

GROUND-TRUTHING AT WĀDĪ RAMM: A FOLLOW-UP TO THE 2005 GPR SURVEY

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The site of Wādī Ramm (ancient Iram) was a small Nabataean religious and trade center located in the Ḥisma region of southern Jordan. Previous excavations at Ramm have not extended beyond the temple and bath complexes in the site center, nor have they located any mortuary remains associated with these features (see Dudley and Reeves 1997; Horsfield and Savignac 1935; Kirkbride 1960; Savignac 1932, 1933; Tholbecq 1998). In 2005, we employed ground penetrating radar (GPR) at Wādī Ramm to map subsurface archaeological features in unexplored areas of the site, with a primary emphasis on locating ancient mortuary features (Perry and Jones 2005). Seven grids (Blocks A-F) totaling 8300m² were explored within the environs of the Nabataean temple and bath/villa complexes and “southern village” (Fig. 1). GPR data were collected along parallel traverses spaced at 1m intervals across these blocks. This rather coarse traverse interval was adopted to maximize horizontal coverage while still providing reasonable resolution, a compromise made because of delays resulting from logistical problems. GPR data were used to produce time-slices, or planview maps, isolating specific depths. These time-slices thus provided indications of subsurface features differing substantially from the surrounding soil matrix.

All seven blocks surveyed had GPR anomalies that were thought to express ancient architecture. Although it was often weak or poorly defined, their linear/rectilinear patterning was very suggestive of cultural origins. Six out of seven blocks also contained more discrete anomalies that could indicate graves. Furthermore, two tomb-like features were noted on the surface in Area F. In 2007 we excavated seventeen separate soundings in Areas A, D, E, F, and

G in order to explore these surface features and subsurface anomalies. Here we present some of the results of ground truthing, focusing on the utility of using GPR in desert environments to locate a variety of subsurface features.

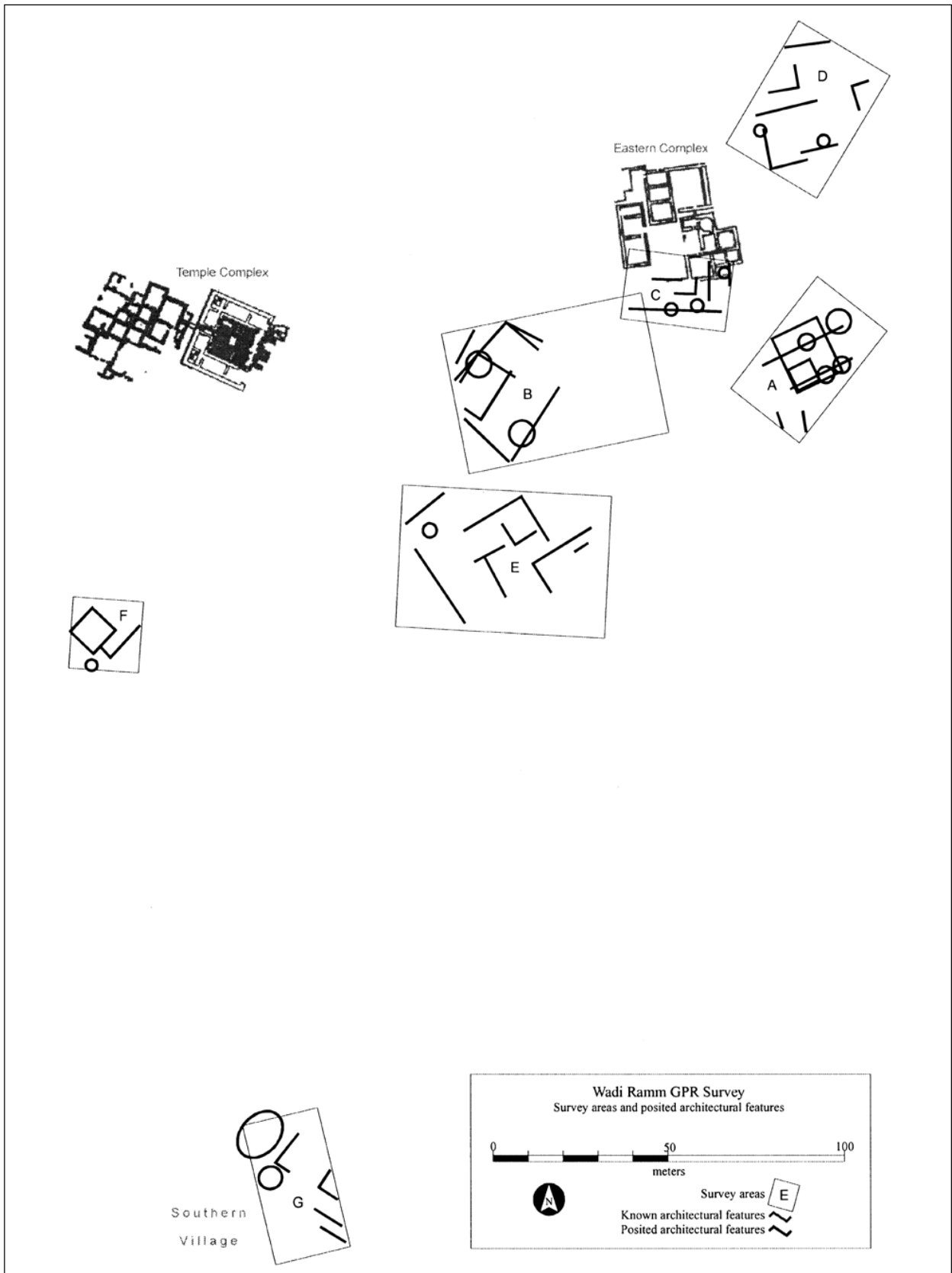
Area A

Three 2m x 2m trenches were placed in Area A, located on a slope ca. 15m east of the villa/bath complex, to explore two areas of linear patterning and two discrete reflectors possibly indicating tombs (Fig. 2). Trenches A.1, A.2, and A.3 failed to reveal any significant archaeological features. A few artifacts were recovered from the topsoil stratum in Trenches A.1 and A.2, but the subsoil layers in all trenches only contained naturally deposited pebbles and small cobbles down to 1.25m below the surface. The ceramic sherds recovered in the topsoil, primarily Early or Late Roman in date, likely were transported downslope from the first century AD villa/bath complex and adjacent structures.

