

# URBAN LIFE IN THE HIGHLANDS OF CENTRAL JORDAN: A PRELIMINARY REPORT OF THE 1996 TALL MĀDABĀ EXCAVATIONS

by

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## Introduction

In the modern Middle East, with its long history of urbanism, the consequences of urban continuity present a daunting challenge to archaeological research. The city of Mādabā, located 30 km southwest of 'Ammān amidst the fertile rolling plains of the Central Jordan Plateau, represents a case in point. Continuing an urban tradition of some 5,000 years, the modern town engulfs the ancient settlement, preserved in the form of a large low-lying *tall* and acropolis that still forms a visible rise in the town center. Nevertheless, Mādabā's historical prominence necessitates a thorough assessment of its role in the long and eventful history of the Central Highlands of Jordan.

The Tall Mādabā Archaeological Project (TMAP) was initiated with the goal of pursuing this investigation. By focusing on the central site of Mādabā, the project aims to expand an emerging regional database, and facilitate analysis of the changing economic and socio-political organization of communities on a regional level, thereby enhancing our ability to chart the dynamic development of social complexity in the region. The first field season of the Tall Mādabā Archaeological Project was held between July 28 and August 31, 1996.<sup>1</sup>

## Research Objectives

The Tall Mādabā Archaeological Project constitutes part of a broader, ongoing regional research effort that is investigating the range of adaptive strategies and social institutions developed by human com-

munities in the semi-arid Central Highlands of Jordan, a geographical area distinguished by its climatic variability and environmental diversity. Drawing on the historical perspective that the archaeological record represents, this effort seeks to achieve the following research objectives: (1) document the changing subsistence strategies of specific communities over time; (2) identify the underlying social factors that may have influenced decision making processes; and (3) assess the impact adaptive responses have had on the fragile balance critical to maintaining ecological equilibrium—and long term viability—in a marginal, or transitional, environment.

Within this broader research framework, TMAP was initiated for the primary purpose of gathering archaeological data from the presumed urban center of a regional settlement network for comparison with existing data sets from comparable contexts (e.g. domestic/residential, administrative/public, etc.) at rural village sites in the region. In order to test prevailing theories about the development of centralized urban institutions and the rise of early state-ordered societies in the southern Levant, this initiative seeks to address the following research questions: (1) Did subsistence practices become less diversified, emphasizing strategies that intensified production and maximized crop yields; (2) Did animal husbandry efforts intensify, shifting toward the market exchange of animal products; (3) Did craft industries (primarily ceramic and lithic) develop from dispersed household production levels into

1. The project field staff consisted of the lead author, Dr Stephen H. Savage, Scott Banting, Robert Harris, Brett McClain, Steven Megibow, Jamie Szudy, Ja-

son Ur, Justine Way and Anne Yanaway. They were joined by Abdullah al-Khraisat of as-Salt. Reem Shgour represented the Department of Antiquities.

larger-scale more centralized configurations; (4) Were redistributive exchange systems replaced by market-oriented ones; and (5) Did an organizational shift occur in social structure away from an emphasis on kin-based extended family networks? To facilitate this longer-term research effort, the 1996 field season was designed specifically to (1) delineate and map the topographic extent of the pre-classical site, (2) establish a stratigraphic profile of the Bronze and Iron Age levels of the lower *tall*, and (3) assess the feasibility of conducting systematic excavations at the site.

### Site Topography (Stephen H. Savage)

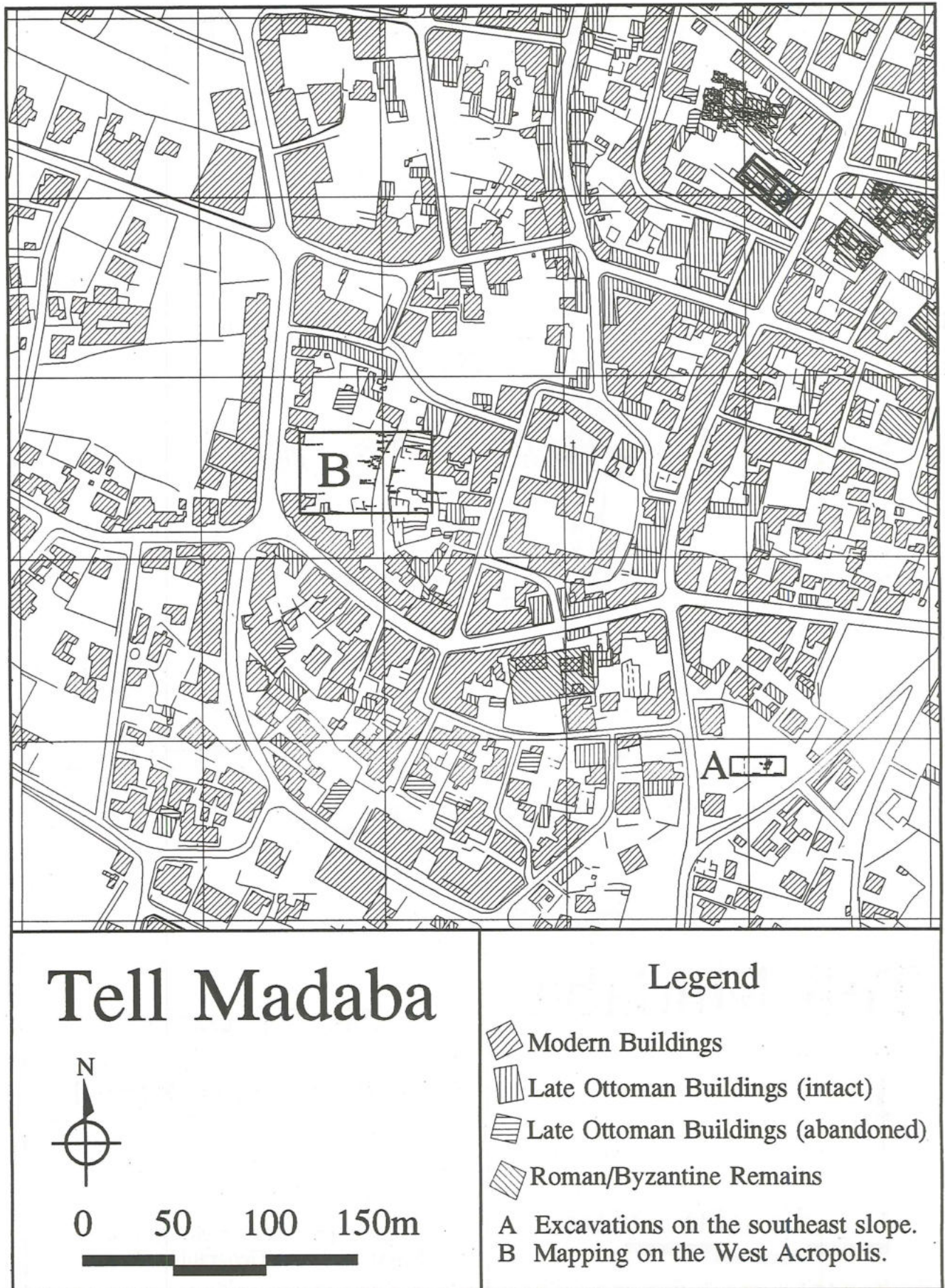
An important outcome of the 1993 surface survey of Mādabā (Harrison 1996; 1997a), conducted as part of the USAID-funded effort to develop an archaeological park along the Roman/Byzantine *cardo*, was the creation of a digitized base map (at 1:1250 scale) of the modern town (Fig. 1). Given the occurrence of modern urban development atop the ancient settlement, Geographic Information Systems (GIS) technology has provided an invaluable research tool in our efforts to isolate, define and categorize the complex spatial data we have encountered. While first implemented in 1993, the GIS solution adopted for Tall Mādabā has evolved over the course of several field seasons, and has resulted in the development of a single computerized database for the entire urban core of Mādabā. The Mādabā database remains unique in Jordan. It was designed not only to assist ongoing and future archaeological research, but also to serve as a cultural resource management tool to aide in municipal urban planning, and thus help reduce the impact of Mādabā's explosive development on its world-renown archaeological treasures. Begun in Arc/Info, later exported to AutoCAD, and finally imported into ArcView, the TMAP GIS stores data at two basic levels of spatial analysis: (1) the urban core of Mādabā itself, and (2) the larg-

er surrounding Mādabā Plain.

