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Gaza Research Project. Report on the 1999 and 2000 Seasons at al-Moghraqa

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This report presents the results of survey and excavation at al-Moghraqa, in the vicinity of the Wadi Gaza. The objective of fieldwork was to establish the date of the site, the nature of its occupation and in particular the context and function of the terracotta cones previously recovered at the site in 1996. The stratigraphic sequence is published, demonstrating that the main period of occupation of al-Moghraqa spans the Middle Bronze II period and is contemporary with the nearby settlement of Tell al-ᶜAjjul. This paper includes the final report on the pottery and the small finds. There is also a report on the geomorphology of the region around the mouth of the Wadi Gaza.

Preface

In September 2000 the Palestinians declared an *Intifada* against Israel and the Gaza Research Project (henceforth GRP) immediately curtailed work in the Palestinian Territories. Consequently, the intended 2001 excavations and 2002 study seasons at al-Moghraqa never took place. This report presents the culmination of the 1999 season of survey and the 2000 season of excavations and the associated specialist reports. Some of the reports are correspondingly brief but as there seems little hope of being able to return to Gaza in the near future to undertake further work on the material, we took the decision to publish an interim study to make the data available to the wider archaeological community.

Introduction

The Bronze Age site of al-Moghraqa (Figs 1, 2) lies in an area of farmland and sand dunes approximately 700 m. north of the Wadi Gaza and the Middle-Late Bronze Age (MB-LB) site of Tell al-ᶜAjjul, in an area designated locally as al-Moghraqa (meaning swampy ground) (Old Grid 094/097, 094/098; Ordnance Map of Israel 1: 500, 000 series, 1985). The site was discovered in 1996 by Dr Moain Sadeq, following the removal of sand dunes for cultivation. The site, one of several archaeological locales to be identified in the area immediately north of the Wadi Gaza since 1996 (Clarke and Steel 1999), has no local toponym and has been designated al-Moghraqa (Area 1) to distinguish it from the other sites in the vicinity. Topographically al-Moghraqa is of interest as it is not the typical tell site of the region, but instead appears to have been founded on low-lying ground. Preliminary surface collection, by the Palestinian Department of Antiquities, Gaza and the École Biblique in 1996 and the Gaza Research Project (GRP) in 1998, brought to light anthropogenic material of Late Bronze Age (LB I) date, including small quantities of pottery. Initial reports of the site also suggest that mud brick was visible on the surface when first uncovered (J.-B. Humbert, personal communication, November 1999). The most significant cultural remains were several pieces of terracotta cones stamped with the prenomen of Thutmose III. Following conservation of the cones in 2000, two cone fragments were also identified with broken stamps bearing the prenomen of his co-regent,

Hatshepsut. This range of material suggests a chronological overlap with nearby Tell al-ᶜAjjul.

There has been limited discussion of the Gaza region during the second millennium (see however Clarke and Steel 1999), despite its strategic military importance to the Egyptian New Kingdom Empire. The region lies at the Palestinian terminus of the 'Ways of Horus', which linked Egypt to the Asian landmass (Gardiner 1920; Oren 1973; 1987; Bergoffen 1991), and included the militarily important towns known to the Egyptians as *š-r-h-n* (Sharuhen) and *mh(w).n-p3-hq3* 'whose Syrian name is *g-d-t* (Gaza)'. These towns are specifically mentioned in Egyptian inscriptions of the MB-LB transition, most significantly in the tomb biography of the commander of marines, Ahmose son of Ibana, at al-Kab (Sethe 1927–1930, 4/14), and in the Karnak 'Annals' of Thutmose III (Sethe 1927–1930, 648/5, 648/10–11, 649/9; Katzenstein 1982). As such it would have been crucial for the movement, by land at least, of traded commodities and Egyptian military and administrative personnel between Egypt and Palestine.

The economic importance of the region can be inferred from later literary sources. During the Graeco-Roman period Gaza was the major port in the region (Glucker 1987; Bauzou 2000, 47–69). It acted as an important entrepôt for goods travelling from the Asian hinterland and Arabia towards the Mediterranean and was particularly noted for the spice and perfumes trade (Mackay *et al.* 1952, 9; Kasher 1982, 65 and 69). Recent excavations at the port of Blakhiyah, Gaza, indicate the importance of the region throughout the first millennium BC (Burdajewicz 2000, 35–39; Humbert and Sadeq 2000, 105–119) and illustrate its strong affiliations with Egypt (Burdajewicz 2000, BLA 134, BLA 6012 illustrated p. 35). The region's economic importance and Egyptian connections can be reasonably extrapolated back as far as the Early Bronze Age (EBA), as has been amply demonstrated by excavations at Tell Sakkan (Miroschedji 2000, 27–30; Miroschedji and Sadeq 2000a, 101–104).

The major second-millennium site in the region is Tell al-ᶜAjjul, the main occupation of which dates to the Middle Bronze Age (MBA), but activity at the site certainly continued into the LBA (cf. Epstein 1966, 174–185; Stewart 1974; Tufnell 1976, 1984, 8–23; Tufnell and Kempinski 1993). The LB I levels and deposits of Cypriot ceramics are of wider Mediterranean importance for issues surrounding the correlation of chronometric dates and Egyptian chronologies at the MB-LB interface (cf. Manning 2000, 181–7; Fischer 2001). The material from al-Moghraqa should add significantly to this debate. Given the proximity of al-Moghraqa to Tell al-ᶜAjjul and the apparent degree of overlap, the relationship between the two sites is fundamental for interpreting the social and economic landscape of the Gaza region during the second millennium BC.

1999 Season

Three weeks of topographic survey and fieldwalking were undertaken in November 1999. The survey had four main objectives:

1. to map the present morphology of al-Moghraqa;
2. to lay out a survey grid of 30 × 30 m. squares across the site;
3. to delimit the visible horizontal extent of the site and to ascertain the spatial distribution of cultural material;
4. to define the chronological limits of the site.

Prior to fieldwork a base map of the site was drawn from an aerial photograph covering the region between the Wadi Gaza in the south and the Israeli settlement of Nizzarim in the north (Fig. 1). The topographic survey was conducted with the help of Derek Alexander and Adel al-Hasani using an EDM (Zeiss 5) (Fig. 3).

A systematic surface survey of al-Moghraqa was undertaken to map the frequency occurrence of cultural remains and to investigate the chronological and typological distribution of the surface scatter. Using the 30 × 30 m. grid, an arbitrary point (North 500 East 500) was set up as the base point from which squares were numbered east and west and south and north. This allowed us to locate squares geographically. For example, N480 E440 was 20 m. south and 60 m. west of N500 E500. An area of 8100 m^2 was extensively field-walked to the north and east of the extant sand dunes, picking up as much material as possible in each 30 m. square in five-minutes. This method was employed in order to avoid sample bias caused by fluctuations in material density. This enabled us to delimit the visible extent of the surface scatter, specifically the MB-LB I cultural material. It was assumed that part of the site still lay beneath the sand dunes, but it was unclear how much had been exposed in 1996 and how much had been exposed prior to 1996. Rather less material was visible on the surface than had been the case in our initial visit to the site in 1998. This was probably partly due to the fact that there had been no recent agricultural activity at al-Moghraqa, and the field had lain fallow over the preceding year, consequently archaeological material had not been exposed by ploughing. Moreover, the site has been visited and picked over by several groups of archae-

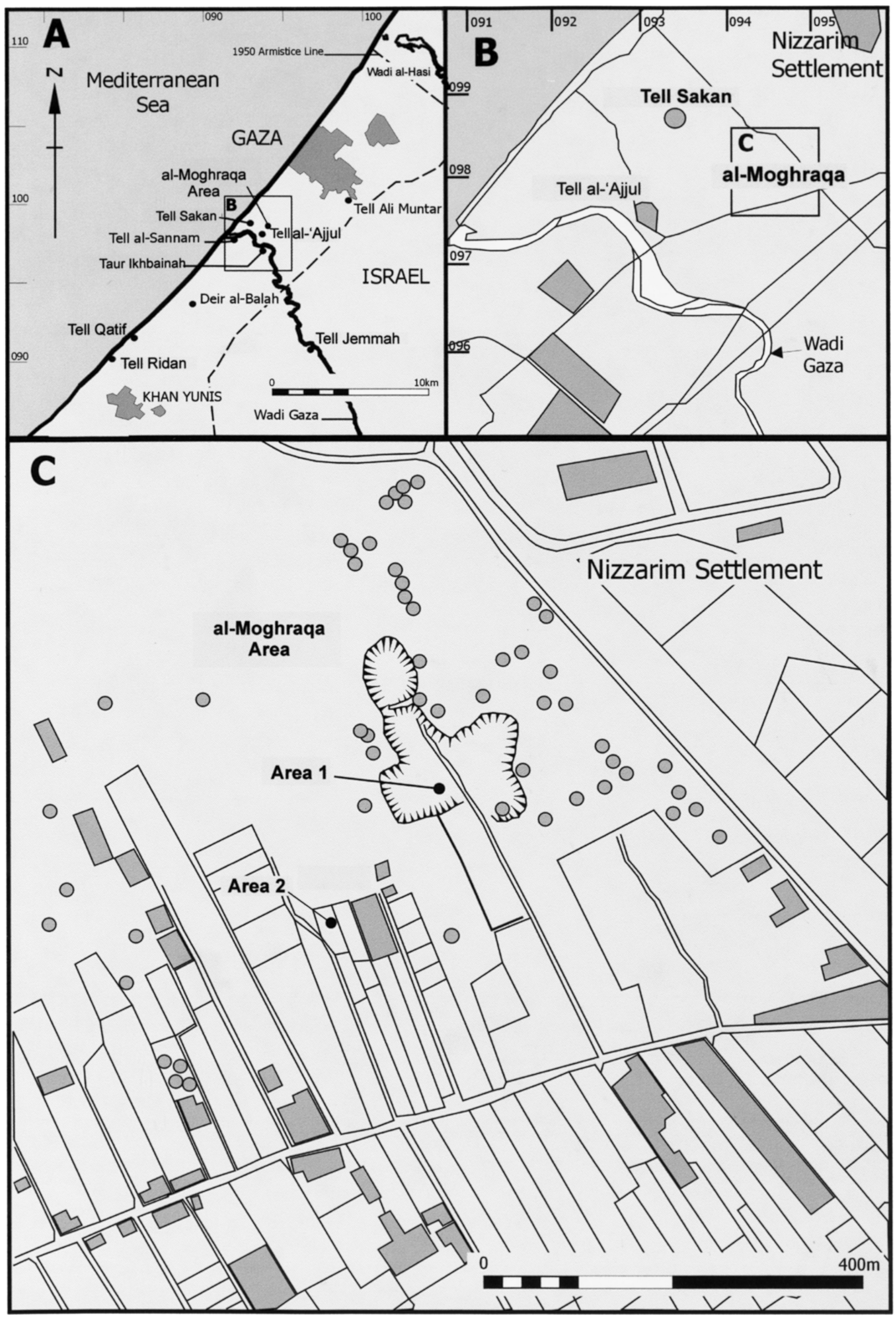

Figure 1. *Map of Gaza region showing location of al-Moghraqa.*

Figure 2. *View of al-Moghraqa Area 1, to the west (2000 season).*

ologists subsequent to its discovery in 1996, hence the denudation of anthropogenic material from the surface. The majority of the ceramics recovered were undiagnostic body sherds. There was a particular concentration of mixed sherds in square N440 E530, ranging in date from MB-LB to Byzantine. In total some 1.6 kg. of pottery was recovered from N440 E530, whereas in most squares only around 0.3 kg. of pottery was retrieved during the extensive survey. MB-LB material was recovered from five adjacent squares (N440 E530, N470 E500, N470 E530, N470 E560, and N470 E590), with a clear concentration of this material occurring in N440 E530. Indeed, around 60% of the identified pottery recovered from N440 E530 was MB-LB in date. The MB material from N440 E530 included several diagnostics: the rim of an MB IIc globular carinated cook pot, two rims and a body sherd of a carinated bowl, the rim of a carinated krater and the handle of an MB II storage jar. The manifest concentration of material in this area clearly identifies it as an MB site. MB-LB material found in the adjacent squares (N470 E500, N470 E530, and N470 E590) might represent the northern extent of the site. The distribution of Byzantine and later pottery was very different: there was an even distribution of later material across the survey area with one particular concentration of material beyond the limits of the MB-LB site, in square N470 E650.

In addition to the extensive surface collection we also conducted an intensive surface collection of 10 × 10 m. squares within our 30 m. grid. The object of the intensive survey was a total retrieval of cultural material from the surface. The area surveyed was extended to include an exposed field system to the north, squares N530 E530 and N530 E560, covering an additional area of 1800 m^2. The distribution and density of the survey material has been plotted on to the grid. Material recovered included ceramics ranging in date from the EBA to the Islamic period (with occasional modern sherds), chipped stone (primarily Canaanite blades), ground stone tools and vessels, carnelian beads and a fragment of an alabaster vase. The pottery recovered confirmed the results of the extensive survey indicating that the main occupation of the site spanned MB II to the LBA (Fig. 4) with background noise from the Byzantine period around the edges of the site (Fig. 5). Petrie described a similar covering of Byzantine and early Islamic material over the sand dunes between Tell al-ᶜAjjul and the coast (Petrie 1931, 1), illustrating the importance of the region during the Byzantine and Islamic periods. Only a very small proportion of the material was earlier than the second millennium BC and so the nature and extent of Chalcolithic-Early Bronze Age activity in the immediate vicinity of al-Moghraqa remains inconclusive. A single EB hole-mouth jar (MOG1–99–7–1) was found in N530 E570. This lies beyond the northern limits of the MB-LB site, and no further material of comparable date was found in the immediate vicinity. Following discussion with the local inhabitants we were able to record a basalt pedestal bowl of Chalcolithic date (MOG1–99–5–1; Fig. 31: 1) reportedly found at the site during agricultural activity. The vessel is now housed in the Department of Antiquities, Gaza. No other Chalcolithic material has been identified at al-Moghraqa.

Although earlier prospection at the site in 1996 and 1998 yielded a significant quantity of terracotta cone fragments, many with cartouches, only two were recovered during survey work (MOG1–99–1–17, MOG1–99–1–18) both beyond the suspected limits of the site, in N470 E580 and N490 E610. The reason for this is unclear but it is likely that it is largely due to the very intensive retrieval of archaeological material in earlier visits to the site by the Palestinian Department of Antiquities, Gaza, the École Biblique and the GRP. Previous work at the site, however, suggested that the cone fragments were concentrated in a discrete area around grid point N470 E560. There was an apparent concentration of small finds in N490 E510 (stone spindle whorl, alabaster kohl bottle), N470 E530 (carnelian bead fragment, two stone spindle whorls, Canaanite blade), and a basalt platter was found in N480 E520. This range of material is consistent with the identification of al-Moghraqa as a significant site of the second millennium BC.

The results of the extensive and intensive surface collections indicate a concentration of cultural mate-

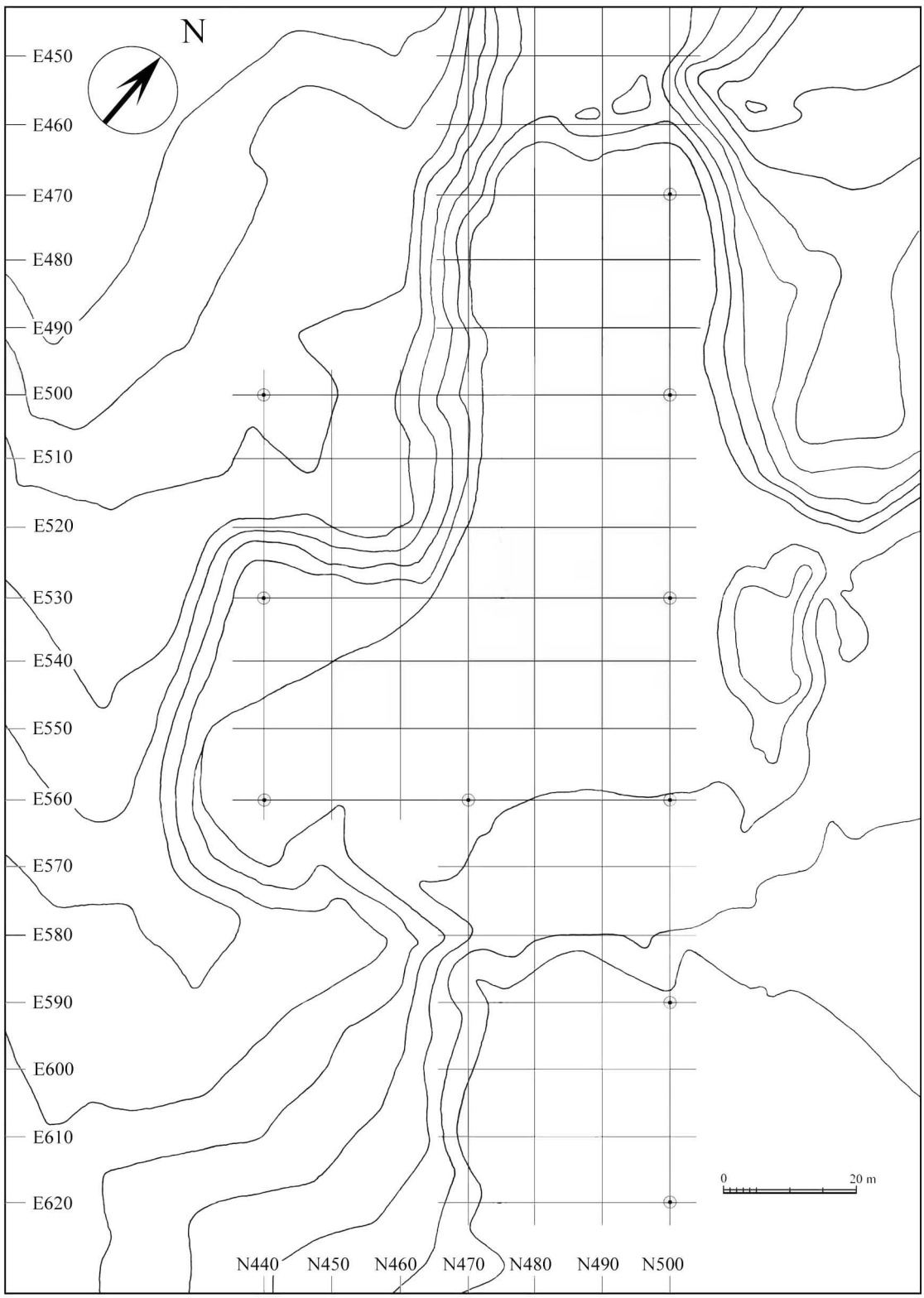

Figure 3. *Topographic plan of al-Moghraqa Area 1 (1999), showing dunes and grid.*

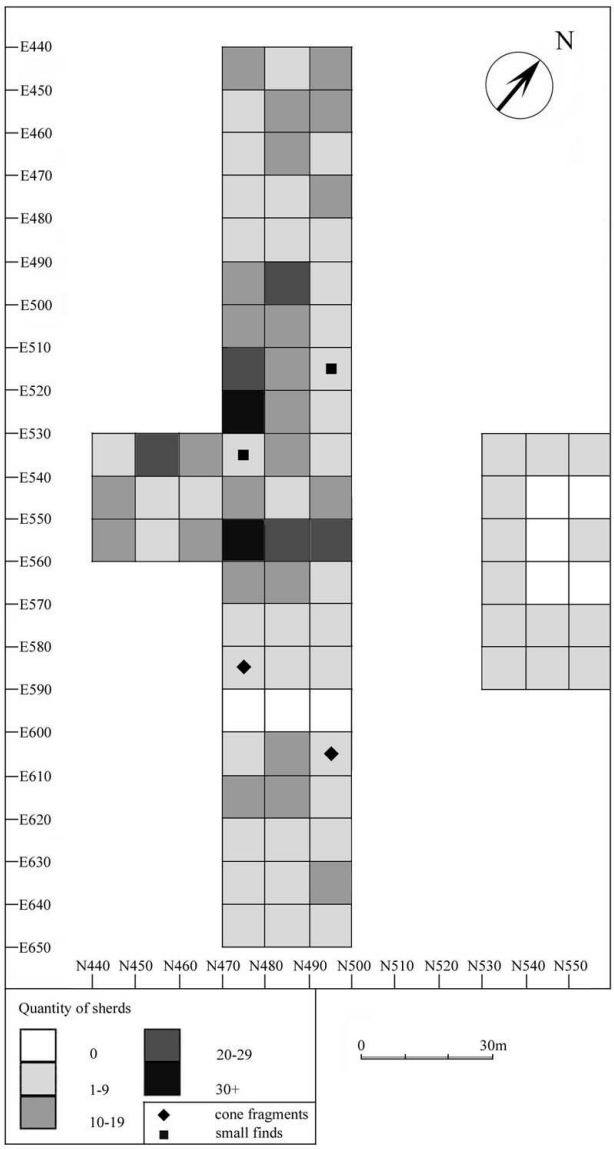

Figure 4. *Density of MB II-LBA material recovered from al-Moghraqa Area 1 during intensive survey.*

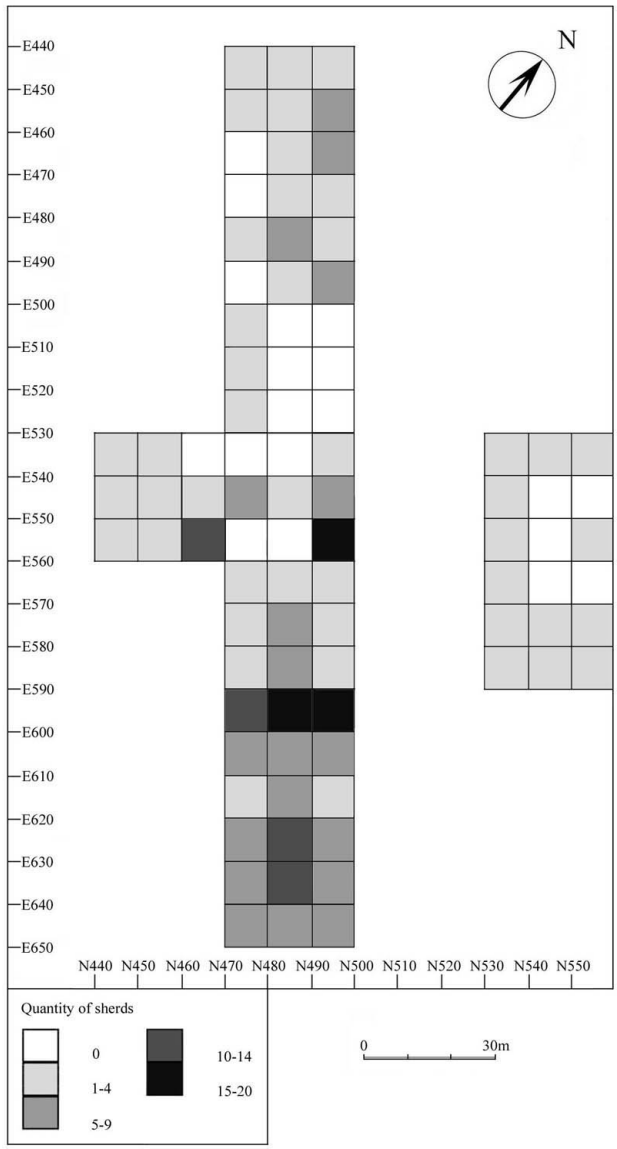

Figure 5. *Density of Byzantine and later material recovered from al-Moghraqa Area 1 during intensive survey.*

rial within the 30 m. square of N440 E530, possibly extending some 20 m. north and west into squares N470 E500 and N470 E530, where there was a particular density of small finds and MB-LB pottery. This seems to represent the northern limits of the site, which appeared to extend south beneath the sand dunes.

In addition to the main surface collection we also conducted surface collection in adjacent field systems to determine whether the archaeological remains continued past the limits of the sand dunes. A second zone of cultural activity was identified approximately 70 m. to the south-west of the main survey area (Fig. 6). This comprised a concentration of well-preserved MB ceramics associated with large pieces of mud brick and cattle bone, which had been brought to the surface by recent ploughing. This has also ensured that the ceramics from this area are better preserved and in larger pieces than those recovered in the main survey area. Sherds include an MB IIa cooking pot (Fig. 22: 1), MB and LB platter bowls, carinated bowls, kraters, and storage jars, one of which has an incised sign on the handle. This area has been designated al-Moghraqa (Area 2), but

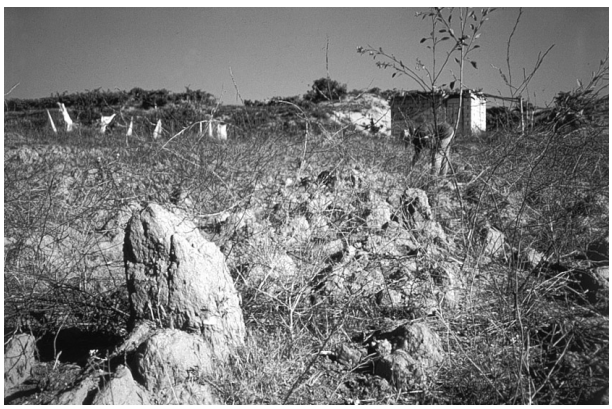

Figure 6. *View of al-Moghraqa Area 2, to the west.*

given its proximity and chronological overlap, it is almost certainly a continuation of al-Moghraqa (Area 1). We were unable to incorporate Area 2 within our systematic survey, but were able to collect diagnostic material from the surface, which has been included within the register of finds.

The close proximity of al-Moghraqa Areas 1 and 2 and their chronological parity indicate that they belong to the same general site (al-Moghraqa). It should also be noted that al-Moghraqa is situated very close to the contemporaneous urban centre of Tell al-ᶜAjjul. Although the relationship between al-Moghraqa and Tell al-ᶜAjjul is unclear, this suggests the existence of important and extensive satellite settlements around major tell sites during the MB-LB period. Unfortunately, recent construction activity in the Zahra area has obliterated much of the surface evidence, obscuring the physical relationship between the two sites. Although a detailed study of the cultural landscape of the region to the north of the Wadi Gaza during the Bronze Age is no longer possible, meticulous contextual and material studies from the on-going excavations at both sites, should elucidate their social and economic relationship.

2000 Season

Aims and methods

The primary objective of the 2000 excavation season was to establish the nature and extent of activity at al-Moghraqa during the second millennium BC. A series of trial trenches were opened that aimed to:

1. delimit the horizontal and vertical extent of al-Moghraqa;
2. establish the archaeological sequence and the chronological limits of the site;
3. assess the evidence for the site's function and its relationship with the coeval settlement at Tell al-ᶜAjjul;
4. investigate the context and function of the terra-cotta cones that mark the site as unique.

In addition to the field component we also wanted to undertake conservation and consolidation of the cones that had been previously collected from al-Moghraqa in 1996 and 1998.

Subsequent to our survey season in November 1999, further bulldozing of sand dunes had taken place to the south, exposing more of the site. Alterations to the topographic map were made accordingly (Fig. 7), however, due to time constraints a surface collection of the newly exposed region was not undertaken.

Alongside the main programme of fieldwork, a geomorphological survey of al-Moghraqa and the area surrounding the mouth of the Wadi Gaza was undertaken (see Munro *infra*), examining the relationship between the Bronze Age sites and the Gazan landscape. We have previously posited that the apparent shifting patterns of settlement in the region were in response to its changing topography (Clarke and Steel 1999, 226). Most notable is the shift in location of settlement from Tell al-ᶜAjjul to Tell al-Sannam at the end of the LBA, possibly attributed to silting of the Wadi Gaza, thereby affecting the viability of Tell al-ᶜAjjul as a major port (Tufnell 1984, 8; Clarke and Steel 1999, 222–3, 226). More recently, Miroschedji has suggested that the movement south of occupation of the primary Bronze Age site, from EBA Tell Sakan to MBA Tell al-ᶜAjjul, resulted from a change in the course of the Wadi Gaza (Miroschedji, pers. comm. 2000). The geomorphological survey therefore aimed to:

1. examine the formation of the distinctive Gaza landscape;
2. establish the date of the sand dunes overlying and surrounding al-Moghraqa;
3. address the shifting patterns of settlement in the region around the estuary of the Wadi Gaza during the Bronze Age.

The geomorphological survey has shown that although al-Moghraqa is not a tell site it is possible that sand dunes had banked up against what may have been slightly raised ground. The archaeological material was found within a matrix of fine, dark yellowish-brown compact sand (the Nusairat Member, see Munro *infra*), which had been immediately overlain by the unconsolidated sand dunes (the Zahra Member, see Munro *infra*). Discussion with local farmers indicates that most of the unconsolidated sand dunes are a recent formation that had accumulated in the area over the past fifty years.