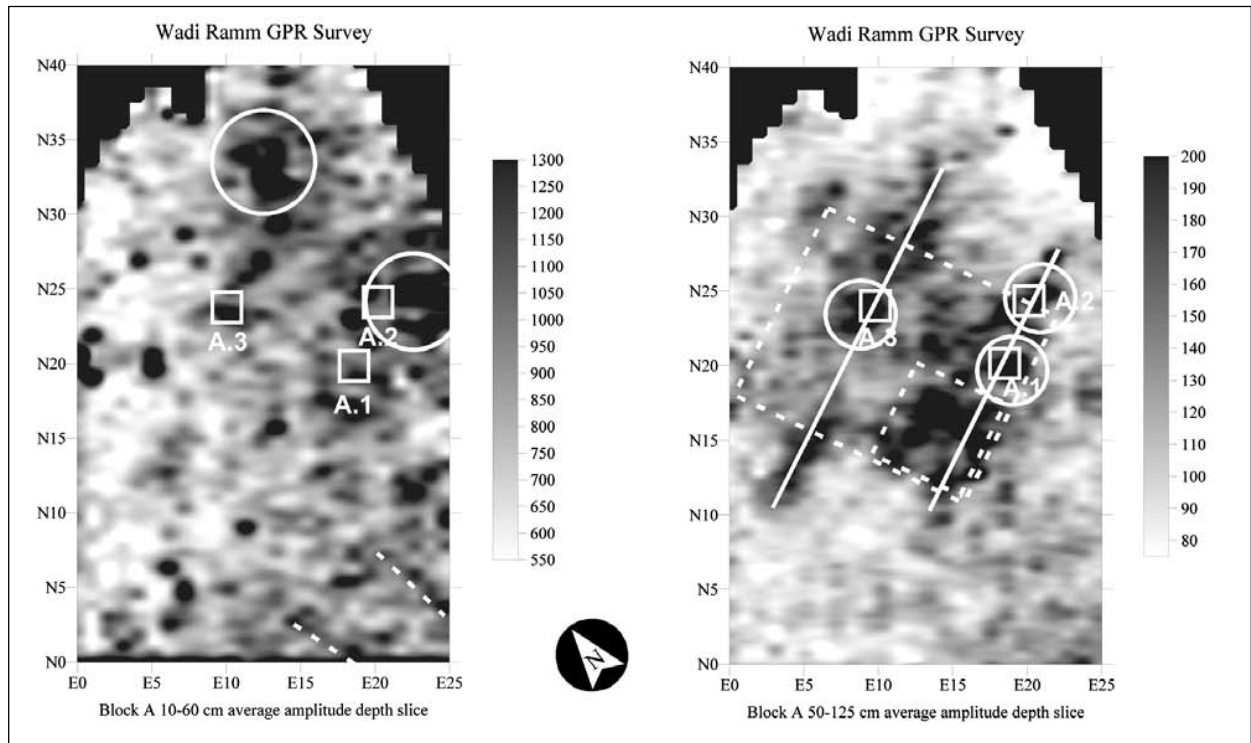
Area D

Two 2 x 2m trenches in Area D, on a slope ca. 20m north of the villa/bath complex, were established to clarify one subsurface linear anomaly and one wall feature noted on the surface (Fig. 3). No archaeological features, with the exception of the wall, were uncovered in this area. Trench D.1, similar to the soundings excavated in Area A, only contained Early/Late Roman artifacts in the topsoil layer that likely had washed down from the area of the villa/bath complex. A 0.25m layer of naturally-deposited cobbles and pebbles were identified ca. 0.25m below ground level.

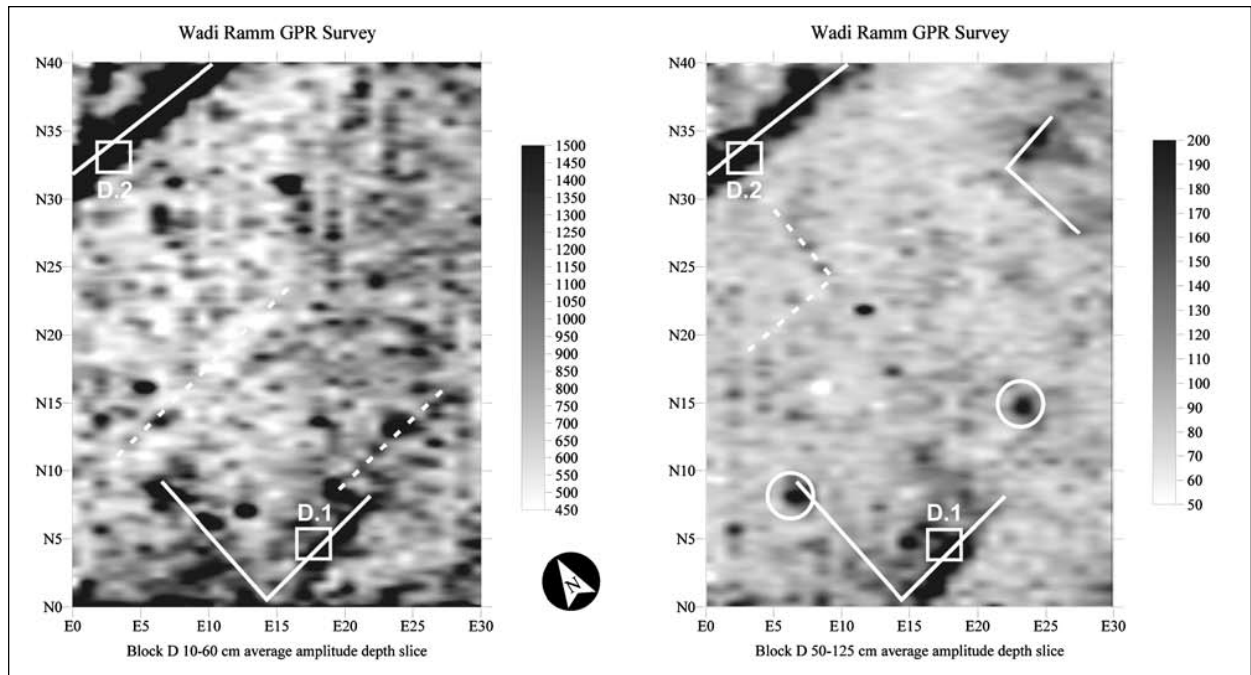
Excavation in Trench D.2 uncovered a 2.25m-long portion of a 0.75m thick and 0.63m high