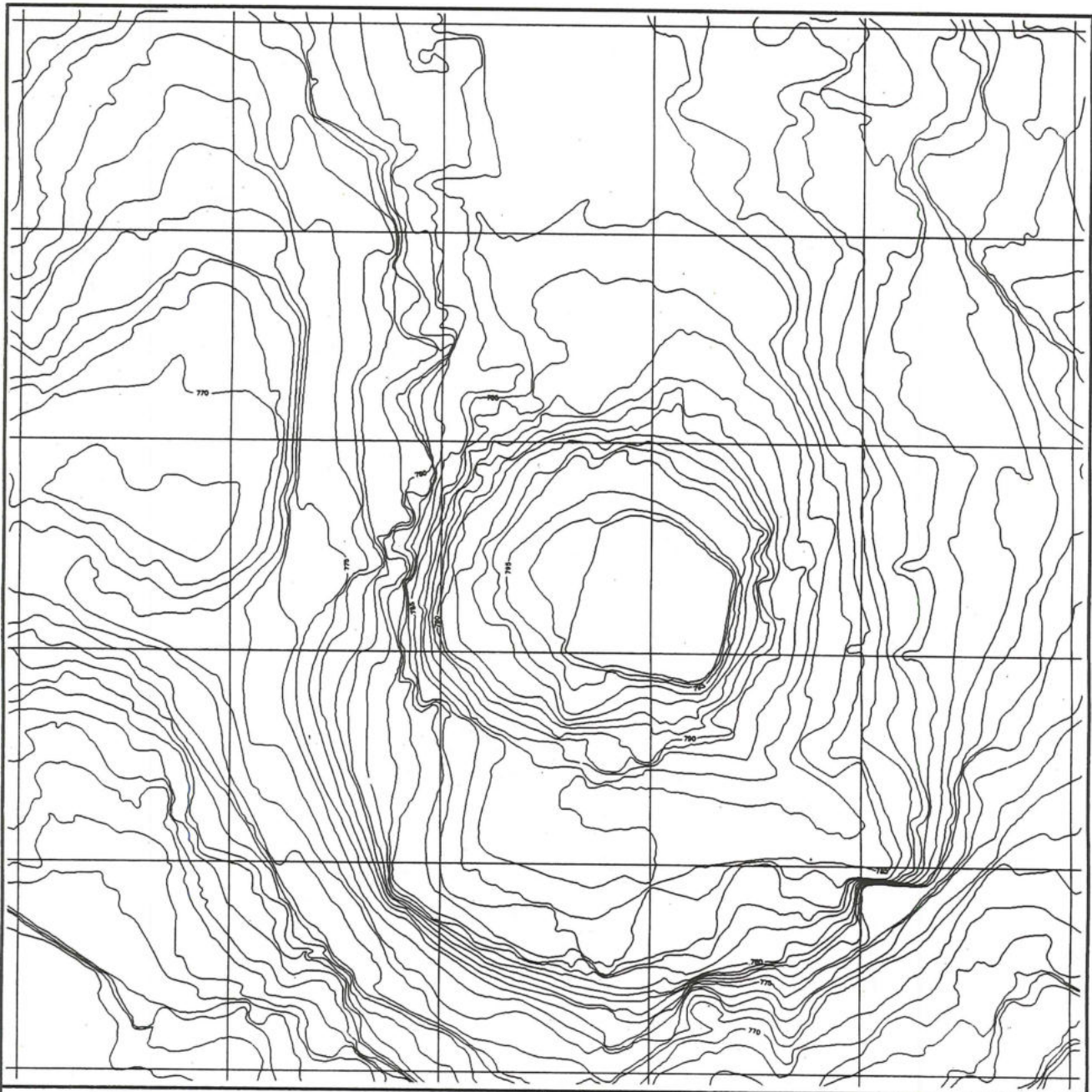
Tall Mādabā is contained within a 500 X 500m square. In conjunction with the 1993 surface survey, a computerized map of the urban core of Mādabā was created in Arc/Info at 1:1250 scale. The topographic data were initially provided by the Royal Geographic Centre of Jordan, in 1m contours. Topography, roads, ancient and modern architecture were recorded on separate thematic layers by InfoGraph of 'Ammān, forming the base map published in Bikai and Dailey (1996). The data were then provided to TMAP during the 1996 field season, and converted to AutoCAD format so that a laptop computer could be used in the field to add the results of our test excavations and mapping directly to the Mādabā town plan. The existing data were joined with layers detailing archaeological features and cadastral data during a study season in 1997.

In order to better understand the underlying landform of the Mādabā town site, the structures, streets, and other features were removed from the base map in AutoCAD (later ArcView), revealing the form of the ancient *tall*, as it now exists (Fig. 2). The topographic layer this produced became the basic site plan upon which archaeological data were superimposed.

Archaeological data, consisting of ceramic counts and the locations of exposed ancient architecture and midden deposits collected during the 1993 surface survey (Harrison 1996), were applied to the base map in order to examine the spatial development of the site over the course of its history, and help develop plans for future excavations. Ceramic data from the survey were entered in a table, including the 50 X 50m collection square, the total number of sherds, and the number of diagnostic sherds for time periods from the Early Bronze Age through the Late Ottoman period. Figure 3, for example, shows the distribution of Early Bronze Age ceramics to be confined primarily to the slopes of the lower *tall*. This