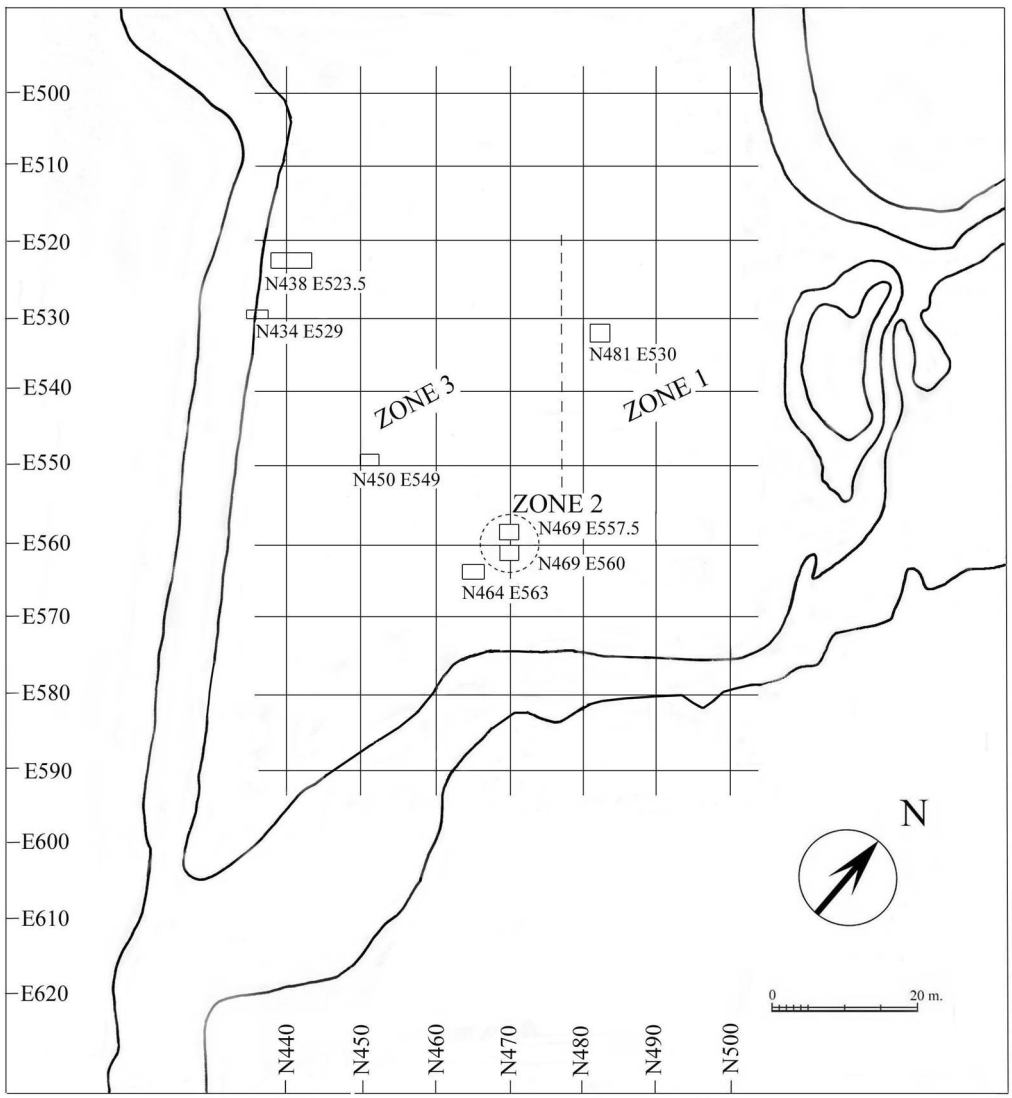

Figure 7. *Topographic plan of al-Moghraqa Area 1 (2000), showing dunes and excavation trenches.*

This has been confirmed by the geomorphological survey (see Munro *infra*).

General overview of the excavations

The 1999 survey season had identified discreet concentrations of pottery and other material but no structures were visible on the surface. We had established a 30 × 30 m. grid across the exposed area of the site in 1999 and we used this to place a series of test trenches at locations that might best address our research aims (Fig. 7):

1. N481 E530 was placed at the suspected northern limit of the site;
2. N469 E557.5, N469 E560 and N464 E563 were all positioned in the area where cone fragments had been reported in 1996;
3. N450 E549 was positioned in the region where the greatest concentration of material had been collected during survey;
4. N434 E529 and N440 E523.5 were placed in a region of newly exposed ground where a surface depression suggested underlying features.

As this was a preliminary exploration of the site to assess the nature of the archaeological remains we decided to cease excavations once we reached significant cultural deposits, which we intended to explore more fully in the 2001 season. The surface finds indi-

cated significant second millennium activity at al-Moghraqa, and one of our primary research aims focused upon the nature of the possible LBA occupation and in particular the context of the terracotta cones. We expected that the soundings would indicate areas where LBA levels overlay MBA deposits, however, every test trench we opened was dominated by MBA deposits with no overlying LBA levels. In one area the MBA deposits were sealed beneath a thick layer of silt, in other areas they were found beneath a predominantly sterile deposit of what appeared to be decayed mud brick, or they were immediately exposed at the surface. In the area where most of the cones had been concentrated there was a residual fine layer of sand (approximately 10 cm. in depth), the remains of a compacted aeolian deposit associated with mixed Bronze Age and Byzantine pottery, lying above mud brick collapse. This deposit was localised to an area of not more than 15 m^2, a much smaller area than had been visible in 1999. We believe that the bulldozing that occurred subsequent to the 1999 season not only went deeper than previous bulldozing in the areas where new sand dunes were being removed but also had gone back over some of the ground that had been exposed in 1996, removing an unknown depth of archaeological deposit.

Summary of trenches

N481 E530: 2 × 2 m. sounding located in the area where a concentration of worked stone objects had been found in the 1999 survey. We expected this area to be rich in cultural remains, however excavation revealed it to be essentially sterile and it probably marked the northern edge of the site. Pottery, ranging in date from the MBA to the Byzantine period, was found in the uppermost compacted aeolian layer, suggesting deposition of this

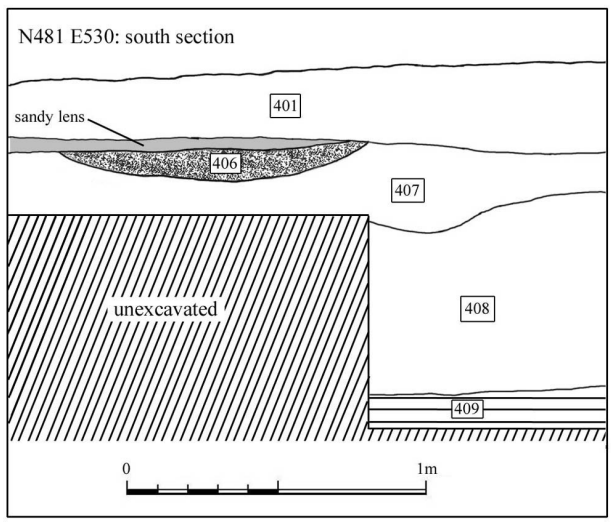

Figure 8. *al-Moghraqa: N481 E530: section, south baulk.*

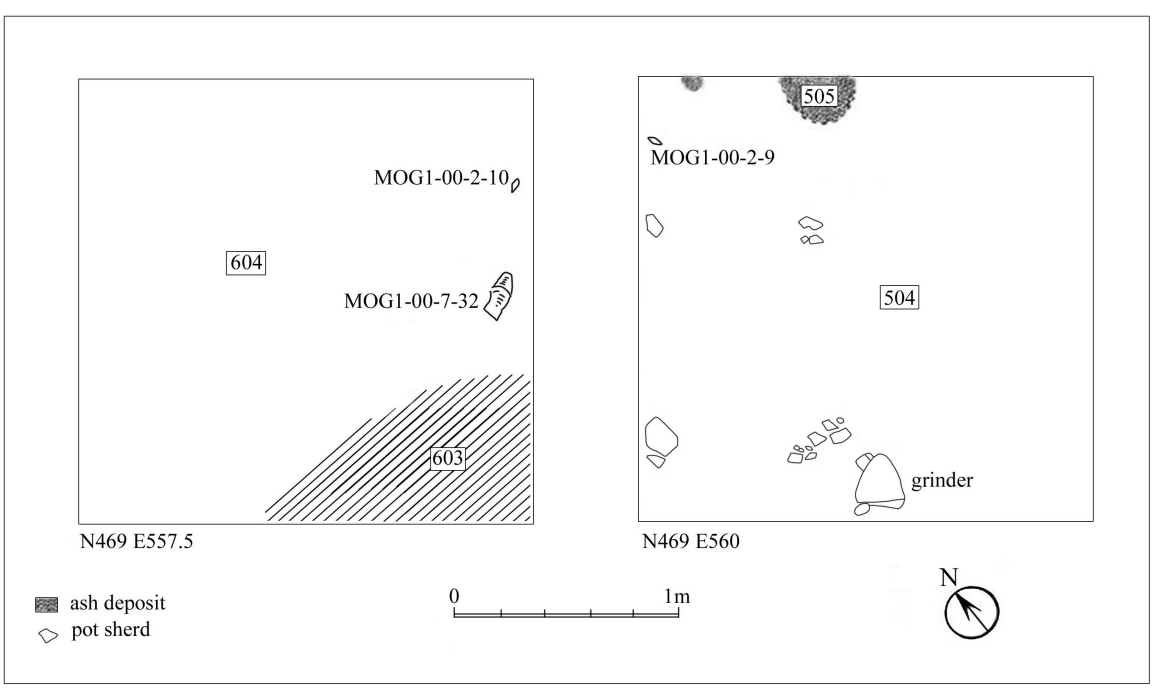

Figure 9. *al-Moghraqa: N469 E557.5 and N469 E560: plan of Surface I.*

layer during the Byzantine period. Below this layer we encountered a sandy loam deposit cut by plough marks of uncertain date. This and the lower deposits were essentially sterile.

Summary of deposits (Fig. 8):
401, 402, 403 – Aeolian sand deposit. Compacted sand containing mixed pottery sherds and some flint;
404 – Plough marks cutting into 405;
405 – Plough (?) surface, compacted hard white clay;
406 – Ash lens. Grey brown fine deposit beneath 405;
407 and 408 – Natural. Sandy loam, sterile;
409 – Sterile kurkar.

N469 E557.5 and N469 E560: two adjacent 2 × 2 m. soundings, which will be described together. These trenches were opened to establish the context of the terracotta cones, to ascertain whether the cone fragments were still within their primary deposit of use, or if they had been 'dumped' here. If the latter were the case we hoped to determine the date of this episode. Specifically we wanted to determine whether the cones had been redeposited during or later than the Bronze Age.

Figure 10. *al-Moghraqa*: Tabun *F509.*

A 5% sample of all deposits was taken for wet sieving and the material recovered in this manner (Table 1, see p. 75) has added significantly to our understanding of the nature of the MB II occupation at al-Moghraqa. The surface layer was a thin deposit of fine compacted aeolian sand, which contained numerous small cone fragments and mixed MBA to Byzantine pottery. No architectural remains were identified. All the evidence suggests that the cones were not in their primary context but had been redeposited, although the nature of this redeposition episode remains unclear. Beneath this layer there was a thick deposit of decayed mud brick. The presence of one or two diagnostic sherds suggest this may be the first of the MBA deposits, possibly building collapse. A patchy surface (I) was identified at a depth of approximately 20 cm. (Fig. 9). Lying on top of this were several arrowheads and a goblet (MOG1–00–7–32; Fig. 27: 5). This surface sealed another thick deposit of decayed mud brick. Directly beneath this there was a *tabun* (F509; Fig. 10), ashy deposits, pottery, flint and bone lying upon a tamped earth surface (II). The patchy nature of the second surface and the *tabun* might suggest it to be an outdoor area, possibly associated with a structure that lay beyond the boundaries of the sounding. Beneath surface II was another thick layer of decayed mud brick. Beneath surface II excavation was limited to a 1 × 2 m. sondage in the northern half of N469 E560, to try to establish the complete stratigraphic sequence down to bedrock in at least one area of the site. Excavation continued to 2.09 m. below datum (135 cm. below surface), however at this depth we were still in cultural deposits. On the final day of excavation we reached a third possible surface deposit, as indicated by the occurrence of a group of three complete MB IIb vessels (F516: MOG1–00–7–39, MOG1–00–7–40, MOG1–00–7–41; Fig. 11).

This area was particularly productive and it was planned that we would considerably expand our excavations here in 2001, to further elucidate the stratigraphy and to explore the nature of the activities represented by the rich remains. Moreover, it was hoped that further expansion of excavation in this area might help clarify the context of the cones.

Summary of deposits (Fig. 12):
501, 502, 601 – Aeolian sand deposit. Compacted very fine deposit of sand representing the present ground surface. Mudbrick fragments mixed with mixed Byzantine and MB-LB sherds, flint, bone and many small cone fragments. Three bronze arrowheads (MOG1–00–2–5, MOG1–00–2–6, MOG1–00–2–7);

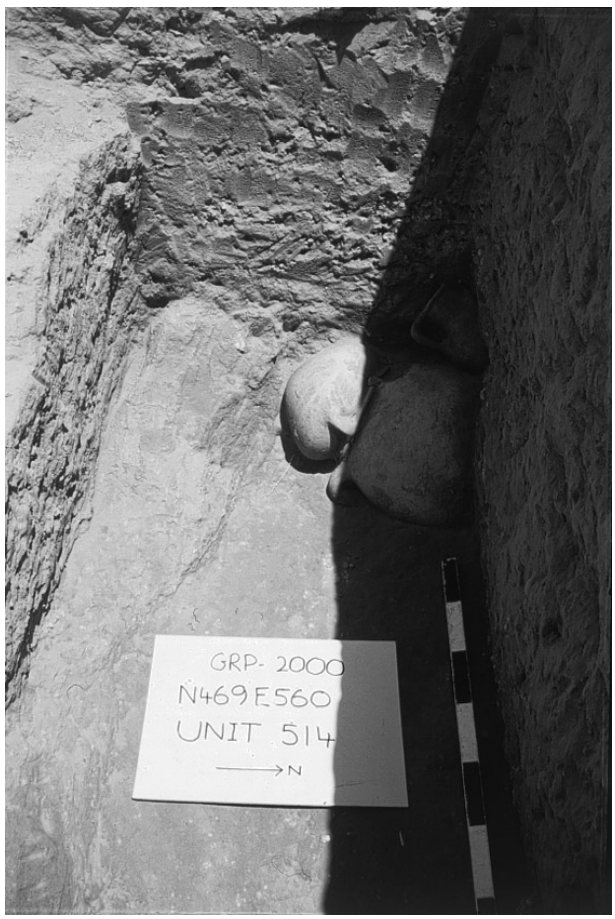

Figure 11. *al-Moghraqa*: *MB II pottery (F516)* in situ.

503, 602 – Decayed mudbrick. Hard compacted clay and mud mixed with degraded mud brick;
517, 606 – Surface I (at the interface between 602/604 and 503/504). This was a thin compacted mud layer within which were numerous ash lenses and upon which was found a goblet (MOG1–00–7–32) crushed *in situ* and three arrowheads (MOG1–00–2–8, MOG1–00–2–9, MOG1–00–2–10);
603 – Yellow clay found in southern part of trench, forming surface, overlying 604. (same as Surface I?)
504, 507 and 604 – Decayed mud brick. Fine to very fine grey brown mud or clay deposit with rich cultural deposits including quantities of MBA pottery, flint and bone, unworked carnelian, slag, fragment of architectural plaster;
505 and 605 – Ash lenses on 504, 604. Rich cultural material found in 505: ceramic bead (MOG1–00–1–4) and paste scarab fragment (MOG1–00–4–2), copper/copper alloy sheet metal, one clay sealing and four pieces of pumice;
506 – Ash. Fill of the *tabun*, F509;
508 – Ash lens. Deposit located near the tabun, F509;
509 – Tabun (F509), sitting on 510;
510 – Decayed mudbrick layer;
511, 512 – Surface II. Rich deposits comprising slag, unworked mother-of-pearl, pumice, several copper/copper alloy tools and one piece of iron, two clay sealings;
513 – Compacted layer of sand with high concentrations of calcium carbonate, next to 511 and 512;
514, 515 – Decayed mud brick. Fine wet brown mud, beneath lens of calcium carbonate and Surface II; Jasper scarab fragment (MOG1–00–3–2), paste bead (MOG1–00–4–1), a piece of haematite and piece of basalt grinding stone found in 514;
F516 – Deposit of three near complete vessels (MOG1–00–7–39, MOG1–00–7–40, MOG1–00–7–41) in the north-west corner of the trench.

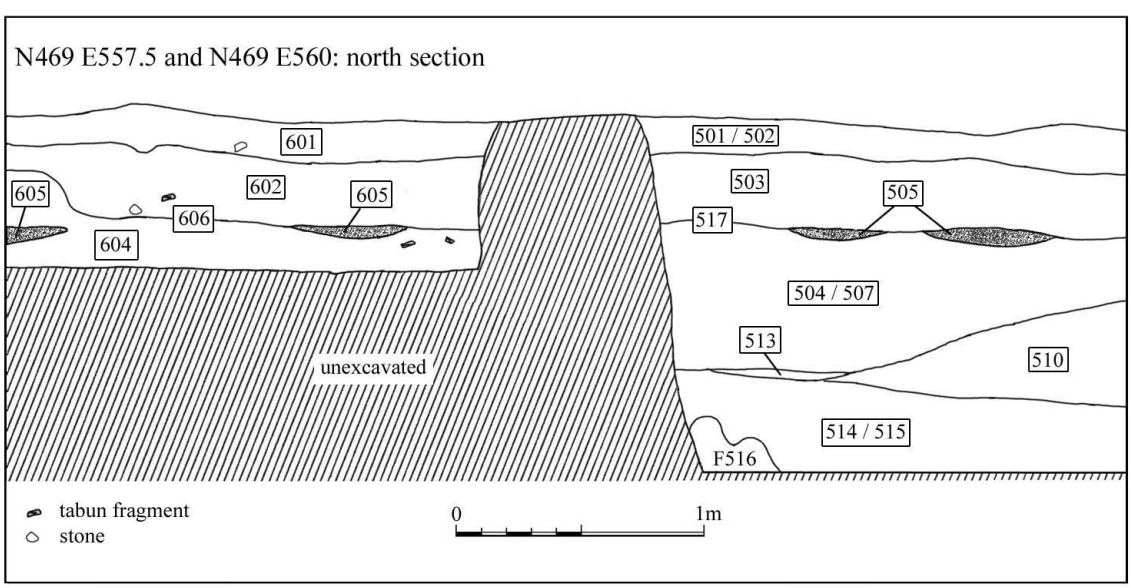

Figure 12. *al-Moghraqa*: *N469 E557.5 and 469 E560: section, north baulk.*

N464 E563: 2 × 1 m. sounding 5 m. south and 3 m. west of N469 E560, opened to ascertain whether the cone deposit extended beyond what appeared to be a very localised area. If the cone concentration represented a discrete dumping horizon, it was argued that the cone fragments would not extend considerably beyond this primary zone.

The uppermost layer comprised compacted aeolian sand, similar to the uppermost deposits in N469 E557.5 and N469 E560. This layer, however, was completely devoid of cone fragments. Beneath this there was a layer of silt, 40 cm. thick, which contained mixed pottery of Bronze Age and Byzantine date. The surface of the silt layer was cut by deep plough ruts, which were filled with the same compacted aeolian sand as in the upper layer. The silt sealed a layer of decayed mud brick, approximately 40 cm. thick, extending across the entire area of the sounding, associated with MB and LB pottery. Beneath the mud brick there were two thin layers of occupation debris. The uppermost layer (unit 008, 009) was 10 cm. thick and contained small quantities of MB II pottery. The lower occupation level remained unexcavated at the end of the season. This trench appears to confirm, therefore that the deposit of cones did not extend this far, as we would have expected to come across at least some small fragments if there had been any in this area.

Summary of deposits (Fig. 13):
001 – Aeolian sand deposit. Compacted, very hard sand mixed with clay. Fragmentary pottery, some flint and bone;
002 – Aeolian sand deposit. Compacted mud and sand, fill of 003. Small quantities of pottery of mixed date;
003 – Plough lines cut into 004;

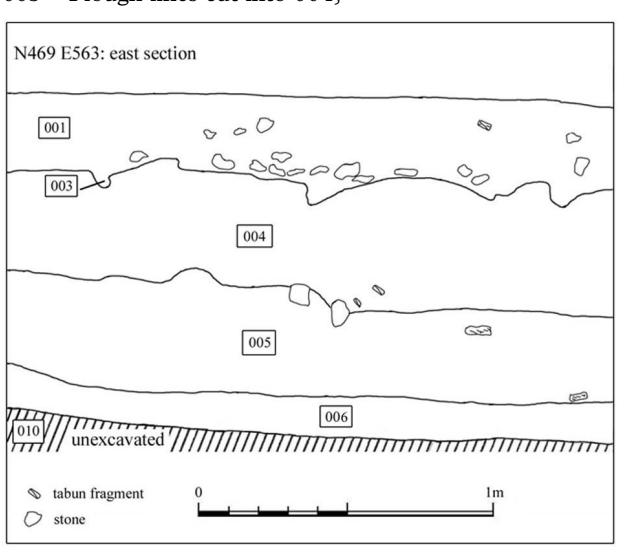

Figure 13. *al-Moghraqa: N464 E563: section, east baulk.*

004 – Silt deposit. Dark brown fine mud and sand. Very moist. Mixed deposit, MB, LB and some Byzantine pottery;
005, 006 – Decayed mud brick. Moderately compacted pink with orange and yellow brick patches. Fine and silty. Exclusively MB and LB pottery, and some bone;
007 – Ash lens. Fine grey black lens within 005, 006;
008, 009 – Occupation deposit. Well compacted brown-dark brown fine sandy, ashy deposit, 008 containing some MB II pottery;
010 – Occupation deposit, with MB II pottery and small pieces of charcoal. Unexcavated.

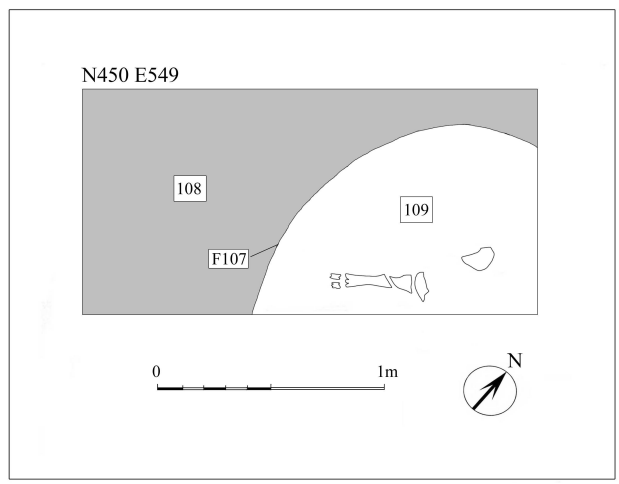

Figure 14. *al-Moghraqa: N450 E549: plan of F107.*

N450 E549: 2 × 1 m. sounding in the area where the greatest concentration of material had been collected during survey. The MBA levels were sealed by a layer of aeolian sand, around 20 cm. thick, and a layer of silting between 20 and 30 cm. thick. This silt layer was also identified in N464 E563 (unit 004), N434 E529 (units 201, 202) and possibly in N438 E523.5 (units 301, 302, 307). The surface of the silt layer was cut by thick plough ruts running east/west. It sealed a substantial deposit of mud brick collapse, approximately 30 cm. thick, covering the entire area of the sounding. MB II pottery, fragmentary animal bone and *tabun* fragments were found in this layer. The mud brick sealed a single activity layer (Fig. 14): a pit (F107), most of which lay beneath the northern baulk of the sounding, was cut into a compacted clay matrix. The upper fill of the pit contained MB II pottery and rich faunal remains in an ashy matrix. Once the pit was identified, excavation was suspended. It was intended that excavations in this area would be extended in 2001.

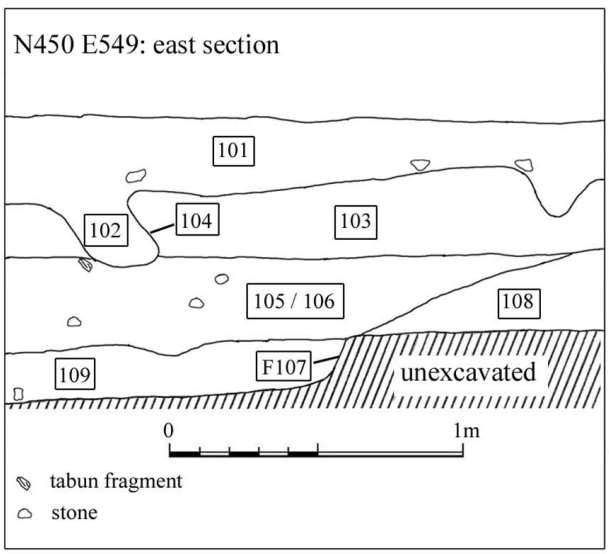

Figure 15. *al-Moghraqa*: *N450 E549: section, east baulk.*

Summary of deposits (Fig. 15):
101 – Aeolian sand deposit. Compacted sand mixed with calcium carbonate chips and mud. Some pottery, primarily Byzantine;
102 – Interface between aeolian sand deposit and silt deposit below, also comprising fill of 104. Very hard compacted clay and sand with limestone chips and mixed pottery;
103 – Silt deposit. Very hard compacted damp dark clay with sandy lenses and higher concentrations of calcium carbonate, similar to silt deposit in N464 E563 and N434 E529. Mixed pottery, some flint, bone and one piece of glass;
104 – Plough lines, 5–6 cm. wide, running east/west, cut through 103. Some mixed pottery and flint debitage in fill;
105, 106 – Decayed mud brick sealed by 103. Possibly same matrix as found in N464 E563 and N469 E557.5, N469 E560. Rich deposit of MB pottery, some bone, *tabun* fragments;
107 – Cut of pit F107, cut into 108. Approximately one quarter of the pit is exposed;
108 – Unknown deposit. Gritty compacted clay with very high concentration of calcium carbonate, essentially sterile. Sealed by 105 and cut by F107. Possibly the same as unit 305 in N438 E523.50;
109 – Upper fill of pit (F107). Moist dark grey loamy soil mixed with fine ash. Lots of MB II pottery and animal bone.

N440 E523.5: 2 × 1 m. sounding in the southern zone of the site exposed after 1999 by bulldozing. This sounding was positioned specifically to test the nature of a large depression in the surface, possibly indicating the presence of underlying archaeological features. The surface layer of silt, up to 10 cm. thick, contained a mixed deposit of pottery ranging in date from MBA to Byzantine, and a burnt clay scarab sealing. This appears to be the same as the silt layer identified in N464 E560 (unit 004) and N450 E549 (unit 103). Sealed beneath this layer there was a large pit (F310), which contained quantities of MB II pottery together with fragmentary animal bone. At the interface of the silt deposit and the upper fill of the pit, in unit 304, we found a steatite cylinder seal (Collon 2002). The trench was expanded to a 5 × 1 m. sounding (N438 E523.50) to try to establish the full diameter of this pit (Fig. 16). The northern limits were identified, cutting into a sterile compacted clay matrix, but the southern edge was not exposed. Only the upper level of the pit was sampled to establish the latest date of the fill, and a 5% sample was taken for wet-sieving. It was decided to halt excavations at a depth of approximately 20 cm. and to

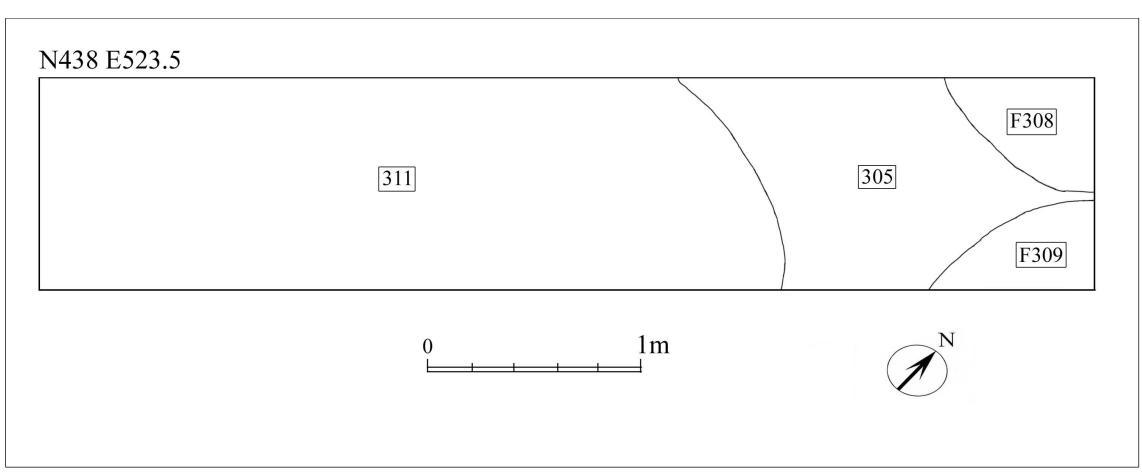

Figure 16. *al-Moghraqa: N438 E523.5: plan of F308, F309, F310.*

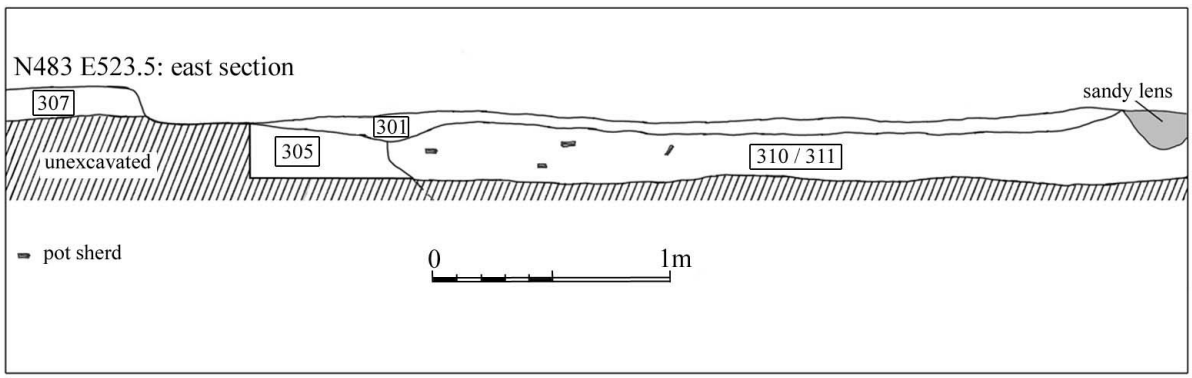

Figure 17. *al-Moghraqa: N438 E523.5: section, east baulk.*

complete excavation of the pit in 2001. Two further pits (F308 and F309) were identified to the north of F310, cut into a sterile deposit of compacted, gritty clay. These were left unexcavated and it was planned to extend this area in the 2001 season.