1. Map of the areas surveyed showing posited and known archaeological features.



2. Time slices of Area A showing location of excavation trenches.



3. Time slices of Area D showing location of excavation trenches.

wall running approximately east to west ca. 60m north of the bath/villa complex (Fig. 4). Excavation of loose, sandy topsoil and subsoil did not uncover any surface or other features associated with the wall. No artifacts were discovered be-

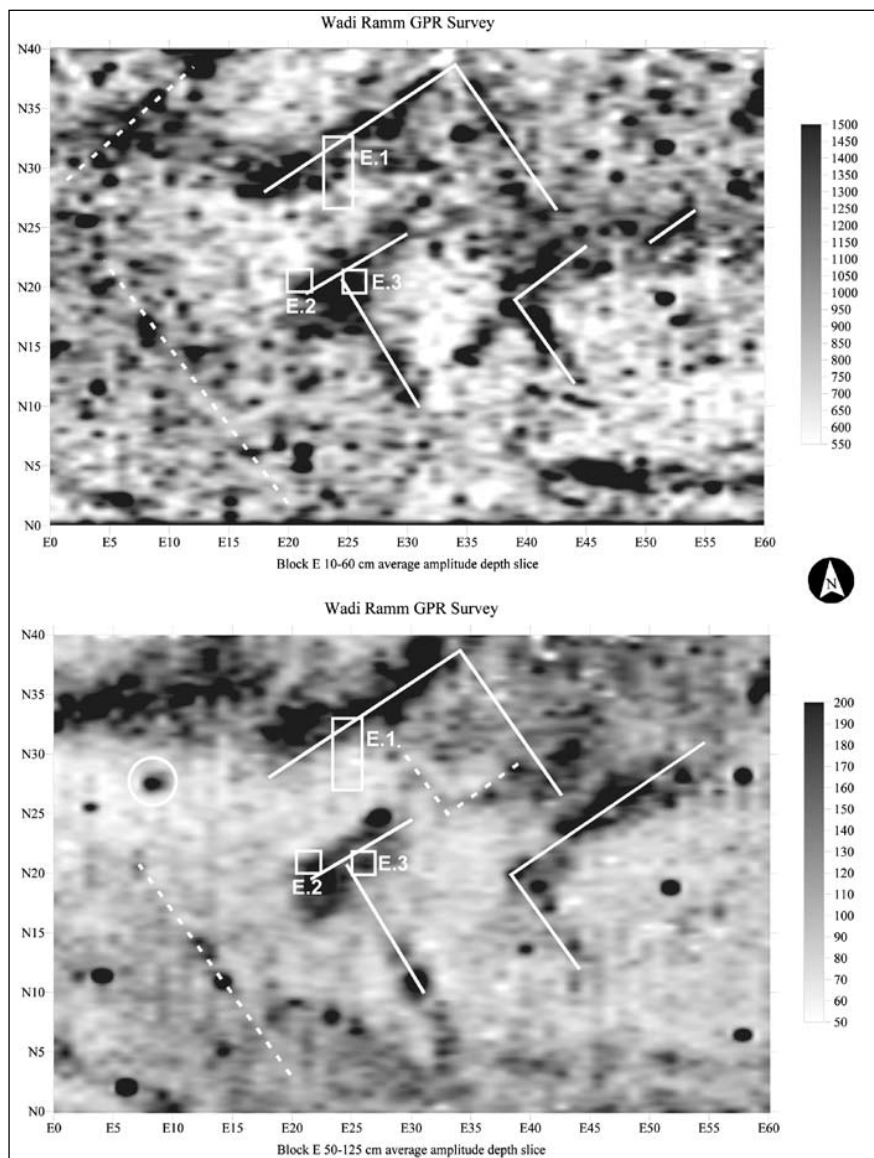
low the topsoil level, with the exception of one Early Roman/Nabataean bowl fragment. The wall may have served as a boundary marker or perimeter wall to the ancient sanctuary, but the date of the wall could not be established.



4. Wall of unknown date in Trench D.2.

Area E

Three trenches were placed in Area E, on the slope to the south of the eastern complex and temple, to investigate two linear subsurface patterns and an area of high-amplitude response extending across the northern portion of the survey area, apparently caused by fill on top of a horizontal stratum below the modern top of the landform (**Fig. 5**). Excavation in 2m x 2m Trench E.2 was halted soon after it began due to its incorrect placement in Area E. Trench E.3, also a 2m x 2m trench, contained naturally deposited cobbles and pebbles just below the topsoil. A small ash feature, possibly a hearth, was incorporated into the top layer of cobbles. Early and Late Roman ceramics were recovered from



5. Time slices of Area E showing location of excavation trenches.

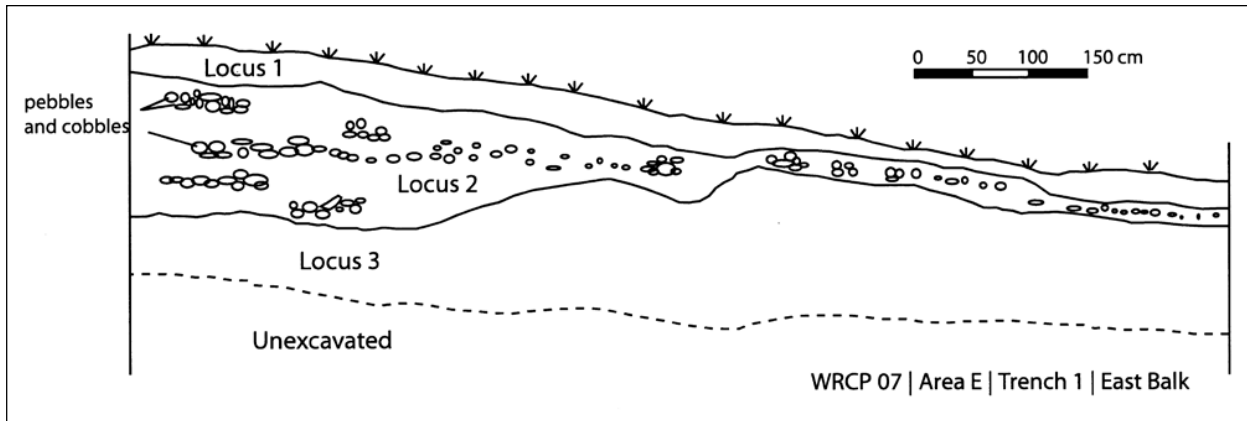
the cobble layer underneath the hearth, implying that it resulted from later human occupation in the area. Excavation in the trench ceased at 1.25m below ground level.

