for the visitation route are underway. They focus on delineating, demarcating, consolidating and – where appropriate – partially restoring gates and pathways, such as the gate between courtyards 304 and 117 (see below). This approach continues the strategy for restoration at the Great Enclosure that was developed by the mission during the mid-2000s and has already been implemented for Temple 300 as

well as the surrounding courtyard walls.¹⁷ Visitors are to be prevented from systematically straying from the route by warning signs and/or light installations, such as metal bars, which can symbolically block off sensitive areas. The visitor path itself can be demarcated with various easily renewable materials, for example by a cover of pebbles or sand of a colour somewhat different from the extant ground surface.

Necessary consolidation and restoration measures that would prepare the route for accelerated visitation were identified and various options for a signage system were explored together with ideas for providing shaded spaces and seating at the monument. Suggested measures involved the rehabilitation of the proposed new entrance area outside the eastern enclosure wall of the Great Enclosure. The area was cleared from excavation rubble and protected from the surface water run-off of Wadi es-Sufra through constructing a low protective (rubble and earth) platform (see below; cf. figs. 9–10).

¹⁷ Scheibner and Mucha 2006, 2007, 2008.



Fig. 8: The wadi east of the Great Enclosure, seen from the south, namely the 'old' track to the Lion Temple, prior to its re-design (photograph: Cornelia Kleinitz)

IMPLEMENTING A VISITOR GUIDANCE SYSTEM: FIRST STEPS

Rehabilitating the areas east and south of the Great Enclosure¹⁸

The area immediately to the east of the Great Enclosure was subject to preparatory work for the implementation of a new visitor guidance system and the installation of a fence protecting the monument in the near future. The area had been used as a storage place for ancient building material from the Great Enclosure and rubble from excavations since the 1960s. The first steps have now been undertaken for its rehabilitation. A large heap of excavation debris was removed and deposited in the wadi bordering the Great Enclosure in the east in an attempt to prevent the further encroachment of this temporary river bed onto the monument (fig. 8). A second kom of excavation debris, situated south of the Small Enclosure and deriving from the excavation of this structure in the 1960s (see fig. 2), was also partly removed and deposited in the wadi. The area reclaimed from the

wadi by these measures was delimited and stabilised on its eastern side by a low wall. To prevent the impression that this wall is an outer wall of the Great Enclosure, its top was covered with sand and earth (figs. 9–10). The wall was covered on its eastern side with a low bank of sand to help protect it against the impending run-off water during the rainy season (fig. 10). This approach was successful, as the construction withstood the waters from the wadi during the 2014 rainy season and was still perfectly intact in October of that year.

Conservation-restoration of courtyard wall 117/304¹⁹

Since 2006, Complex 300 has been a major focus of conservation measures at the Great Enclosure with the conservation and restoration of Temple 300 itself (2007, 2008), the conservation and restoration of the surrounding courtyard walls 305/E (2006), 304/305 (2008), 304/307 (2009) and the adaptation of the previously restored walls 305/415 (2006), 304/E (2007),

¹⁸ Work was undertaken in March and April 2014 and led by Claudia Näser and Cornelia Kleinitz, assisted by Zaroog Mohamed Bakri, Hassan Ibiadallah Abdallah and Mohamed Mohamed el Tayeb.

¹⁹ This project was undertaken in February and March 2014 and led by Claudia Näser, Zaroog Mohamed Bakri and Peter Becker, assisted by Sefian Mutukil el Tahar.



Fig. 9: The area east of the Great Enclosure, seen from the north, after its re-design with a low rubble and earth platform bordered by a low wall towards the wadi (photograph: Cornelia Kleinitz)



Fig. 10: The area east of the Great Enclosure with the rubble and earth platform and the newly constructed wall, covered by sand and equipped with a bank of sand on the wadi side (photograph: Cornelia Kleinitz)



Fig. 11: Wall 117/304 with the gate towards courtyard 117 prior to conservation measures (photograph: Cornelia Kleinitz)

307/E (2008) and 307/N (2009) to the current conservation-restoration strategy.²⁰ On the basis of the findings of condition mapping at the Great Enclosure and the planning of a visitor guidance system (see above), the western wall of courtyard 304 with its gate to courtyard 117 was identified as a major point of concern as this area will become part of the main visitation route envisaged for the monument. The wall in question was in a poor state of preservation and sections of it were only visible above ground as rubble heaps (fig. 11). The movement of larger numbers of visitors through this area would have necessarily led to further destruction of these remains. The aim of the conservation-restoration project therefore was to expose and clearly identify the ancient building substance, to consolidate it in situ and rehabilitate the ancient gateway in a way that makes it safely and sustainably usable for visitor movement without endangering the original substance and evoking its further loss.