1. Digitized base map of the urban core of Mādabā (1:1250 scale).



# Tell Madaba



0 50 100 150m

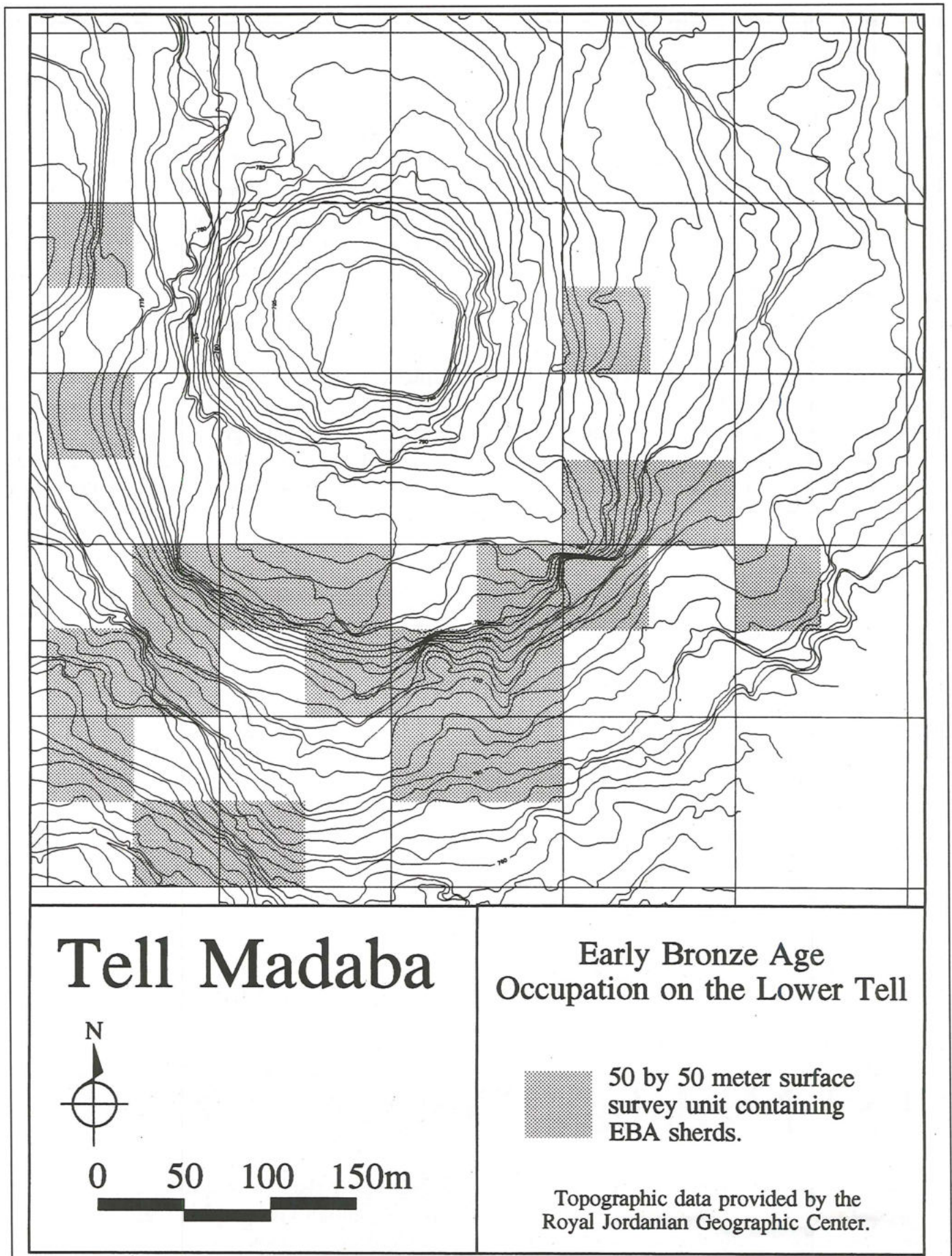


Site Topography

One Meter Contour Intervals.

Topographic data provided by the  
Royal Jordanian Geographic Center.

2. Topographic relief map of Tall Mādabā.



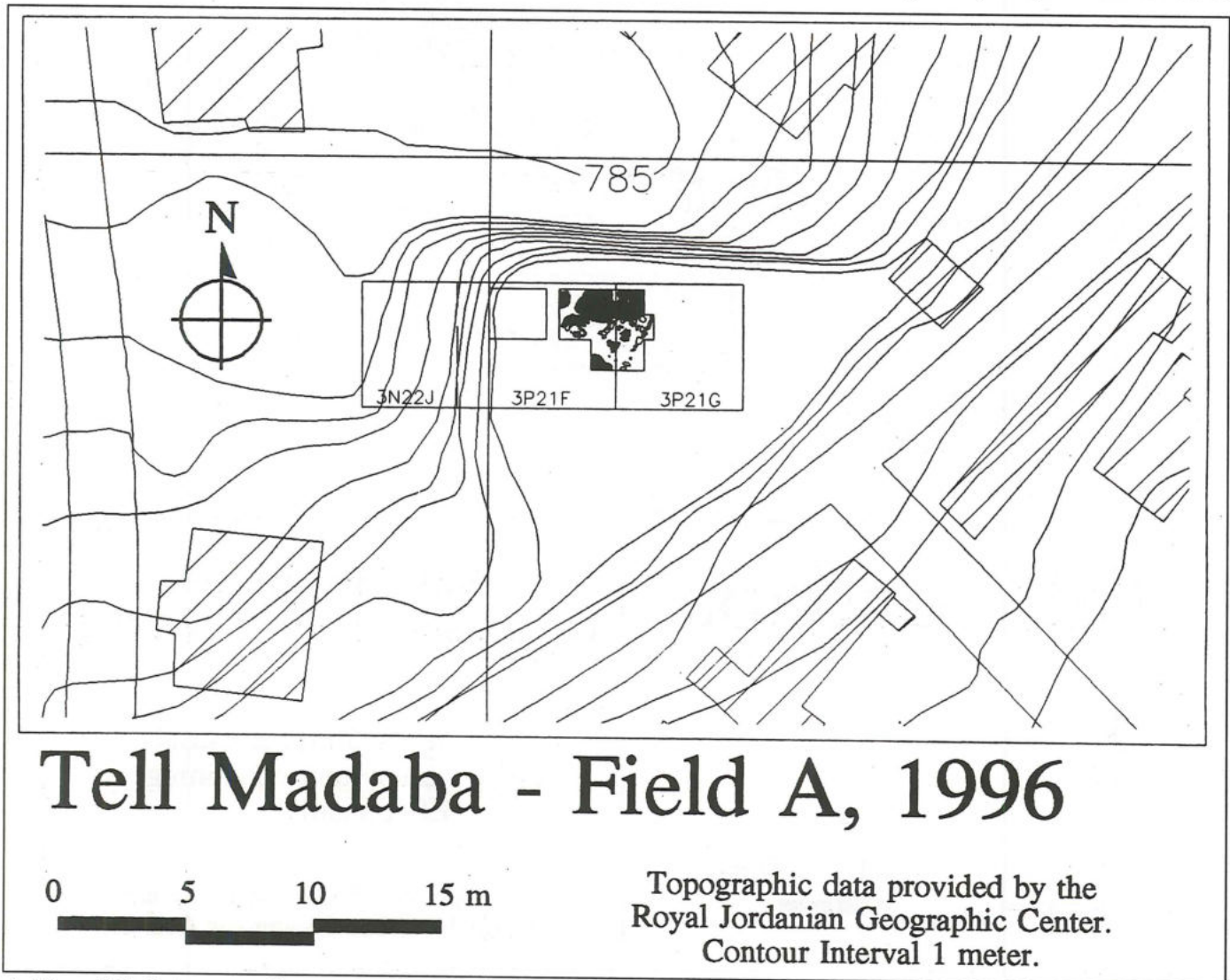
3. Early Bronze Age sherd distribution over the surface of the tell.

distribution pattern was particularly helpful in identifying a specific area of the *tall* (Field A) with the potential to provide a substantial horizontal exposure of this early phase in the site's occupational sequence. Excavations in Field A, conducted during the 1996 field season (see below), subsequently confirmed the results of the surface survey.

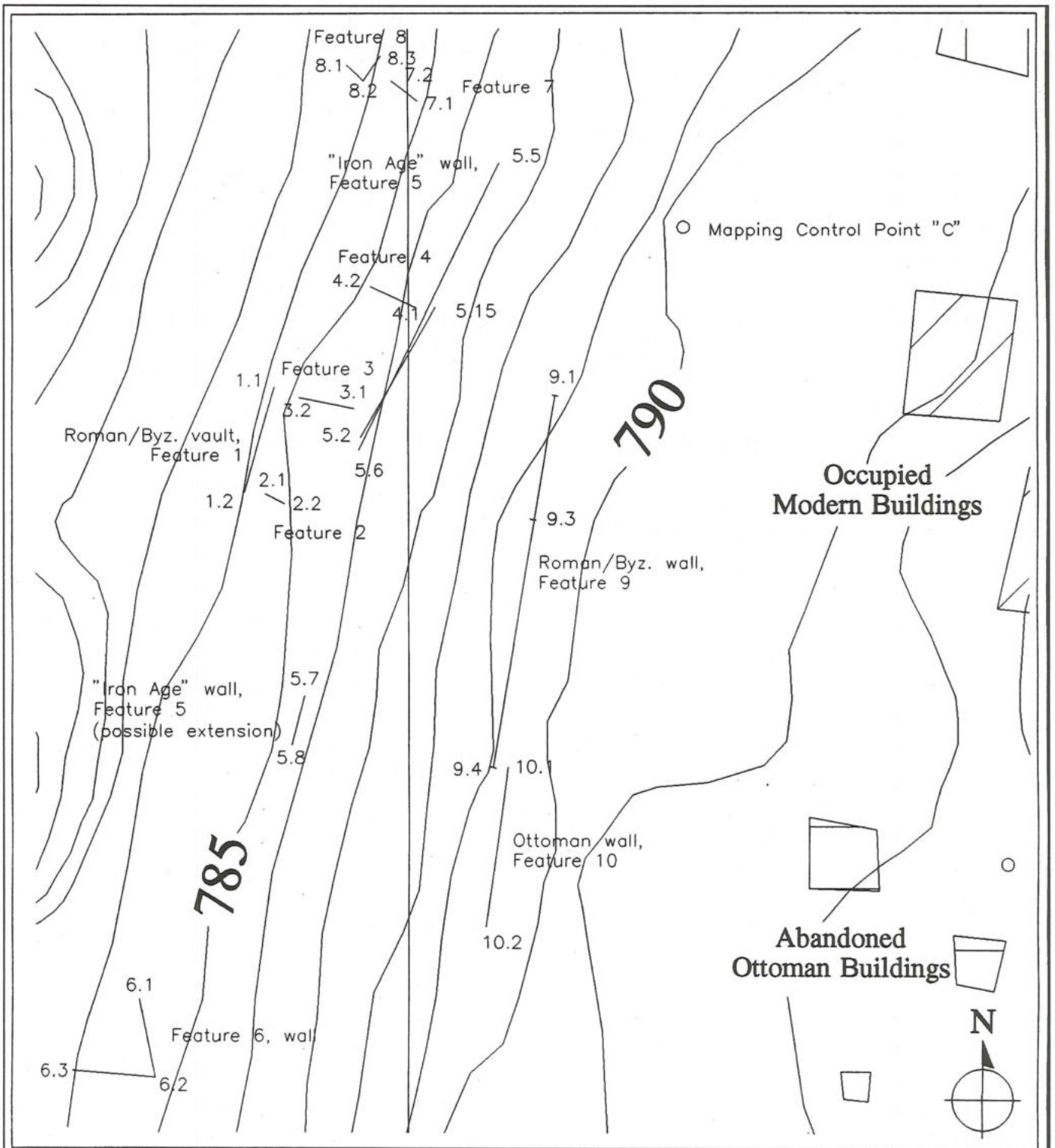
Following the 1996 season, the archaeological data excavated in Field A were added to the Mādabā base map (Fig. 4). Visible architectural features mapped in Field B (see below) were also added (Fig. 5). The data from Field A were encoded by stratigraphic layer, enabling examination of the development of this part of the site over a succession of building phases. Each fea-