Trench E.1 was a 2m x 6m trench situated to explore a linear anomaly at the northern end of Area E in addition to the high-amplitude response noted above. The loose, pebbly, sandy topsoil and more compact subsoil with fewer pebbles contained very few artifacts and no architecture features. The second stratum, Locus 2, partially consisted of a thick layer of alluvial deposits concentrated on the northern end of the trench and tapering off to the south (Fig. 6). This wash/tumble layer of large pebbles and small cobbles may have resulted in the high-

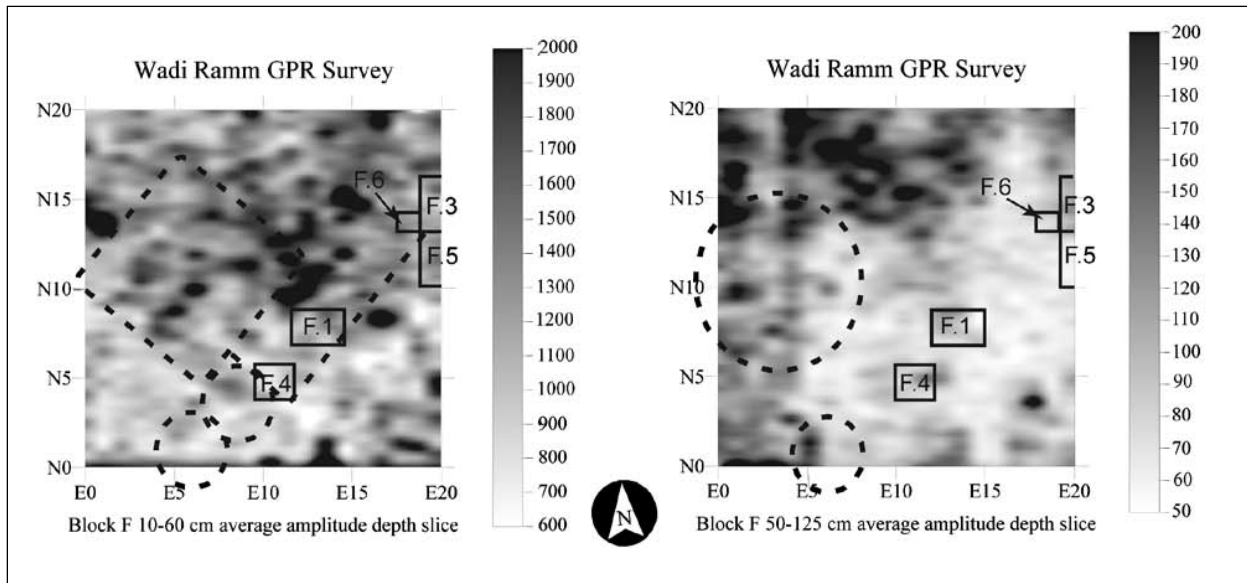
amplitude response noted above. No other features were noticed in this trench to a depth of 1.65m.

The Cemetery in Area F

Seven trenches in Area F, on a small alluvial fan ca. 100m to the southwest of the temple complex, served to explore two surface features, possibly tombs, in addition to a linear subsurface feature and a discrete anomaly at the southern end of the area (Fig. 7). Three trenches uncovered two primary, single burials, and four trenches uncovered a monumental tomb located just outside of the eastern edge of the GPR survey area. One trench did not reveal any evidence of archaeological features.



6. East section in Trench E.1 showing layer of cobbles and pebbles possibly picked up by the GPR.



7. Time slices of Area F showing location of excavation trenches.

The Cist Tomb in Trench F.1

The 2m x 3m Trench F.1 was situated to investigate a surface feature resembling the corner of a cist tomb noticed in 2005. Removal of the loose topsoil revealed a cist tomb constructed with partially worked sandstone slabs containing a poorly preserved adult individual (Fig. 8). The top of the western end of the 0.20m high cist tomb was located ca. 0.20m under the modern surface, while the southern end was exposed. The 10-60cm GPR slice does not indicate any anomaly representing the cist tomb structure, however.

The cist tomb contained a single, very poorly preserved individual surrounded by medium compact sandy fill. The sandstone slab at the foot of the grave was decorated with 10 circular impressions arranged into two rows. A small blue glass bead (RO #07.1) was recovered from within the fill above the body. The bones in this grave had been mostly replaced by small rootlets, with the exception of the dentition and a few parts of the lower limbs, prohibiting any assessment of sex or age beyond identifying this individual as an adult. Despite the poor preservation, a few observations could be made. This person was interred on his/her back, with legs and arms extended, and the skull slightly facing the north. Just to the right and above the head, a small glass bowl was discovered *in situ*, although taphonomic processes had broken it into numerous small fragments. The entire body apparently was covered with leather (RO #07.14), upon which some textile impressions could be seen. Nine iron spear points (RO #07.2-07.10) were recovered to the right of the pelvic region and upper leg, which apparently had been hafted on to wooden spears that were not preserved in the burial environment (Fig. 9). Further investigation of the spears and glass will provide a date for the burial, although the body orientation and an Early Roman/Nabataean body sherd in the grave fill implies that the burial dates between the Early Roman/Nabataean and Late Byzantine/Early Islamic eras.

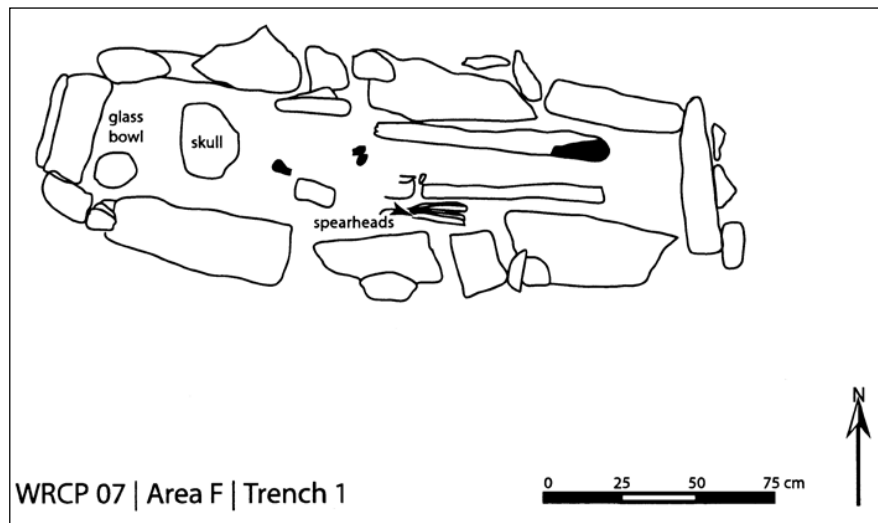
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The Monumental Tomb in Trenches F.2, F.3, F.5, and F.7

Four 3m x 3m trenches, F.2, F.3, F.5, and F.7 were laid out to explore another surface feature resembling a tomb that was noted during the 2005 season. This tomb was not included within the area explored by the GPR in 2005. It was apparent at the beginning of the field season that this structure had been significantly disturbed through human activity since it was last visited in 2005; local informants stated that the robbing



9. Spear point (RO#07.10) recovered from cache in Trench F.1 burial.



8. Burial in Trench F.1.

had occurred during the past two months (**Fig. 10**). Most of the disturbance involved displaced ashlar blocks from the upper sections of the structure, in addition to the lifting of sandstone pavers and excavation beneath the floor level.