As a first step, recently and sub-recently accumulated sediments were removed, and all fallen blocks uncovered and evaluated in situ for re-use. An archaeological investigation was not necessary, as the rubble did not extend into an archaeologically

relevant depth.²¹ Standing original parts of the wall were consolidated. During the in situ examination of the fallen blocks, portions of the wall were identified, which had collapsed en bloc and could be re-fitted in their original position. The blocks were then directly used in the reconstruction. On top of the wall portions which were originally preserved or re-fitted in original position, a slightly recessing intermediate layer of bricks was inserted, corresponding in height to the same respective layer of sandstone blocks. On top of this, blocks from the collapse uncovered in the excavations which had originally come from the wall, but whose exact original position could not be detected were inserted. Missing portions – including those where block material from the collapse had been removed undocumented during excavations of the 1960s – were filled with bricks. The work was finished with the complete plastering and a patina-like colouring of all wall portions executed in brick. The top of the restored wall was designed in an open, stepped way showing the two block shells and the filling blocks, in order to emphasize its character as

²⁰ Scheibner and Mucha 2006, 2007, 2008, 2009.

²¹ Archaeologically relevant observations concerned an ancient water opening in the northern part of the wall, the relationships of wall 117/304 to the adjoining walls 117/121 and 304/305 and details of the construction of gateways 117-304 and 117-305, the latter being located at the southern end of the conserved wall.



Fig. 12: Wall 117/304 with the gate towards courtyard 304 after reconstruction (photograph: Cornelia Kleinitz)

a restored ruin. The top was eventually sealed with coloured lime mortar. This approach marks the wall as a consolidated original wall, partly reconstructed, but not pretending to extend to its original height (fig. 12).

The conservation and restoration of relief columns on the Central Terrace: a pilot project²²

The central columns of the double row of columns in front of the Central Temple are decorated with various singular motifs and scenes in raised relief. All of these unique pieces are in a more or less poor state of preservation. In the mid-1990s some larger parts, as well as several minor fragments from these columns had been transferred to the on-site museum and several column bases were protected in situ by brick encasings.²³ This situation is unsatisfactory as it means firstly, that most columns are not visible to the visitor and secondly, that several unseemly protective brick structures obscure the space in front of the Central Temple. One of the aims within site management planning for the Great Enclosure is,

therefore, to find a solution that allows the re-exhibition of the relief columns and especially, the rehabilitation of the area in front of the Central Temple. This necessitates the conservation, consolidation, restoration and partial re-assembly of some or all relief columns. Initially, the protective encasings of several columns were opened in order to monitor their state of preservation. Some of these columns had been 3D-scanned in 2009²⁴ and their state of preservation at that time was compared to the present situation. One column base (number 8 in the inner row, immediately north of the entrance to the Central Temple), which showed particularly heavy damage was chosen for conservation in order to develop, test and consequently refine an overall conservation strategy. In order to protect the piece during treatment, it was temporarily removed from its original position and transported to the on-site museum.²⁵ The investigation of the state of preservation of column base 8 showed that the sandstone in its core had completely lost its integrity and turned into more or less loose sand. This meant that the column base could not be conserved in its entirety. Only its outer 'shell' with the relief decoration, somewhat harder than the core

22 This project was undertaken by the conservators Sebastian Speiser and Tobias Flacke in January and February 2014.
23 Wolf and Pitterschatscher 1996.

24 Kleinitz, Bauer and Näser 2009.

25 Incidentally, this allowed excavation in this spot for the first time. For its results see Scheibner, this volume.



Fig. 13: The northern column base in room 108 after the removal of its temporary protective cover (photograph: Claudia Näser)

of the column base, was rescued and consolidated in several pieces. To be able to re-exhibit the conserved shell of the column base, it was decided to construct a core from a concrete mixture, and re-position the relief-decorated shell around it, separated from the core by a layer of mortar. The new, strong column core will also allow the re-positioning of further column drums on the restored base. The completion of the conservation of this piece and the return to its original position is planned for the coming autumn season (2014/15). The brick encasings of all the other columns which had been opened were renewed for the further protection of these columns until they can receive conservation treatment.