Summary of deposits (Fig. 17):
301, 302, 307 – Silt deposit. Compacted sand and clay containing mixed MBA and Byzantine pottery. Clay sealing (MOG1–00–9–1) found in 301;
303 – Gritty compacted clay with very high concentration of calcium carbonate, essentially sterile. The context number was cancelled during excavation as it was too difficult to define its boundary with 304. It was however clear in section and is the same as 305;
304 – Interface between overlying silt deposit and upper fill of pit (F310). Compacted sandy clay with some calcium carbonate. Concentration of pottery in southern area is the earliest indication of the presence of a possible pit feature (F310). Mixed MBA, LBA and Byzantine pottery, and cylinder seal (MOG1–00–3–1);
305 – Gritty compacted clay with very high concentration of calcium carbonate, essentially sterile. Cut by pits (F310, F308 and F309). In section this is clearly the same as 303;
306 – Fill of pit F310. Compacted sandy clay with some calcium carbonate. Appears to be a continuation of 304, but the context change was determined on the basis of a change in pottery from mixed to pure MBA deposits;
308 – Pit (F308) cuts 305. Sealed by 307. Unexcavated. Bone and pottery visible on surface;
309 – Pit (F309) cuts 305. Sealed by 307. Unexcavated, but fill appears to be very compacted, containing ashy material;
F310 – Pit cuts 303, 305;
310 – Fill of F310. Compact sandy clay with calcium carbonate, ash and patches of unfired orange clay. High concentrations of pottery, burnt pottery and bone. 5% sample taken for wet-sieving;
311 – Fill of F310. Comprised damp, compacted sandy clay. 5% sample taken for wet-sieving.

N434 E529: was a 2 × 1 m. sounding in the newly exposed southern sector of the site. Although excavated to a depth of 0.8 m. below the present surface, no significant archaeological horizons were encountered and it was decided to abandon the sounding. The very moist compacted matrix of sand and clay represents the layer of silting that covers the MBA remains in other areas of the site. This contained small quantities of mixed pottery of MBA, LBA and Byzantine date. This layer of silting appears to be the same as that identified in N464 E563, N450 E549 and N438 E523.50, but in this area it is particularly thick. Possibly the silting seals MBA deposits, but this needs to be tested in future excavations.

Summary of deposits:
201 – Silt. Hard, slightly moist compacted sand and mud. Some mixed pottery and a single Roman tessera;
202 – Silt. Moist brown silty sand with very few artefacts other than occasional pottery sherds.

Summary of activity zones and stratigraphy at al-Moghraqa

The morphology of al-Moghraqa recorded during the 1999 survey had been altered by bulldozing activity during the spring of 2000. In 1999 a thin layer of aeolian deposit, surviving to a depth of approximately 10 cm., had extended across much of the site. By 2000 sand dune clearance had exposed a greatly expanded area of the site, directly down to the underlying silt layer. One small pocket of ancient sand dune survived in N469 E557.5 and N469 E560 around the base of a tree. The site can be divided into three discreet zones (Fig. 7): Zone 1 is essentially the north-west quadrant and lies at the very edge of the site; Zone 2 is the north-east quadrant and is characterised by the concentration of

terracotta cones in a matrix of compacted aeolian sand; Zone 3, in the southern sector of the site, is characterised by a layer of silt which is absent from the northern quadrants. In some places the silt forms the surface deposit where it was exposed by bulldozing, while in other areas it still lies beneath compacted aeolian sand.

Zone 1: in the north-west quadrant of the site. Here recent sand dunes lay directly above plough soil. Only very small quantities of mixed pottery were recovered in the top quarter of the deposit, probably denoting a number of ploughing episodes. Beneath this the soil was completely sterile. At completion of excavation we had excavated to a depth of just under 1.5 m. of which the last 50 cm. was completely devoid of material culture. Bedrock was never reached. The actual nature of the bedrock in this area is not clear but this is probably the same as the hard aeolianite (finely layered sands with calcium carbonate cement) that form the underlying rocky foundation at ʿAjjul. Traces of the sands with *kurkar* concretions that overlie the aeolianites were found in some trenches and the 'bedrock' is probably not much further down. Although this area had been particularly rich in artefactual material during the 1999 survey, it appears to lie beyond the limits of the MBA site.

Zone 2: in the north-east quadrant, where a small and discreet area of ancient compacted aeolian sand survived over an area of approximately 6–8 m^2 to a depth of around 10 cm. It is in this deposit that large quantities of cone fragments were located. Beneath this layer there was a clear stratigraphic sequence of MB II occupation and collapse, represented by patchy surfaces sealed by thick deposits of decayed mudbrick. A rich assemblage of artefacts was found associated with the various surface layers. The significant quantity of worked stone and cultural material implies we may have exposed a workshop area. Certainly the patchy nature of the surfaces, the apparent absence of architecture and the presence of a *tabun* suggest that it was an outside area. Future work should indicate the nature of the activities that took place in this area.

Zone 3: the southern half of the site, defined the presence of a silt layer up to 80 cm. thick in some areas (N434 E529) and at least 30 m. across. In N450 E549 and N464 E563 the silt layer was covered by ancient sand dune (as in Zone 2) and the upper surface of the silting had been ploughed. In the southern part of Zone 3, however, the bulldozing activity in 2000 had cut through any higher deposits and the layer of silt was exposed on the surface. The western and southern extent of the silting disappears under sand dunes and it does not appear to extend as far south as Area 2. The form of the silt deposit suggests that it might be the remains of a pond or localised swamp that existed in this area in antiquity. The silting directly sealed the MBA deposits, but the date of the silting episode is unclear. The associated pottery recovered is mixed MB, LB to Byzantine. Sealed beneath the silt layer we identified secure MB II cultural levels. In the southernmost part of the site the silt directly overlay the MB II surface and a series of large pits. Further north the occupation levels, represented by tamped outdoor surfaces, were covered by a deposit of mud brick collapse, 40 cm. thick. This appears to relate to the latest level of mud brick collapse identified in Zone 2. The significant MB activity areas identified in Zone 3 were to be the focus of future excavations.

Phasing

A Harris matrix (Harris 1975, 1979) was constructed, relating the stratigraphic sequence from Zones 1, 2 and 3. Due to the limited nature of the soundings the relational information of the matrices is very simple, however we have used these to construct a phasing sequence for Zone 2 (Fig. 18) and to extrapolate this throughout the site.

The earliest occupational activity at the site has only been identified in Zone 2, in sounding N469 E560. Phase Ia, identified at the end of the season, is an MB IIb-c occupation level. This is represented by the cache of pottery (F516), probably lying immediately on an occupational surface. Phase Ib represents the building debris (units 512, 514, 515) sealing Phase Ia. Phase IIa is a later occupation layer immediately overlying the building collapse of Phase Ib. It is represented by units 510, 511 and probably also the compacted layer of sand, unit 513. Secondary occupation, represented by the *tabun* (F509) and associated ashy layer (unit 506) should probably be assigned to Phase IIb. This is dated by the associated finds to MB IIb-c. It is sealed by a layer of building collapse, Phase IIc.

Phase III is more widely represented in Zones 2 and 3, and also dates to the MB IIb-c period. Surface I (units 603, 606, 517), in soundings N469 E557.5 and N469 E560, is definitely to be assigned to Phase IIIa, as is the surface (unit 010) identified in the bottom of sounding N464 E563. This occupational layer is sealed by mudbrick collapse, representing Phase IIIb. At present it is not clear whether the occupation layers identified in Zone 3, and represented by an area of pitting cut into sterile clay, should be assigned to Phase IIIa or to an earlier phase of activity at the site. For the purposes of this publication we have tentatively assigned the

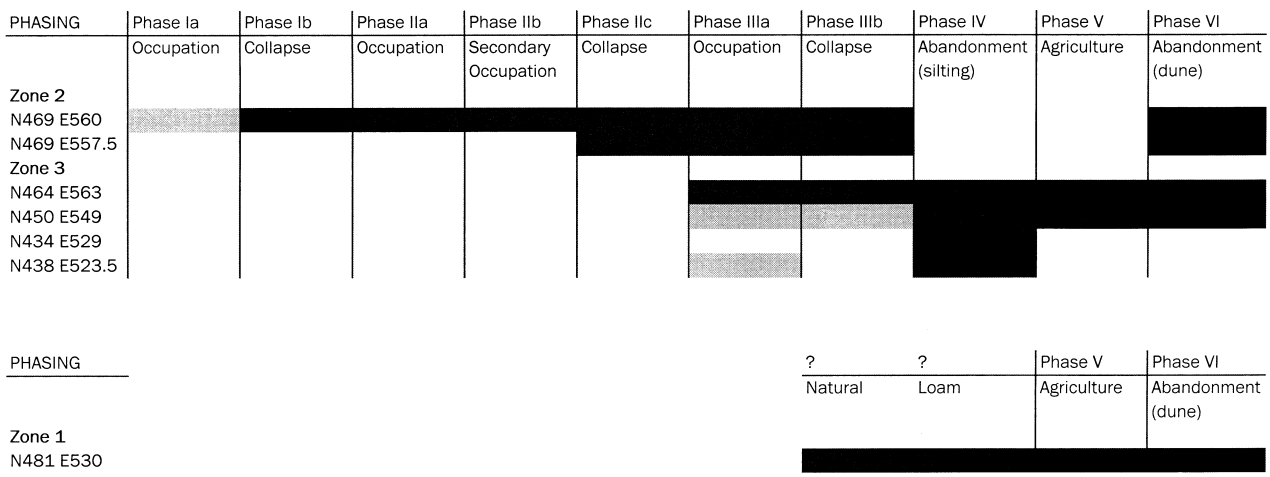

Figure 18. *Phasing scheme for al-Moghraqa.*

activity represented by the cut and the fill of the pits to phase IIIa. It is possible, however, that the initial silting episode in Zone 3 occurred while Zone 2 was still occupied, and consequently that the MBA levels in Zone 3 might relate to either Phase I or Phase II. However, further excavation is necessary to assess the stratigraphic relationship between Zones 2 and 3.

Phase IV represents the initial abandonment of the site, during which time the southern half of the site (Zone 3) became silted. This layer of silting immediately overlies the MB IIb-c occupation layers and the absence of any intermediate aeolian deposit suggests that the site had become waterlogged almost immediately after abandonment. Indeed it is possible this episode may have caused the abandonment of al-Moghraqa at the end of the MBA. The silt layer contained very little cultural material and all of it was mixed, MBA, LBA and Byzantine. This implies that the area remained swampy throughout later antiquity.

Phase V is characterised by agricultural activity: cf. the plough marks identified in N481 E530 (Zone 1) and N464 E563, N450 E549 in Zone 3. This Phase is not apparent in Zone 2 (the area of the cones). The date of the plough activity is unclear, but the material filling the plough marks is mixed. Phase VI is a final period of abandonment during which time the site was covered by sand dune: units 401, 402, 403 in Zone 1, units 501, 502, 601 in Zone 2 and units 001, 101 in Zone 3. Possibly the deposition of the cone fragments in Zone 2 should be assigned to Phase VIa and the covering of the site with sand to Phase VIb. Certainly the cone fragments were mixed in with the sandy matrix that characterises this Phase. The date of the dumping episode is not clear, but mixed in the matrix were sherds as late as Byzantine in date. Soil formation appears to have stabilised the sand dunes during the Byzantine period, effectively sealing an irregular dune landscape, and the site. In more recent times active sand dunes moved inland again and their removal, to access the moist loamy fertile agricultural soil beneath, exposed Moghraqa.

The pottery from al-Moghraqa
J. Clarke

1. General observations

Current land use and topography dictated the strategy for recording and retrieval of the pottery. In 1999 a significant amount of the survey area was still covered in sand dunes and only small strips had been cleared for agricultural purposes. We conducted only limited survery around the edges of the dunes, as it would appear from the geomorphologic findings (see Munro *infra*) that the dunes are quite recent. The pottery found on the surface of the dunes, largely Byzantine and Islamic, had probably been re-deposited during the formation of the dunes.

The range of wares, forms and the chronological range of the pottery reflects similar trends in both the survey and excavation assemblages. For the most part the survey pottery can be assigned to the MBA and LBA. Just under 1600 sherds were collected through survey: 1240 were collected by intensive survey; and two-thirds of this pottery was attribut-

able to the MBA and LBA; 25% was Byzantine or Islamic with occasional modern sherds (the typical Gaza black ware); and a remaining 5% were unidentifiable and/or abraded. Similar trends were observed in the pottery from the excavations: 11297 sherds were collected; 2719 came from mixed deposits and 8578 from sealed deposits. Fewer than 5% of the sherds from mixed deposits post-dated the MB and LB periods. The pottery from deposits sealed beneath the silt layer and decayed mud brick all dates to MB II. Very few examples of imported wares were found in survey or excavation, despite the large quantities of Cypriot pottery from nearby Tell al-ᶜAjjul; indeed there was only one clear Cypriot import, a Middle Cypriot White Painted wishbone handle from Area 2 (Fig. 28).

2. Methodology and typology

The pottery was sorted according to date, ware, form and components, and the results were then compared with contemporary assemblages from other second-millennium sites in the Levant. The most comprehensive typological and comparative analysis of MBA pottery available is the report from the Tell Balatah excavations (Cole 1984). The Tell Balatah assemblage is useful shape typology for MB II pottery that can be broadly adapted to other Levantine sites, despite some regional variation. Cole's typology has been adapted for this report and where we have enough of the vessel remaining a shape code based on Cole 1984 has been allocated.

Although we identified Byzantine, Islamic and modern pottery amongst the survey assemblage, we decided to record only the quantity, shape and type of vessels represented, as our primary concern was with the second-millennium material. Our study of the second-millennium pottery was more detailed to allow us to explore issues such as fragmentation and traces of use-wear. For the most part the pottery was very fragmentary and there were few complete profiles. Moreover there were few diagnostics and a significant proportion of the rim and base sherds could have come from a range of vessel shapes. The breakdown of component types should be helpful in interpreting the range of activities at al-Moghraqa. For example the proportions of open and closed vessels or large and small vessels and the contexts in which they were found might indicate different activity areas. Similarly, use-wear analysis might help to ascertain the types of activities taking place in a given area.

Research questions arising from the survey were different to those arising from excavation and therefore we tailored our analyses accordingly. Our primary research interests for the survey focused on distribution patterns (presence/absence of ware types and shapes and chronological and morphological frequency distributions). This allowed us to identify concentrations of MBA and LBA pottery and thereby to establish the extent of the site, and possibly some indication as to its nature. We also observed the extent of abrasion of the survey pottery: very abraded sherds would suggest that material had been churned up through agricultural activities over a period of time, whereas fresh breaks would indicate that the sherds had only just come to the surface and were largely *in situ*. This theory was substantiated by the patterns of abrasion we noted on sherds collected from the top of sand dunes and sherds collected from Area 2. The former group was usually rounded at the edges and quite small and the surface was largely worn, whereas sherds from Area 2, which had only recently been ploughed in 2000, were larger with sharp breaks and intact surface treatment. The sherds from the main survey area (Area 1) were abraded, but not to the extent of those found on the top of sand dunes. The degree of abrasion noted on these sherds was consistent with the initial exposure of the site in 1996.

The format of the ceramic report has been shaped by the limitations of the excavation. The data from use-wear studies and component analyses have not been included because of the limited excavation exposure. The small soundings offer a snapshot of the types and the chronological range of ceramics represented at al-Moghraqa, but there is insufficient stratigraphic information for more rigorous analysis.

3. Shapes

The ceramic assemblage is limited to a few basic forms. The most common forms are platter bowls, large jars and deep bowls. Carinated bowls were also common and there are some examples of smaller jars. The absence of imported vessels is surprising. There were two examples of biconical vessels of Egyptian type but these were locally made. Other than a White Painted II wishbone handle found in Area 2 (Fig. 28) there were no Cypriot imports, which was quite surprising given the quantity of Cypriot imports at nearby Tell al-ᶜAjjul.

Platter bowls

All examples of platter bowls at al-Moghraqa come from survey and surface deposits. A range of platter bowl types was represented at al-Moghraqa. Simple flaring bowls with straight sides and tapered rims were found in Area 2 and in unstratified excavation deposits (Fig. 20: 1–2). These are best paralleled at

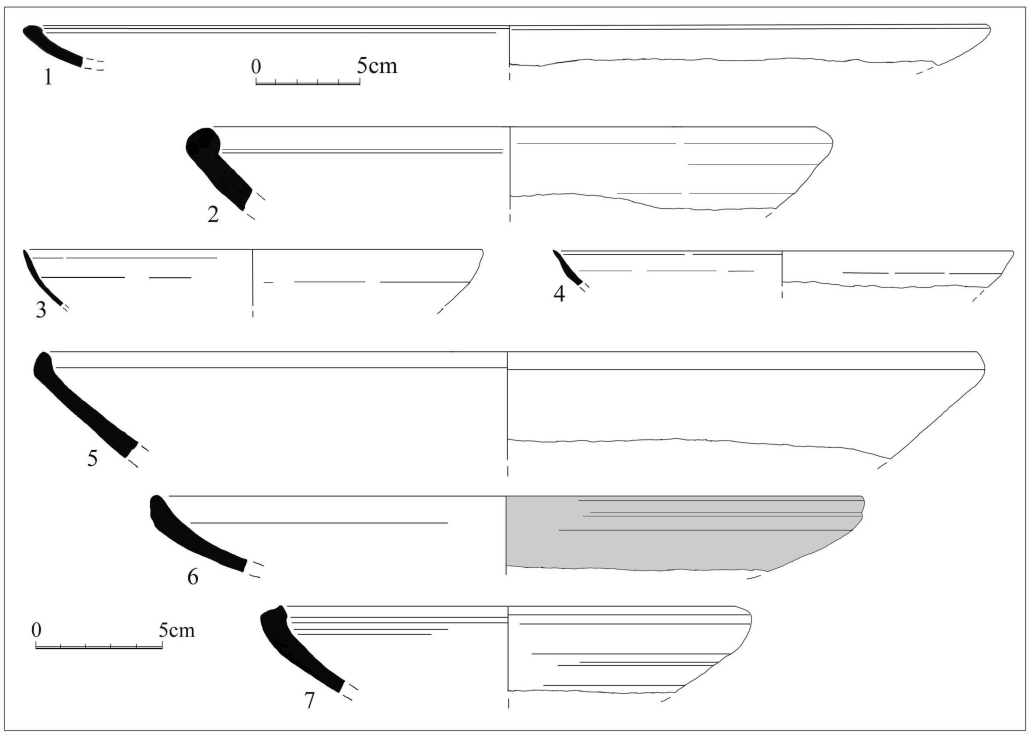

Figure 19. *al-Moghraqa: MB-LB platter bowl rims: (1-5, 7) Area 1; (6) Area 2.*

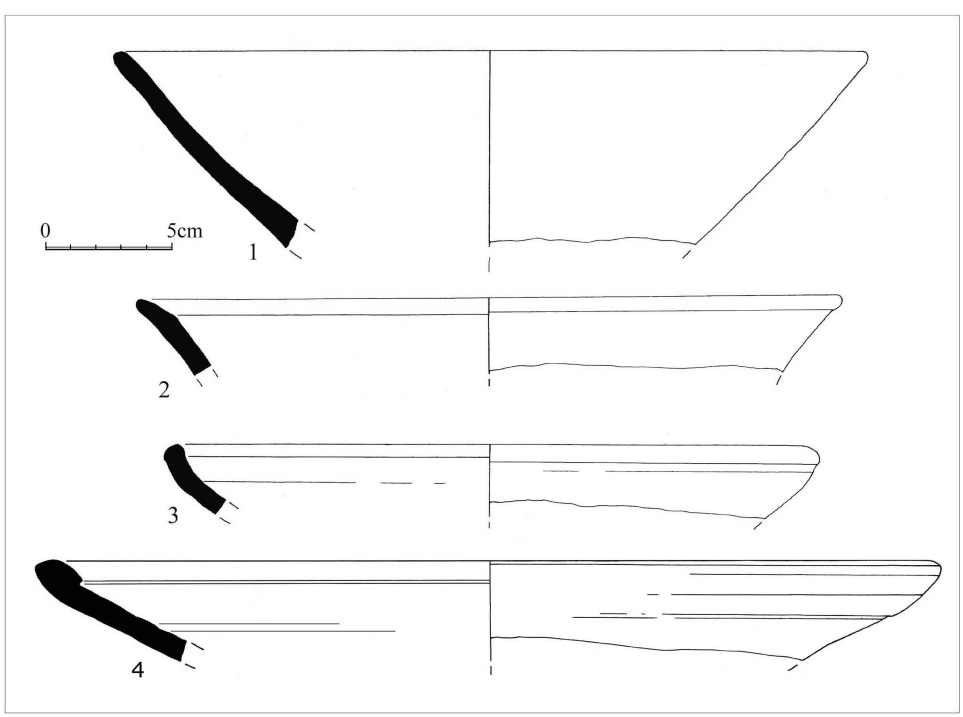

Figure 20. *al-Moghraqa: MB-LB platter bowl rims: (1, 3, 4) Area 1; (2) Area 2.*

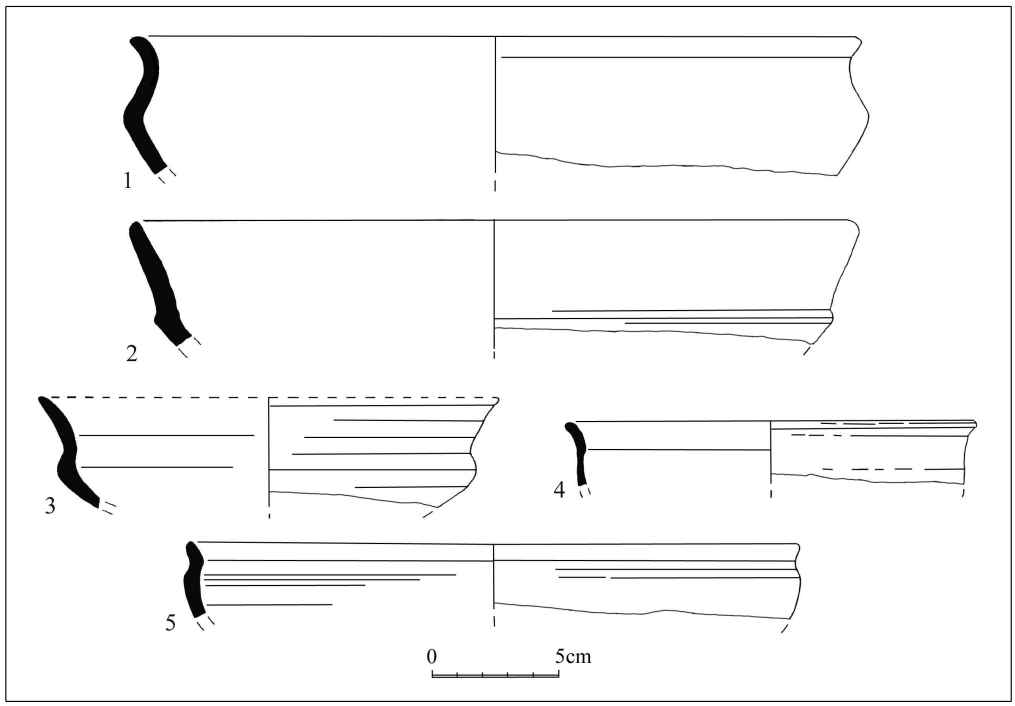

Figure 21. *al-Moghraqa: MB II carinated bowl rims: (1, 4, 5) Area 1; (2-3) Area 2.*

Tell al-ᶜAjjul in the upper levels (Fischer and Sadeq 2002, figs 9: 7 and 12: 2) and are typologically similar to Late Bronze Age shapes known from other sites (see Amiran 1969, 127, pl. 38: 4 and 38: 5). Platter bowls with rounded or bulbous inverted rims or tapered rims with flattened external edge (Cole 1984, type Bp.12.h) were the most common types (Fig 19: 1–7). Less common were bowls with elongated inverted rims with triangular section (Fig. 20: 4). This type is represented at Tell Balatah in the MB IIc period (Cole 1984, 109, pl. 5e) but were uncommon at Tell al-ᶜAjjul. There were also two examples of small shallow hemispherical bowls in eggshell ware (Fig. 19: 3–4).

Carinated and S-shaped bowls

Carinated and s-shaped bowls at al-Moghraqa are all of the evolved MB IIb-c type with a gentle inverted curve from rim to a rounded carination and rounded everted curve to the base of the bowl. There were two examples of sharply carinated bowls with straight flaring upper walls, a sharp carination and straight angled lower wall (Fig. 21: 2–3). The rim profile MOG1–00–7–35 (Fig. 21: 1) was the only example of an s-shaped bowl found in a sealed deposit. It has parallels at Tell al-ᶜAjjul (Fischer and Sadeq 2002, 126, fig. 17: 5) and can be dated to MB IIb-c.

Deep bowls

Almost all the al-Moghraqa examples of deep globular bowls were fragmentary. There is one example from Area 2 of an MB IIa type coarse cooking pot with applied rope decoration (Fig. 22: 1; see Amiran 1969, 101, pl. 30: 1; Beck 1975, 49, fig. 2: 15). This fragment has a hole situated just above the rope decoration; such holes are a normal feature of these vessels. All other examples are deep and globular with and without single loop handles running from the rim to the shoulder. Five rim types are represented.

1. The plain everted rim (Cole 1984, class Bd C) (Fig. 22: 2, 23: 1–3).
2. The folded rim with sharp external transition (Cole 1984, class Bd C.32 and Ch. 22) (Fig. 23: 4–5).
3. The outward folded undercut rim (Cole 1984, class Bd C. 32 and Ch. 21).
4. The outward folded and squared rim (Cole 1984, class Bd C. 33) (Fig. 24: 1).
5. The incurving squared rim (Cole 1984, class Bd B. 1) (Fig. 24: 4–5). There are also a number of variants.

Our one example of a complete globular bowl was situated in unit 514, a decayed mud brick deposit above a probable floor. It has a globular body,

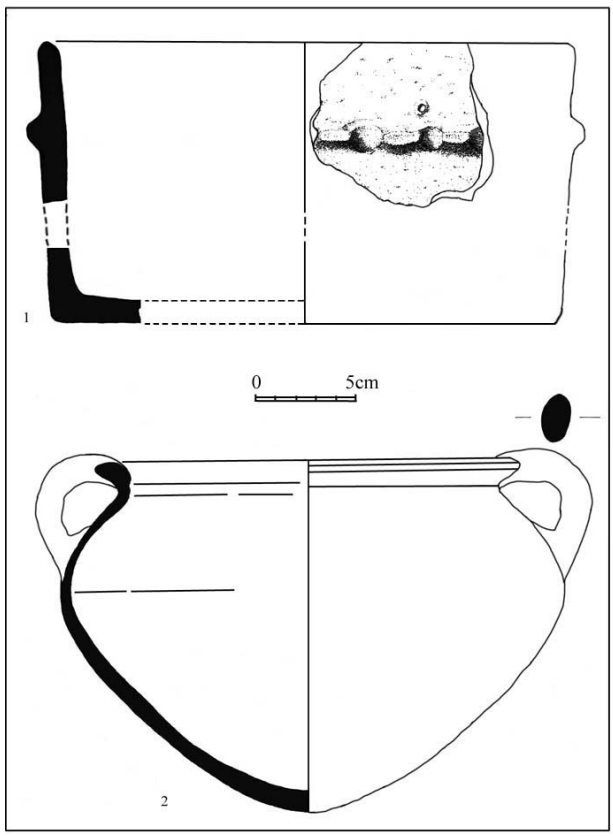

Figure 22. *al-Moghraqa: (1) MB IIa coarse ware cooking pot rim from Area 2; (2) MB IIb-c deep globular bowl (F516).*

rounded base with two handles from the rim to the shoulder and a plain everted rim (Fig. 22: 2). The vessel was found together with two other almost complete vessels, a large (Canaanite) jar and a trefoil mouthed jug. All three vessels were unslipped and undecorated apparently for everyday use in the storage, preparation and serving of foodstuffs.

Large jars

As with deep bowls, at al-Moghraqa large jars are mostly represented by sherds. A wide variety of rim types are represented, some typical of MB II while others are common in both the MBA and the LBA. Unfortunately only one example comes from a sealed deposit, the large (Canaanite) jar discovered in unit 514 with the cooking pot and jug with trefoil mouth. This example has an ovoid body tapering to a rounded base, two vertical single loop handles with oval sections attached at opposite sides of the body at the place of widest circumference and a tall flaring gently rippled neck (Fig. 26: 1). Parallels are known from Megiddo (Finkelstein, Ussishkin and Halpern 1999, 197, figs 9.6.16 and 9.7.30) in the MBA and its wide oval profile would suggest an MBA date. Other rim types included simple and complex externally profiled (Fig. 25: 2, 3, 5, 6, 8) and internally and externally profiled (Fig. 25: 7). Some examples have their best parallels in the LBA, including Fig. 25: 3 and Fig. 25: 8 but both are also known from the MBA.

Jugs and juglets

Again jugs and juglets were mostly represented in sherd form. There are a number of pointed bases that presumably come from dipper juglets and there is a rim of a jug of MB II type (Fig. 25: 9; see Amiran 1969, 109, pl. 33: 6). A single sherd from the shoulder of a Tell al-Yahudiyah ware piriform juglet was found in an ash lens on Surface 1, along with the goblet (detailed below). The sherd has registers of punctuations between incised vertical lines (Fig. 27: 4). An almost complete jug was found in unit 514 with the large (Canaanite) jar and the deep bowl. It has an ovoid body, trefoil mouth and a single loop handle with oval section from the rim to the shoulder (Fig. 26: 2). This shape is common in MB II and examples are known from most sites, including Megiddo (Finkelstein, Ussishkin and Halpern 1999, 206, fig. 9.8.13), Tel Aphek (Beck 1975, 73, figs 12: 7, 12: 11, and 15: 6), Tell Beit Mirsim, Jericho, Gezer and Tell al-ᶜAjjul (Dajani 1960). Dajani (1960, 109) also saw their place of origin as the southern coastal Levant, however as they are known from sites across the region it is uncertain whether this attribution is founded.

Other shapes

A rather unusual goblet (Fig. 27: 5) with tall carinated pedestal base and high slightly flaring carinated walls is close in style to a goblet found at Tell al-ᶜAjjul (Fischer and Sadeq 2002, 135, fig. 25: 7). The al-Moghraqa goblet was found lying on the uppermost surface directly below the latest deposit of decayed mud brick. The Tell al-ᶜAjjul example dates to MB IIb-c. Finally, there are two examples of biconical jugs. The first is decorated in horizontal bands of red paint just below the rim and has a flaring rim with internal gutter. The second is covered in a white slip and has an outward folded rim. Both are locally made copies of Egyptian types (Figs 27: 1 and 27: 3).