Excavation revealed the plan of a large partial cruciform-shaped tomb structure measuring almost 5m N-S by 5m E-W (**Fig. 11**). The tomb consists of a square central room with rectangular 2m X 2m rooms off to the north, west, and south, all constructed from sandstone ashlar blocks sitting on a cobble foundation (**Fig. 12**). The northern room was divided with a ca. 0.18m wide sandstone block that provided a double repository. The northern and southern rooms and the central area were paved with sandstone paving stones. Portions of these paving stones

in the western room and the eastern sector of the central room had been removed by looters. Remnants of plaster adhering to the divider of the northern room suggest that the interior of the tomb had originally been covered in plaster.

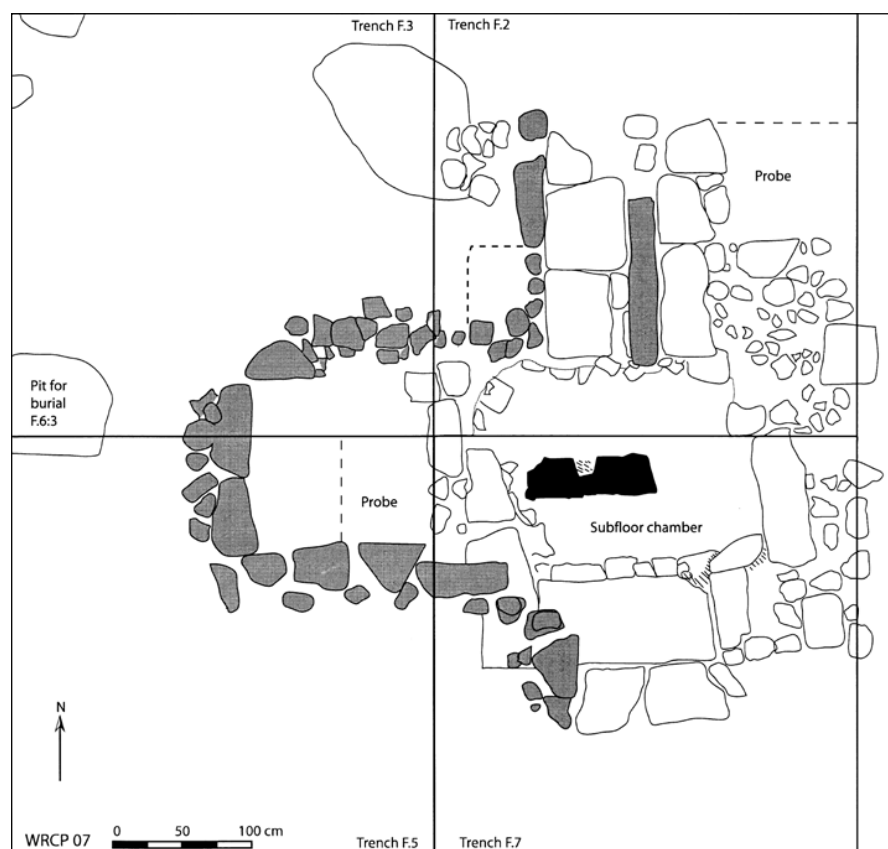
The paving stones in the central room originally covered a ca. 1.5m E-W x 1.10m N-S chamber. The interior face of the chamber was constructed with ashlar sandstone blocks with the exception of the northern side, while the outside portion consisted of unfinished cobbles. The chamber itself is divided into two E-W compartments (southern compartment = 0.52m wide; northern compartment = 0.35m wide) by a single row of ashlar two courses (0.48m) tall. The eastern section of this divider was not *in situ*. The southern compartment and the east-



10. Before and after pictures of the monumental tomb in Trenches F.2, F.3, F.5 and F.7 showing recent disturbance.



11. Monumental tomb in Area F (view to the S).



12. Plan of monumental tomb in Area F.

ern end of the northern compartment contained disturbed soil that included cobbles in addition to ceramics and disturbed human and faunal skeletal remains. The western end of the northern compartment on the other hand contained homogeneous sandy fill with no artifacts. The subfloor chamber thus was robbed, likely first in antiquity, and the tomb robbers discovered that only the northern compartment was devoid of artifacts and skeletal remains once they removed part of the ashlar divider. That the ashlar blocks of the divider were only finished on their southern side, i.e., facing the southern chamber, providing further evidence that only the southern compartment was used for burial. The minimum number of individuals (MNI) recovered from this tomb is three [one subadult and two adults (a 20-30 year-old, and an old adult)], although the original number might have been higher before tomb erosion and robbing.

The pattern of ashlar finishing and the style of the tomb suggests that it originally was partially or mostly underground. The walls of the tomb only contained finished ashlar blocks on

their internal surface, but the outer side of the wall was only constructed of rubble fill. The alluvial fan presumably has eroded since the tomb was constructed, but we can see that the foundation walls surrounding the subfloor chamber and supporting the central room are slightly deeper on the eastern end (1.03m) than the western end (0.65m) to accommodate the ancient slope. The entrance to the tomb likely was through its highly degraded eastern end that once may have contained a doorway built into the slope.

Little evidence remains to establish the date of this tomb. Local informants report that similar tombs were discovered in the 1960s near the modern Islamic cemetery and village road, possibly the mysterious tombs uncovered by the Department of Antiquities in the 1960s that originally initiated our search for the cemetery at Ramm. The disturbed soil within the tomb contained Early and Late Roman ceramics, including the remains of utilitarian jugs and cooking pots, and a lamp fragment currently under investigation. The ceramics from the cemetery strictly date to the Nabataean and Roman peri-

ods, suggesting that this tomb and the other excavated graves also date to this period.