ture (or locus) was encoded in the database according to its soil or feature (architectural) type, and the artifacts present, allowing for easy sorting and displaying of archaeological information.

These data form the first part of a detailed GIS database planned for the entire urban core of Mādabā, in which information from archaeological projects dispersed throughout the town will be included. In addition to the data collected during the 1996 field season, for example, the Tall Mādabā database already includes architectural and feature plans from the various Roman and Byzantine structures that now comprise Mādabā's archaeological park (see the northeast corner of Fig. 1). Using the capabilities of the ArcView system, implemented on a



4. Map of Field A excavation area on the southeast slope of the lower tall.



# Tell Madaba - Field B, 1996

## Architectural features on the West Acropolis.



5. Map of visible architecture in Field B on the west acropolis.

laptop computer in the field, "hot links" were established between ArcView layers showing Roman and Byzantine architectural remains and scanned images of the mosaic floors excavated in various rooms. This feature of the database, still in its developmental stages, will allow users to "click" on hot link icons superimposed on architectural plans, and pull up full color images of the floors, providing a more comprehensive view of the overall layout of the archaeological remains of the town.

### Field A Excavations

Given the constraints imposed by the modern town, an opportunistic excavation strategy was adopted in the selection of a site with the greatest potential of producing a stratigraphic profile of the *tall*. Fortunately, the 1993 survey identified specific areas of the site where erosion (and other post-occupation formation processes) had exposed pre-modern archaeological levels. In particular, a portion of the southeastern slope of the lower mound, exposed during clearing activity by tobacco farmers in search of crop fertilizer in the early 1980s, revealed an extensive vertical section of the site's depositional history (see the southeast corner of Fig. 2 and Fig. 4), offering the possibility of securing a stratigraphic sequence with a minimum of excavation. Consequently, the 1996 field season concentrated its efforts in this area, cutting a section through the exposed slope of the *tall*, with a horizontal trench excavated eastward to gain lateral exposure of the site's earlier occupational levels.

Excavation and recording procedures intentionally followed those employed by the Mādabā Plains Project (Herr 1989; 1994), and other projects in the region, in order to ensure the creation of compatible data sets. Because of the project's emphasis on subsistence strategies, special attention was devoted to the systematic collection of paleobotanical and faunal remains. In addition to

dry screening, a fixed flotation routine was maintained to ensure the collection of statistically meaningful samples for subsequent comparative analysis.

Using the north-south east-west grid system established during the 1993 survey, three 10 X 10 m excavation units were laid out in Field A, Squares 3N22J, 3P21F, and 3P21G (see Fig. 4). Square 3N22J straddled the vertical section, while Squares 3P21F and 3P21G occupied the horizontal area to the east of the vertical cut. The excavations were confined to the eastern portion of 3N22J, the northern half of 3P21F, and the western part of 3P21G, totaling approximately 100m<sup>2</sup> of lateral exposure.

As alluded to above, the major goals of the 1996 field season in Field A were two-fold: (1) establish the stratigraphic history of the lower *tall*, from summit to bedrock, and (2) gain horizontal exposure of the earliest levels of the *tall*. In all, an 8m vertical section was excavated in Field A, extending from the summit of the lower *tall* down to bedrock. Bedrock was reached in Squares 3P21F and 3P21G, with a stratigraphic link made to the exposed slope in 3N22J.

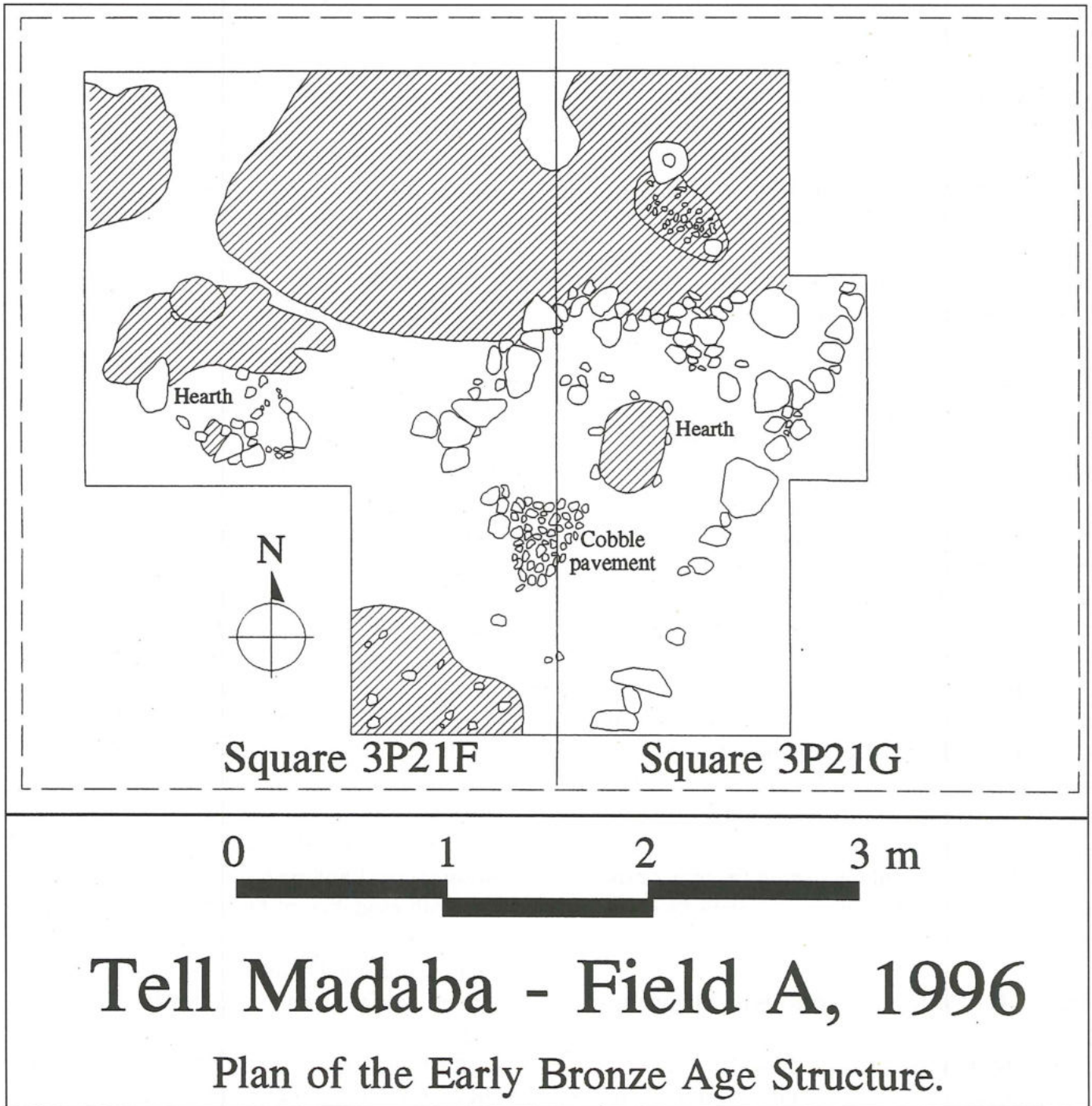
The earliest depositional activity above bedrock consisted of sterile reddish-brown *terra rosa* soil. The earliest occupational levels in Field A cut into this *terra rosa*, are tentatively dated to the late EB I/II. Two distinct architectural phases were identified. The earliest phase consisted of a single large wall that ran in a northeasterly direction through 3P21G. Excavations succeeded in exposing ca. 4.75 m of the wall, which was constructed of unhewn boulder-sized stones, with the wall ranging from 0.9 to 1.1m in width. Time prevented a full elucidation of this substantial structure. It was not immediately evident whether the structure served as an encircling wall, or part of a free-standing building. A concentration of cobble-sized stones to the west of the wall may have been part of a pavement, while concentrations of ash to the east may repre-