4. Chronology

As mentioned above the singular lack of imported sherds made the attribution of stratigraphic units to chronological phases very difficult. The only trenches where excavation was undertaken to any

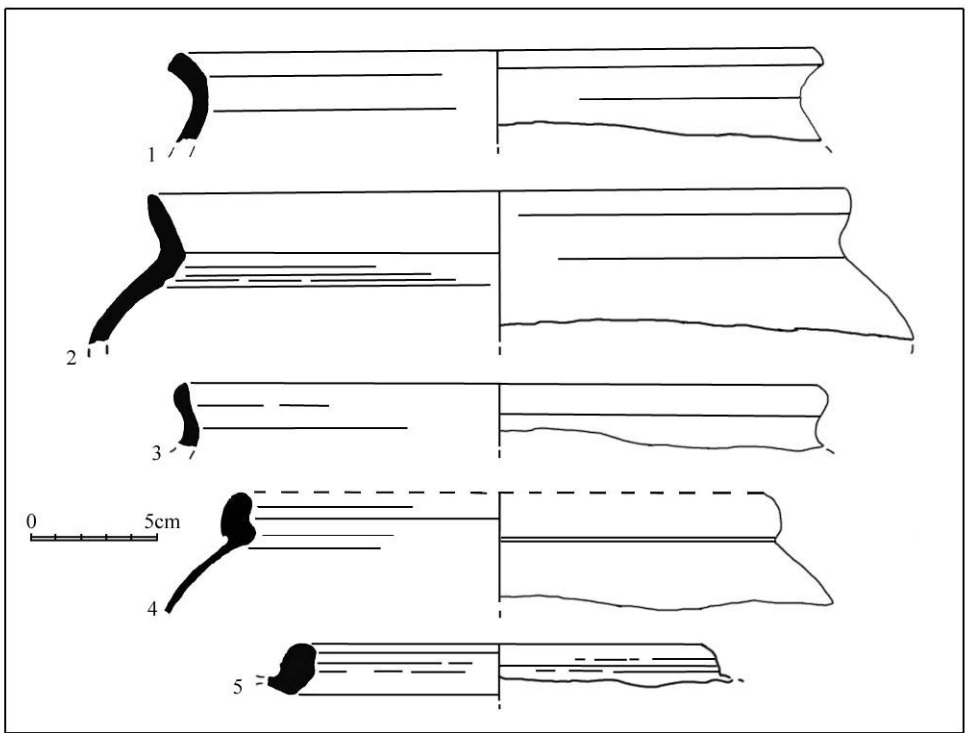

Figure 23. *al-Moghraqa: MB II deep bowl rims: (1-4) Area 2; (5) Area 1.*

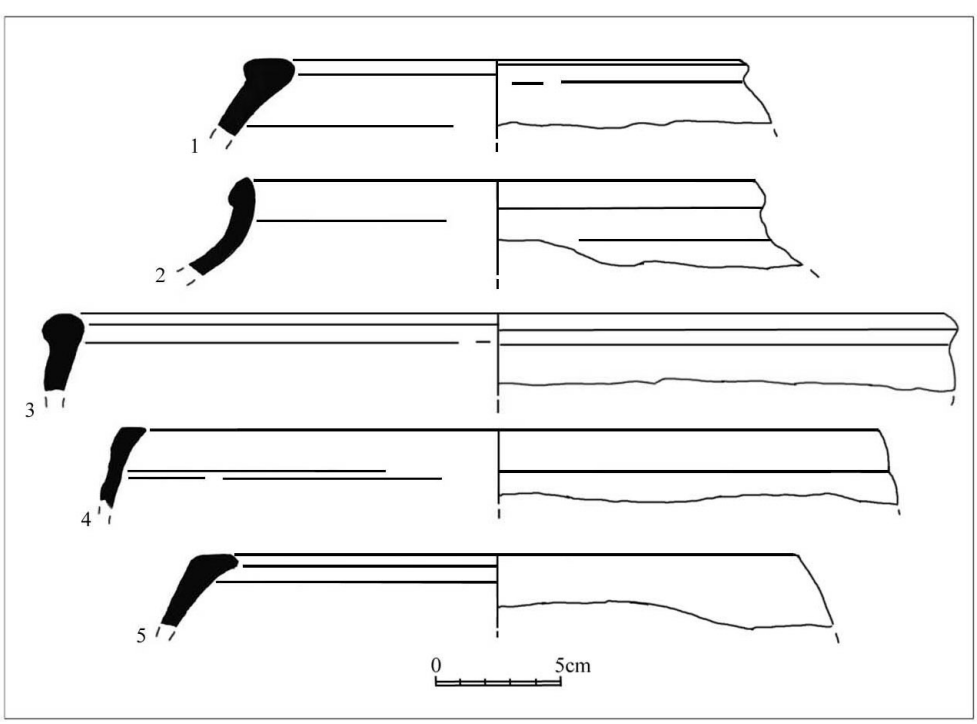

Figure 24. *al-Moghraqa*: *MB II deep bowl rims: (1) Area 2; (3-5) Area 1.*

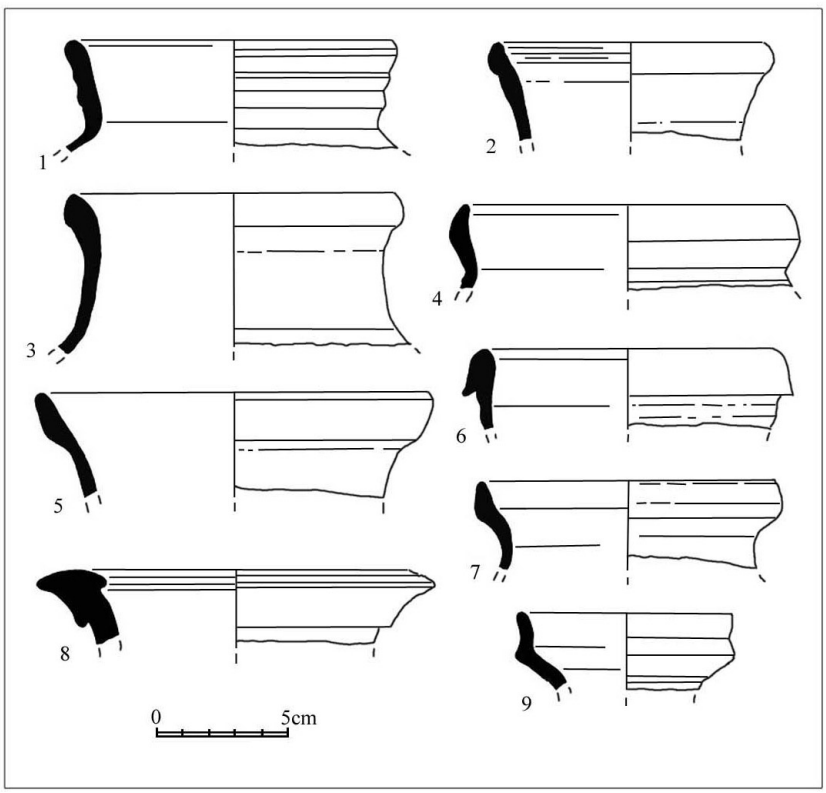

Figure 25. *al-Moghraqa: MB-LB jar rims: (1-3, 5, 7) Area 2; (4, 6, 8) Area 1; (9) MB II jug rim, Area 1.*

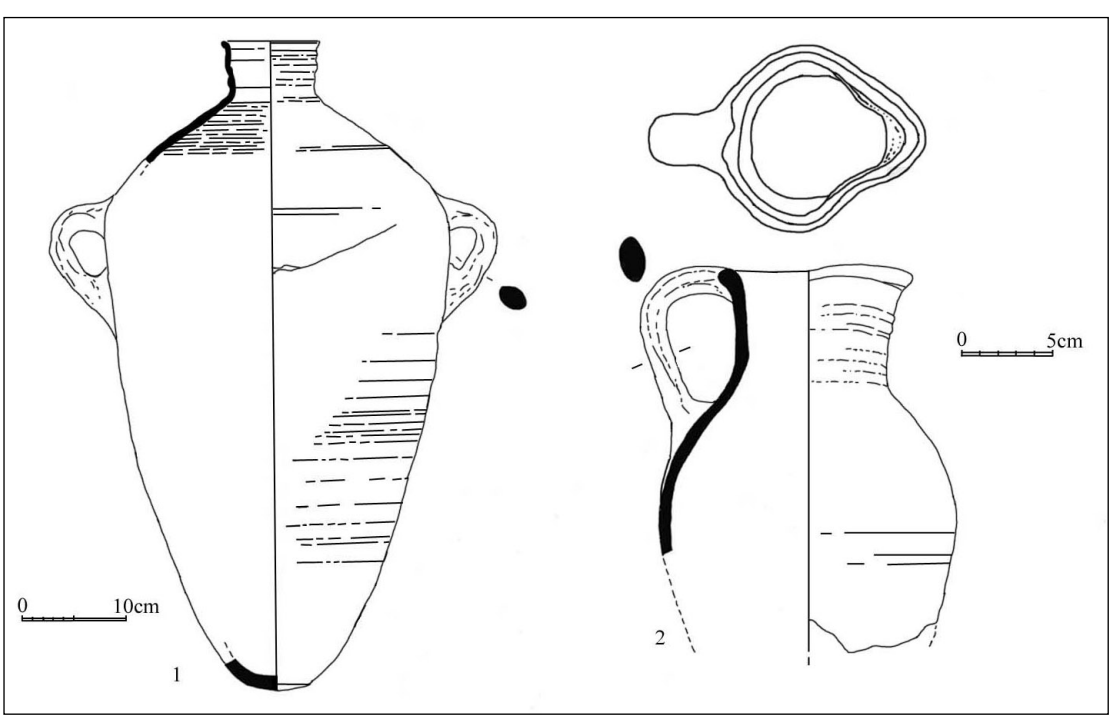

Figure 26. *al-Moghraqa: (1) MB II jar (F516); (2) MB II trefoil jug (F516).*

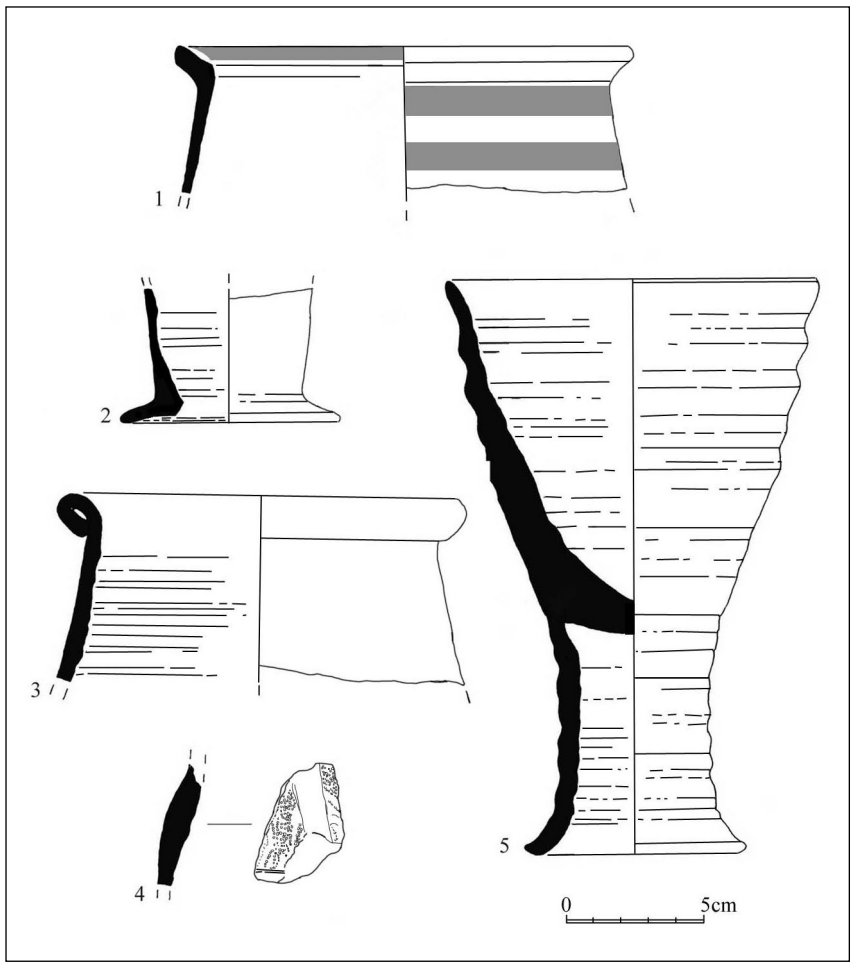

Figure 27. *al-Moghraqa: various MBA forms (1) Rim of biconical jug, Area 2; (2) base of fine-walled vessel, Area 1; (3) rim of biconical jug, Area 1; (4) Tell al-Yahudiyah ware sherd, Area 1; (5) goblet, Area 1.*

depth were N469 E557.5 and N469 E560. Here we encountered two surfaces separated by a thick deposit of decayed mud brick. The latest surface lay beneath plough soil and decayed mud brick and was not considered a sealed context, therefore some contamination of this surface may have occurred. On this surface was the Tell al-Yahudiyah ware sherd, which although common in MBIIa, is also found in numbers in MB IIb-c phase. As the al-Moghraqa example appears to be of a rather degenerated type a date in MB IIb-c seems most likely. The goblet, found in the same unit as the Tell al-Yahudiyah ware sherd, is an unusual form. Its closest comparison is an example from Tell al-ᶜAjjul but this has a clear carination at the base of the bowl, where the al-Moghraqa example has a straight flaring profile. The Tell al-ᶜAjjul example has been dated to the MB IIb-c and the al-Moghraqa example may also date to the same phase.

Below Surface I was another thick deposit of decayed mud brick and a second surface. Within the decayed mud brick layer there were numerous sherds including rims of platter bowls (Bp 11, Bp 13, Bp 53, Bp 61 in Cole 1984); carinated bowls with rounded shoulders (Bc B. 11), large jars (Jl 0.0. 11) and deep bowls (Bd C. 11, Bd C. 12). All types listed fit well within the MB IIb-c. In Zone 2 three complete vessels were found in the sounding beneath Surface II. All three were locally made vessels for everyday use and fit well within the MB IIb ceramic sequence. Similar examples have been found throughout the phase at other sites in Israel and Palestine.

5. Conclusions

The ceramic assemblage from the excavated areas would have been used for everyday activities, such as preparation, serving and storage of foodstuffs. The assemblage was dominated by locally produced wares. The absence of imported pottery was notable but it is difficult to make any judgements based on the very small exposure of the 2000 season. Unfortunately the absence of imported pottery also hampers our ability to assign an accurate date to the deposits exposed in N469 E560. The presence of Tell al-Yahudiyah ware gives us a *terminus post quem* of the MB IIa period and most of the pottery recovered suggests a date of MB IIb-c.

6. Catalogue of illustrated pottery

MOG1–00–7–18 N440 E523.5, unit 304. MB-LB platter bowl with inverted rounded rim (see Cole 1984, 107, pl. 4, Bp. 51). Exterior and interior surfaces covered in a thin light grey slip (10YR7/2). Diameter of rim 48 cm. (Fig. 19: 1)
MOG1–00–7–19 N440 E523.5, unit 304. MB-LB platter bowl with bulbous inverted rounded rim (see Cole 1984, 107, pl. 4 Bp51). Exterior and interior surfaces covered in greyish-white slip (7.5YR8/1). Fabric light red (2.5YR 6/6). Rim diameter unmeasured. (Fig. 19: 2)
MOG1–00–7–16 N440 E523.5, unit 301. Late MB II eggshell ware platter bowl rim. Very fine fabric, thin walled (see Amiran 1969, 97, pl. 27: 6). Diameter of rim 18 cm. (Fig. 19: 3)
MOG1–00–7–21 N440 E523.5, unit 304. MB-LB eggshell ware platter bowl rim. Exterior and interior surface very pale brown (10YR8/2). Diameter of rim 18 cm. (Fig. 19: 4)
MOG1–00–7–23 N450 E549, unit 104. MB IIb-c platter bowl with sharp inverted rim and rounded external edge (see Cole 1984, 103, pl. 2, Bp. 21). Exterior and interior surfaces covered in greyish-white slip (7.5YR8/1). Fabric light red (2.5YR 6/6). Diameter of rim 37 cm. (Fig. 19: 5)
MOG2–99–7–1 Area 2, surface. LB I platter bowl rim. Pink fabric (5YR7/3) with reddish brown core (5YR5/4). Surface covered by partially worn red slip (2.5YR4/6). Horizontal burnish lines visible on interior and exterior surface. Diameter of rim 32 cm. (Fig. 19: 6)
MOG1–99–7–7 MB II or LB platter bowl with inverted tapered rim (see Amiran 1969, pls 25: 8, 26: 3–4; Cole Bp.12.h). Well levigated paste with very small black and white grits (10YR7/3). Very pale brown surface (10YR8/2). Diameter of rim 20 cm. (Fig. 19: 7)
MOG1–00–7–38 N469 E560, unit 503. Rim and part of body of an MB II-LB straight-sided platter bowl with plain rim (see Cole 1984, 101, pl. 1, Bp.11). Exterior and interior surfaces covered in a pale pink to reddish-yellow self slip (7.5YR8/3–7/6). Paste incompletely fired, well levigated, slightly gritty with high concentrations of chaff and other organic temper. Extant height 7.6 cm.; diameter of rim 30 cm. (Fig. 20: 1)
MOG2–00–7–7 Area 2, surface. MB II or LB I flaring bowl rim. Pink fabric (5YR7/4). Diameter of rim 10 cm. (Fig. 20: 2)
MOG1–00–7–15 N481 E530, unit 401. MB IIc or LBA platter bowl with elongated inverted rim (see Cole 1984, 101, pl. 1. Bp 11). Exterior and interior surfaces covered in a thin greyish-white slip (10YR8/1) on a red fabric (2.5YR5/6). Diameter 25 cm. (Fig. 20: 3)
MOG1–99–7–5 Area 1, surface. MB IIb-c rim of platter bowl. Flattened bulbous rim folded over inside. White paste (2.5Y8/1) with thick light grey core (2.5Y6/1). Rim diameter unmeasured. (Fig. 20: 4)
MOG1–00–7–35 N440 E523.5, unit 311. MB IIb-c carinated bowl rim. Sharp angular shoulder, plain everted rim (see Cole 1984, 131, pl. 16 Bc A). Exterior and interior surfaces covered in a reddish-yellow self slip (7.5YR7/6). Fabric completely fired throughout to reddish-yellow 5YR6/6. Medium fine paste with medium concentrations of organic temper and tiny angular grey grits. Extant height: 5.8 cm.; diameter of rim 30 cm. (Fig. 21: 1)
MOG2–00–7–6 Area 2, surface. MB II or LB I rim of carinated bowl with slight s–shaped carination. Very pale brown fabric (10YR8/4). Diameter of rim 11 cm. (Fig. 21: 2)
MOG2–99–7–2 Area 2, surface. MB carinated bowl rim. Slightly flaring plain rim, s-shaped profile. Very fine paste with occasional small limestone grits, reddish-yellow (5YR76–7.5YR7/4) with darker core (7.5YR6/6). Surface is wet-smoothed. Rim diameter unmeasured. (Fig. 21: 3)
MOG1–00–7–5 N440 E523.5, unit 301. Middle Bronze Age IIc carinated bowl rim. Fine thin fabric (though not eggshell). Exterior and interior surfaces completely fired throughout to reddish-yellow (5YR6/6). Diameter of rim 16.5 cm. (Fig. 21: 4)
MOG1–99–7–6 Area 1, surface. MB or LB I rim of rounded open bowl. Rim bevelled around interior and a slight gutter below rim along exterior. Very pale brown fabric (10YR6/6) with some calcite and black grits. Diameter of rim 24 cm. (Fig. 21: 5)
MOG2–99–7–6 Area 2, surface. MB IIa rim and base of cooking pot (see Amiran 1969, 101, pl. 30: 1). Straight-walled cooking pot with simple rounded rim and flat base. Horizontal band of applied clay below rim, with thumb impressions. Two partially pierced holes 4 cm. apart below rim. Coarse gritty paste, incompletely fired, dark reddish-brown (2.5YR3/4 to 5YR3/3). High concentration of grit and chaff temper. Exterior and interior surface fired dark reddish-grey (5YR4/2) to reddish-brown (5YR4/3) to brown (7.5YR5/4). Diameter of rim *c.*18 cm.; thickness 1.2 cm. (Fig. 22: 1)
MOG1–00–7–40 N469 E560, unit 514. MB IIb-c deep globular bowl with rounded base and single ovoid section loop handle from lip to shoulder (see Amiran 1969, 101, pl.30: 5; Cole 1984, 113, pl. 7 BdC.11). Complete. Short flaring rim with internal 'gutter'. Squat ovoid body with high shoulder and tapering body. Exterior and interior surfaces wet smoothed red-brown (5YR5/6–5/8). Coarse gritty fabric completely fired throughout. High concentrations of grey and quartz-like pebbles up to 1 mm. in diameter. High concentrations of chaff temper. Height 17.6 cm.; diameter of rim 27 cm. (Fig. 22: 2)

MOG2–00–7–1 Area 2, surface. MB II carinated cooking pot out-turned rim. Shell tempered cooking pot fabric, reddish-brown (5YR4/4). Diameter of rim 25 cm. (Fig. 23: 1)

MOG2–00–7–2 Area 2, surface. Late MB II cooking pot with plain everted rim. Basalt-tempered fabric, reddish-brown (5YR5/4). Diameter of rim *c.* 27.5 cm. (Fig. 23: 2)

MOG2–00–7–4 Area 2, surface. MB or LB cooking pot rim. Light reddish-brown fabric (5YR6/4). Diameter of rim 25 cm. (Fig. 23: 3)

MOG2–99–7–4 Area 2, surface. LB cooking pot with guttered triangular rim. Gritty paste with high concentration of fine dark grits. Reddish-yellow (5YR5/6) at exterior and strong brown at interior (7.5YR5/6). Diameter of rim 18 cm. (Fig. 23: 4)

MOG1–00–7–7 N440 E523.5, unit 301. Middle Bronze Age IIb-c rolled back rim of globular(?) krater (see Amiran 1969: 100, pl. 29: 4). Exterior and interior surfaces grey (5YR5/1). Diameter of rim 16.5 cm. (Fig. 23: 5)

MOG2–99–7–3 Area 2, surface. MB globular carinated krater with flattened outward projecting (roll-back) rim. Fine paste with low concentration of small limestone grits. Evenly fired throughout. Reddish-yellow (5YR7/6 to 7.5YR7/4) at surface and darker at interior (7.5YR6/6). Diameter of rim unmeasured. (Fig. 24: 1)

MOG1–00–7–25 N464 E563, unit 005. MB II deep globular bowl rim with external projection. Exterior and interior surfaces light red (2.5YR6/8). Diameter of rim 36 cm. (Fig. 24: 3)

MOG1–00–7–27 N464 E563, unit 002. MB II deep globular bowl with elongated incurved rim. Exterior and interior surfaces light red (2.5YR6/8). Diameter of rim 24 cm. (Fig. 24: 4)

MOG1–00–7–24 N450 E549, unit 104. MB II rim of deep bowl with upright walls (see Cole 1984, 111, pl. 6, Bd. A). Exterior and interior surfaces brown (10YR5/3). Diameter of rim 30 cm. (Fig. 24: 5)

MOG2–99–7–8 Area 2, surface. Rim and should of storage jar. Short offset tightly ribbed neck and plain rim. Medium coarse fabric with some chaff temper and grey and white grits. Red (2.5YR6/6) to reddish-yellow (5YR6/6). Diameter of rim 8.4 cm. (Fig. 25: 1)

MOG1–00–7–28 N464 E563, unit 002. MB II storage jar with gutter rim and slanting neck. Light red fabric (2.5YR7/6). Diameter of rim 10 cm. (Fig. 25: 2)

MOG2–00–7–3 Area 2, surface. LB storage jar rim. Pinkish fabric (5YR7/4). Diameter of rim 5 cm. (Fig. 25: 3)

MOG1–99–7–8 Area 1, surface. LB I storage jar with guttered rim. Pale brown fabric (10YR8/2) with very small black and white inclusions. Diameter of rim 11.8 cm. (Fig. 25: 4)

MOG2–00–76 Area 2, surface. MB or LB storage jar rim. Very pale brown fabric (10YR 8/4). Diameter of rim 14.6 cm. (Fig. 25: 5)

MOG1–00–7–9 Area 1, surface. Byzantine? jar rim with triangular external rim. Diameter of rim 12 cm. (Fig. 25: 6)

MOG1–00–7–26 N464 E563, unit 002. MB II internally and externally profiled 'gutter' rim of closed (possibly storage) vessel. Exterior and interior surfaces light reddish-brown (5YR6/4). Diameter of rim 12 cm. (Fig. 25: 7)

MOG2–99–7–11 Area 2, surface. MB storage jar. Thickened outward flaring rim. Fine sandy to gritty fabric evenly fired throughout, with even concentrations of grey and red grits. Paste reddish-yellow (5YR6/8). Interior and exterior surface reddish yellow (5YR6/6). Diameter of rim 11.5 cm. (Fig. 25: 8)

MOG1–99–7–9 Area 1 extensive survey, N470 E520. MBII jug rim with interior gutter (see Amiran 1969, 109, pl. 33: 6). Well levigated clay with occasional very small white and grog grits. Very pale brown (10YR7/3) at exterior and light brown (7.5YR6/4) at interior. Diameter of rim 7.2 cm. (Fig. 25: 9)

MOG1–00–7–39 N469 E560, unit 514. MB IIb-c storage jar. Ovoid shape with high straight rilled rim and gentle flaring lip. Two handles placed vertically from shoulder to just below the shoulder. Articulated flattened base with shallow point. Gritty brick red-brown fabric (2.5YR4/6–4/4) incompletely fired throughout. Exterior and interior surfaces wet smoothed or self slip, encrusted with whitish concretion of calcium carbonate. Height 63 cm.; diameter of rim 9 cm., greatest width at shoulder 32 cm. (Fig. 26: 1)

MOG1–00–7–41 N469 E560, unit 514. MB IIb-c jug with trefoil mouth and globular body. Simple rounded out-turned rim with internal gutter. Strap handle from rim to shoulder. Pale orange-red surface, wet smoothed with whitish concretion on interior and exterior surface. Gritty brick red-brown fabric with high concentrations of grey tuff grits up to 2 mm. in diameter. Some chaff. Same fabric as MOG1–00–7–39 and MOG1–00–7–40. Height 21 cm.; diameter of rim 11 cm.; maximum diameter of body 16.2 cm. (Fig. 26: 2)

MOG2–00–7–13 (Fig. 27: 1)

MOG1–00–7–34 N469 E557.7, unit 604. Base and part of wall of thin walled vessel. Flat base and slightly flaring straight profile. Exterior and interior very pale brown self slip (10YR8/4–8/3). Fine, well levigated, slightly sandy fabric. Completely fired throughout to a very pale brown-buff. Low concentrations of holes where fine organic temper burnt out. Very low concentrations of tiny grey angular inclusions. Extant height 4.7 cm.; diameter of base 8.8 cm. (Fig. 27: 2)

MOG1–00–7–36 N440 E523.5, unit 311. Rim and shoulder of drop-shaped jar (possible biconical jug of Egyptian type) with outward folded lip and prominent gap between wall of vessel and lip fold. Exterior surface covered in a very pale brown self-slip (10YR8/2). Interior surface left unslipped with prominent rill lines approximately 8 mm. apart (5YR7/6–7/8). Evenly fired throughout with low concentrations of white limestone grits and small grey quartz inclusions. Extant height 7 cm.: diameter of rim 15 cm. (Fig. 27: 3)

MOG1–00–7–33 N469 E557.5, unit 605. MB IIa-b Tell al-Yahudiyah ware juglet. Lower body sherd of a possible piriform juglet. Grey paste with many small dark inclusions. Very well fired. Exterior and interior surface covered with thick dark grey-brown slip, burnished vertically and horizontally. Decoration is alternating panels of incised vertical lines and punctured stippling in loose line formation. Above the alternating panels is a horizontal reserved band separating decoration into registers. Exterior

Figure 28. *al-Moghraqa: White Painted II wishbone handle, Area 2.*

and interior surfaces grey to dark grey (2.5Y6/1–4/1). Extant height 4.2 cm.; width 2.5 cm. (Fig. 27: 4)
MOG1–00–7–32 N469 E557.5, unit 602/604. Goblet, possibly MB II. Largely intact. Finely levigated clay with chaff temper, not all burnt out. Some lime particles. Many small to medium angular voids. Exterior and interior surfaces of vessel covered in a matt red slip (2.5YR5/6). Height 20.5 cm.; diameter of rim 14 cm.; diameter of base 8 cm. (Fig. 27: 5)
MOG2–99–7–19 Area 2, surface. MB. Imported Cypriot White Painted II wishbone handle. Finely levigated paste (5YR7/4). Surface covered with light slip (2.5Y7/3). Traces of dark paint (2.5Y4/2). Length *c.*11.7 cm. (Fig. 28)

Small finds
L. Steel

Significant quantities of small finds have been found at al-Moghraqa. Twenty-two artefacts were recovered during survey (Table 1), comprising two cone fragments, four worked stone objects, eight ground stone objects and eight chipped stone tools. A further eighteen terracotta cones housed in the Department of Antiquities, collected in 1996, are included in the discussion. Where identification was possible these artefacts largely appear to be consistent with the MB-LB date of the site. Thirty objects made in a greater range of materials were recovered during the soundings in 2000 (Table 1, see p. 75). In addition to worked and ground stone artefacts, these comprise terracotta and clay, metal (largely copper/copper alloy), worked bone, and faience/paste. For the most part the artefacts derive from the MB-LB occupation of the site, but there are occasional later objects of Byzantine and Islamic date. Each of the artefacts was assigned a catalogue number, recording the area of the site (MOG1 or MOG2), year of discovery, the type of material being catalogued (1 terracotta; 2 metal; 3 worked stone; 4 vitreous materials; 5 ground stone; 6 chipped stone; 7 pottery; 8 unbaked clay objects; 9 baked clay objects; 10 ivory/bone), and a running serial number for each category of material.