The Burial in Trenches F.3 and F.6

Another burial with similar preservation to the one in Trench F.1 was discovered at the western end of Trench F.3 and in Trench F.6. The burial was placed in a simple pit 1.0m E-W x 0.60m N-S covered with oblong, unshaped capstones ca. 0.28m thick and 0.70m long. The section between Trench F.3 and Trench F.6 showed that the pit had been dug into the compact subsoil, which had been overlain with the extant sandy topsoil. Only ca. 0.20m of topsoil existed above the pit cut, suggesting, like the other tombs, that the ancient surface had been much higher and has eroded since the Nabataean/Roman period.

The grave contained the remains of a single individual interred on his/her left side in a tightly flexed position with the head to the west and facing north (**Fig. 13**). The preservation of this adult individual resembled the burial in Trench F.1, with most of the bone replaced with small



13. Burial in Trenches F.3 and F.6.

rootlets. Poor preservation hindered any detailed demographic assessment beyond an adult of unknown sex. Some textile impressions, possibly from a burial shroud, were observed on some of the skeletal remains. Some of the bones appeared to be carbonized by exposure to low-intensity heat source, and small patches of ash were noted around the skeletal remains. A small bowl constructed of pieces of wood held together with bronze fasteners was discovered in the pit fill ca. 15 cm above the head (**Fig. 14**). No other artifacts, including secondary ceramic sherds, were discovered in the burial fill.

Trench F.4

Trench F.4, measuring 2m x 2m, was placed at the southern edge of the area to explore a discrete reflection noted in the GPR results. A 1m x 1m probe was placed in the southwest corner of the trench to try and uncover features that may have resulted in the observed GPR reflection. Excavation of this probe uncovered successive layers of naturally deposited strata to a depth of 1.25m below the surface. A number of large cobbles were uncovered at that level in the probe that may explain the GPR results in this area.

The Nabataean Village in Area G

Eight trenches in Area G, the area of the “southern village,” were laid out to investigate several linear anomalies picked up by the GPR



14. Fragments of wooden bowl with copper fasteners in situ above the burial in Trenches F.3 and F.6.

in addition to surface architectural features (**Fig. 15**).

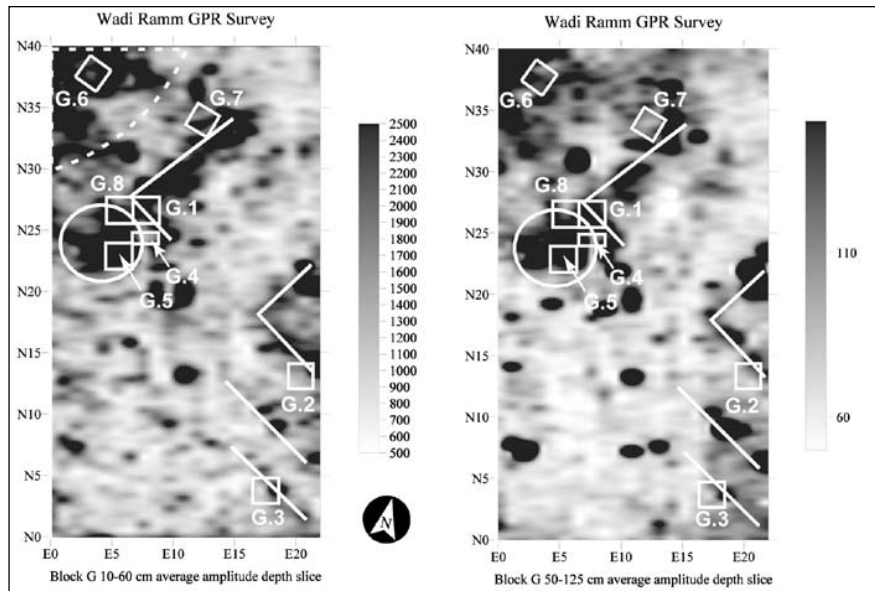
The Wall in Trenches G.1 and G.8

A 2m x 2m trench, Trench G.1, was placed to explore a linear anomaly noted in the GPR results. Excavation revealed a 1.30m thick wall constructed of unworked cobbles running north-east to southwest. Another 2m x 2m trench, Trench G.8, was placed to the west of G.1 to uncover the continuation of the wall in G.1, and to see if it cornered to the southeast, as suggested by the GPR data. In this trench the wall continues to the southwest instead of cornering to the southeast (**Fig. 16**). The wall was preserved at a height of 1.25m in both trenches. No clear floor or surface associated with the wall was dis-

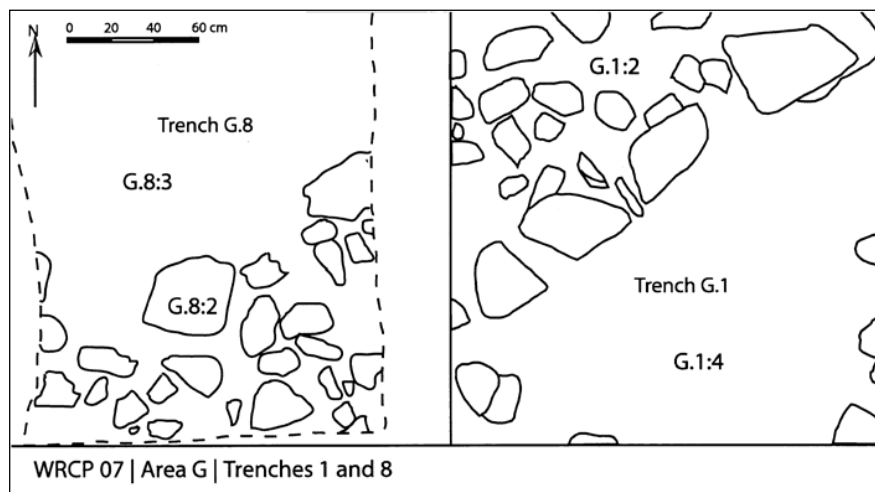
covered, however the wall was surrounded by a layer of ashy, silty soil that contained a large number of artifacts, likely occupational debris. Datable ceramics from this stratum date strictly to the first century AD according to preliminary analyses.