sent traces of in-door occupational activity, although the limited portion excavated render this speculative. A possible threshold and doorway were preserved in the southern part of the wall.

The second architectural phase incorporated portions of the earlier wall to form the eastern wall line of a rectangular structure, approximately 3 x 4m in size (Fig. 6). The contents of the room included grind-

ers, a basalt quern, and other objects utilized in food preparation. The center of the room contained a fire pit or hearth. A concentration of cobble-sized stones adjacent to the fire pit may have served as a raised pavement or platform. The room also contained a number of bone awls, ceramic spindle whorls, stone loom weights and other household items. An intact stone post support and a pit were uncovered to the north of the



6. Plan of Early Bronze structure in Field A.

structure, while a second hearth was found to the west. Preliminary analysis of the associated pottery points to a late EB I/II date (see below; Figs. 7 and 8).

A thin layer of wind-blown sand and silt covered the Early Bronze Age levels, suggesting an extended period of abandonment in Field A that lasted until the Iron II period.

A series of secondary trash deposits (middens), excavated only in the vertical section in 3N22J, formed a 5 m deposit of superimposed material over the earlier Early Bronze Age levels. The successive deposits were rich in faunal, paleobotanical and metallurgical remains (including significant quantities of slag), as well as jewelry, a number of seals and seal impressions, and other small finds. The sequence produced a relatively homogenous ceramic corpus, tentatively dated to the Iron IIB (ca. ninth/eighth-early seventh centuries BC) (see below; Fig. 9). The nature of the evidence suggests that during the Iron II, Field A served as a dumping ground for the site's inhabitants, with the Iron Age settlement confined farther to the west and north.

While the stratigraphic profile preserved in Field A failed to uncover *in situ* remains dating to the latter part of the EBA (i.e. EB II-III and IV), the Middle Bronze, Late Bronze and Iron I, the extensive Iron II midden deposits did produce isolated sherds dating to each of these cultural periods, indicating that they are preserved elsewhere on the *tall*. In spite of the lengthy occupational gap suggested by the Field A sequence, Tall Mādabā clearly was inhabited during the third and second millennium BC. However, the nature of settlement in Mādabā during these periods will have to be defined by excavations elsewhere on the *tall*.

### Field B (West Acropolis) Mapping Survey

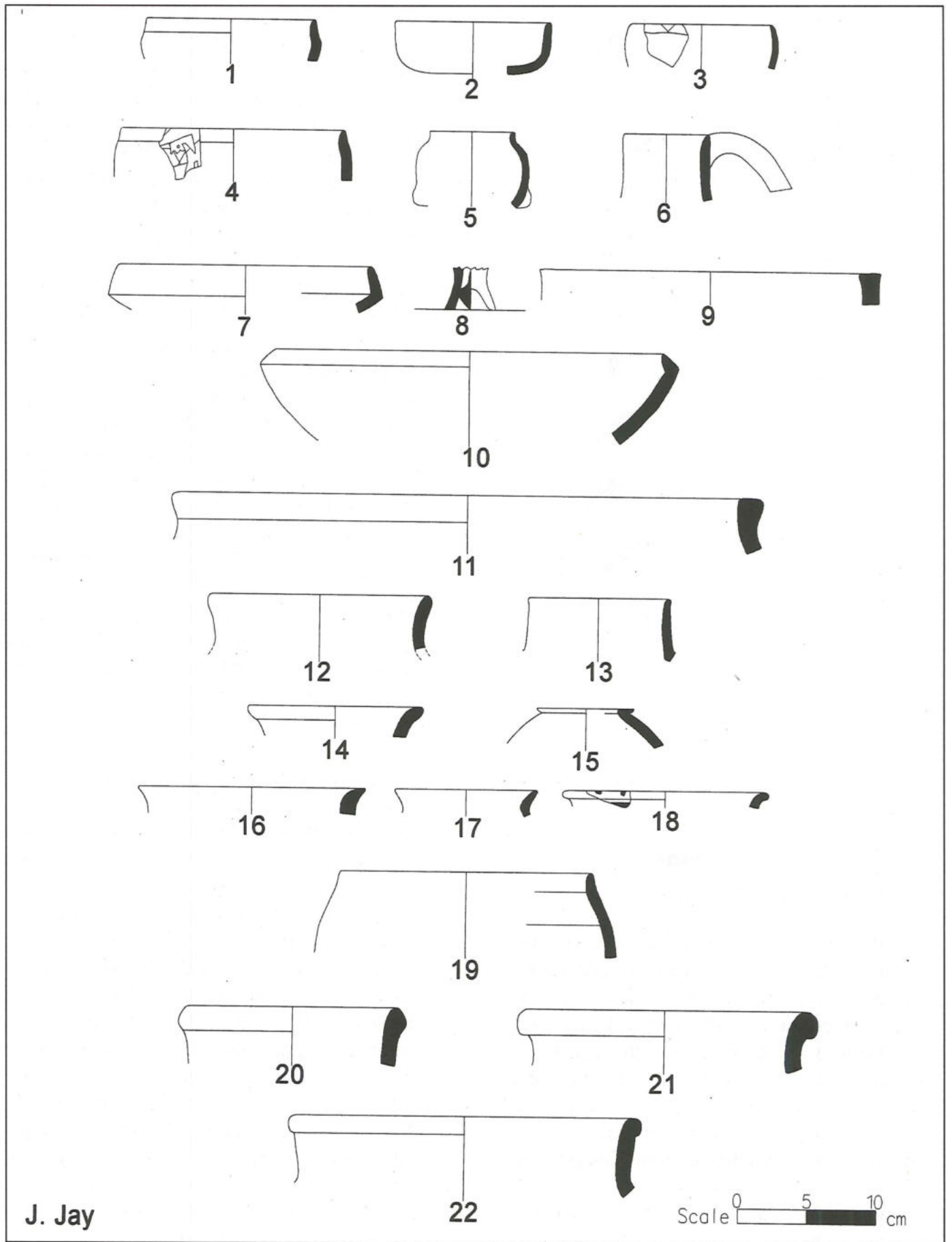
In addition to the excavations in Field A, a mapping survey was conducted on the western edge of the acropolis, or upper *tall*,

and designated Field B. All visible wall lines were drawn and recorded, and then located on the digitized base map (Fig. 5). Following the 1996 field season, these features were digitized, and the information added to the base map. Extensive architectural remains, including a possible Iron Age fortification wall and a series of vaulted structures, were clearly visible in Field B, and warrant further investigation and preservation. The west acropolis survey further substantiated our view that this area of the *tall* contains the best-preserved remains of pre-classical Mādabā. Though a complex undertaking, Field B, or the west acropolis, holds the potential of revealing substantial archaeological remains from each of the cultural periods represented on the *tall*.