1. Terracottas

Cones
The most significant anthropogenic material recovered from al-Moghraqa comprises the terracotta cones (Fig. 29; Steel *et al.* in press). These were found in the upper levels of the site, in a matrix of compacted aeolian sand in a discrete area of deposition. In addition to the seventeen catalogued pieces, large quantities of very small cone fragments were found during excavation in N469 E557.5 and N469 E560 (Table 1). Other cones had been collected at the site by the École Biblique in 1996. These however, are not included in the discussion of the inscribed material. The cones are made of clay with very dense organic temper (chaff and in one instance a lentil, MOG1–99–1–7; Fig. 30), small inclusions of quartz, some shell and occasional grog. They are very badly fired and the cones were all very fragile and flaky. The cones had been broken in antiquity but also have one or more fresh breaks, probably due to bulldozing or ploughing activity. All the cones have a thick dark core and they are frequently vitrified on one side to a pale white/green/mauve colour. This vitrification is similarly observed in the numerous tiny cone fragments recovered during excavation. Very patchy traces of a red slip were observed on some cones, though for the most part this had worn off. Eight bases, seven body fragments and two tips have been catalogued. For the most part the cones have a flat base and are roughly circular in section. They taper down towards the pointed tip (Fig. 29: 4). No cones have survived intact and it is unclear how long the original cones were.

The cones were stamped on the round face and upper side with a single cartouche before firing, while the clay was still moist. The upper side was slightly flattened for the stamp. Finger impressions where the cone had been held during this process are visible on several examples. In most cases the inscriptions give the prenomen of Tuthmose III (*mn-ḫpr-r'*; Fig. 29: 1-3) but two examples instead give the prenomen of Hatshepsut (*m3't-k3-r'*; MOG1–00–1–9, MOG1–00–1–12; Fig. 29: 5–6). The occurrence of Hatshepsut alongside Thutmose III

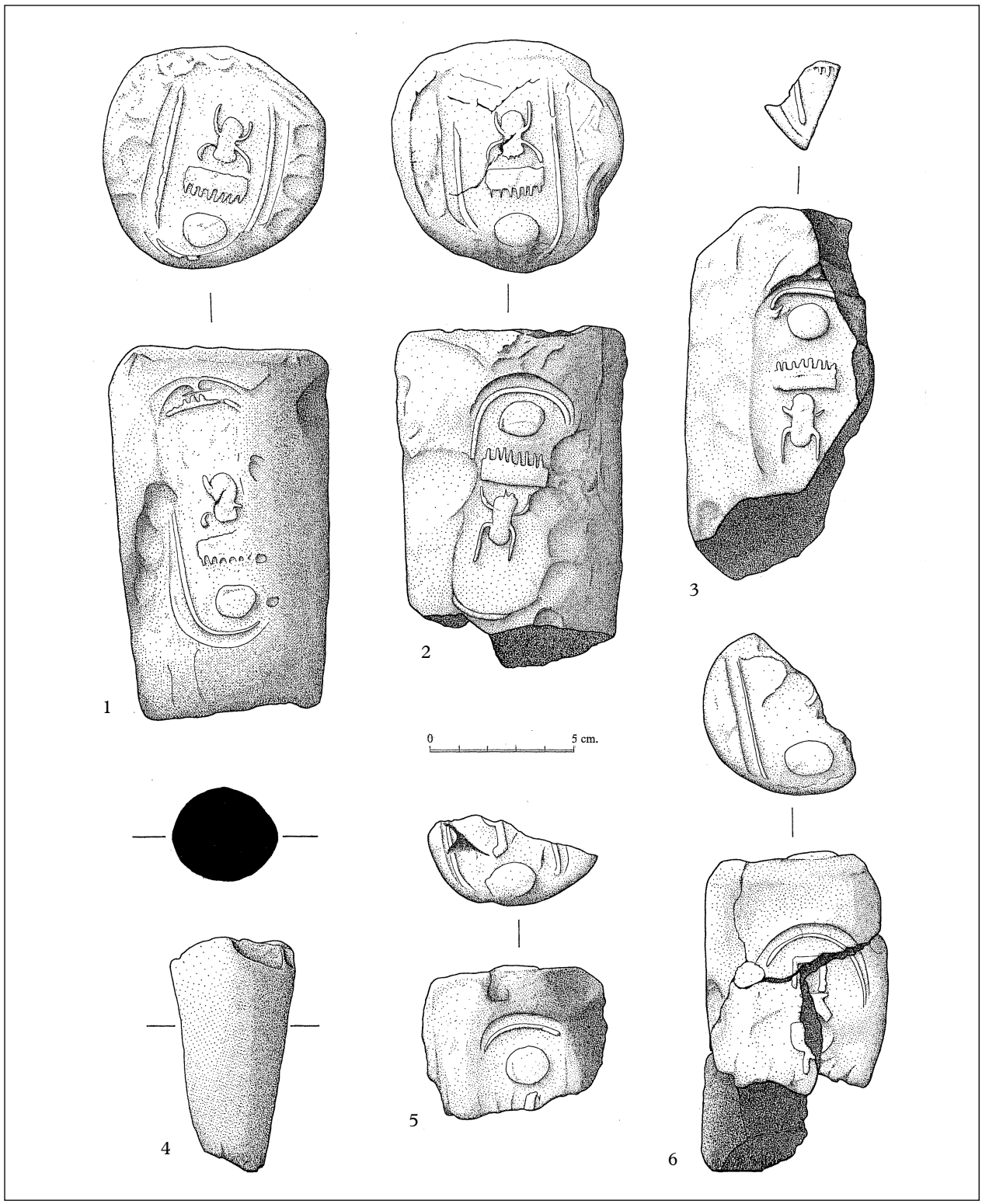

Figure 29. *al-Moghraqa: terracotta cones: (1-3) stamped with prenomen of Thutmose III; (4) cone tip; (5-6) stamped with prenomen of Hatshepsut.*

Figure 30. *al-Moghraqa: section of cone, showing lentil amongst organic temper.*

is particularly significant, as this suggests a date for the original use of the cones during the co-regency (*c.* 1473–1458 BC). This co-regency is usually assumed to have ended before Thutmose III's first Palestinian campaign in year 21/22 of his reign, during which he entered Palestine via Gaza, although a dating to that campaign cannot be excluded.

Although the cones are unique in Syro-Palestine, they are extremely similar in form and construction to funerary cones common in Dynasty XVIII Egypt (Davies and MacAdam 1957; Ryan 1988). These are essentially an Upper Egyptian phenomenon, with the vast majority deriving from Thebes. The specific significance of the Egyptian cones is much debated, but they are certainly a funerary phenomenon, normally inserted in batches around the doorway of a tomb. The name and titles of the individual concerned would be stamped on the face, but there are no examples from Egypt that include the name of the king. The cones from al-Moghraqa fall within the known chronological range of their Egyptian counterparts. However, the actual function of the cones at al-Moghraqa remains enigmatic. Although the original length of the cones is unknown, it should be noted that they are consistently broken off at a length of around 10 cm. This implies that like the Theban cones they were essentially an architectural element that had been used to seal a building, projecting approximately 10 cm. from the wall. At some later date, possibly when the building was dismantled, the cones had been broken off at this point. While the stamped round faces that projected from the wall have survived in large numbers, in only two instances (MOG1–99–1–18, MOG1–00–1–5) does the pointed tip of the cone survive. The nature of the presumed building sealed by the cones cannot be determined given the available contextual evidence. Given the use of the royal names of Hatshepsut and Thutmose III we might assume it to be an official building associated with the Egyptian administration of the Gaza region. It is plausible, given the funerary aspect of the Egyptian comparanda, that this building might have been the tomb of the Egyptian governor in the region or even a funerary chapel associated with a communal grave for fallen Egyptian soldiers. This, however, is conjecture.

Lamps

Two mould-made oil-lamps were recovered during surface collection prior to excavation in 2000. MOG1–00–1–1 (Fig. 31: 7) has been identified as an Islamic slipper lamp with tongue handle and moulded geometric decoration (Day 1942, 72; Hadad 1999, 203–13, fig. 2: 1), probably dating to the Abbasid period. MOG1–00–1–3 is a typical Byzantine mould-made oil-lamp (compare with Saliou 2000, J70 illustrated p. 73). The presence of these lamps on the surface at al-Moghraqa, together with the concentration of late period pottery identified during the 1999 survey and the coins recovered in surface collection in 2000, indicate probable occupation in the vicinity of al-Moghraqa during later antiquity and the Islamic period.

Bead

A single ceramic bead was found in N469 E560, unit 505. Its form, biconical with decoration of incised vertical lines at the widest point, is common amongst MB-LB beads made in a variety of materials found in Levantine contexts (see for example the paste beads from Lachish, Tufnell 1958, pl. 29: 36, 37, 41).

2. Worked stone artefacts

Cylinder seal

One of the more significant finds from the 2000 excavation season was a steatite cylinder seal (MOG1–00–3–1; Collon 2002), found in the upper levels of a large pit (unit 304 of F310) in N438 E523.5. The seal can be assigned to the Old Assyrian class of glyptic on stylistic and technical grounds, but Collon has noted a number of unusual features from which she infers that it was a local product rather than an import (Collon 202, 232). These include the choice of material (steatite rather than the more usual haematite), its unusually large size, and above all certain egyptianising iconographic details. Significant signs of wear indicate sphragistic use of the seal. Its worn surface implies that the seal was in circulation for some time before being deposited.

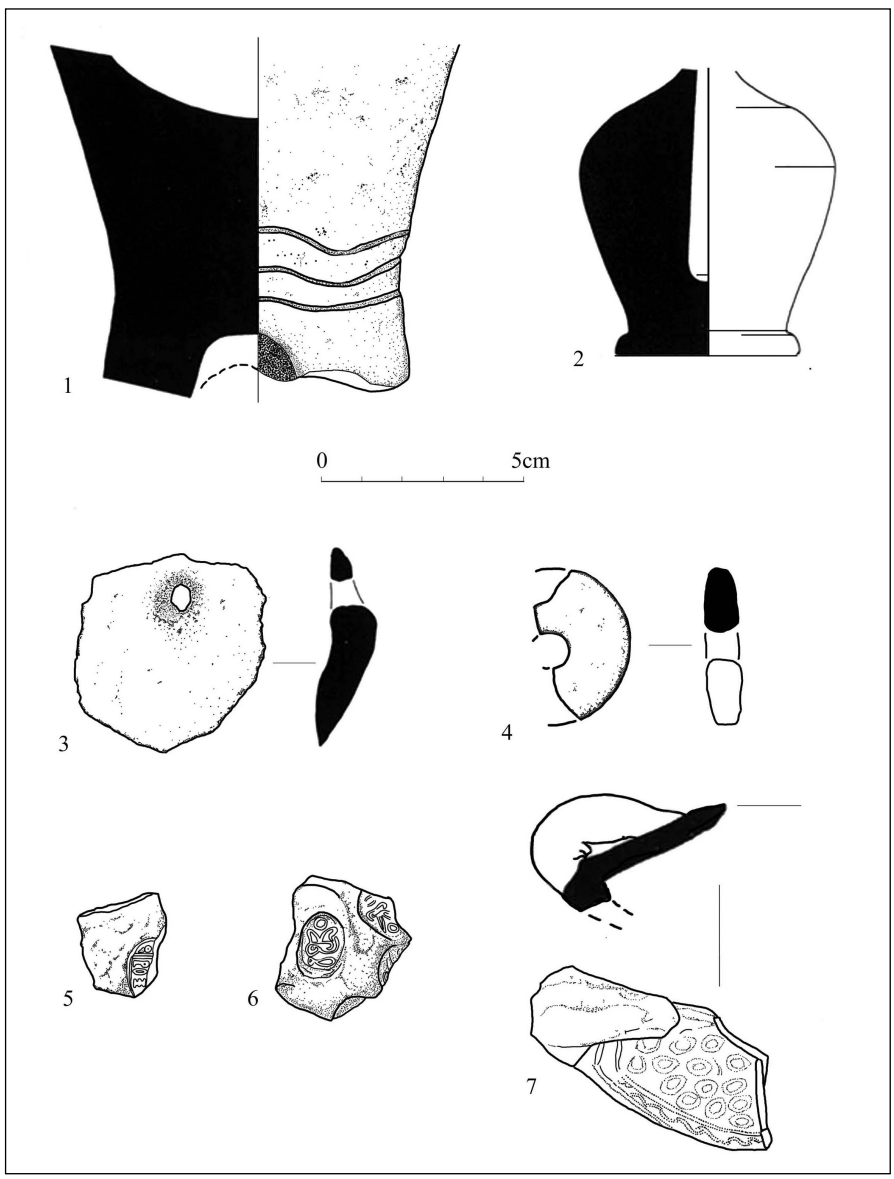

Figure 31. *al-Moghraqa: miscellaneous small finds: (1) Chalcolithic pedestal vase; (2) alabaster kohl bottle; (3-4) spindle whorls; (5-6) clay sealings with scarab impressions; (7) Islamic moulded lamp*

Kohl bottle

The alabaster kohl bottle (MOG1–99–3–1; Fig. 31: 2) was found in intensive survey in N490 E510. The form is characteristic of Egyptian kohl bottles of the Middle Kingdom and Dynasty XVIII (Sparks 1996, 57; Higginbotham 2000, 197–8, fig. 12: 5). Alabaster cosmetic containers are amongst the most common form of Egyptian stone vessel to be imported to Syro-Palestine during the second millennium BC and local imitations are common. Even so, the Egyptian imports are distinct from locally produced alabaster vases both in terms of the material used and the manufacturing technique. For the most part Egyptian alabaster vessels are made of calcite, whereas the Syro-Palestinian vases were primarily of gypsum (Ben-Dor 1945, 94–5; Sparks 1996, 51). The interior of the Egyptian vases was hollowed out using a tubular drill (Lucas and Harris 1962, 423–5; Sparks 1996, 53–5, fig. 1: 1–2), whereas the locally produced Palestinian vases were hollowed out using flat-bladed chisels, leaving distinct vertical chisels marks on the interior surface of

the vessel (Sparks 1996, 55, fig. 1: 3–5). Although MOG1–99–3–1 has not been submitted for analysis it is almost certainly an Egyptian import. This type of container was not one that was adopted into the local, Canaanite repertoire of forms. Moreover, technically it falls within the spectrum of Egyptian manufactured vessels. The interior was hollowed out using a drill and traces of the horizontal drill lines are clearly visible around the interior walls. The distribution of Egyptian imported vases and Palestinian imitations supports this conclusion. Local imitations tend to be found at locations lying some distance from the main trade routes. Egyptian imports, however, are predominantly found in southern Palestine and there is a particular concentration at Tell al-ᶜAjjul (Petrie 1931, pl. XXV: 31–33, 35–37; Petrie 1932, pl. XXII: 18; Petrie 1933, pl. XXVI: 9, 12; Petrie 1934, pl. XXXVIII: 40, 41, 44, 45, 47, 48; Mackay and Murray 1952, pl. XIX: 15; Sparks 1996, 65).

Scarab

A small fragment of a green jasper scarab was found in unit 514 in N469 E560 (MOG1–00–3–2). Jasper, a type of opaque quartz, was used extensively in Egypt and the Near East to manufacture a variety of beads, amulets, cylinder seals, scarabs and inlay for jewellery (Lucas and Harris 1962, 397–8; Moorey 1994, 98–99). In Levantine contexts jasper scarabs are uncommon. Tufnell (1984, 42) lists five examples of jasper or 'greenstone' scarabs from Megiddo, and a possible example from Jericho. The al-Moghraqa scarab is therefore a significant addition to the corpus. The source of this material has been ascribed to Egypt (Collon 1990, 37) and the Levant (Moorey 1994, 99). Although throughout much of the Bronze Age the preference was for red jasper, there appears to have been a particular taste for the green variety during the Middle Bronze Age, contemporary with the al-Moghraqa example. In Middle Kingdom Egypt (Dynasty XIII) green jasper was used to make scarabs and beads (Lucas and Harris 1962, 397–8; Tufnell 1984, 42) and Collon has identified a Middle Bronze Age Syrian seal workshop, which had a preference for green jasper in the manufacture of high quality cylinder seals (Collon 1987; 1990, 36–7). Green jasper continued to be used in Dynasty XVIII and was particularly common for large scarabs, including heart scarabs.

The scarab was worn as a bead or a ring bezel and was perforated along its length. There was no decoration on the base, but the back of the scarab was incised with small nicks (compare with Jericho Reg. 909, Tufnell 1983, fig. 353: 1). The surface of the scarab was highly polished. Although most MBA scarabs have motifs and inscriptions on the base, plain scarabs made from a variety of materials (amethyst, carnelian, faience, greenstone) were found in the MBA tombs at Jericho (see Kirkbride 1965). The 'greenstone', possibly jasper, scarabs from Tomb J45 (Kirkbride 1965, 629, fig. 294: 19) and from Gezer (Weinstein 1988, 92, pl. 28: 3) are the closest parallels to the scarab from al-Moghraqa, suggesting that MOG1–00–3–2 conforms to a Dynasty XIII date (*c.*1759–1641 BC according to the orthodox low chronology).

Beads

A large fragment of a spherical bead of carnelian (MOG1–99–3–3) was found in the intensive survey in N470 E530. This is probably Bronze Age, but cannot be more closely assigned to the MB or LB period. Carnelian (amongst other highly coloured stones) was particularly prized for the manufacture of beads from the EBA (see Talbot 1983, 792–800) and carnelian beads in a variety of forms are found in MB-LB contexts in the Levant. Spherical beads, similar to MOG1–99–3–3 have been found at Lachish (Tufnell 1958, pl. 29: 15) and in the MBA Tomb B48 at Jericho (Talbot 1983, 800, reg. 115). A variety of carnelian beads and pendants were used in the jewellery at the nearby LBA cemetery of Dair al-Balah, including plain rounded beads in Tomb 114 (Dothan 1979, 24, 43, 77, figs 56, 103, 104, 174, 175).

Basalt vases

A small number of basalt vessels were recovered during survey. Possibly the most interesting of these is a pedestal bowl (MOG1–99–5–1; Fig. 31: 1). Such vessels are one of the defining characteristics of the Chalcolithic culture as defined in the southern Levant, with a distribution from the northern Negev to the Sea of Galilee (Amiran and Porat 1984, 11). MOG1–99–5–1 was carved from a single piece of basalt and the surface had been smoothed using a rubbing technique. Three horizontal wavy lines had been incised into the exterior wall of the bowl, at the junction between the bowl and the pedestal. Most of the cylindrical pedestal had been broken off but the fenestrations, three rectangular holes cut from the pedestal wall, are clearly visible. These are all typical attributes of Chalcolithic pedestal vases (see Amiran and Porat 1984, 12, fig. 1: 2), ultimately derived from the ceramic repertoire. Although this vessel is without a secure context, and no further Chalcolithic material was identified at al-Moghraqa, it is significant in that it demonstrates the presence of Chalcolithic settlement in the Gaza region. Otherwise, there is only limited archaeological evi-

dence for Chalcolithi-EB I occupation around the mouth of the Wadi Gaza, mainly focused on the excavations at Taur Ikhbainah (Oren and Yekutieli 1992).

MOG1–99–5–2 represents the rim of a basalt vessel possibly of a similar type to the LB I-II pedestal footed bowl from Lachish Tomb 216 (Tufnell 1958, 84, pl. 26) or the LBA shallow bowl/mortar from Jericho (Dorrell 1983, fig. 233: 4).

Spindle whorls

Two discoidal stone spindle whorls (MOG1–99–3–2, MOG1–99–3–4; Fig. 31: 3–4) were recovered during the survey of al-Moghraqa. These are of uncertain date.

Unworked stone

In addition to the finished artefacts small quantities of raw materials were found in N469 E557.5 and N469 E560 (Table 1) associated with Surface I and in the ashy lenses on this surface. Carnelian and agate pebbles were found in unit 504, and pieces of agate together with unworked mother-of-pearl in unit 605. These were associated with the apparent debris and tools of manufacturing processes: abrasives (pumice), a grinding stone, small fragments of slag, a sherd with slag adhering and a piece of sheet metal. Small quantities of haematite were found in the lower deposits in N469 E560, in unit 514, associated with a basalt grinding stone.

Pebbles of carnelian, a translucent red chalcedony, are found in significant quantities in the Egyptian eastern desert (Lucas and Harris 1962, 391) and this material was used extensively in Egypt from the Early Dynastic period to make beads, amulets, and later for inlay in jewellery and furniture. Agate (a banded form of chalcedony) is likewise abundant in Egypt and the eastern desert and was extensively used to manufacture beads, amulets and scarabs (Lucas and Harris 1962, 386). Mother-of-pearl, the nacreous lining of oyster shells, had a very limited use in ancient Near Eastern craftsmanship, for the most part being restricted to southern Mesopotamia during the Early Dynastic period. It was used to manufacture pendants and as decorative inlay in third-millennium burials, most notably at the Royal Cemetery of Ur, but otherwise it is extremely rare (Moorey 1994, 139). An unstratified mother-of-pearl pendant of uncertain date, however, was found at Jericho (Talbot 1983, fig. 363: 4). Given the elusive nature of mother-of-pearl within the archaeological record, its occurrence at al-Moghraqa is of great significance. The source of this material was the Red Sea and the Persian Gulf (Lucas and Harris 1962, 38, 401; Moorey 1994, 139). Haematite, an iron oxide, was commonly used for cylinder seals. Its source is probably the Taurus Mountains in southern Anatolia (Moorey 1994, 84) or Transjordan (K. Prag, personal comment). The occurrence of these materials illustrates the international connections of al-Moghraqa. Moreover the combination of raw materials associated with grinding stones and metal tools is very suggestive of a workshop area, possibly illustrating high status craft specialisation organised by the elite of Tell al-ᶜAjjul. Certainly, the range of raw materials identified at al-Moghraqa demonstrates that the site played an important role in the second-millennium trade networks, procuring luxury raw materials to be used in the production of prestige objects.

3. Vitreous materials

Only two paste objects were identified: a small scarab fragment (MOG1–00–4–2) in N469 E560, unit 505 and a cylindrical bead (MOG1–00–4–1) in N469 E560, unit 514. Paste beads in a variety of forms were common in western Asiatic jewellery in the MB-LB periods and at Lachish paste was the most common material used in personal ornamentation (Tufnell1958, 88, pl. 29). Similar cylindrical paste beads were found at Dair al-Balah (Dothan 1979, figs 192–198). MOG1–00–4–1 therefore conforms to the typical range of MB-LB material culture recorded for the region. Faience or paste was commonly used for the manufacture of scarabs during the First Intermediate period in Egypt. This continues to be used to make scarabs in Syro-Palestine during the MBA. The scarab from al-Moghraqa is too fragmentary for a more detailed discussion.

4. Metal objects

For the most part the metal objects have a very restricted distribution, largely occurring in N469 E560 and N469 E557.5. As these objects have not been analysed it is not apparent whether they are copper or a copper alloy, and so are referred to throughout as copper/copper alloy. Two lumps of iron were identified in N469 E560 (unit 511 and 512). These are too oxidised to determine the original form. Three main classes of artefact have been identified: coins, tools and weapons.

Two coins were recovered during the 2000 excavation season: MOG1–00–2–2 during surface collection and MOG1–00–2–3 in topsoil (201) in N454 E529. The conservator assessed the state of the coins and determined that they were stable and not in need of immediate conser-

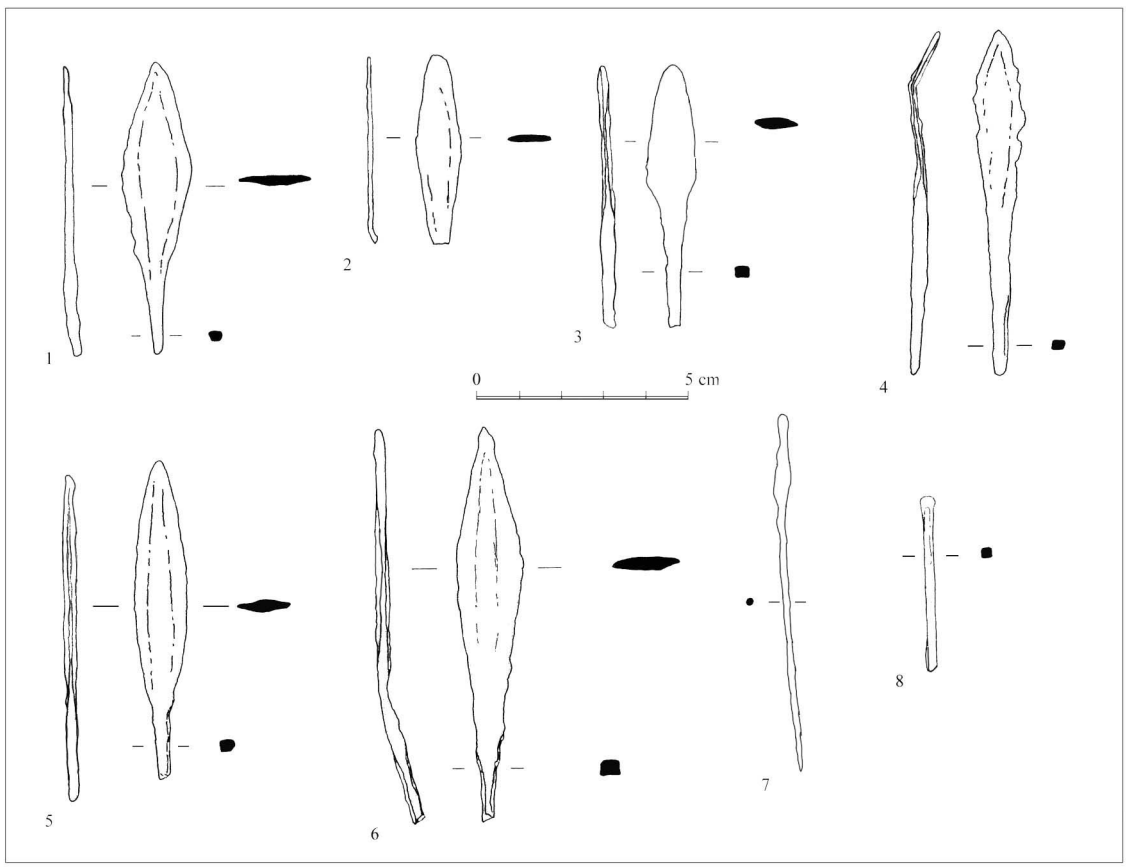

Figure 32. *al-Moghraqa: copper/copper alloy artefacts: (1-6) arrowheads; (7) pin/needle; (8) awl*

vation work. As these objects were not an immediate priority they were placed in silica gel and left to be cleaned in a subsequent excavation season. Unfortunately, we have not been able to return to Gaza to undertake this conservation work and the coins remain undrawn and unstudied, consequently their date is unclear. The obverse of MOG1–00–2–2 was illegible, but the reverse was marked with the Chi-Ro symbol, suggesting a Byzantine date. This is further evidence for occupation of the environs of al-Moghraqa during the Byzantine period.

A copper/copper alloy needle (MOG1–00–2–1) was found in surface collection and a copper/copper alloy pin or needle (MOG1–00–2–4; Fig. 32: 7) in N440 E523.5, unit 304. Two awls were found in N469 E 560, units 510 and 512 (MOG1–00–2–13, MOG1–00–2–16; Fig. 32: 8). These awls further illustrate the utilitarian nature of activities carried out at al-Moghraqa,

A discrete cluster of six arrowheads (Fig. 32: 1–6) was found in N469 E560 (units 501, 502, 504; MOG1–00–2–5 to MOG1–00–2–9) and in N469 E557.5 (unit 604; MOG1–00–2–10). These are typical examples of the tanged arrowheads with leaf-shaped blades current in the Near East from the EBA, and a characteristic item of military equipment during the MBA and in particular the LBA (Philip 1989, 144–148). It should be noted that bronze arrowheads in fact are comparatively rare in archaeological contexts in comparison to the representation of other weapon types (Philip 1989, 145). For the most part MBA arrowheads occur in settlement contexts and they are only rarely found in metal hoards or as grave goods, possibly because they were not considered to be emblems of warrior status but instead were common weapons. It was not until the LBA that arrowheads were typically included as grave gifts in tomb groups (Philip 1989, 146; Tufnell 1958, pl. 25; Seger 1988, 103–104), reflecting a shift in military tactics and ideologies, in particular the introduction of chariot warfare with its elite connotations.

5. Chipped stone

A small number of chipped stone tools were recovered during survey and excavation (Fig. 33). These have only been recorded at a basic level and more detailed study of the chipped stone artefacts was planned for the 2001 season. The chipped stone tools recovered during excavation have not been catalogued. The chipped stone tools mainly appear to comprise sickle blades and Canaanite blades, comparable to those from the Middle Bronze Age levels at Jericho (Crowfoot Payne 1983, 725–7).

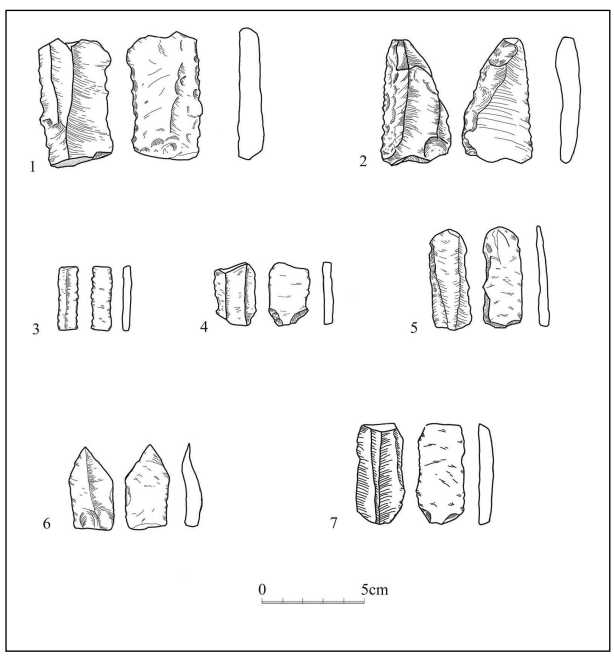

Figure 33. *al-Moghraqa: chipped stone blades: (1-6) Area 1; (7) Area 2.*

6. Worked bone

Only two worked bone artefacts were identified: a worked point in N469 E557.5, unit 605, and a possible piece of inlay with incised decoration in N440 E523.5, unit 304. The point was probably a tool used in the craft activities that it is suggested took place in Zone 2. The possible inlay was too fragmentary and poorly preserved for analysis with the naked eye.