A further study accompanied the conservation procedure: the testing of properties of the local sandstone in terms of its reaction to fluids.²⁶ Studies regarding the properties of local sandstone as well as the development of replacement mortars are urgently required. Hence, a beginning was made with the fabrication and testing 30 sandstone and three mortar trial cubes (base recipe with different additional sands) measuring 40x40x40mm. These trial cubes were then measured and weighed to establish their mean density. Subsequently, they were exposed to water and, after being weighed under

given environmental conditions, were dried to their original (dry) weight, their constant mass. On the base of this evaluation first conclusions were drawn regarding damage mechanisms, structural measures of stone consolidation and the development a suitable stone replacement mortar.

Within the realm of the conservation project, it was also decided to open the protective cover of one of the two column bases with figural decoration in room 108. This cover diverged in construction from the brick encasings in front of the Central Temple and it was deemed necessary to evaluate the state of preservation of the base and the effect which the sand filling of the cover had had on the object. The examination brought satisfactory results: after having been covered since the mid-1990s, the base was found to be in a good condition (fig. 13).

OTHER CONSERVATION MEASURES AT THE GREAT ENCLOSURE

Apart from measures directly linked to the planning and implementation of a visitor guidance system, additional conservation and restoration work has been taking place at the Great Enclosure, accompanying the work more directly linked to the presentation of the site. An ongoing conservation project

²⁶ This study was undertaken by Tobias Flacke.



Fig. 14: Applying a lime mortar covering to an open wall top in Complex 200; in the foreground a wall top after treatment (photograph: Juliette Brauer and Franziska Lehmann)



Fig. 15: Wall 212/215 with the protective cover of lime mortar in place (photograph: Juliette Brauer and Franziska Lehmann)

is concerned with protecting the walls of the Great Enclosure from further deterioration by water seepage. Almost all of the walls of the Great Enclosure have lost their original capping, the so-called donkey-backs i.e. sandstone blocks with a triangular section that aids water run-off to the sides of the walls. Most walls with their two-shell masonry and core of sandstone rubble embedded in earth mortar are now open for intruding rain water which erodes the earth mortar of the filling and destabilises the walls. An effective measure against this deterioration is to seal the wall tops with a layer of lime mortar that is then painted to match the colour of the sandstone blocks. The lime mortar wall covers are applied without physical intervention into the existing portions of the walls, apart from some cleaning of the wall tops from loose rubble before the application of the mortar. The new wall covers are clearly differentiated from ancient material and their application is reversible. In the 2013/14 season work in this project concentrated on Complex 200 i.e. the buildings and courtyard walls surrounding Temple 200. Altogether, more than 100m of walls received a lime mortar cover (figs. 14–15).²⁷

²⁷ This project was led by Ahmed Musa and his team of seven local workers, with input by Zaroog Mohamed



One particularly endangered wall in Complex 400 (416/406), of which only the blocks of the wall's southern face were still in situ, while the wall filling and northern face had been lost, has also received an earth and lime mortar cover as an urgent measure to prevent the pending collapse of the remaining wall.²⁸

Minor conservation measures were undertaken at Temple 300. Four carved ornaments at the temple entrance were restored by closing cracks, strengthening the stone structure and replacing lost parts where statically necessary. Eleven blocks on interior and exterior walls received treatment by closing cracks and replacing detached fragments, especially in zones where ancient graffiti are located.²⁹

Further conservation measures focused on walls 506/507-509, on rooms 507-509 and on wall 506/510W. Open wall tops were closed with lime mortar wall coverings and several wall portions which showed structural destabilisation due to missing stone blocks were filled with bricks. These portions were subsequently plastered and coloured according to the general conservation strategy applied at the site.³⁰

Apart from the protection of extant walls, minor adjustments at the site concerned the northern outer wall of the Great Enclosure (wall 224+226/N), re-erected in 1997 using bricks.³¹ Its design has now been adapted to the visual language established for restored walls within the new conservation-restoration strategy from 2006 onwards.³² Sections of the upper brick layers of the reconstructed wall were removed, thus giving the wall top an irregular stepped appearance. Its upper edge was executed showing the two sandstone masonry shells and the (reconstructed) filling between them, instead of the previous capstone-like mortar covering. An earth-coloured lime mortar sealing was applied to protect the wall from intruding rain water.³³ With this measure all of the restored enclosure walls now conform to the current conservation-restoration approach.