The Room in Trench G.6

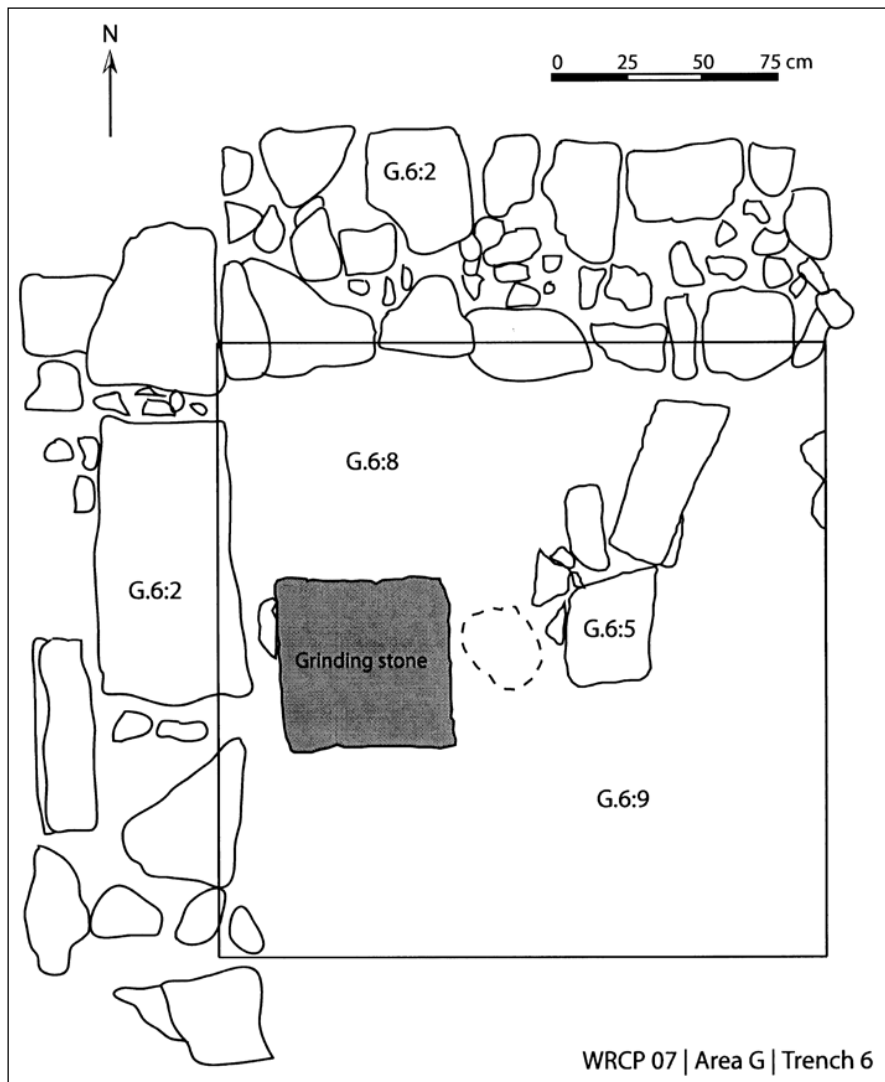
The 2m x 2m trench G.6 was placed within an area bounded to the west and north by two bonded walls visible on the surface. These two walls, running approximately N-S and E-W, were constructed from unworked cobbles and boulders. The room contained a beaten earth floor, upon which was constructed a small curved 0.35m wide feature separating the NW corner from the rest of the room (**Fig. 17**). A 0.55m wide grind-



15. Time slices of Area G showing location of excavation trenches.



16. Wall in Trenches G.1 and G.8.



17. Plan of the room in Trench G.6.

ing stone was built into the southern part of the feature, which suggests that this room was used for food preparation and perhaps storage. Numerous ceramics were discovered along the northwestern wall and within the corner enclosure, all dating to the first and early part of the second century AD. The ceramic corpus from this small trench contained 24 unguentarium fragments, mostly from different vessels, perhaps suggesting that the room was used for production of oil or other liquids in addition to domestic activities.

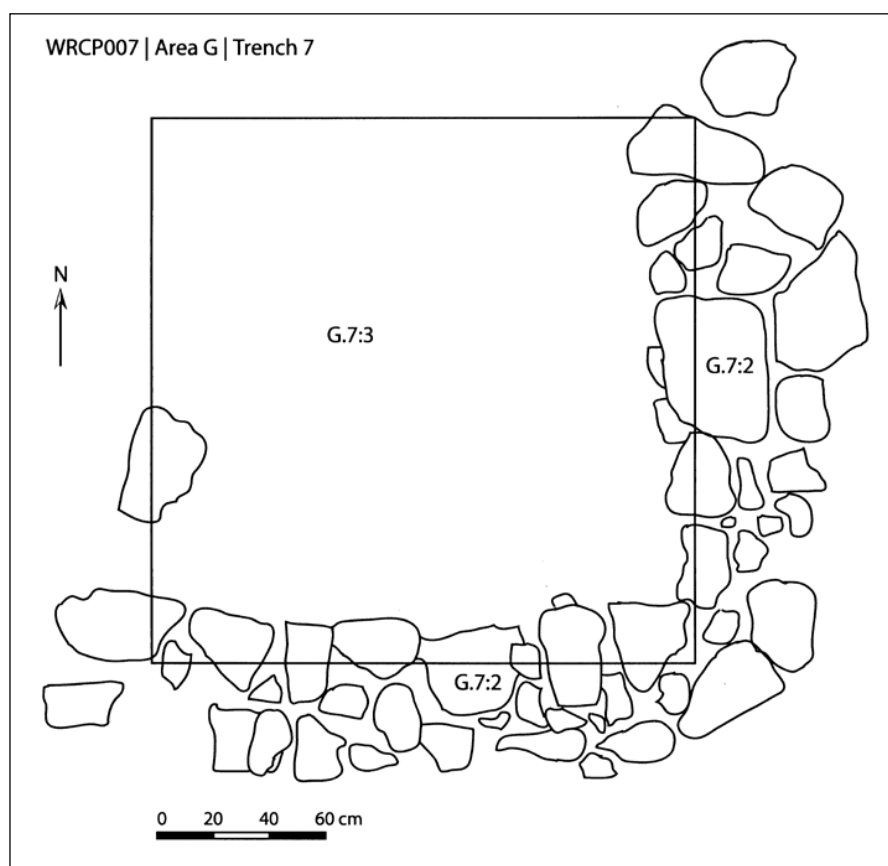
The Room in Trench G.7

Trench G.7, a 2m x 2m trench, was placed within the southeastern corner of another room in the “southern village”. This corner of the room was bounded by two visible walls running

E-W and N-S and constructed using unworked cobbles and boulders, similar to the other walls in this area (**Fig. 18**). As with Trench G.6, this room had a floor of beaten earth. Ceramics associated with the single phase of occupation date to the late first and early second centuries AD. No evidence for the function of this room was noted.