7. Catalogue

1999 Survey: Area 1

MOG1–99–1–1 Surface collection 1996. Terracotta cone base. LB I. Badly abraded and accreted, broken in antiquity and one fresh break. Flat base, sub-circular in section. Very badly fired. Reddish-yellow at surface (5YR6/6) and lower side is vitrified, light grey (2.5Y7/2). Thick very dark grey core (2.5Y3/0). Dense chaff temper and some small rounded inclusions of quartz and grog. Surface is self-slipped, white (2.5Y8/2). The base and upper side of the cone are stamped with hieroglyphic signs within vertical cartouche: *mn-ḫpr-r'*. Cartouche on base measures 7.4 × 3.6 cm. Signs raised; depth of stamp 0.2 cm. Finger impressions on lower side of cone (single thumb print on left side and three finger prints on right side), indicating how cone was held when stamped. Length 10.2 cm.; diameter of base 8.2 cm.; minimum diameter 6.6 cm.

MOG1–99–1–2 Surface collection 1996. Terracotta cone base. LB I. Badly abraded and accreted, broken in antiquity and one fresh break. Flat base, oval in section. Reddish-yellow (5YR6/8) at surface and thick dark greyish brown (10YR4/2) core, with diffuse firing lines. Dense chaff temper and occasional rounded quartz inclusions. Elusive traces of red slip (2.5YR5/6) on surface. The base has a very shallow, worn vertical cartouche impression, which is too faint to read. There is a possible flattening on the upper side of cone for a cartouche. Four finger impressions on lower right side. Length 6.4 cm.; diameter of base 7.2–9.2 cm.

MOG1–99–1–3 Surface collection 1996. Terracotta cone base. LB I. Abraded and accreted, broken in antiquity. Sub-circular in section, tapering in from flat, splaying base. Lower side is flattened. Badly fired and very soft. Yellowish-red (5YR5/8) at surface and thick dark grey core (2.5Y4/2), diffuse firing lines. Dense chaff temper and occasional small rounded pieces of quartz. Self-slipped, white (2.5Y8/2). The base and upper side of the cone are stamped with hieroglyphic signs within vertical cartouche: *mn-ḫpr-r'*. Cartouche on base measures 7.2 × 3.8 cm. Signs raised; depth of stamp 0.15 cm. Cartouche stamped on upper side is slightly oblique and measures 8.3 × 3.5 cm.; depth of impression *c.* 0.13 cm. Length 12.6 cm.; diameter of base 7.1–7.6 cm.; minimum diameter 6.1 cm. (Fig. 29:1)

MOG1–99–1–4 Surface collection 1996. Terracotta cone base. LB I. Abraded and accreted, broken in antiquity and one fresh break. Flat base, sub-circular in section. Lower side of cone flattened. Badly and unevenly fired. Reddish-yellow (7.5YR6/6) at surface with thick dark grey core (10YR4/1) and diffuse firing lines. Partially vitrified, very pale brown (10YR7/3). Dense chaff temper and a large ovoid void possibly from a piece of wood, small rounded quartz inclusions and some grog. Self-slipped, white (2.5Y8/2). Surface covered with reddish-brown slip (2.5YR4/4), thick over the base of core but otherwise very patchy. The base and upper side of cone are stamped with hieroglyphic signs within vertical cartouche: *mn-ḫpr-r'*. Cartouche on base measures 7.2 × 3.65 cm. (not all of cartouche frame extant). Signs raised; depth of impression *c.* 0.55 cm. Cartouche on upper side measures 7.95 × 3.3 cm. (not all of frame extant); depth of impression *c.* 0.1 cm. Two finger impressions on lower left side of cone. Length 11.1 cm.; diameter of base 7.5–7.7 cm.; minimum diameter 5.8 cm. (Fig. 29: 2)

MOG1–99–1–5 Surface collection 1996. Terracotta cone base. LB I. Abraded and accreted, broken in antiquity, and one very large modern break slicing cone in half. Flat base. Badly fired, reddish-yellow (7.5YR6/6) at surface and thick dark greyish-brown core (10YR4/2) and diffuse firing lines. Dense chaff temper and some rounded pieces of quartz and shell inclusions. Self-slipped, white (2.5Y 8/2). The base and upper side of cone are stamped with hieroglyphic signs within vertical cartouche. Most of the base stamp is lost (modern break), and only the frame of cartouche and part of *mn* sign are extant. Signs raised; depth of impression *c.* 0.15 cm. Cartouche on upper side is impressed on a flattened surface with *mn-ḫpr-r'*, the *r'* sign towards the base. The full length and width of cartouche are not extant. Signs raised; depth of impression *c.* 0.13 cm. Length *c.* 13.2 cm.; maximum diameter *c.* 8.2 cm.; minimum diameter *c.* 7.8 cm. (Fig. 29: 3)

MOG1–99–1–6 Surface collection 1996. Terracotta cone fragment. LB I. Flaking, broken in antiquity. Circular in section, tapering towards pointed end. Badly fired, reddish-yellow (5YR6/6) at surface and thick very dark grey core (10YR3/1). Vitrified, light grey (2.5Y7/2) on one side. Chaff temper and small rounded inclusions of quartz. Self-slipped, white (2.5Y8/2). Most of surface has flaked off. Length 10.8 cm.; maximum diameter 6.1 cm.; minimum diameter *c.* 5.3 cm.

MOG1–99–1–7 Surface collection 1996. Terracotta cone fragment. LB I. Flaking, broken in antiquity, and two fresh breaks. Fragment from central or lower part of cone, elliptical in section. Poorly fired, reddish-yellow (5YR6/6) at surface and thick dark grey core (2.5Y4/0), sharp firing line. Vitrified on one side, very pale brown (10YR7/4). Dense chaff temper and one void, possibly a lentil in temper that had burned out, small rounded quartz inclusions. Self-slipped, white (2.5Y8/2). Length 10.0 cm.; maximum diameter 7.6 cm.; minimum diameter 5.8 cm.

MOG1–99–1–8 Surface collection 1996. Terracotta cone base. LB I. Accreted, abraded, broken in antiquity and one fresh break. Flat base, circular in section. Poorly fired, yellowish-red at surface (5YR5/6) and thick dark grey core (2.5Y3/0). Vitrified on one side, light grey (2.5Y7/2). Dense chaff temper and small rounded quartz inclusions. Very patchy traces of reddish-brown slip (2.5YR5/4). The base is stamped with hieroglyphic signs within vertical cartouche: *mn-ḫpr-r'*. Cartouche as extant measures 4.3 × 2.6 cm.: the upper part of the *r'* sign and the lower part of the *ḫpr* sign are missing. Signs raised; depth of impression *c.* 0.1 cm. Length 9.0 cm; diameter of base *c.* 6.7 cm.

MOG1–99–1–9 Surface collection 1996. Terracotta cone base. LB I. Accreted, and very abraded, broken in antiquity and several fresh breaks (four joining fragments, including MOG1–99–1–14). Half base preserved. Flat base, sub-circular in section. Poorly fired, yellowish-red at surface (5YR5/6) and thick very dark grey core (10YR3/1). Vitrified on one side, light grey (5Y7/2) to pinkish-grey (7.5YR7/2). Dense chaff temper and small rounded quartz inclusions. The base and upper side of the cone are stamped with hieroglyphic signs within vertical cartouche. On the base the cartouche is incomplete, only the *r'* sign, the tip of the feather of the *m3't* sign and the cartouche frame on the right side are extant. As extant, cartouche measures 4.7 × 3.2 cm. Signs raised; depth of impression 0.15 cm. On the upper side the lower two signs of the cartouche are extant and the lower rounded frame. Most of the signs have flaked off leaving only a faint negative impression. Signs can be identified as *m3't-k3* (probably *m3't-k3-r'*). Length *c.* 10.7 cm.; diameter of base *c.* 6.5 cm. (Fig. 29: 6)

MOG1–99–1–10 Surface collection 1996. Terracotta cone fragment. LB I. Flaking, broken in antiquity and one fresh break. Fragment from central part of cone. Circular in section, tapering towards pointed end. Badly fired, strong brown (7.5YR5/6) at surface and thick brown core (10YR5/3), diffuse firing line. Chaff temper and small rounded inclusions of quartz. Very patchy red slip, most worn (2.5YR4/6). Length 10.1 cm.; maximum diameter 5.6 cm.; minimum diameter 4.9 cm.

MOG1–99–1–11 Surface collection 1996. Terracotta cone fragment. LB I. Flaking, broken in antiquity and one fresh break. Fragment from central part of cone. Circular in section, tapering towards pointed end. Badly fired, yellowish-red at surface (5YR5/6) and thick very dark grey core (10YR3/1). Chaff temper, small rounded inclusions of quartz and possible grog inclusion. Very patchy elusive red slip (2.5YR5/6). Length *c.* 9.3 cm.; maximum diameter 5.7 cm.; minimum diameter *c.* 4.6 cm.

MOG1–99–1–12 Surface collection 1996. Terracotta cone base. LB I. Abraded and accreted, broken in antiquity and one fresh break. Flat base, sub-circular in section. Reddish-yellow (7.5YR6/6) at surface and thick dark grey core (10YR4/1). Dense chaff temper, some shell and small rounded quartz inclusions, one large piece of grog. Self-slipped, white (2.5Y8/2). The base and upper side of cone are stamped with hieroglyphic signs within vertical cartouche. On base only upper part of cartouche is extant. Signs can be identified as *r'* and the feather and top of head of *m3't* sign (probably *m3't-k3-r'*). As extant, cartouche measures 3.0 × 3.7 cm. Signs raised; depth of impression 0.2 cm. On upper side only the upper part of the cartouche survives: *r'*sign (towards base) and feather of the *m3't* sign. Cartouche measures 3.1 × 3.0 cm. as extant. Signs raised; depth of impression *c.* 0.15 cm. Length 5.3 cm.; diameter of base *c.* 6.0 cm. (Fig. 29: 5)

MOG1–99–1–15 Surface collection 1996. Terracotta cone fragment. LB I. Flaking, broken in antiquity and two fresh breaks. Fragment from central part of cone. Circular in section, tapering towards pointed end. Poorly fired, reddish-yellow (7.5YR6/6) at surface and thick dark grey core (10YR4/1), diffuse firing line. Vitrified on one side, light grey (2.5Y 7/2). Chaff temper, small rounded inclusions of quartz and large pieces of shell (0.9 cm. in length). Self-slipped, white (2.5Y8/2). Length 6.6 cm.; maximum diameter 6.7 cm.; minimum diameter 5.9 cm.

MOG1–99–1–16 Surface collection 1996. Terracotta cone fragment. LB I. Flaking, broken in antiquity. Restored from five pieces, modern breaks. Fragment from central part of cone. Ovoid in section. Poorly fired, light brown (7.5YR6/4) at surface and thick dark grey core (10YR4/1). Vitrified on one side, light grey (2.5Y7/2).

Dense organic temper, chaff and grain of wheat burnt out. Some small rounded inclusions of quartz. Self-slipped, white (2.6Y8/2). Patchy traces of red slip (2.5YR5/6). Length 9.1 cm.; maximum diameter 6.4 cm.

MOG1–99–1–17 Intensive survey: N470 E580. Terracotta cone fragment. LB I. Abraded, broken in antiquity. From lower part of cone, tapering towards tip. Roughly circular in section. Poorly fired. Yellowish-red (5YR5/8) at surface and thick dark grey core (10YR4/1), diffuse firing line. Chaff temper, small rounded quartz inclusions. Two finger impressions on surface. Length 7.6 cm.; maximum diameter 5.2 cm.

MOG1–99–1–18 Intensive survey: N490 E610. Terracotta cone tip. LB I. Abraded, broken in antiquity, two fresh breaks. Pointed tip of cone, tip broken off. Roughly circular in section. Poorly fired, reddish-yellow (7.5YR6/6) at surface and very dark grey core (10YR3/1). Vitrified on one side at tip, light grey (2.5Y7/2).Dense chaff temper and some small rounded quartz inclusions. Length 7.9 cm.; maximum diameter 4.6 cm.; minimum diameter *c.* 3.1 cm.

MOG1–99–3–1 Intensive survey: N490 E510. Alabaster kohl bottle. LBA. Incomplete, about 1/3 of body preserved, foot broken, neck and rim missing. Piriform body on flat foot. Narrow drill hole, with horizontal drill lines. Exterior surface and base of foot are polished to a fine finish. Preserved height 6.9 cm.; diameter of base unmeasured; maximum diameter *c.* 6.0 cm.; diameter of drill hole *c.* 1.7 cm. (Fig. 31: 2)

MOG1–99–3–2 Intensive survey: N490 E510. Stone spindle whorl. MB-LB? Incomplete, about 1/3 preserved. Discoid, with rough finish. Unidentified white stone. Diameter *c.* 7.2 cm.; thickness 1.1 cm.; diameter of perforation *c.* 0.6 cm. (Fig. 31: 3)

MOG1–99–3–3 Intensive survey: N470 E530. Carnelian bead fragment. MB-LB. Incomplete spherical bead, with perforation near top. Surface polished. Height 3.3 cm.; width 2.1 cm.; diameter of perforation *c.* 0.6 cm.

MOG1–99–3–4 Extensive survey: N470 E530. Stone spindle whorl. MB-LB? Incomplete, about 1/2 preserved. Discoid of unidentified grey stone. Diameter *c.* 3.2 cm.; thickness 0.8 cm.; diameter of perforation *c.* 1.0 cm. (Fig. 31: 4)

MOG1–99–5–1 Basalt tripod mortar. Chalcolithic. Incomplete, upper body, rim and lower legs missing. Conical body with deep bowl hollowed out, interior of bowl smoothed to fine finish. Three legs, ovoid in section. Three horizontal lines roughly incised on the exterior surface above the legs. Exterior surface less well finished than the interior surface of the bowl. Extant height *c.* 8.0 cm.; rim diameter 8.9 cm.; thickness 1.5 cm. (Fig. 31: 1)

MOG1–99–5–2 Intensive Survey: N480 E520. Basalt bowl. LB. Two joining pieces (modern break), forming large rim fragment of shallow bowl, almost one half preserved. Flattened lip. Interior and exterior surfaces are smoothed. Height *c.* 4.0 cm.; diameter of rim *c.* 38.0 cm.; thickness 0.8 cm.

MOG1–99–5–4 Saddle quern fragment. Date? Working surface is smooth, lower surface unworked. Basalt. Pres. height *c.* 05 cm.; thickness 0.5 cm.; length 0.6 cm.; width 0.8 cm.

MOG1–99–5–5 Basalt millstone. Medieval/modern? Upper stone of 'water-wheel' type millstone. Flat smooth bottom and arched back. Length 13.0 cm.; width 15.5 cm.; height 37.0 cm.

MOG1–99–5–6 Extensive survey: N470 E470. Basalt grinding stone. Bun-shaped upper grinding stone, to go with saddle quern. Flat base and curved back. Broken on one side. Length 9.0 cm.; width 15.5 cm.; thickness at widest point 3.0 cm.

MOG1–99–6–1 Extensive survey: N470 E530. Chert sickle blade. MB? Rectangular blade with irregularly denticulated edges. Silica sheen along one edge. Length 6.3 cm.; width 3.3 cm.; thickness 0.8 cm. (Fig. 33: 1)

MOG1–99–6–2 Extensive survey: N470 E500. Chert sickle blade. MB? Triangular blade with irregularly denticulated edges. Silica sheen along edges. Length 6.3 cm.; width 3.3 cm. (at widest point); thickness 0.7 – 1.1 cm. (Fig. 33: 2)

MOG1–99–6–3 Intensive survey: N490 E540. Chert blade. MB? Rectangular bifacial blade with flat back and denticulated edge. Length 3.1 cm.; width 1.0 cm.; thickness 0.4 cm. (Fig. 33: 3)

MOG1–99–6–4 Extensive survey N470 E650. Chert blade. MB? Bifacial blade with flat back, one edge finely serrated. Length 3.0 cm.; width 0.9 cm.; thickness 0.3 cm.

MOG1–99–6–5 Intensive survey: N490 E560. Chert blade. MB? Broken rectangular blade. Three faces on upper side, flat back and both edges serrated. Length 3.0 cm.; width 1.9 cm.; thickness 0.4 cm. (Fig. 33: 4)

MOG1–99–6–6 Intensive survey: N480 E590. Chert blade (broken). MB? Bifacial blade with flat back. Triangular section and three faces at broken end. Length 3.5 cm.; width 2.5 cm.; thickness 0.6 cm.

MOG1–99–6–7 Surface collection prior to survey. Chert blade. MB? Rectangular blade with rounded end, three faces on upper side, flat back, and one irregularly denticulated edge. Length 4.9 cm.; width 1.9 cm.; thickness 0.35–0.5 cm. (Fig. 33: 5)

MOG1–99–6–8 Surface collection prior to survey. Pointed chert blade. MB? Pointed bifacial blade, broken at one end and flat back. Triangular section at pointed end. Length 4.0 cm.; width 2.1 cm.; maximum thickness 0.65 cm. (Fig. 33: 6)

1999 Survey: Area 2

MOG2–99–6–2 Chert blade. Flat bottom and bifacial back with triangular section at broken end. Barely serrated edges along both sides of blade. Length 4.9 cm.; maximum width 2.4 cm.; thickness 0.7 cm. (Fig. 33: 7)

2000 Excavations

MOG1–00–1–1 Surface collection. Terracotta mould-made lamp. Islamic. About one quarter preserved. Slipper form with tongue handle and moulded decoration, small circles on shoulder. Well fired, reddish-brown fabric (5YR5/4) with no visible core. Surface is white (5YR8/1) post-depositional conditions? Height 3.4 cm.; length 6.0 cm.; thickness 0.8 cm. (Fig. 31: 7)

MOG1–00–1–3 Surface collection. Terracotta lamp. Byzantine. About one third preserved, but near complete profile. Flat base, flattened depressed profile, spouted nozzle attached just above base. Moulded decoration of concentric circles around shoulder. Very dense matrix and hard fired. The clay is well levigated but with small rounded inclusions. Reddish-brown at surface (5YR5/4) with grey core (2.5Y5/1). Height 2.3 cm.; length 5.3 cm.; thickness 0.35–0.6 cm.; thickness of nozzle 1.0 cm.

MOG1–00–1–4 N469 E560, unit 505. Ceramic bead. Bronze Age. Complete but worn on the surface. Biconical bead with 15 vertical incisions around the widest point of the bead. Height 1.2 cm.; maximum diameter 1.6 cm.; diameter of stringhole 0.1 cm.; weight 2.2 g.

MOG1–00–1–5 N469 E557.5, unit 601. Terracotta cone tip. LB I. Incomplete, ancient break. Poorly fired, material is very soft and crumbly. Dense organic temper and some small quartz inclusions. Reddish-yellow at surface (5YR5/6) and thick dark grey core (10YR4/1). Length 8.0 cm.; maximum diameter 4.2 cm. (Fig. 29: 4)

MOG1–00–2–1 Surface collection. Copper/copper alloy needle found with burnt shell (with copper stain) in Zone 3. Date? Incomplete, corroding. Fragment of needle with eye, broken at one end and bent. Length *c.* 2.6 cm.; thickness 0.2 cm.; length of eye 0.3 cm.; weight 0.3 g.

MOG1–00–2–2 N450 E550, surface collection. Copper/copper alloy coin. Byzantine? Complete, corroding. Obverse is not legible. *Chi Rho* symbol on reverse. Maximum diameter 1.3 cm.; thickness *c.* 0.2 cm.; weight 1.8 g.

MOG1–00–2–3 N434 E529, unit 201. Copper/copper alloy coin. Date? Complete, corroded and accreted. Obverse and reverse are not legible. Maximum diameter 1.1 cm.; thickness *c.* 0.2 cm.; weight 0.5 g.

MOG1–00–2–4 N440 E523.5, unit 304. Copper/copper alloy pin fragment. Date? Incomplete, corroding. Pointed end of needle or pin, other end broken. Length *c.* 1.6 cm.; thickness 0.15–0.3 cm.; weight 0.3 g.

MOG1–00–2–5 N469 E560, unit 501. Copper/copper alloy arrowhead. MB-LB. Complete, corroding. Leaf-shaped arrowhead, flat in section. Length 6.9 cm.; maximum width 1.6 cm.; weight 7.0 g. (Fig. 32: 1)

MOG1–00–2–6 N469 E560, unit 501. Copper/copper alloy arrowhead. MB-LB. Complete. Leaf-shaped arrowhead with bent tang. Length 9.2 cm.; thickness 0.15–0.3 cm.; weight 15.8 g. (Fig. 32: 6)

MOG1–00–2–7 N469 E560, unit 502. Copper/copper alloy arrowhead. MB-LB. Complete, edge of blade corroding. Leaf-shaped arrowhead with bent blade. Length 8.1 cm.; weight 7.6 g. (Fig. 32: 4)

MOG1–00–2–8 N469 E560, unit 504. Copper/copper alloy arrowhead. MB-LB. Complete. Leaf-shaped arrowhead. Length 7.4 cm.; thickness 0.2 cm.; weight 7.2 g. (Fig. 32: 5)

MOG1–00–2–9 N469 E560, unit 504. Copper/copper alloy arrowhead. MB-LB. Leaf-shaped arrowhead with broken tang. Length 4.4 cm.; thickness 0.1 cm.; weight 2.2 g. (Fig. 32: 2)

MOG1–00–2–10 N469 E557.5, unit 604. Copper/copper alloy arrowhead. MB-LB. Leaf-shaped arrowhead with pointed blade and concave tangs. Length 6.1 cm.; thickness 0.2–0.3 cm.; weight 5.0 g. (Fig. 32: 3)

MOG1–00–2–11 N469 E560, unit 505. Copper/copper alloy sheet. MB-LB. Badly corroded. Small rectangular piece of bronze sheet, perforated with nine small holes. Bent in the middle. Length 5.5 cm.; width 1.5 cm.; thickness 0.4 cm.; weight 5.4 g.

MOG1–00–2–12 N469 E560, unit 510. Copper/copper alloy pin. MB. Corroded. Fragment of pin, circular in section, with curved top, broken at other end. Length 3.8 cm.; thickness 0.2 cm.; weight 0.9 g.

MOG1–00–2–13 N469 E560, unit 510. Copper/copper alloy awl. MB. Fragment of awl, square in section with thickened head and broken point. Length 4.1 cm.; thickness 0.2 cm.; weight 2.0 g. (Fig. 32: 8)

MOG1–00–2–14 N469 E560, unit 511. Iron fragment. MB. Badly corroded amorphous lump of iron. Length 2.5 cm.; width 2.0 cm.; thickness 1.5 cm.; weight 7.4 g.

MOG1–00–2–15 N469 E560, unit 511. Four fragments of scrap copper/copper alloy. Combined weight 26.3 g.

MOG1–00–2–16 N469 E560, unit 512. Copper/copper alloy awl. MB. Two pieces of awl with pointed tip, round in section. Head of awl broken off. Length 5.2 cm.; thickness 0.3 cm.; weight 2.0 g.

MOG1–00–2–17 N469 E560, unit 512. Copper/copper alloy pin. MB. Two joining pieces, corroded. Round in section, fine point, broken off at other end. Length 8.4 cm., thickness 0.1 cm.; weight 1.0 g. (Fig. 32: 7)

MOG1–00–3–1 N440 E523.5, unit 304. Steatite cylinder seal. MBA. (Collon 2002, 229).

MOG1–00–3–2 N469 E560, unit 514. Jasper scarab bead. MB, Dynasty XIII. Incomplete (one half preserved). Back: nicks at side to indicate divisions between elytra and pronotum. Base: plain scaraboid. Perforated longitudinally. Polished surface. Length 3.3 cm.; height *c.* 0.6 cm.; width *c.* 0.5–0.6 cm.; diameter of string-hole *c.*0.2 cm.; weight 0.6 g.

MOG1–00–4–1 N469 E560, unit 514. Paste (vitreous materials with a very degraded surface) bead. MB. Complete but worn. Grey in colour with traces of white surface. Pierced vertically. Height 0.3 cm.; maximum diameter 0.6 cm.; thickness 0.2 cm.; diameter of stringhole 0.2 cm.; weight 0.1 g.

MOG1–00–4–2 N469 E560, unit 505. Paste scarab. MB. Incomplete (less than half preserved) and very worn. Very pale whitish-blue colour. Back: incised line around edge. Base: very little preserved : border of three incised lines. Length 1.2 cm.; preserved height 0.4 cm.; preserved width 0.8 cm.; weight 0.3 g.

MOG1–00–5–1 N460 E560, unit 504. Grinding stone, MB-LB. Incomplete. Limestone based stone with high silica content. Almost triangular piece of stone, with worked, flattened upper surface. Lower surface is unworked. Two circular depressions on upper surface. Length 9.2 cm.; width 21.2 × 19.8 cm.

MOG1–00–9–1 N440 E523.5, unit 301 (see McCarthy, *infra*).

MOG1–00–9–2 N. 469 E560, unit 505 (see McCarthy, *infra*)

MOG1–00–9–3 N464 E563, unit 008. Clay plug/bung. MB-LB. Incomplete, ancient break. Amorphous lump of clay, rounded with upper and lower nodule, surface of upper nodule is flattened. Traces of string impression. Fine well levigated light brown clay (10YR5/2). Height 2.4 cm.; maximum diameter. 4.5 cm.; weight 21.8 g.
MOG1–00–10–1 N469 E557.5, unit 605. Worked bone point. MB. Circular in section, sharp point, other end broken, polished surface. Length 3.7 cm.; thickness 0.55–0.7 cm.; weight 0.8 g.
MOG1–00–10–2 N440 E523.5, unit 304. Worked bone fragments. MB? Four fragments of worked bone with linear incised decoration, forming small squares. Length unmeasured; thickness 0.1 cm.

Seal impressions
A. McCarthy

Two seal-impressed objects were found in the 2000 soundings at al-Moghraqa. Three further clay sealings were identified in N469 E560 on surface II (units 510, 511). In these cases, however, no impression was extant. While the seal impressions at best give a very rough chronological indication, they seem to corroborate an MB II date for the lower levels of the site (Steel *et al.* 2002, 940). More specifically, an MB IIb-c date for these seal impressions would appear entirely consistent with the style of the seals and the associated pottery. This being said, scarab impressions are not good chronological indicators and a Dynasty XVIII date (LB Ia-b) is not out of the question. In any case, these impressions indicate that local seals were being used to administer control of commodity exchanges in what was a suburb of a city at the Levantine terminus of the 'Ways of Horus'.

Description of objects and discussion of comparanda

MOG1–00–9–1 N440 E523.5, unit 301. Clay sealing. MB IIb-c? Fragment of baked clay object with a single incomplete impression of stamp (scarab) seal on obverse. No reverse impressions. Length of impression (min.): 1.4 cm.; width of impression (min.): 0.75 cm. Design is of four hieroglyphic or pseudo-hieroglyphic signs (Canaanite reinterpretations) arranged in a linear fashion. What is probably a linear border separates the terminal sign from the other signs in a distinct register. Impression is oval/sub-rectangular. Length 2.5 cm.; width 2.2 cm.; thickness 0.9 cm.; weight 5.1 g. (Fig. 31: 5)

This object is made of fine clay, consistent with the type of clay used in sealing containers or locks, although no reverse impressions survive to indicate what this object might have been sealing. The object has the fragment of a single stamp seal impression, probably made from a scarab, based on the size, shape and design of the impression. The object was impressed while the clay was still wet and before it was fired. The impression is oval/sub-rectangular in shape, typical of scarabs. A border surrounds the design on this scarab impression. The design is of hieroglyphic or pseudo-hieroglyphic characters (Canaanite reinterpretations) arranged in a linear fashion along the long axis. Only a portion of the design remains, and it is very likely that the original design would have had another column of signs running parallel to the surviving one, or a larger motif positioned adjacent. The terminal sign (probably bottom of seal) appears to be separated from the other signs by way of a single or possibly double line. The surviving column of characters appears to represent three actual hieroglyphic signs, but they are probably linguistically meaningless, and in any case the design is fragmentary. These three signs are above a line separating the design into at least two registers, and a fourth fragmentary (?) and unidentifiable sign is in this register. This fourth sign consists of a dotted circle next to a small dotted triangle.

This impression has many similarities in other seals from the Levant and the Eastern Mediterranean. It is typical of Canaanite copies of Egyptian scarabs, incorporating hieroglyphic and pseudo-hieroglyphic characters into the design as purely decorative elements. It is doubtful that the characters used in the seal used to impress this object were arranged to convey any real language information. A cowroid seal from Lachish dating to the MB II period has very similar signs (although grouped along the wide axis) with separated registers at both ends, each with inverted *'nh*-signs in them (Tufnell 1940, pl. 45: 157). Dating can only confidently come from contextual analysis, however, and thus a date of MB IIb-c has been assigned.

MOG1–00–9–2 N469 E560, unit 505. Clay sealing. MB IIb-c? Fragment of baked clay object with at least four impressions of the same stamp (scarab) seal on obverse. No reverse impressions. Design is of three hieroglyphic or pseudo-hieroglyphic signs (Canaanite reinterpretations) arranged in a linear fashion. Impression is oval/sub-rectangular. Length 3.5 cm.; width 3.2 cm.; thickness 1.6 cm.; weight 13.1 g. (Fig. 31: 6)

This object is made from fine clay, consistent with the type of clay used in sealing containers or locks, although no reverse impressions survive to indicate what this object might have been sealing. The obverse was impressed a minimum of four times with a stamp seal, probably a scarab, while the clay

was still wet and before the object was fired. At least three of the impressions were made using the same seal and the fourth impression is too fragmentary to show any design. The seal used to make the impression has a design consisting of three distinct elements: a ring or circle, a swirling pattern that may be a Canaanite reinterpretation of an Egyptian hieroglyphic sign, and a simple fish motif (*cf.* Petrie 1931, pl. XIV, no. F154) or twisted cord motif (the hieroglyphic sign *šs* or *šn*). There might have been a border surrounding the central design, but this is unclear from the impression. The impressions are the typical oval/sub-rectangular shape of scarabs.