One major project for the 2014/15 field season concerns the fencing of the Great Enclosure, and

ideally also the Small and Smallest Enclosures. While a fence will alter the appearance of the site, damage caused by roaming animals, especially donkeys and goats, has now reached a degree that necessitates drastic measures for the protection of the building complexes. Planning for the route, the height and type of fence resulted in the decision to follow the general outline of the Great Enclosure and install a metal mesh fence to a height of 1.50m, with metal poles fastened into the ground with concrete foundations to a minimum depth of 0.50m.³⁴ Issues to be resolved concern 1) the location of the fence to the east of the Great Enclosure, along the course of the wadi, 2) the rehabilitation of the southeastern corner of the Great Enclosure, which is not visible above ground and which has been cut by an earthen, curving demarcation wall installed in the 1960s, 3) the location of the car park, which needs to be moved in accordance with the development of a visitor guidance system and a new entrance area, and 4) the re-routing of the track from the Great Enclosure to the Lion Temple. The plans concerning the fencing of the named monuments and the re-designing of the surrounding areas were presented on site to the director of NCAM, Abdelrahman Ali Mohamed, in August 2014 and approved.

REHABILITATION MEASURES AT MUSAWWARAT BEYOND THE GREAT ENCLOSURE

Rehabilitation of the area of the tourist police station³⁵

The area of the tourist police station, the first stop for visitors to Musawwarat, was cleared from building debris and other rubble, including the remains of an older square enclosure that had housed the first police checkpoint at the site (fig. 16). A new, low enclosure was constructed from bricks for the new police station (fig. 17). The visitor toilet was equipped with entrance gates that are hoped to prevent donkeys from invading the toilet area in search of shade. Additionally, repairs to the doors of individual toilet cubicles were undertaken and the floor of the building received a concrete cover. An installation by the tourist police at the Smallest Enclosure involving a pole and barrel for gaining a better telephone signal was removed.

Bakri, Claudia Näser and Cornelia Kleinitz; it took place between January and April 2014.

28 Work was led by Zaroog Mohamed Bakri, assisted by Sefian Mutukil el Tahar, in March 2014.

29 Conservation work was conducted by Sebastian Speiser and Tobias Flacke in January and February 2014.

30 This project was led by Zaroog Mohamed Bakri, assisted by Sefian Mutukil el Tahar, in January 2014.

31 Wenig 1999.

32 Scheibner and Mucha 2006, 2007, 2008, 2009.

33 Work was led by Thomas Scheibner and Zaroog Mohamed Bakri, assisted by Sefian Mutukil el Tahar, in October and November 2013.

34 Planning was undertaken by Claudia Näser, Cornelia Kleinitz, Zaroog Mohamed Bakri and Hassan Ibiédallah Abdallah in March 2014.

35 Work was led by Zaroog Mohamed Bakri and assisted by Sefian Mutukil el Tahar in March and April 2014.



Fig. 16: Re-designing the area of the tourist police station, including the removal of an unused enclosure of the first police checkpoint; in the foreground work at the kom of debris south of the Small Enclosure (photograph: Cornelia Kleinitz)



Fig. 17: The new enclosure at the police station (photograph: Cornelia Kleinitz)



Fig. 18: Installing the new gate in the fence of the Lion Temple (photograph: Cornelia Kleinitz)



Fig. 19: Flattening heaps of modern debris from the excavations in the Great Hafir by the Sudan Civilization Institute in the mid-2000s (photograph: Cornelia Kleinitz)



Rehabilitation of the Lion Temple area

The first measures in the rehabilitation of the Lion Temple in the 2013/14 season comprised in the construction of a new entrance gate at the customary car park area northeast of the temple, the repair and closure of the old gate, the partial consolidation of the fence surrounding the temple, the removal of accumulated sand from the entrance area, the closure of water gullies and the removal of the defunct explanatory sign (fig. 18).³⁶

Rehabilitation of the southeastern flank of the Great Hafir³⁷

As an initial measure alleviating the extreme visual intrusion into the site caused by hundreds of lorry loads of hafir deposit that were removed from the monument and deposited along its flanks upon initiative of the Sudan Civilization Institute in the mid-2000s,³⁸ two stretches of heaps in the immediate proximity of the Lion Temple were flattened (fig. 19). This measure sped up the process of the deflation of the mounds, which would have naturally resulted in a similar situation within several decades due to water runoff. The measure has partially re-established the view-sheds from the Lion Temple to the hafir, and from the top of the hafir to the Lion Temple, as they existed before the intervention of the Sudan Civilization Institute. It is clearer now to the observer, which mounds are part of the wall structure of the ancient monument and which are a result of the recent re-digging of the Great Hafir.