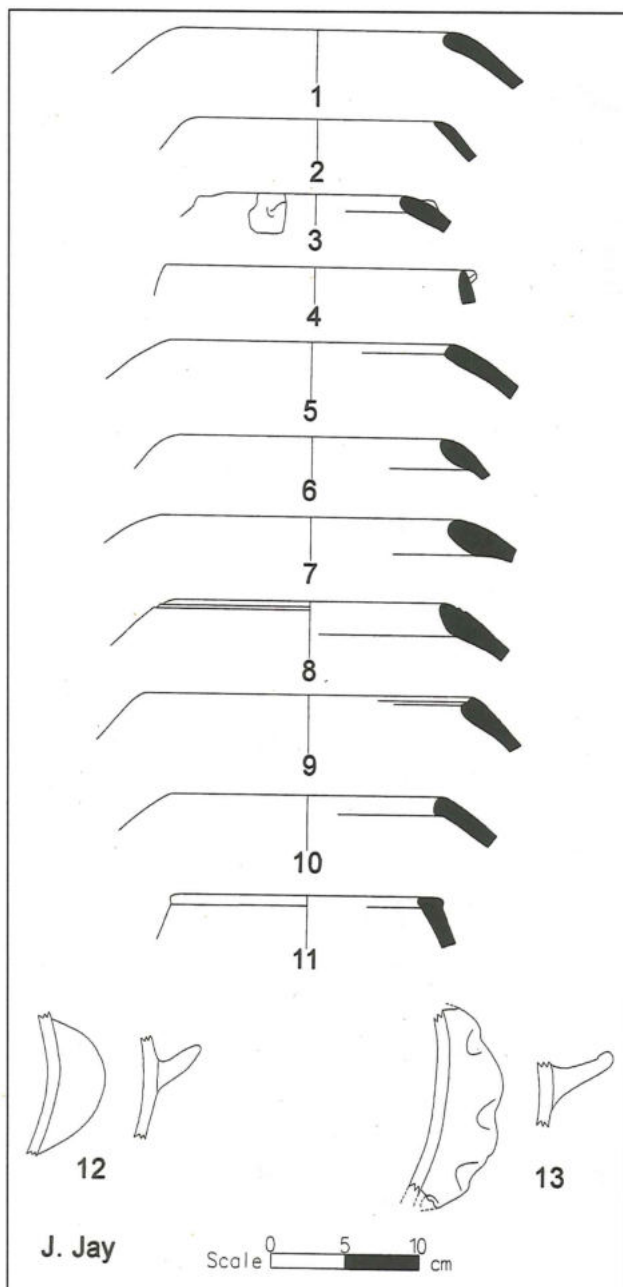
### Ceramics

The Field A ceramics comprised two distinctly separate assemblages: (1) an Early Bronze Age domestic assemblage associated with the architectural remains in Squares 3P21F and 3P21G (Figs. 7 and 8), and (2) a relatively homogenous Iron II sequence recovered from the superimposed trash deposits excavated in the vertical cut in Square 3N22J (Fig. 9).

The Early Bronze Age assemblage contained a relatively complete range of domestic forms, including simple bowls and cups (Fig. 7:1-5), platters (Fig. 7:7 and 10), deep bowls/basins (Fig. 7:9 and 11), a pedestal bowl/cup (Fig. 7:8), jugs (Fig. 7:6), necked jars (Fig. 7:12-19), flared rim jars (Fig. 7:20-22), and rounded rim holemouth jars (Fig. 8:1-10). The pottery was predominantly handmade, using the coil method, with evidence of the use of a slow wheel to finish the rims of the larger closed forms. Only a minimal number of vessels had received surface treatment beyond that of a slip. A few bowls were painted with a reddish-brown decoration (e.g. Fig. 7:4), and the platters preserved evidence of hand burnishing. One necked jar was pattern bur-



7. Early Bronze pottery from Field A.



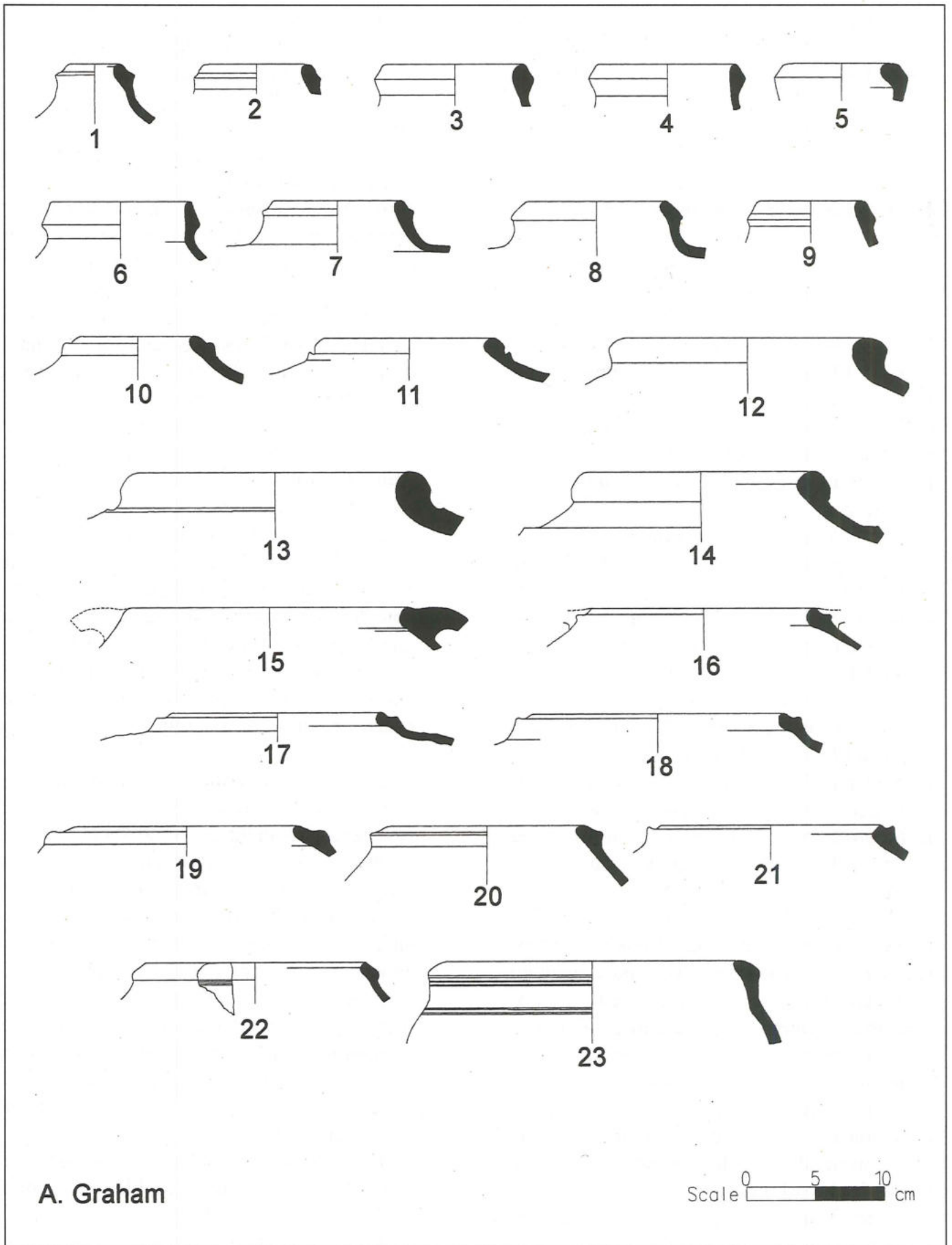
8. Early Bronze pottery from Field A.

nished (Fig. 7:15), and a second had received a reddish brown painted decoration applied to a white slip (Fig. 7:18). Microscopic (petrographic and chemical) analyses are currently underway to establish a more systematic characterization of this material, with the broader aim of reconstructing the manufacturing technology employed, and the organization of the ceramic industry at the site.