Scarabs are very difficult to date precisely (Tufnell *et al.* 1940, 68), but there are some clues that may narrow down the range of possibilities for this particular example. The dating of the other materials from the excavations at al-Moghraqa can help to determine this object's date, rather than the other way around. It is therefore very likely that the MB IIb pottery found in association secures at least a *terminus post quem* for this object and MOG1–00–9–1. Neither of these two objects (MOG1–00–91 and MOG1–00–9–2) seems to fit neatly into any of the Hyksos categories of scarabs (see Tufnell 1958, 110–111 for a discussion of the problems of Hyksos seals and for further references), but this does not mean that these objects cannot date to this time period. Comparanda with other scarab seals suggest that an MBA, rather than an LBA date is appropriate for this impression, as the design is of large, deeply engraved characters common amongst seals in the MBA, although this is by no means certain. Therefore, an MB IIb-c date has been given for both of the seal impressions, although a LB Ia-b date cannot be ruled out. For comparisons in the MBA, see examples from Lachish, now in the British Museum (WA12236 and WA12239).

The central sign is unidentifiable and in the end it could simply be a motif unrelated to any Egyptian character or design. Some suggestions as to what it might have been derived from can be suggested. The motif is of a swirling pattern incorporating at least two projecting features. Two possibilities of similar hieroglyphic characters are the 'bee' (which writes *bjty* 'king') and the 'eye of Horus' (*wd3t*). These signs would have presumably been familiar to the Canaanite crafts people, as *bjty* is a standard part of the Egyptian royal titulary, and the '*wd3t* -eye' is an amuletic symbol often seen inside and outside Egypt (for 'bee', *cf.* Fischer and Sadeq 2002, fig. 29: 4 from Tell al-ᶜAjjul; for '*wd3t* -eye', *cf.* Tufnell *et al.* 1958, pl.30: 66, from Lachish). Alternatively, the central figure could be a rendition of a winged uraeus, of which an example from the time of Thutmose III can be seen in Petrie (1917), pl. XXX: 11. The ring or circle in this design, when paired with the central sign could be taken to represent a Canaanite attempt to replicate the signs for *ḥtmw bjty* ('king's seal-bearer'), which consists of the 'bee' with 'a seal on a necklace'. Indeed this could be an attempt to emulate royal bureaucracy by the local administration.

Discussion

These seal-impressed objects are likely to represent the use of seals for administrative control close to the time in which the seals themselves were created. This contrasts with the cylinder seal found at al-Moghraqa (Collon 2002), which dates to the Old Assyrian period and would have been produced several hundred years before its deposition. As administrative residue, the two seal-impressed objects may also provide a link between the MB assemblage and the Dynasty XVIII impressed funerary cones with the prenomen of Thutmose III and Hatshepsut also found at the site (Steel *et al.* 2002), albeit from a slightly later time period. The impressions do not have any precise chronological indicators, however, and are therefore independently best described as simply belonging to the Middle Bronze Age.

The objects themselves are made of fine clay and impressed with stamp seals, once for MOG1–00–9–1 and at least four times on MOG1–00–9–2, before being baked. The two objects do not join to each other and neither shows signs of any reverse impression. Nonetheless, it is presumed that the objects would have sealed a container or lock of some sort, and the impressions were a bureaucratic or ownership mark. This function therefore contrasts with the impressed cones, which display a royal name and are thought to have been funerary in nature (Steel *et al.* 2002; Steel *et al.* in press; Davies and MacAdam 1957). Roughly contemporary impressed sealings were found at Tell al-ᶜAjjul (Petrie 1933, pl. V; *cf.* Tufnell 1940, pl. XXXIIB: 30, for scarab-impressed sealing with rope-marks from Lachish), attesting a tradition of glyptic administrative control in this general area of the southern Levant.

Both of the impressions from al-Moghraqa were probably made by scarabs or scaraboids. Although the size and shape of the impressions are also similar to bi-, tri- and quadri-faced prism beads (from Palestine/Israel see Keel and Schroer 1985; from Crete, see Kenna 1960), the design style is more consistent with scarabs. The border around the design further suggests that these are scarabs. Scarab seals are extremely common in Syro-Palestine and

the Eastern Mediterranean in the Middle Bronze Age, and this find fits in very well with a long established tradition. In particular, both impressions show what appear to be psuedo-hieroglyphic scripts, meaning that some actual Egyptian hieroglyphic characters are represented, but they were probably copies made by local Canaanite craftspersons and do not convey any meaningful language information. That these are Canaanite copies and not imported Egyptian scarabs is supported by object MOG1–00–9–2, which shows impressions of a seal engraved with a unconventional sign that might be a misrepresentation of *bjty* ('king') or possibly the '*wd3t*-eye' (see object descriptions and comparanda above).

These impressions support the idea that al-Moghraqa, as a suburb of nearby Tell al-ᶜAjjul, functioned as a station for the importation of 'luxury materials and production of prestige items' (Steel *et al.* 2002, 940). Seals and especially seal impressed objects are often associated with the bureaucratic control of commodities, and as such, the Canaanite impressions from al-Moghraqa represent the local administration of goods flowing to the terminus of the 'Ways of Horus' from Egypt (Oren 1987) and from areas further north in the Levant. If al-Moghraqa functioned as an *entrepôt* for commodity exchange (and presumably goods obtained this way were used in the Dynasty XVIII cemetery at Tell al-ᶜAjjul (Steel *et al.* 2002, 940; Petrie 1932; 1933; 1934), it appears as though those controlling the flow of these goods were using seals produced locally.

Geomorphology and soils of the al-Moghraqa area, Gaza

R. Neil Munro

Preliminary archaeological appraisals of the Gaza region between 1996 and 1999 (Clarke and Steel

Square	Unit	Description
N469 E560	501	2 pieces of mud with matting impressions; 2 copper/copper alloy arrowheads; *c.* 276 cone fragments + 6 cone fragments with hieroglyphic signs extant
N469 E560	502	Copper/copper alloy arrowhead; 34 cone fragments
N469 E560	502/503	11 cone fragments
N469 E560	504	Unworked carnelian; slag; piece of copper/copper alloy; 2 copper/copper alloy arrowheads; grinding stone
N469 E560	505	4 pieces of pumice; copper/copper alloy sheet metal; clay sealing (inscribed); ceramic bead; paste scarab fragment
N469 E560	506	Slag; tabun
N469 E560	507	Piece of iron stone; piece of architectural plaster
N469 E560	508	2 pieces of tabun
N469 E560	509	Several pieces of tabun
N469 E560	510	2 clay sealing fragments (no impression extant); slag; small piece of pumice; several pieces of unworked mother-of-pearl; copper/copper alloy pin; copper/copper alloy awl
N469 E560	511	Clay sealing; no impression extant; iron fragment; copper/copper alloy scrap metal
N469 E560	512	Piece of iron; copper/copper alloy awl; copper/copper alloy needle
N469 E560	514	Piece of metal (undetermined); 2 pieces of haematite; jasper scarab bead fragment; paste bead; piece of grinding stone (amygdaloidal) basalt)
N469 E557.50	601	*c.* 72 cone fragments; 2 joining fragments with partial cartouche impression
N469 E557.50	604	Sherd with slag adhering; copper/copper alloy arrowhead
N469 E557.50	605	Large piece and several small fragments of unworked mother-of-pearl; 2 pieces of agate; bone point
N469 E557.50	606	Two pieces of slag

Table 1. *al-Moghraqa: list of small finds recovered from deposits in Zone 2.*

Proposed Formation Name	Code and Proposed Name of Member.	Lithostratigraphy	Approx Thickness -meters-	Depositional Environments and relations to other beds	Soil Development	Locations	Archaeology	Moghraqa Area Section
WADI GAZA. Alluvial sands with gravels, and silts. Holocene	**G2 RAFA Member**	Thinly bedded silts, cross-bedded sands, and loams, with construction detritus.	>2.6 m	Recent and active slack water deposits along Wadi Gaza where flow is restricted (by series of man-made structures, roads, pipes, garbage, sewage etc.). Overlies other alluvial beds.	Development of weakly gleyed fluvisol in flooded alluvial environment.	Wadi Gaza floodplain	None. Modern deposits with garbage.	MG-11; MG-12
	G1 RABWE Member	Yellowish Brown to Light Brown, cross-bedded, sands and gravels.	>2 m Base not seen	Ephemeral wadi channel floodplain. Rapid deposition of sands and fine gravels. Almost no fines. Appears to cut into K1 near Gaza Power Station.	Very weak soil structure at surface only. Profile below shows no soil development.	Wadi Gaza floodplain	None seen. Pre-garbage era recent Holocene deposits. Post Bronze Age.	MG-11; MG-12
MOGHRAQA. late Pleistocene(?) / Holocene Aeolian sands.	**M5 ZAHRA Member**	Loose to Finely stratified, Brownish-Yellow to Yellow, fine sands and medium sands.	> 4 m	Active Aeolian sand sheets and dunes migrating across area from west. Time equivalent to G1 and later alluvium. Overlies all earlier aeolian formations.	Depositional layering below loose surface layer is unaffected by faunal bioturbation	Throughout area north of line from wadi Gaza mouth to Moghraqa site.	None. Active aeolian sands	MG-4; MG-6; MG-13
	M4 NUSAIRAT Member	Massive, weakly stratified, Yellowish Brown, sands to loamy sands.	>4.5 m	Aeolian sand sheet and dune forms migrating eastwards across area from coast. Overlies, M1, M2 and the Moghraqa BA Loams. Soil layer may be time equivalent to upper part of Moghraqa BA Loams.	Weak sub-angular structure of surface horizon only. Sub-surface strongly affected by bioturbation with faint traces of layering.	Moghraqa; Tell Sakan	Sand deposition in late Roman, Hellenistic & Byzantine periods. Soil formation likely to be post-Byzantine	MG-1; MG-2 MG-3; MG-4; MG-5; MG-6; MG-7; MG-8; MG-9; MG-13
	M3 BURAIJ Member	Thin, stratified, Yellowish Brown, Fine Sands, lying between midden /ash layers. Upper part Loamy Fine Sand.	>0.3 m	Brief phase of aeolian sand sheet deposition on steep west facing slopes of Tell. Probably thickens to west.	At base sterile sand without soil develop-ment, but upper part mixed with tell material and weak structure.	On west facing outer rampart of Tell Sakan	EBA to MBA?	Tell Sakan only

	M2 SAKAN Member	Massive, fine / medium sands, with soil development at top.	> 2 m. Base not seen	Aeolian sand. Massive structureless sands that overlie M1. Overlain by Sakan (EBA) Loams.	Weak structure at surface only. Original topsoil seen immediately to south of tell.	Identified at Tell Sakan area only so far.	Earlier than EB-II.	Tell Sakan area
	M1 SANAM Member	Weakly stratified, Light Yellowish Brown, sands and sandy loams with CaCO3 concretions over soft massive sands. Formed over Pleshet Formation.	>1.0 m	Aeolian sand deposition with post-depositional CaCO3 cementation and soil formation. Has developed over P1 aeolianite ridges, and probably elsewhere.	Darker coloured calcareous sandy subsoil with concretions. May be partly formed on the aeolianite.	Tell al-ᶜAjjul; al-Moghraqa; Tell Sakan	Early Bronze Age to Late Stone Age	MG-1; MG-2; MG-3; MG-5; MG-6; MG-7; MG-13
KISHASH Clayey and silty alluvium with loess. Late Pleistocene (?) & Holocene. (= Rehovoth Formation in Israel. Issar, 1968).	**K1 HALFA Member**	Deep, Reddish Brown, Clays to silty clay loams.	>4.6 m Base not seen	Alluvial back-swamp deposit, and suspected reworked loess and *in situ* loess components. Stone line may indicate cultural layer. Generally no artefacts observed. May be, in part, lateral equivalent to Moghraqa BA Loams.	Strong sub-angular blocky structure developed in swampy deposit.	Gaza Power Station area, on left bank of Wadi Gaza.	Late Bronze Age and earlier	MG-1; MG-3; MG-10
PLESHET Pleistocene to Holocene Aeolianite with coversands. (Pleshet defined by Hull, 1886; redefined Issar, 1968).	**P1.**	Light Yellowish Brown, finely stratified and calcareous sandstones, with silty partings, cemented by CaCO3.	>10m. Base not seen	Pleistocene sands and silt layers, believed to be coastal aeolian, with post-depositional CaCO3 cementation. The earliest beds in area.	Calcareous soil developed on outcrops is M1	Tell al-ᶜAjjul	None seen. Elsewhere Palaeolithic	Tell al-ᶜAjjul area; likely to be buried at Tell Sakan.

Table 2. *Preliminary appraisal of sedimentary and soil formations in western Wadi Gaza area.*

Location in which layers occur	Proposed name for cultural layers	Lithology	Approx thickness -meters-	Depositional environments and relations to Members of Formations	Soil development	Locations	Archaeology	Moghraqa Area Section
MOGHRAQA	**Moghraqa (LBA) Loams**	Pale Brown to Dark Brown, slightly to moderately organic, sandy clays and sandy loams with cultural materials	>1 m	Close to alluvial depression or back swamp adjacent to Wadi Gaza. Clayey infill, modified by cultural influence. Overlain by M4 and later M5. Passes down into M1 and P1. Appears to pass laterally into K1.	Blocky soil structure in cultural layers	al-Moghraqa area	MB-LB	MG-1; MG-2; MG-3; MG-4; MG-5; MG-6; MG-7; MG-8; MG-9; MG-13
AJJUL	**Ajjul (MBA) Loams**	Stratified cultural deposits. Not yet studied	No data	Overlain in part by M4 and M5 sands	Weak sub-angular blocky sandy loam formed on upper part of Kurkar aeolian sand sheet over-lain by Tell deposits	Tell al-ᶜAjjul	MBA	Not seen
SAKAN	**Sakan (EBA) Loams**	Stratified cultural deposits, interbedded with thin layers of clay, current bedded sand, aeolian sand, & ashy/mud brick colluvial slope deposits. Under study at present.	>11m	Cultural deposits with some modification of locally (tell) derived alluvial deposits. With colluvial and aeolian inclusions. Underlain by M2, M1 and probably P1 sandstones. Includes thin layers of M3. Appears overlain by M4 and M5, aeolian sands.	Generally few indicators. Limited to blocky soil-like structures in a number of clayey layers. Note that recent & living roots penetrate throughout tell.	Tell Sakan area only	EB II–III and MBA	Not seen

Table 3. *Cultural deposit layers in the Wadi Gaza area*

1999) identified the need for a geomorphological study. In 2000 R. Neil Munro made four visits to al-Moghraqa and its surroundings: in May, from June 18 to 21, on July 29, and in October. The main visit was in June 2000 towards the end of the field season, when excavations trenches were open and it was possible to undertake studies in adjacent parts of the 'Gaza Strip'. Detailed observations and measurements were made at thirteen sections of soils and sediments collected during June 2000 in Gaza. These have been described according to international classification systems for sediments. Soil structural features and general format are based on the Food and Agricultural Organization (FAO) of the United Nations (FAO 1977), and United States Dept. of Agriculture (USDA, 1951). Geomorphological observations followed guidelines given in Goudie (1981), and Dackombe and Gardner (1983). Aeolian features are described according to the terminology of Pye and Tsoar (1990).

An initial review has been made of some of the previous excavations and geomorphic studies carried out in the Gaza region, where these enhance our understanding of the landscape development at al-Moghraqa, thereby allowing a comparative assessment of landscape development in the area around the mouth of the Wadi Gaza. Early geomorphic observations, in the immediate vicinity of the site, were made during excavations by Flinders Petrie between 1930 and 1934 at nearby Tell al-ᶜAjjul. Petrie noted (1931, 2) that the ancient city stood on a natural sandstone hill formed from a mass of ancient dunes. The latter are aeolianites in modern geomorphic nomenclature. It was claimed that these dunes had been 'solidified by gypsum working up from below the soil, owing to long drought in the summer' (Petrie 1931, 2). The gypsum was said to form nodules in the sand, the marls overlying the sandstones and inside pottery found on the site. Petrie suggested that the Wadi Gaza, from about 10,000 BP (Neolithic), was an estuary with a direct connection with the sea and small boats could reach up to Tell al-ᶜAjjul. By the LBA (Egyptian Dynasties XVIII and XIX) however, the estuary and port were thought to have become silted up and the site of Tell al-ᶜAjjul declined as a major Canaanite centre (Petrie 1931; Tufnell 1984, 8). It has been suggested that harbour facilities might have existed at the site up to the sixteenth century BC and possibly as late as the fourteenth century, at which point the port moved closer to the mouth of the Wadi Gaza at the site of Tell al-Sannam (Tufnell and Kempinski 1993, 53; Clarke and Steel 1999, 223).

Though little geomorphological research work has been made in Gaza in the past, the work of Hull (1886) that identified an aeolian origin for the *kurkar* ridges remains an important source. On adjacent territories on the coastal plains of Israel though, considerable studies on soils and geomorphology as related to archaeology have been made during the past 40 years, and in 1997 the Geological Survey of Israel published a comprehensive bibliography of the coastal area. Some of the studies that are relevant to our investigations at Moghraqa include Quaternary stratigraphy and palaeogeography (Horowitz 1975), aeolian sand formations and sand movement (Hunt 1991; Goldsmith *et al.* 1990), alluvial chronology (Rosen 1986), and loess (Bruins 1976; Bruins and Yaalon 1979; Issar and Bruins 1983; Pye 1987; Pye and Tsoar 1987). Issar (1961, 1968) correlated borehole data to define the Plio-Pleistocene stratigraphy and in particular placed the '*kurkar*' sand ridges in the Pleshet Formation, synonymous with the Calcareous Sandstone of Philistaea (Hull 1986). Stratigraphic nomenclature was refined by Gvirtzman and Reiss (1965) who noted that the Pleshet includes both marine and continental assemblages and ranged in age from Pliocene to Holocene. Study of the structure and palaeowind directions of the *kurkar* ridges enabled Yaalon and Laronne (1971) to show that they were aeolianites. On the coastal plain, processes of soil formation and palaeosols have been described on dune sands by Ravikovitch (1952), Karmeli *et al.* (1968), Yaalon and Dan (1967), and Dan and Yaalon (1971), while the catenary relationships on coastal dunes were elaborated by Dan *et al.* (1968) who noted the importance of the silt-plus-clay ratio in defining periods of soil accumulation.

In recent years there have been a number of excavations at Bronze Age locales in the vicinity of the Wadi Gaza: Tell al-ᶜAjjul (Fischer and Sadeq 2000, 2002), Tell Sakan (Miroschedji and Sadeq 2000b) and at al-Moghraqa (Steel *et al.* 2002). The current research has identified a series of Quaternary formations in the Wadi Gaza area and provisionally has given a number of names to these (Gaza, Moghraqa, Kishash and ᶜAjjul). A suite of members (lithostratigraphic subdivisions of formations) has also been drawn up. All are based on local names in the Wadi Gaza area. It is considered inappropriate to use the Israeli formation and member names. Where possible, however, the names identified in the Gaza area will be correlated with the Israeli formations.

Site investigations (2000)

Geomorphological and soil investigations were made at various locations in and around the site. These include sections cut into adjacent sand dune

formations around the site, trenches excavated by the archaeological team on site, trenches dug for the new Gaza Power Station (GPS) on the left bank of Wadi Gaza and trenches cut into the Wadi Gaza floodplain and sand plain for the GPS pipeline.

The Bronze Age site of al-Moghraqa lies on gently undulating ground between higher, undulating areas of sand sheets and sand dunes. The site has been exhumed from beneath the dune sands. These sands appear, on first sight, to be part of one extensive sand belt. A closer examination of sedimentological and soil features, however, has enabled differentiation of these sediments, and showed that broadly speaking the site is underlain by at least one older, and overlain by two younger, aeolian sand formations. In addition, the cultural deposits of the site merge in the south into the alluvial terraces and floodplain of the Wadi Gaza, and higher elevated areas are built on Pleistocene aeolianite ridges. In adjacent areas that have been studied a more complex picture is apparent, with some five aeolian phases distinguished overlying the aeolianites.

The lithostratigraphy of a group of Formations, Members and Beds is given in Table 2. These units have been identified on the basis of their depositional origins and relative positions in the geological column of the Wadi Gaza area. This is a provisional grouping, likely to be revised in the light of more detailed field studies. The choice of names too must be regarded as provisional. This work has provided a preliminary assessment of fluvial, aeolian and soil processes in the Moghraqa area of Gaza. The study area includes the new Gaza Power Station and the lands as far as Tell Sakan currently being excavated by Miroschedji and Sadeq (2000a; 2000b). A full report on the soil and geomorphological investigations at Tell Sakan is being prepared elsewhere. The Bronze Age cultural stratigraphy is closely linked with the geologic layers and can be grouped into three main sequences based on excavations at al-Moghraqa, Tell al-ᶜAjjul and Tell Sakan. These are defined in Table 3.

Sections in aeolian sand formations

a) Pleshet Formation

The basal superficial sediments of the study area are included in the Pleshet Formation. The Pleshet Formation, originally defined by Hull (1886), comprises a thick accumulation of stratified calcareous sandstones. These have calcium carbonate ($CaCO_3$) concretions, silty partings, and matrix that are $CaCO_3$ cemented. The beds dip steeply (about 31°) to the east and south–east. Each bed is between 1.5 and 3 mm. thick. These are recognised as the *kurkar* aeolianite ridges that have been described along the coast of Palestine between Egypt and Haifa (Yaalon 1967; Issar 1968; Dan *et al.* 1968; Yaalon and Laronne 1971). These beds are equivalent to the Pleshet Formation in Israel (Issar 1968). The aeolianites form a series of hills and ridges, including Tell al-ᶜAjjul, the uplands west and south of the Gaza Power Station, and probably under the sand covered mound of Tell al-Sakan. The ridges are not exposed at al-Moghraqa, a low-lying area, but may occur at depth there. Petrie (1931, 2) considered that the aeolianites were cemented by gypsum. Although gypsum may occur at Tell al-ᶜAjjul in the occupation layers, the present writer has not seen any in the ancient aeolianites, and it is quite clear that the cementation of the sand dunes has been largely by calcium carbonate. Furthermore the overlying concretionary sandy soil, the *kurkar* of modern usage, is also of calcium carbonate rather than gypsum.

b) Moghraqa Formation

The Pleshet Formation, as defined in Israel, includes both the sandstone ridges and the subsequent mantles of unconsolidated aeolian formations that have been described in Gaza and in particular at Moghraqa. This author considers that the unconsolidated sands and soils should be placed in a later formation, named Moghraqa. The Moghraqa Formation comprises the Zahra, Nusairat, Buraij, Sakan and Sannam Members. These are a suite of five aeolian sand deposits, each distinctive on account of various pedogenic features, such as soil structure and carbonate concretions, and their location in relation to archaeological deposits.

Zahra Member (M5): the Zahra sands are the most recent sands, which originate on the foreshore as thin sandy drifts, and then blow inland as sand sheets, coppice dunes and transverse dunes. On the south–west side of the Moghraqa site (in trench N434 E529 and Section MG-4) some 4 m. of unconsolidated, finely layered, horizontally bedded sands are exposed where a bulldozer has cut into the heart of a dune. Loose and structureless seasonally active sand sheets occupy the surface layer and pass down into the finely stratified sands. From their relation to the underlying Nusairat sands it appears that these sands represent an aeolian episode that post-dates the Byzantine period and continues to the present day. Modern dune building and movement however may be affected by a reduced supply of sand along the coast and also by fencing, natural vegetation and crops, especially vines, that slow down sand transport.

Nusairat Member (M4): on the north side of al-Moghraqa, forming an undulating plateau that extends on one side into the neighbouring Israeli settlement of Nizzarim and on the other side onto the plateau area towards Tell Sakan, are some 4.5 m. of massive bedded sands capped by a weakly structured soil. These sands overlie the cultural layers on the site. This has been termed the Nusairat Member of the Moghraqa Formation. At section MG-3, which lies 50 m. north-east of trench N481 E470, a thick sequence (4.4 m.) of the Nusairat Member is preserved. The upper part topsoil includes a firm, weakly crumb structured, dark yellowish-brown, fine sand with many roots. This lies over yellowish-brown to pale brown, massive, fine sands. The archaeological evidence from this section gave fragments of Byzantine pottery in the topsoil, with Late Roman and Hellenistic pottery at a depth of 3.5 m. These beds passed down at 4.3 m. into a transitional sandy-loam layer with what appear to be plough markings. The cuts are made into pale brown sandy clay loam. On the west side of al-Moghraqa, and near the base of section MG-4, the Nusairat Member sands are much thinner, with less than 1 m. preserved above the Bronze Age cultural deposits, and overlain by the Zahra sands.

Buraij Member (M3): these are stratified, yellowish-brown, fine sands, at present identified only as thin layers within the cultural deposits of the EBA site of Tell Sakan. They post-date the formation of the concretionary sands of the Sannam Member and if present in the al-Moghraqa area would lie above the concretionary sands and pre-date the Bronze Age loams.

Sakan Member (M2): these are thick, massive bedded, fine to medium sands, with weak soil development at the top. They are at present only identified in the Tell Sakan area where they appear to underlie the entire fill of EBA cultural deposits. They also post-date the formation of the concretionary sands of the Sanam Member and if present in the Moghraqa area would lie below the Bronze Age loams.

Sannam Member (M1): this lies on the top of the Pleshet aeolianites, and comprises sterile sands packed full of small white $CaCO_3$ concretions that pass up into a weakly structured yellowish-brown loamy sand soil with $CaCO_3$ concretions. Their age is earlier than the EBA. These are similar to the sands and soils developed over the *kurkar* ridges of the coastal plains in Israel, and described by numerous investigators. Our studies of the Moghraqa *kurkar* sands show them to be identical to the *kurkar* packed yellow sands seen *in situ* at Tell al-ᶜAjjul, at nearby locations on the coast, and used as a secondary slope fill on the outer ramparts of Tell Sakan.

The stratigraphic record at Tell al-ᶜAjjul recorded by Petrie shows one layer of sand at around the time of 1600 BC. This passes laterally into layers of black clay. The sand may represent evidence of mobile aeolian sands covering part of the site at this time, but were contemporaneous with 'black clays' suggesting wet depressions with soil formation, and where mobile loose sands were absent. It is likely that the limit of mobile aeolian sands lay along the edge of Tell al-ᶜAjjul or slightly to the north of Tell al-ᶜAjjul, much as it does today with sands blowing onshore immediately north of the mouth of the Wadi Gaza in an easterly direction. These sands also just cover al-Moghraqa.

Sediments at al-Moghraqa

At al-Moghraqa there are cultural layers of dark coloured clayey to silty clay loam, sandy clay loam and sandy loam to a depth of at least 1 m. These layers, termed the Moghraqa Bronze Age (BA) loams (termed on site the Moghraqa 'clays') are a heterogeneous collection of dark coloured sediments, with moderate organic matter and containing cultural levels including floors and circular pits. The sediments are moist and quite friable when opened up, due to moisture seeping downwards from the (now removed) sandy overburden, but they become extremely hard on exposure to air. The dark coloured clayey and silty layers of the Moghraqa BA loams are overlain by the aeolian sands of the Nusairat Member (M4). In turn, these pass up into the more recent aeolian sands of the Zahra Member (M5).

A thin zone of mixed clay and sand fragments marks the transition from dark clayey sediments to sands, as is visible in several sections in the excavated area, and also seen outside the excavations. This appears to be a plough layer. Deep curved incisions are seen in the section of trench N440 E549 (sections MG-5 and MG-6) and also appear to be plough marks. It is conceivable that some of these are modern plough marks made since the Moghraqa Formation cover sands were stripped off by the farm developers. Also, it is the custom of contemporary farmers in the area to leave a thin layer of sand over the exposed Moghraqa loams so that rainfall infiltrates rapidly through the sand into the hard drying loams below. Water then percolates easily into the loams where it is utilised by deep

rooting vines and other plants. However, at two other localities there are traces of plough marks, which are covered by over 4 m. thick accumulations of Nusairat Member aeolian sands, deposited in later Roman to Byzantine periods. These occur at the base of the Zahra Member where it merges with Nusairat Member in section MG-4, and at the base of the Nusairat Member where it overlies the Moghraqa BA loams in section MG-3. The age of these plough marks is not yet clear. Sparse pottery fragments above the marks suggest that the former may range from the late Byzantine to more recent periods, whilst the latter is earlier than Hellenistic. Clearly, a programme of Optically Stimulated Luminescence (OSL) dating of the dune sands could yield useful information on early farming practices.

The dark sediments appear to be have been deposited in a wet swampy environment that was rich in decaying organic matter and probably had considerable living plants, as sediments often have many old root pores. The heavier clays and silty clays thus suggest an alluvial depression or back swamp in a tributary of the Wadi Gaza floodplain. To the immediate south of al-Moghraqa, towards the Wadi Gaza, these beds appear to merge into the deep fine textured, reddish-brown, clays and silty clay loams of the Haifa Member of the Kishash Formation. On the Moghraqa side, however, the clayey beds thin away from the floodplain towards the settlement sites that are thought to lie between al-Moghraqa and Tell al-ᶜAjjul. At al-Moghraqa this 'silty clayey' infill has been modified by cultural influence as artefacts and organic refuse were dropped into the wet areas, and there may also have been areas for making mud bricks, with pits dug in specific areas. The more sandy dark sediments appear to have formed on sands on higher ground, on the margins of the alluvial floodplain. The extraordinary case hardening of the beds, such that fine and coarse textured sediments appear at first to all be clayey, is probably due to presence of organic and iron compounds in the sediments that harden on exposure to air. The hardening is reversed if water is added and material soon slakes in water. At the base of the Moghraqa 'clays' are the yellow sands, packed with $CaCO_3$ concretions, of the Sanam Member (M1).