OUTLOOK

It is clear that the preservation and public presentation of the monuments of Musawwarat must be based on a concise, integrated management plan. However, the specific architectural characteristics of the Great Enclosure, its building history, the checked history of its exploration and the diverse publics visiting the site, make it an especially complex task to protect and present this monument. Consequently, planning and implementation measures have initially focused on this main component of the Musaww-

warat site. The on-site interpretive system, which is being developed for the Great Enclosure, will eventually be extended to cover a number of monuments at Musawwarat, and it will be accompanied by information material, such as a flyer and a brochure. All sets of information material will be published in Arabic and English. In addition to the information that will be available at Musawwarat itself, a project website (www.musawwarat.com) is in the process of being built and will provide in-depth information on the site and its monuments, the local community living at Musawwarat, as well as on the Archaeological Mission to Musawwarat es-Sufra, its objectives, projects³⁹ and people.

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- ³⁶ These rehabilitation measures were led by Claudia Näser, Cornelia Kleinitz and Zaroog Mohamed Bakri, assisted by Sefian Mutukil al Tahar, in March and April 2014.
- ³⁷ The project was led by Cornelia Kleinitz and Hassan Ibieddallah Abdallah in April 2014.
- ³⁸ Scheibner 2005; Scheibner and Mucha 2006; Kleinitz 2013.
- ³⁹ One project has been online already since 2011, the Musawwarat Graffiti Project led by Cornelia Kleinitz, with its open access online research archive, the Musawwarat Graffiti Archive (<http://musawwaratgraffiti.mpiwg-berlin.mpg.de/>).



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- Die einzelnen Komponenten des in der Herbstkampagne 2013 und der Frühjahrskampagne 2014 durchgeführten Site-Management-Projekts waren:
- eine übergeordnete Begehung des Fundplatzes zur Beurteilung des allgemeinen Erhaltungszustands einzelner Monumente und Fundstellen; Konservierungsmaßnahmen mit hoher Priorität wurden identifiziert und partiell eingeleitet
 - eine detaillierte Schadenskartierung der Großen Anlage, in deren Verlauf nicht nur die vorhandenen Schadensbilder erfasst, sondern auch nach ihren Ursachen und Verläufen klassifiziert wurden; diese Kartierung kann damit die Grundlage für die systematische Planung von Konservierungsmaßnahmen bilden und gleichzeitig im langfristigen Monitoring von Schäden eingesetzt werden
 - eine Besucherstudie, die Eckdaten zum Besucherverhalten in der Großen Anlage lieferte; diese Studie umfasste ein GPS-Tracking und strukturierte Interviews ebenso wie die Befragung von Wächtern, Führern und Tourismusunternehmern vor Ort und in Khartoum
 - die konzeptionelle Entwicklung eines ersten, später erweiterbaren Besucherleitsystems für die Große Anlage, das eine Wegeführung vom antiken Haupteingang im Osten der Großen Anlage durch den Komplex 300 zur Zentralterrasse und schließlich zum Site-Museum umfasst
 - die Identifizierung und partielle Durchführung notwendiger konservatorischer Maßnahmen an sensiblen Punkten entlang der geplanten Wegeführung in Vorbereitung auf die Implementierung dieses Leitsystems, um weitere Schäden zu minimieren und die Wegeführung sicher zu gestalten und visuell hervorzuheben.