Stylistically, the range of forms consisted of types generally assigned to the EB I or EB II at sites in the region. Comparison

with the stratified sequence from Tall al-'Umayri (Harrison 1997b; in press), for example, clearly places the Field A material prior to the EB III. The simple platters (Fig. 7:7 and 10) are dated typically to the EB II (and even to the EB III), as is the necked jar with sharply everted rim and exterior pattern burnishing (Fig. 7:15; Harrison 1995). However, the preponderance of holemouth jars with simple rounded rims, including examples with grooves (e.g. Fig. 8:8) or knob handles (e.g. Fig. 8:3) along the rim exterior, argue for an earlier, EB I date. Rounded (Fig. 8:12) or slightly indented (Fig. 8:13) ledge handles also argue for an early, pre-EB II date. These stylistic features, while relatively general and ambiguous, nevertheless point to a late EB I or early EB II date for the Early Bronze Age levels in Field A. Carbon samples were collected during the 1996 season, and will be submitted for radiocarbon dating in order to provide a more precise chronological framework for the Field A material. The Field A Early Bronze Age assemblage also produced a cylinder seal impression, inferring that a certain amount of administrative activity occurred at the site.

The vertical sequence of Iron Age trash deposits in Square 3N22J produced a wealth of Iron II pottery (Fig. 9), stylistically dated to the Iron IIB, or approximately the 9th/8th-early seventh centuries BC. In spite of the depth of the stratigraphic sequence (ca. 5m), there was very little morphological development evident between the pottery from the earliest and latest levels, and the overall impression is one of a very homogenous assemblage. The pottery generally was undecorated. Wheel burnishing was noticeably absent, as were forms typical of the Late Iron II/Iron IIC sequence reported at nearby sites, such as Hisbān, Tall al-'Umayri and Tall Jalūl to the north and east of Mādabā. While analysis of the Iron Age assemblage from Field A is still in its early stages, and the observations presented here are only pre-



9. Iron II pottery from Field A.

liminary, the corpus nevertheless seems to have its closest affinities with material from sites to the west and south of Mādabā, such as Khirbat al-Mukhayyat, Mā'in, Libb, Niti, Khirbat al-Mudayna (W. Thamad), and Dhibān.

### **Lithics** (Douglas W. Schnurrenberger)

With few exceptions, the lithic material excavated in Field A came from Early Bronze Age deposits, and therefore will be the focus of the analysis summarized here. The analysis consisted of an initial technological breakdown of the assemblage into flakes, blades, cores, and a category of miscellaneous pieces. These categories were then subdivided based on the inferred function and/or subsequent reshaping of the original piece.

*Flakes:* The greatest number of flakes (42%) exhibited fine, irregular edge damage in the form of microflakes. These specimens were probably utilized briefly for some activity and then discarded. Approximately 23% of the flakes and flake fragments revealed no evidence of use or retouch. The vast majority of the flakes were produced from cherts available locally. Approximately 5% of the specimens were manufactured from a fine-grained brown chert, resembling that of some of the tools. The origin of this chert is not known, but similar quality chert can be recovered locally.

*Flake Tools.* The flake tools were divided into miscellaneous retouched flakes and tabular scrapers. The retouched flakes included specimens that have been classified as scrapers, small scrapers, notches and denticulates (Rosen 1997: 86-91). These specimens accounted for 23% of the flake tools. The specimens were unstandardized in terms of morphology, and appeared to have undergone minimal retouch in order to produce the desired working edge.

*Tabular Scrapers:* The 1996 excavations recovered one complete and another fragmentary tabular scraper. The complete spec-

imen measured 7.7 x 9.5 x 1.0cm (L x W x T), with a moderate-sized faceted platform (1.7cm), a thick cortical covering (except where it had been thinned adjacent to the striking platform) bearing evidence of two sets of striations, and abrupt dorsal retouch along the distal margin (11cm). The distal, abrupt retouch truncated the striations, suggesting either that the tool edge was created after dorsal modification, or that the final set of retouch flakes were resharpening flakes. The broken specimen, recovered from an Iron II deposit, preserved a distal fragment of a flake, relatively thin (0.5cm), and bore no evidence of dorsal incisions.

The small number of tabular scrapers recovered hinders generalization. Nevertheless, it is important to note that the single complete specimen is nearly identical to the classical fan-shaped tabular scraper (Rosen 1983b; 1997: 71-80). Similar specimens elsewhere in Syro-Palestine date from the Late Neolithic to the Early Bronze Age (Rosen 1997: 75). The presence of the broken specimen in an Iron II deposit is interesting, but may simply represent curation, or residual preservation resulting from Iron Age construction activities.

*Blade Tools:* A total of ten blade fragments were recovered from the Early Bronze Age levels in Field A. One specimen was produced from the same chocolate brown, fine-grained flint employed in the manufacture of the tabular scrapers, while the remaining specimens were produced from a light tan, variegated and coarser flint not found elsewhere in the collection. The exact source for either of these flints is unknown, but similar raw materials were used to produce blade segments from Early Bronze occupational levels at Tall al-'Umayri (Schnurrenberger 1997).

The Canaanean blade and sickle segments produced from these blades are hallmarks of the Early Bronze Age lithic industry. The blade segments from Tall Mādabā can be classified as Canaanean sick-

les, given the very gross criteria suggested for their identification by Rosen (1983a; 1997: 44-60). Their dimensions fall within the published dimensions of sickle blades from other sites, although they fall on the shorter end of the spread. In comparison with other published assemblages, the frequency of marginal silica gloss is rather low, although the small size of the collection probably renders this difference meaningless.

**Cores:** Two specimens classified as cores were recovered from the 1996 excavations. One specimen was manufactured from local chert, and falls within Rosen's category of nodular flake cores (1997: 31). Rosen has proposed that these specimens were ad hoc cores for the rapid production of non-standardized flakes readied for immediate use.

While the 1996 excavations produced a relatively limited lithic sample, the range of technologies exhibited in the Field A material represents a typical Early Bronze Age

lithic assemblage. More specifically, the assemblage closely parallels collections recovered from other Early Bronze sites in the region, such as Tall al-'Umayri (Schnur-berger 1997), and presents an opportunity to develop a regional picture of the chipped stone industry. The lithic assemblage also reinforces the sedentary character of the Early Bronze Age settlement at the site, providing clear evidence of an active involvement in agricultural cultivation on the part of the inhabitants who occupied the structures uncovered in Field A.

**Fauna** (Brian Hesse)

Approximately 4100 bone fragments were processed and analyzed from the 1996 season. All the bone finds were labeled with find spot information (square, locus, pail), and assigned to one of six chronological units based on the periods represented by the associated pottery (Late EB I/II, Iron II, Modern, and three mixed loci).

*Species Present:* Table 1 summarizes the

**Table 1.** Distribution of faunal remains by period of occupation.

	Late EB I EB II		Iron II		Modern		EB IRI IRII Per RB		EB LB IRI? IRII RB		EB(III?) IRI/II Dom	
Sheep	30	2%	88	4%	5	4%	0		4	80%	1	1%
Goat	10	<1%	14	<1%	0		0		0		1	1%
Sheep/Goat	375	23%	436	21%	22	16%	42	19%	0		38	33%
Cattle	15	1%	63	3%	1	<1%	10	4%	1	20%	8	7%
Gazelle	1	<1%	0		0		1	<1%	0		0	
Equid	3	<1%	2	<1%	0		1	<1%	0		0	
Pig	0		1	<1%	1	<1%	0		0		0	
Dog	4	<1%	0		0		0		0		0	
Small mammal	2	<1%	1	<1%	0		1	<1%	0		0	
Medium Mammal	214	13%	377	18%	8	6%	31	12%	0		21	18%
Large Mammal	4	<1%	18	<1%	0		0		0		0	
<b>Animal</b>	<b>957</b>	<b>59%</b>	<b>1051</b>	<b>51%</b>	<b>93</b>	<b>71%</b>	<b>135</b>	<b>61%</b>	<b>0</b>		<b>45</b>	<b>39%</b>

identified remains from the site during all six periods. However, additional analysis concentrated on the first two well-defined periods. The remains included bones from the usual mix of barnyard stock in the Middle East: sheep, goat, cattle, equids (almost certainly donkeys) and pigs, as well as dogs and a few gazelles. A few fragments that may derive from deer or large antelope were included in a small collection of still to be identified material.