Occupational Layers in Trenches G.2 and G.3

Excavation of the 2m x 2m Trenches G.2 and G.3 uncovered only one layer possibly associated with human occupation along with naturally deposited soil layers containing no artifacts. Most evidence for human occupation in the area comes from a ca. 0.20m thick, extremely ashy and silty layer. This stratum contained many animal bones and almost purely first century AD



18. Plan of the room in Trench G.7.

ceramics, and is probably with the architecture uncovered in the rest of the area. A small hearth constructed of small cobbles was discovered on top of this layer in Trench G.3, which may have produced the shallow circular anomaly at N3/E19. Neither of these trenches, however, contained architecture or anything that could have resulted in a linear anomaly in each trench.

Previous Excavation Soundings in Trenches G.4 and G.5

The area of Trenches G.4 and G.5 was selected for excavation due to a large rectangular/L-shaped anomaly noticed in the GPR results. The GPR apparently detected backfill from unpublished soundings excavated by Tholbecq due to the soil and compaction differences between these backfilled trenches and the natural strata.

Discussion

GPR was utilized to identify the Nabataean cemetery and other subsurface archaeological features at Wādī Ramm. In a few cases, the GPR clearly identified subsurface features, such

as the capstones covering the grave in Trenches F.3 and F.6, and the stone wall running diagonally across Trenches G.1 and G.8. The GPR additionally picked up architectural features partially visible on the surface in Trench D.2, and in Trenches G.6, and G.7, and the back-filled excavation trenches in Trenches G.4 and G.5. However, the GPR failed to pick up the cist tomb structure in Trench F.1. The physical properties of the sandstone slabs used to construct the cist did not differ significantly from the surrounding sandy strata, and therefore were undetectable by GPR. The walls in Trenches D.2, G.1, G.6, G.7, and G.8 were constructed primarily of uncut granite stones held together with clay mortar, which the GPR differentiated from the surrounding sand. Builders of many of the walls in the Wādī Ramm area preferred granite over sandstone (see also Rollefson and Matlock 2007: 212); therefore, GPR would effectively identify these structures in this context. On the other hand, it would not pick up features constructed of sandstone, such as many of the paving stones utilized at the site, or cist tombs

similar to that in Trench F.1.

Additionally, in many cases the GPR provided false positive results. Excavation of Trench F.4 to explore oblong, grave-like subsurface anomalies and of Trenches D.1, G.2, and G.3 to confirm linear reflections did not turn up any evidence of occupation or anthropogenic features. Trenches in Areas A and E produced similar results. The evidence from Block D demonstrates the difference between very unambiguous patterning explored by Trench D.2, which uncovered a wall, and weak patterning near Trench D.1. The GPR could be picking up changes in natural stratigraphy in the latter example. The natural strata in D.1 included a ca. 0.35m thick deposit of pebbles and cobbles surrounded by sterile sandy layers. These strata did not appear to be associated with human activity or occupation, and were almost completely devoid of artifacts, unusual at a Nabataean site. The other trenches with false positive results had similar deposits.

Despite the above issues with ground-truthing of the GPR results, the 2007 excavation season shed light on the extent of occupation of the ancient site of Iram. Soundings in Areas A, D, and E discovered that structures related to the main religious, social, and political center of the site do not extend far beyond the top of the alluvial fan. The well-constructed, but undated, wall in Trench D.2 may be contemporary with the temple and bath complexes on top of the rise.

The date and function of the “southern-village,” located ca. 150m south from the temple and bath, was also confirmed through excavations within Area G. The ceramic and stratigraphic evidence from the two partially excavated rooms and the outlying areas suggest that the village had a single period of occupation during the first and possibly into the second century AD. This occupation is contemporary with the last building phase of the temple, originally constructed in the first century BC (Tholbecq 1998: 245-246), and may slightly post-date construction of the villa and bath in the Eastern Complex (Dudley and Reeves 1997: 99). The relationship between the domestic structures and the temple and bath/villa complexes remains unclear, and the flexible chronology provided by the ceramic dates cannot clarify the sequence of construction.

The abandonment of the domestic structures at Ramm, probably in the second century AD, appears to have occurred concomitant with desertion of the temple. Continued study of the ceramics, faunal remains, and archaeobotanical evidence will illuminate the trade networks and diet of this community. Many parallels exist between it and Khirbat adh-Dhariḥ, a Nabataean religious and economic center north of Petra (see Al-Muheisen and Villeneuve 2005). The Dhariḥ sanctuary appears to have been constructed before the domestic structures, similar to the purported sequence at Ramm. It is possible, as these sites grew more religiously and economically important, that more people were needed to perform subsidiary duties for the temple, in addition to engaging in market transactions and possible domestic-based production. This drew a permanent population to these religious and economic centers.

The 2007 excavations additionally discovered what appears to be a first century AD cemetery contemporary with occupation at the site. The two primary, intact burials were positioned slightly differently, but both were facing north, which, incidentally, is the direction of the temple. Mourners placed importance on including objects within the graves, including a set of weapons and a glass bowl in one, and a wooden bowl in the other. The monumental tomb at Ramm unfortunately was extremely deteriorated and ransacked, making it difficult to discover anything regarding the individuals in the tomb, local mortuary practices, or the tomb superstructure.

Summary

The 2007 season of the Wādi Ramm Cemetery Project discovered evidence of a pre-Islamic, likely Nabataean or Roman, cemetery on the alluvial fan between the temple area and the “southern village”. It is anticipated that this area contains additional, as yet undiscovered tombs. Numerous local informants furthermore remarked that communal tombs similar to the one in Area F had been uncovered during construction of the main modern village road and new cemetery. Therefore multiple cemeteries, including the one in Area F, may have been utilized during Nabataean and Roman occupation of the site. The date of the southern village ex-

plored by Tholbecq also was confirmed through further excavation this season. Test trenches excavated around the temple and related complexes furthermore discovered that this sector of the site does not extend much beyond the excavated areas, a finding important for further development of the region. This investigation demonstrated that linear/rectilinear patterning in geophysical results — often considered to be diagnostic of cultural features — should be interpreted cautiously, for linear natural deposits can mimic architectural features. It is possible that survey at higher resolution (closer sample intervals) may have made it possible to better distinguish between natural and cultural features. Finally, the GPR results may be elucidated by any future excavation within the survey areas; comparison of excavation results and geophysical data can inform geophysical interpretation and help to extrapolate excavation results.

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