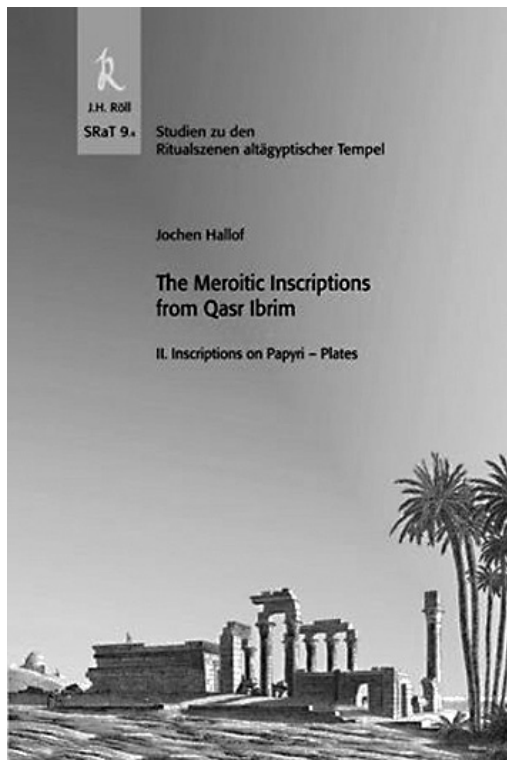
ZUSAMMENFASSUNG

Der Beitrag berichtet von den konzeptionellen Planungen und ersten ausführenden Arbeiten für die Entwicklung eines umfassenden und nachhaltigen Site-Management-Plans für den Fundplatz von Musawwarat. Die Erhaltung und Präsentation des Ortes betrachtet die Archaeological Mission to Musawwarat es-Sufra als eine vorrangige Aufgabe im Rahmen des im Herbst 2013 gestarteten Qatar-Sudan Archaeological Project (QSAP). Ein besonderer Fokus liegt auf dem Hauptmonument, der Großen Anlage, die auf Grund ihrer schieren Größe, ihrer architektonischen und gestalterischen Spezifik sowie ihrer komplexen Bau- und Erforschungsgeschichte eine besondere Herausforderung für den Schutz und die Vermittlung darstellt.

- Zu den wichtigsten bereits ausgeführten und erfolgreich abgeschlossenen Maßnahmen gehören:
- die Neugestaltung des Areals östlich der Großen Anlage, das zum Haupteingang für die Besucher entwickelt werden soll
 - die Konservierung von Mauer 117/304 im Westen von Komplex 300, durch deren Durchgang 117-304 die konzipierte Wegeführung verläuft
 - eine Pilotstudie zur Konservierung der Reliefsäulen auf der Zentralterrasse, die mit der Behandlung der Säulenbasis 8 nördlich des Eingangs zum Zentraltempel begonnen hat
 - gestalterische Maßnahmen im weiteren Umfeld der Großen Anlage, vor allem im Bereich eines großen Abrauhügels der Grabungen der 1960er Jahre südlich der Kleinen Anlage sowie bei der Polizeistation am Eingang zum Fundplatz

- die Entwicklung einer Projekt-Website (www.musawwarat.com)⁴⁰ und vorbereitende Schritte zur Erstellung weiterer Informationsmaterialien, die jeweils in Arabisch und Englisch publiziert werden sollen, um die unterschiedlichen Gruppen von Besuchern und Interessierten in adäquater Weise zu erreichen.
- Idealerweise sollen die vorgestellten Konzeptionen und Aktivitäten in Zukunft in die Entwicklung eines übergeordneten Site-Management-Plans für alle Komponenten des UNESCO-Weltkulturerbe-Platzes 'Island of Meroe' einfließen und mit diesem verzahnt werden.

40 Ein Teilprojekt, das Musawwarat Graffiti Project, ist bereits seit 2011 mit dem Open Access Musawwarat Graffiti Archive online (<http://musawwaratgraffiti.mpiwg-berlin.mpg.de/>).



JOCHEN HALLOF

The Meroitic Inscriptions from Qasr Ibrim II Inscriptions on Papyri - Plates

Studien zu den Ritualszenen altägyptischer Tempel, SRaT 9.4

Excavations have been carried out in the fortress of Qasr Ibrim since 1963 under the auspices of the Egypt Exploration Society. On behalf of the Egypt Exploration Society and Dr. Pamela J. Rose, field director of the Qasr Ibrim excavation, Dr. Jochen Hallof, Egyptologist and Meroitist at the University of Würzburg/Germany, is preparing the publication of more than 700 Meroitic texts from the excavation at this site. The edition consists of three volumes: This volume SRaT 9.1: Meroitic Inscriptions on Ostraka The first volume contains the publication of 189 Meroitic texts, among them a very important ostrakon (REM 2112) with the Meroitic figures from 1 to 900000. To appear: SRaT 9.2: Meroitic Inscriptions on Papyri (c. 300 pages and 120 plates) SRaT 9.3: Meroitic Inscriptions on wood, stone, parchment and gourd (c. 150 pages and 60 plates) An additional volume (SRaT 13; in German) will be exclusively dedicated to Meroitic numbers and fractions: SRaT 13: Das meroitische Zahlensystem.

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