*Relative Abundance of Main Domestic Taxa:* The relative abundance of the main domestic taxa were calculated for the Early Bronze Age and Iron Age occupations using the Estimated Total Number of Fragments. These results are presented in Table 2. Two contrasts are apparent. There is a weak tendency for sheep to be more common and a strong tendency for cattle to be more abundant in the later period. Both of these changes can signal increased intensity of production in the agricultural sector and an enhanced significance for "market" exchange in animal products.

*Mortality in the Sheep/Goat Sample:* The mortality experienced by domestic animals can be a guide to the production goals of pastoralists, as well as the market demands of settled communities. Only the sheep/goat sample is abundant enough to estimate age at death. Both tooth wear and long bone fusion proportions were calculated. This information is presented in Tables 3 and 4.

**Table 2.** Abundance of the main domesticates in the two main periods of occupation. Bold italicized figures indicate that the cell contributed a significant amount to the table chi-square.

	Sheep		Goats		Sheep/Goats		Cattle	
<b>EBI/II</b>	29	74%	10	26%	<b>418</b>	<b>97%</b>	15	3%
<b>Iron II</b>	89	86%	14	14%	<b>538</b>	<b>89%</b>	<b>63</b>	<b>11%</b>
	chi-sq = 2.129				chi-sq = 16.8			
	p=.145				p=0			

**Table 3.** Estimates of sheep and goat mortality based on long bone fusion. The percentages indicate the number of animals that survived past the age that head each column.

	> 6-10 months	>13-16 months	>18-28 months	>36-42 months
<b>EI/II</b>	90%	76%	64%	66%
<b>Iron II</b>	96%	94%	82%	32%

**Table 4.** Estimate of sheep and goat mortality based on tooth wear. The percentages indicate the number of animals who died in the age interval given in the column headings.

	0-3mo	3-6mo	6-12mo	1-2yr	2-3yr	3-4yr	4-6yr	6-8yr	8-10yr
<b>EI/II</b>	7%	4%	6%	21%	17%	16%	17%	9%	2%
<b>Iron II</b>	2%	4%	4%	19%	12%	23%	19%	13%	4%

Each estimate tells a slightly different story. The fusion data suggests that there were two culls in the Early Bronze Age flock, one of about 25% taken at the end of the first year, and another much larger one, approximately 2/3rds, taken after the animals reached the age of three years or more. During the Iron II, most of the animals survived until the end of their second year. About half were taken in the third year, leaving a third of a typical cohort to survive into maturity. The tooth wear data indicates, as before, that slightly more of the less than a year old animals were culled during the EBA than during the Iron Age. The EB tooth wear, however, suggests a substantial cull during the 1-3 year interval, while the Iron Age data indicates that most animals were being culled at ages greater than 3 years. There is no obvious way to resolve this contradiction, although the answer may be rooted in the uncertainties of the techniques we have available to age teeth and long bones. Despite these inconsistencies, the mortality information suggests that there is a contrast in the culling/marketing patterns that were practiced in the two periods. Taken together with the increased importance of sheep in the later economy, it is possible that sheep management had become decoupled to a degree from the husbandry efforts of the local



community, and that the marketing of “finished stock” had become a part of the local economy in Iron II times.

**Carcass Part Patterns.** In an effort to ascertain if the carcasses of the main domestic animals were being processed in roughly equivalent ways during the two periods, the “archaeological animals” (characterizations of the relative abundance of the various skeletal parts that represent a taxon) for “medium mammals” (probably almost all sheep and goats) and “large mammals” (almost all cattle) were constructed. These data are presented in Table 5. Only one weak contrast was uncovered. Medium Mammal teeth and tooth fragments, cranial fragments, and pieces of mandible were relatively more abundant in the Early Bronze Age sample than in the Iron Age one. Often this particular contrast is interpreted as the effect of an increasing social/spatial differentiation of the process of carcass reduction, since the head contains relatively little meat (save the tongue), and may be likely to be discarded early in the dismemberment and butchery process. This explanation would certainly parallel the shifts in the species proportions and mortality described above. However, it is also true, as ethnographic study has demonstrated, that the head of a sheep or goat is often of considerable symbolic significance in Middle Eastern culinary practice. It is therefore a bit early in the analysis of the Tall Mādabā faunal re-

mains to conclude that the processes that brought animal to table were organized much differently in the later period.

Nevertheless, this preliminary analysis of the Tall Mādabā faunal data suggests that significant differences in species composition, husbandry patterns, and carcass utilization exist in the Early Bronze I/II and Iron II samples. These shifts seem to indicate that the agricultural system supporting Mādabā had intensified, and that the pastoral systems supporting the site had become significantly more complex by the time of the later occupation.

**Paleobotany**

Paleobotanical samples were systematically collected from the Early Bronze and Iron Age levels in Field A, in keeping with the project goal to assemble archaeological data to document the changing subsistence strategies employed by the inhabitants of the region over the course of the Bronze and Iron Ages. While a full understanding of the economic implications of this material will have to await the completion of analysis, preliminary indications point to a mixed economy that included cereal farming (wheat and barley), horticulture (both grape and olive), and the cultivation of a wide range of legumes. This strategy seems to have been employed first in the Early Bronze Age, and intensified during the Iron II.

**Conclusion**

The 1996 field season of the Tall Mādabā Archaeological Project was designed as a preliminary, exploratory season aimed at defining the broad stratigraphic history of Bronze and Iron Age Mādabā, and assessing the potential for further, long-term excavations at the site. Though brief, the 1996 season succeeded in achieving these basic objectives. A computerized base map of the entire urban core of Mādabā was established, enabling future discoveries to be integrated in a single database for the site. From this, a topographic relief map that de-

**Table 5.** Carcass parts of Medium (sheep-sized) and Large (cow-sized) Mammals. The cells that contributed most to the chi-sq statistic in the Medium Mammal sample are highlighted and italicized.

	Large Mammals		Medium Mammals	
	Early Bronze	Iron Age	Early Bronze	Iron Age
Axial (ribs and vertebrae)	3	18%	17	21%
Head (crania, mandibles, teeth)	5	29%	25	37%
Forelimb (shoulder girdle to wrist)	6	35%	12	15%
Hindlimb (hip to ankle)	1	6%	13	16%
Toes	2	12%	13	16%
	chi-sq=4.4 p=.349		chi-sq=27.9 p=0	

fined the extent of the *tall* was created.

The excavations in Field A resulted in an 8 m vertical profile of the existing stratigraphy of the southeastern slope of the lower *tall*, extending from the summit down to bedrock. The earliest levels reached in Field A revealed a settlement history that began in Late EB I/II (ca. 3100 BC), followed by a lengthy occupational gap that extended for the better part of the third and second millennium BC. Residual ceramic evidence suggest that the settlement was confined farther to the west and north during this period. The Field A excavations also revealed some of the richness of the Iron Age levels at Mādabā, preserved in the secondary context of extensive trash (or midden) deposits. These Iron Age remains have also provided valuable comparative material that will facilitate analysis of changing subsistence and economic strategies over the course of the Bronze and Iron Ages in the region.

As a preliminary, exploratory effort, therefore, the 1996 field season succeeded in demonstrating the considerable potential of Tall Mādabā, particularly in the area of the west acropolis, to contribute to the archaeological investigation of the Bronze and Iron Age history of the Central Highlands of Jordan.

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