Trenches at the Gaza power station and pipeline trench

In the Wadi Gaza the alluvial sands and gravels of the Wadi Gaza Formation are clearly modern at the surface as garbage layers occur at intervals. These sediments include thinly bedded silts, cross-bedded sands, and loams, with construction detritus, and have been termed the Rafa Member (G2).

The trenches cut for the Gaza Power Station also showed an earlier sequence of coarse textured layers but these were devoid of any diagnostic artefacts. These beds of the Rabwa Member (G1) include yellowish-brown to light brown, cross-bedded, sands and gravels. There is an absence of artefacts in these beds, but the beds cut into the silts that are considered to be equivalent to the LBA. From these field studies in the Gaza valley it is thought that these deposits are later than the Bronze Age.

In contrast are the gravel and sand free, fine textured silty clays and silty clay loams of the Kishash Formation (K1) that form terrace lands on either bank of the Wadi Gaza. These beds comprise deep reddish-brown clays to silty clay loams, and occur at a higher elevation than the gravels and sands of the Gaza Formation. This suggests that they form an alluvial terrace bordering the Wadi Gaza, that has been cut by the later sands/gravels of the Wadi Gaza Formation. The soils developed in these sediments were well exposed in sections in the Gaza Power Station, and show strong subangular blocky structure has developed. No occupation layers or artefacts were found in these sediments.

A clear field section, however, that would show the boundary relationships between the Kishash and Wadi Gaza Formations has not been located. It was hoped that this would be seen in the GPS pipeline, but the vital part where the boundary should occur was not yet dug at the time of the last visit. The silts do appear to inter-finger with the darker coloured and organic rich Moghraqa cultural deposits (the Moghraqa BA Loams), but further field studies are required to prove this. The Kishash deposits suggest gentle deposition of reddish-brown clayey and silty sediments in a back swamp or lagoonal basin behind the coastline.

Conclusions on aeolian and alluvial chronology

The studies in the al-Moghraqa area have indicated the presence of a complex stratigraphy of aeolian sand deposits on the north bank of the Wadi Gaza. The source of these quartz and calcareous sands is likely to be from the coast at the mouth of the Wadi Gaza and they appear to justify grouping under one formation of Late Quaternary aeolian sands, which has been named the Moghraqa Formation. The presence of soil layers within some of these sands demonstrate that the movement of sand dunes and sand sheets was not continuous but was repeatedly interrupted by phases of aeolian inactivity when soil formation took place.

The main phases of sand movement that post-date the formation of the *kurkar* ridges are recognised to have included an aeolian phase prior to the EBA, with deposition of the Sannam sands (M1). These were stabilised by soil formation with abundant carbonate concretions. The ages of the aeolian phase and the soil formation are not known at present. There is also a second aeolian phase represented by the Sakan sands (M2) with a well-developed soil on the top near to Tell Sakan. Less is known at present about the extent of the subsequent Buraij Sands (M3) deposition phase during the EBA-MBA. These are only seen at Tell Sakan as a thin layer. A later major sand movement phase (Nusairat sands, M4) immediately post-dates the al-Moghraqa Bronze Age cultural deposits, with deposition continuing into the Byzantine period. These sands were stabilised by soil formation at a later period, as yet not precisely dated, but probably over a considerable period of time when aeolian deposition had ceased in the area. This soil is also quite distinct from the loose structureless soils of the modern Zahra sands. Finally there is the recent sand deposition phase of the Zahra sands (M5), which post-dates the soil on the Nusairat sands and continues to the present. Future research on these sand formations will be aimed at establishing the timing of active aeolian and soil formation phases and how these relate to changing patterns of settlement.

It has been suggested that the Wadi Gaza changed course and cut a route closer to Tell Sakan during part of the Bronze Age (P. de Miroschedji, personal communication, October 2000). Although there are some unusual linear and curved topographic hollows in this area, no evidence yet has been found north of the Wadi Gaza (the Moghraqa-ᶜAjjul-Sakan area) of sediments that prove that there had been a different, earlier channel. It is hoped that future research will investigate the lands between Tell al-ᶜAjjul, Tell Sakan and the coastline with borings and trenches to establish the nature of the sediments that are buried beneath post-Bronze Age sand sheets and dunes.

In the Wadi Gaza it is considered that an earlier fine textured deposit (Kishash Formation) was deposited in quiet conditions behind a coastal sand barrier. If the Wadi Gaza was carrying a mixed bed load of sand, gravel to clay-sized particles (as it does now) then there is a question as to where the coarser sediments were deposited during this phase. The origin of the fine textured Kishash Formation sediments could include erosion of loessic and sedentary clayey soils in the Wadi Gaza catchment, or by deposition of wind blown loess dust. If the sediment load of the Wadi Gaza was very high in silt during the Kishash Formation period then there may not have been a coarse bed load at all, and no need to search for a different course that might have carried such sediments whilst the old course silted up. It is notable that thick accumulations of loessic silts occur on the interior plains immediately to the south-east of the Gaza area and have been described in benchmark studies at Netivot (Bruins 1976; Bruins and Yaalon 1979; Pye and Tsoar 1987). The upper age of these loess deposits is 27,000 BP and clearly they may extend back far into the Pleistocene. The Netivot loess soils were reviewed by Pye (1987), who concluded that the loess originated in the Negev and Sinai in the late Pleistocene under more humid conditions than the present, when dust-bearing winds transported silty sediments from the south. During the Holocene (since 10,000 BP), however, there has been a change to more semi-arid conditions in the desert fringe and loess has been eroded by water and redeposited by streams in lowland areas. This fits the scenario presented in the current study of large-scale deposition of silty sediments, actually reworked loess, in the lower Wadi Gaza as the Kishash Formation.

Recommendations for future studies

Although security considerations curtailed the present work, the field studies conducted at al-Moghraqa have led to a greater understanding of landscape change in the Gaza area. Further research is necessary to refine this preliminary appraisal and should provide a better knowledge of the environments along the Wadi Gaza. The primary aims of future research are to characterise any changes in the Wadi courses, to assess the relation of al-Moghraqa to other sites in the area, namely Tell Sakan and Tell al-ᶜAjjul, and to review the status of the Formations and Members that have been devised for the area. On the southern side of the Tell al-ᶜAjjul area the naturally elevated ridge of aeolianite adjacent to the hypothesised Gaza estuary provided security. The elevation of the ditch needs to be investigated and related to the sediment stratigraphy in the Wadi Gaza, and to water levels in the Gaza estuary and how these relate to al-Moghraqa. Alongside fieldwork there will need to be an emphasis on laboratory analysis, with sample collection for analytical work on sands. This includes laser granulometry analyses of sediments to obtain particle size characteristics, binocular and scanning electron microscope (SEM) examination of sand grain morphologies, and analyses of soil chemistry to assist in characterising sand dune stabilisation, similar to the author's extensive research programme on dune sands from Yemen (Munro 1999). A programme of Optical Stimulated Luminescence (OSL)

dating of the dune sands could yield useful information on early farming practices, as has been demonstrated for Jordanian sand dunes (Munro *et al.* 1997). The author is currently working on a similar OSL-based dating framework of fixed dunes in Yemen and Saudi Arabia.

Discussion
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The 1999 and 2000 seasons proved to be very productive and the overall research objectives were achieved. Although full analysis and interpretation of the site is not possible without further excavation, it is possible to make certain inferences as to its use, which, it is hoped, can be tested in the future. The surface survey and trial soundings produced a wealth of material remains, in particular pottery, worked stone artefacts, metal artefacts, and quantities of terracotta cone fragments. Unfortunately, given the nature of the preliminary soundings, it is not yet possible to fully contextualise this material. The pottery confirms that the main period of occupation at al-Moghraqa dates to MB IIb-c and is contemporary with the adjacent urban centre of Tell al-ᶜAjjul. Although some LBA pottery was recovered from the surface during the 1999 survey season, there does not appear to be a consistent LB I occupation level across the site, although it is possible that this was removed during bulldozing between the 1999 and 2000 seasons. In the northern area of excavation the MB II levels were sealed by a thick layer of silting and a layer of compacted aeolian deposit.

The soundings in Zone 2 demonstrated that the stratigraphy of al-Moghraqa survives to some depth. Excavations reached a depth of deposit of 1.35 m. and it was apparent that we had by no means reached the lower levels of deposition. These trenches, which had been opened in the area where cone fragments were reported in 1996, were particularly rich in cultural deposits. Our primary research objective had been to elucidate the context and use of the terracotta cones first identified in 1996, however this proved to be extremely problematic. During excavations in 2000 quantities of cone fragments were found in a matrix comprising compacted aeolian deposit (the Nusairat Member, Munro *supra*). Although found in a discrete location, the cones were not found in their primary context but instead appear to represent a discard phase. At present we would suggest that the cones had been used to seal some form of Egyptian official building (possibly funerary), the nature of which can only be surmised. This posited building probably dates to the co-regency of Hatshepsut and Thutmose III (*c.* 1473–1458). It should be stressed that there is no physical evidence for such a structure at the site and it is only supposition that the primary use of the cones occurred at al-Moghraqa rather than at another location. The date at which the presumed building was dismantled and the cones dumped is more problematic. The associated pottery comprises a mix of non-diagnostic MBA, LBA and Byzantine sherds. It would appear therefore that the deposit of cones was made during antiquity, but possibly long after the final abandonment of al-Moghraqa, subsequent to which the site was covered by sand dunes (the Nusairat Member).

Two surfaces, apparently relating to distinct activity phases, were identified below the layer of cone fragments in the Nusairat Member. A possible third surface was reached at the end of the season. The excavation area was too limited to determine the nature of occupation represented by these surfaces and no architectural remains were identified. However, the material recovered beneath surface I is very suggestive of a workshop area, specifically associated with processing imported luxuries such as carnelian and mother-of-pearl. Certainly the material remains recovered at the site illustrate the economic importance of the Gaza region within the MBA-LBA trade networks of the east Mediterranean. This, however, needs to be demonstrated by further, more extensive excavations.

There was an area of pitting in the southern part of the site. These pits had an estimated diameter of around 2 m. and were filled with rich archaeological deposits animal bone, pottery, and in F310 a clay sealing (MOG1–00–9–1) and the cylinder seal (MOG1–00–9–1). It was decided to leave the full excavation of these pits for the 2001 season. Certainly this area offers enormous potential for future exploration, specifically to answer questions concerning the MBA economy of al-Moghraqa.

Although concentrations of worked stone artefacts were found during in survey in N490 E510, N470 E530 and N480 E520, the single sounding in N481 E530 was essentially sterile and appears to delimit the northern extent of the site.

The most significant results of fieldwork at al-Moghraqa concern the second-millennium cultural landscape of the Gaza region and in particular the nature of settlement in the coastal plain surrounding the primary urban settlements represented by tell sites. The cultural remains indicate that al-Moghraqa is contemporary with the main phase of occupation at Tell al-ᶜAjjul in MB II. The two sites are approximately 700 m. apart and it is probable

that al-Moghraqa represents either a continuation of the tell site or a small satellite settlement, possibly associated with the procurement and production of luxury artefacts. If future fieldwork at al-Moghraqa is possible this will provide an opportunity to examine the nature and extent of extramural occupation beyond the limits of a tell site during the early second millennium BC.

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Bibliography

Amiran, R. (1969) *Ancient Pottery of the Holy Land*. Massada Press: Jerusalem.

Amiran, R. and Porat, N. (1984) The Basalt Vessels of the Chalcolithic Period and Early Bronze Age I. *Tel Aviv* 11, 11–19.

Bauzou, T. (2000) La Gaza romaine (69 avant J.-C. – 403 après J.-C.). Pp. 47–69 in J.-B. Humbert (ed.) *Gaza Méditerranéenne. Histoire et archéologie en Palestine*. éditions errance: Paris.

Beck, P. (1975) The Pottery of the Middle Bronze Age IIA at Tel Aphek. *Tel Aviv* 2/2, 45–83.

——— (1985) The Middle Bronze Age IIA Pottery from Aphek, 1972–1984: First Summary. *Tel Aviv* 12/2, 181–203.

Ben-Dor, I. (1945) Palestinian Alabaster Vases. *QDAP* 11, 93–111.

Bergoffen, C.J. (1991) Overland Trade in Northern Sinai: the Evidence of the Late Cypriot Pottery. *BASOR* 284, 59–76.

Bruins, H.J. (1976) *The Origin, Nature and Stratigraphy of Paleosols in the Loessial Deposits of the N.W. Negev (Netivot)*. M.Sc. Thesis, Hebrew University of Jerusalem.

Bruins, H.J. and Yaalon, D.H. (1979) Stratigraphy of the Netivot Section in the Desert Loess of the Negev. *Acta of the Geological Academy of Science, Hungary* 22, 161–170.

Burdajewicz, M. (2000) Gaza pendant les périodes du Bronze moyen et récent et de l'Âge du Fer. Pp. 31–39 in J.-B. Humbert (ed.) *Gaza Méditerranéenne. Histoire et archéologie en Palestine*. éditions errance: Paris.

Clarke, J. and Steel, L. (1999) Demographic Patterns and Differential Settlement in the Bronze Age Landscape of Palestine. Pp. 211–231 in I. Abu-Lughod, R. Heacock and K. Nashef (eds) *The Landscape of Palestine: Equivocal Poetry*. Birzeit University Publications.

Cole, D.P. (1984) *Shechem*. I. *The Middle Bronze IIB Pottery*. American Schools of Oriental Research: Winona Lake.

Collon, D. (1987) The Green Jasper Cylinder Seal Workshop. Pp. 57–70 in M. Kelly-Buccellati (ed.) *Insight Through Images. Studies in Honor of Edith Porada*. Bibliotheca Mesopotamica, 21. Undena: Malibu.

——— (1990) *Near Eastern Seals*. University of California Press/British Museum: Berkely and Los Angeles.

——— (2002) The Old Assyrian Cylinder Seal from Gaza. *Levant* 34, 229–238.

Crowfoot Payne, J. (1983) Appendix C: The Flint Industries of Jericho. Pp. 622–758 in K.M. Kenyon and T.A. Holland *Excavations at Jericho*. V. *The Pottery Phases of the Tell and Other Finds*. British School of Archaeology in Jerusalem: London.

Dackombe, R.V. and V. Gardiner (1983) *Geomorphological Field Manual*. George Allen and Unwin: London.

Dajani, A. (1960) Middle Bronze Age Pottery. *ADAJ* IV and V, 99–113.

Dan, J., Yaalon, D.H. and H. Koyumdjisky (1968) Catenary Soil Relationships in Israel. A. The Netanya Catena on Coastal Dunes of the Sharon. *Geoderma* 2, 95–120.

Dan, J. and D.H. Yaalon (1971) On the Origin and Nature of the Paleopedological Formations in the Coastal Desert Fringe Areas of Israel. Pp. 245–259 in D.H. Yaalon (ed.) *Paleopedology Origin, nature and dating of Paleosols*. Israel University Press: Jerusalem.

Davies, N. and MacAdam, M.F.L. (1957) *Corpus of Inscribed Egyptian Funerary Cones*. Oxford University Press: Oxford.

Day, F. (1942) Early Islamic and Christian Lamps. *Berytus* 7, 65–79.

Dorrell, P.G. (1983) Appendix A: Stone Vessels, Tools and Objects. Pp. 485–575 in K.M. Kenyon and T.A. Holland *Excavations at Jericho*. V. *The Pottery Phases of the Tell and Other Finds*. British School of Archaeology

in Jerusalem: London.

Dothan, T. (1979) *Excavations at the Cemetery of Deir el-Balah*. QEDEM 10. Israel Exploration Society: Jerusalem.

Epstein, C. (1966) *Palestinian Bichrome Ware*. E.J. Brill: Leiden.

FAO (1977) *Guidelines for Soil Profile Description*. Food and Agricultural Organization: Rome.

Finkelstein, I., Ussishkin, D., and Halpern, B. (1999) *Megiddo*. III. *The 1992–1996 Seasons*. Tel Aviv.

Fischer, P.M. (2001) Cypriote Bichrome Wheel-Made Ware and Base-Ring Ware from the New Excavations at Tell el-ᶜAjjul: Synchronism and Dating. Pp. 221–230, in P. Åström (ed.) *The Chronology of Base-ring and Bichrome Wheel-made Ware*. The Royal Academy of Letters, History and Antiquity: Stockholm.

Fischer, P.M. and Sadeq, M. (2000) Tell el-ᶜAjjul 1999. A Joint Palestinian Swedish Field Project. First Season Preliminary Report. *Ägypten und Levante* 10, 211–226.

——— (2002) Tell el-ᶜAjjul. Second Season Preliminary Report. *Ägypten und Levante* 12, 109–153.

Gardiner, A.H. (1920) The Ancient Military Road Between Egypt and Palestine. *Journal of Egyptian Archaeology* 6, 99–116.

Glennie, K.W. (1970) *Desert Sedimentary Environments. Developments in Sedimentology* No. 14. Elsevier: London.

Glucker, C.A.M. (1987) *The City of Gaza in the Roman and Byzantine Periods*. BARIntl Series 325. Oxford

Goldberg, P. (1994) Interpreting Late Quaternary Continental Sequences in Israel. Pp. 89–102 in O. Bar-Yosef and R.S. Krau (eds) *Late Quaternary Chronology and Paleoclimates of the Eastern Mediterranean*. Radiocarbon.

Goldsmith, V., P. Rosen, and Y. Gertner (1990) Eolian Transport Measurements, Winds, and Comparison with Theoretical Transport in Israeli Coastal Dunes. Pp 79–101 in F.K. Nordstrom, N.P. Psuty and R.W.G. Carter (eds) *Coastal Dunes: Form and Process*. John Wiley and Sons Ltd: London.

Goring-Morris, A.N. and Goldberg P. (1990) Late Quaternary Dune Incursions in the Southern Levant: Archaeology, Chronology and Palaeoenvironments. *Quaternary International* 5, 115–137.

Goudie, A.S. (1990) *Geomorphological Techniques*. Edited for the British Geomorphological Research Group. (2nd Edition). Routledge: London.

Gvirtzman, G. and Reiss, Z. (1965) Stratigraphic Nomenclature in the Coastal Plain and Hashefela Regions. Jerusalem. *Geological Survey of Israel, Report*. No. OD/1/65.

Hadad, S. (1999) Oil Lamps from the Abbasid Through the Mamluk Periods at Bet Shean, Israel. *Levant* 31, 203–224.

Harris, E.C. (1975) The Stratigraphic Sequence: A Question of Time. *World Archaeology* 7, 109–121.

——— (1979) *Principles of Archaeological Stratigraphy*. (First edition). Academic Press: London

Horowitz, A. (1975) The Quaternary Stratigraphy and Paleogeography of Israel. *Paléorient* 3, 47–86.

Hull, E. (1886) *The Survey of Western Palestine: Memoir on the Geology and Geography of Arabia Petraea, Palestine and Adjoining Districts, with Special Reference to the Mode of Formation of the Jordan-Arabah Depression and the Dead Sea*. Palestine Exploration Fund: London.

Humbert, J.-B. and Sadeq, M. (2000) Fouilles de Blakhiyeh Anthedon. Pp. 105–120 in J.-B. Humbert (ed.) *Gaza Méditerranéenne. Histoire et archéologie en Palestine*. éditions errance: Paris.

Hunt, S-J.C. (1991) *Provenance and Palaeoclimate of the Late Quaternary Aeolian Sediments, Northern Negev Desert, Israel*. Unpublished PhD Thesis, University of Cambridge, UK.

Issar, A. (1961) The Plio-Pleistocene Geology of the Ashdod area. *Bulletin of the Research Council, Israel*, 10G.

——— (1968) Geology of the Central Coastal Plain of Israel. *Israel Journal of Earth Sciences* 17, 16–29.

Issar, A. and Bruins, H.J. (1983) Special Climatological Conditions in the Deserts of Sinai and the Negev During the Latest Pleistocene. *Paleogeography, Palaeoclimatology, Palaeoecology* 43, 63–72.

Jones, A.P., M.E. Tucker, and J.K. Hart eds (1999) The Description and Analysis of Quaternary Stratigraphic Field Sections. *Quaternary Research Association, London, Technical Guide* No. 7.

Karmeli, A., Yaalon, D.H. and Ravina, I. (1968) Dune Sand and Soil Strata in Quaternary Sedimentary Cycles of the Sharon Coastal Plain. *Israel Journal of Earth Sciences* 17, 45–53.

Kasher, A. (1982) Gaza During the Greco-Roman Era. Pp. 63–78 in L.I. Levine (ed.) *The Jerusalem Cathedra*. Jerusalem – Detroit.

Katzenstein, H.J. (1982) Gaza in the Egyptian Texts of the New Kingdom. *JAOS* 102, 111–113.

Keel, O. and Schroer, S. (1987) *Studien zu den Stempelsiegeln aus Palästina/Israel*. Orbis biblicus et orientalis 67. Universitätsverlag Freiburg Schweiz: Göttingen, Vandenhoeck and Ruprecht: Freiburg.

Kenna, V.E.G. (1960) *Cretan seals: with a Catalogue of the Minoan Gems in the Ashmolean Museum*. Clarendon Press: Oxford.

Kirkbride, D. (1965) Appendix E: Scarabs. Pp. 580–655 in K.M. Kenyon *Excavations at Jericho*. II. *The Tombs Excavated in 1955–8*. British School of Archaeology in Jerusalem: London.

Lucas, A. and Harris, J.R. (1962) *Ancient Egyptian Materials and Industries*. Edward Arnold: London.

Mackay, J.H. and Murray, M.A. (1952) *Ancient Gaza*. V. *City of Shepherd Kings*. British School of Egyptian Archaeology: London.

Manning, S.W. (2000) *A Test of Time. The Volcano of Thera and the Chronology and History of the Aegean and East Mediterranean in the Mid Second Millennium BC*. Oxbow Books: Oxford.

Maxwell–Hyslop, K.R. (1971) *Western Asiatic Jewellery c.3000–612 B.C.* Methuen: London.

Miroschedji, P. de (2000) La Palestine et Egypte au Bronze ancien. Pp. 27–30 in J.-B. Humbert (ed.) *Gaza Méditerranéenne. Histoire et archéologie en Palestine*. éditions errance: Paris.

Miroschedji, P. de and Sadeq, M. (2000a) Tell es-Sakan.

Pp. 101–104 in J.-B. Humbert (ed.) *Gaza Méditerranéenne. Histoire et archéologie en Palestine*. éditions errance: Paris.

——— (2000b) Tell es-Sakan, un site de Bronze ancien découvert dans le région de Gaza. Pp.123–152 in *Comptes Rendus des Séances de L'Année 2000, Janvier-Mars*. Académie des Inscriptions and Belles-Lettres: Paris.

Moorey, P.R.S. (1994) *Ancient Mesopotamian Materials and Industries: the Archaeological Evidence*. Clarendon Press: Oxford.

Munro, R.N. (1997) Optical Dating and Landscape Chronology at ad-Disa, Southern Jordan, and its Potential. Pp. 97–103 in *Studies in the History and Archaeology of Jordan*. VI. Department of Antiquities, Amman, Jordan: Amman.

——— (1999) *Aeolian Sand Formations of the Tihama: Geomorphology and Assessment of Sand Stabilisation Programmes*. Unpublished technical report for the Tihama Development Authority, Hodeidah, Yemen. HTS Development, Hemel Hempstead, UK.

Oren, E.D. (1973) The Overland Route Between Egypt and Canaan in the Early Bronze Age. *IEJ* 23, 198–205.

——— (1987) The 'Ways of Horus' in North Sinai. Pp. 69–119 in A.F. Rainey (ed.) *Egypt, Israel, Sinai: Archaeological and Historical Relationships in the Biblical Period*. Tel Aviv University: Tel Aviv.

——— (1993) Northern Sinai. Pp. 1386–1396 in E. Stern, A. Lewison-Gilboa and J. Aviram (eds) *NEAEHL*. 4. Israel Exploration Society: Jerusalem.

Oren, E.D. and Yekutieli, Y. (1992) Taur Ikhbeineh: Earliest Evidence for Egyptian Interconnections. Pp. 361–84 in E.C.M. van den Brink (ed.) *The Nile Delta in Transition*. Israel Exploration Society: Jerusalem.

Petrie, W.M.F (1917) *Scarabs and Cylinder Seals with Names: Illustrated by the Egyptian Collection in University* College, London. Bernard Quaritch: London.

——— (1931) *Ancient Gaza*. I. *Tell el Ajjul*. British School of Archaeology in Egypt: London.

——— (1932) *Ancient Gaza*. II. *Tell el Ajjul*. British School of Archaeology in Egypt: London.

——— (1933) *Ancient Gaza*. III. *Tell el Ajjul*. British School of Archaeology in Egypt: London.

——— (1934) *Ancient Gaza*. IV. *Tell el Ajjul*. British School of Archaeology in Egypt: London.

Philip, G. (1989) *Metal Weapons of the Early and Middle Bronze Ages in Syria-Palestine*. BAR International Series 526. Oxford.

Pye, K. (1987) *Aeolian Dust and Dust Deposits*. Academic Press: London and Orlando.

Pye, K. and Tsoar, H. (1987) The Mechanics and Geological Implications of Dust Transport in Deserts with Special Reference to Loess Formation and Dune Sand Diagenesis in the Northern Negev, Israel. Pp 139–156 in L.E. Frostick and I. Reid (eds) *Desert Sediments: Ancient and Modern*. Geological Society, London Special Publication 35. Blackwell: Oxford.

Ravikovitch, S. (1952). The Aeolian soils of the Northern Negev. Desert Research. Pp. 404–433 in *Proceedings of the International Symposium, Jerusalem: Research Council of Israel and UNESCO*.

Reineck, H.E., I.B. Singh (1975) *Depositional Sedimentary Environments*. Springer-Verlag: Berlin.

Rosen, A. (1986) Quaternary Alluvial Stratigraphy of the Shephala and its Paleoclimatic Implications. *Geological Survey of Israel, Report* GSI/25/86, Jerusalem.

Ryan, D.P. (1988) The Archaeological Analysis of Inscribed Egyptian Funerary Cones. *Varia Aegyptiaca* 4, 165–170.

Saliou, C. (2000) Gaza de 407 à 637. Pp. 73–77 in J.-B. Humbert (ed.) *Gaza Méditerranéenne. Histoire et archéologie en Palestine*. éditions errance: Paris.

Seger, K.E. (1988) The Bronzes. Pp. 102–107 in J.D. Seger *Gezer*. V. *The Field I Caves*. Israel Exploration Society: Jerusalem.

Sethe, K. (1906–09) *Urkunden der 18e Dynastie 5–16*. (Urk IV). Leipzig.

——— 1930 *Urkunden der 18e Dynastie 1–4*. (Urk IV). Leipzig.

Sparks, R. (1996) Egyptian Stone Vessels in Syro-Palestine During the Second Millennium B.C. and Their Impact on the Local Stone Vessel Industry. Pp. 51–66 in G. Bunnens (ed.) *Cultural Interaction in the Ancient Near East. Abu-Nahrain Supplement Series* 5. Peeters Press: Louvain.

Stein, J.K. and Farrand, W.R. (1988) *Archaeological Sediments in Context*. Center for the Study of Early Man, Institute of Quaternary Studies, University of Maine, Orono, Maine.

Steel, L., Manley, B., Clarke, J., Sadeq, M. (2002) Late Bronze Age Gaza: Prestige Production at el-Moghraqa. *Antiquity* 76, 939–940.

——— (in press) Egyptian 'Funerary Cones' from el-Moghraqa, Gaza. *Antiquaries Journal* 84.

Stewart, J.R. (1974) *Tell el-ᶜAjjul. The Middle Bronze Age Remains*. SIMA 38. P. Åströms Förlag: Göteborg.

Talbot, G.C. (1983) Appendix K: Beads and Pendants from the Tell and Tombs. Pp. 788–801 in K.M. Kenyon and T.A. Holland *Excavations at Jericho*. V. *The Pottery Phases of the Tell and Other Finds*. British School of Archaeology in Jerusalem: London.

Tucker, M.E. 1996. *Sedimentary Rocks in the Field*. John Wiley and Sons: New York.

Tufnell, O. (1958) *Lachish*. IV. *(Tell ed-Duweir): The Bronze Age*. Oxford University Press: London.

——— (1976) El-ᶜAjjul, Tell (Beth ᶜEglayim). Pp. 52–61 in M. Avi-Yonah (ed.) *Encyclopedia of Archaeological Excavations in the Holy Land*. Oxford University Press: London.

——— (1983) Appendix E: Jericho Scarabs and Seal Impressions. Pp. 766–769 in K.M. Kenyon and T.A. Holland *Excavations at Jericho*. V. *The Pottery Phases of the Tell and Other Finds*. British School of Archaeology in Jerusalem: London.

——— (1984) *Studies on Scarab Seals*. II. *Scarab Seals and their Contribution to History in the Early Second Millennium BC*. Aris and Phillips: Warminster.

Tufnell, O., Inge, C.H. and Harding, L. (1940) *Lachish*. III. *Fosse Temple*. Oxford University Press: London.

Tufnell, O. and A. Kempinski (1993) Tell el Ajjul. Pp.

49–54 in E. Stern *et al.* (eds) *NEAEHL*. I. Israel Exploration Society: Jerusalem.

USDA (1951) *Soil Survey Manual*. United States Department of Agriculture, Handbook 18. US Government Printing Office, Washington D.C.

Vita-Finzi, C. (1978) *Archaeological Sites in their Setting*. Thames and Hudson: London.

Weinstein, J.M. (1988) Scarabs. Pp. 91–94 in J.D. Seger *Gezer*. V. *The Field I Caves*. Israel Exploration Society: Jerusalem.

Yaalon, D.H. (1967) Factors Affecting the Lithification of Eolianite and Interpretation of Its Environmental Significance in the Coastal Plain of Israel. *Journal of Sedimentary Petrology* 37, 1189–1199.

Yaalon, D.H. and Dan, J. (1967) Factors Controlling Soil Formation and Distribution in the Mediterranean Coastal Plain of Israel During the Quaternary. *Quaternary Soils. 7th INQUA Congress Proceedings* 1965. Volume 9, 321–338.

Yaalon, D.H. and J. Laronne (1971) Internal Structures in Eolianites and Paleowinds, Mediterranean Coast, Israel. *Journal of Sedimentary Petrology* 41, 1059–1064.