The pots and potters of Assyria : technology and organization of production, ceramics sequence and vessel function at Late Bronze Age Tell Sabi Abyad, Syria

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The Pots and Potters of Assyria

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“You cannot help but learn more as you take the world into your hands.
Take it up reverently, for it is an old piece of clay, with millions of thumbprints on it.”
John Updike

“The deeper that sorrow carves into your being the more joy you can contain.
Is not the cup that holds your wine the very cup that was burned in the potter's oven?”
Gibran Khalil Gibran

On the cover: “Pot” by the Dutch artist Mieke Verhaar (www.miekeverhaar.tk), inspired by her stay at Tell Sabi Abyad.

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Preface and Acknowledgements

Preface

It must have started when my father was digging in his vegetable garden and found a big old bronze key, this fascination with the daily life of people from the past. I was intrigued by the idea that where our strawberries were now growing, other people a long time ago had a meadow with cows and a farm with a big wooden door to which the key would fit… How did these people live? Many years later this fascination was again at the core of my experiences, excavating as a student at Tell Sabi Abyad, Syria. But how on earth did I end up "doing" the pottery from that site? Why did I commit myself to describe thousands and thousands of similar looking sherds, piled up high in dusty brown bags behind me and arriving in growing numbers each day from the field? Weren't all pottery publications boring lists of types and shapes? But although the fieldwork in the pottery shed was often only bearable due to the pleasant times spent with the people mentioned below, the topic became more and more interesting when I started preparing for this thesis. There is a wealth of literature dealing with pottery both ancient and modern, which goes far beyond the presentation of shapes and chronology. With the archaeological discipline at large the field of pottery studies shares its combination of different technical, theoretical and methodological approaches that makes archaeology such a fascinating field of study. Pottery studies deal with provenance studies, shaping and firing techniques, technical properties of raw materials, with style and decoration, organization of production, workshop layout, the role of pottery and potters in society, symbolism, chronology, trade and interregional contacts, and many more interesting aspects of this ubiquitous find category. This multidimensionality is exactly what is so interesting about archaeology as a discipline. Without taking a particular theoretical position, I have tried in this thesis to combine several approaches or perspectives on pottery, in an attempt to reach a deeper understanding of how the pottery was made, how this production was organized and how the pots were used after they had left the workshop. Through the work on this thesis, the pottery stopped being a boring pile of sherds that had to be published. They started to "talk", almost as in Omar Khayyams pottery workshop (in The Rubayat), giving me clues about the people who made them and the kind of social and cultural environment they were produced and used in.

This book is organized in seven chapters and several appendices. Chapter I will provide the reader with a general background to the history and society of the Middle Assyrian kingdom. It also briefly presents the research questions that form the core of the study. Chapter II offers a detailed description of the methods and techniques used in the excavation, description and publication of the pottery at Tell Sabi Abyad, including definitions of terms, explanations of statistical measures, etc. Chapter III is a summary overview of the stratigraphy and architecture at the site. Chapters IV, V and VI form the core of the thesis. In Chapter IV the pottery is discussed in detail per stratigraphical level, on the basis of a shape typology. The characteristics of the assemblage in each level are discussed (dealing with shape, raw materials, decoration etc.), and comparisons from other sites are cited. The chapter concludes with a short discussion of relative and absolute dating of the assemblages in the various levels. Chapter V collects all information pertaining to the organization of pottery production at the site. The evidence contained in the pottery itself, like traces of shaping techniques and evidence for firing temperatures, is discussed at length. A detailed presentation is given of several pottery workshops and other production locations, pottery kilns and the spatial layout and relation to the rest of the settlement, as well as the tools used by the potters. Textual evidence and information about the standardization, output, and demand is then drawn into the reconstruction of the organization of pottery production at the site. Chapter VI discusses what would have been at the core of the potter's aims: the function and use of the vessels. Again information from a variety of sources is drawn together to sketch a picture of the function and use of several groups of vessels. A discussion of Assyrian vessel names from texts is part of this chapter. Chapter VII, finally, collects the conclusions and presents an outlook on future research. The Appendices A-G contain many of the raw data on which the chapters are based.

Acknowledgements

A formal occasion for thanking all those who were instrumental in the making of this study has rarely presented itself. Writing the acknowledgements is one of these occasions, and it is with great pleasure that I take the opportunity here to mention those who have assisted me. When I first started out as a “pottery person” on the excavations at Tell Sabi Abyad, I could not have foreseen the many interesting and stimulating contacts that would result from this work.

Funds and facilities are an important part of any project. I had started my PhD self-funded during my appointment as director of the Netherlands Institute for Academic Studies in Damascus. Of crucial importance, however, was the opportunity to work full time for a year to complete the study through a sabbatical scholarship. The sabbatical was financed by the Netherlands Organisation for Scientific Research (NWO), under the programme “Vervangingssubsidie Geesteswetenschappen”, grant number 365-62-003. My employer at the time, the Netherlands Institute for the Near East in Leiden, kindly cooperated with the sabbatical. NWO also supported the archaeometric research at the laboratory in Berlin with a travel scholarship, grant number R 28-530. The Foundation for Anthropology and Prehistory in the Netherlands (SNMAP) kindly supported the archaeometric research with a grant to cover the costs of producing the thin-section slides. The German Archaeological Institute (DAI) in Damascus, directed by Karin Bartl, kindly offered me a working space and access to their library. Without their hospitality and support it would not have been easy to keep my working pace and achieve so much in such a short time. The National Museum of Antiquities in Leiden is thanked for offering facilities and access to the excavation databases, stored in the museum. The General Directorate of Antiquities and Museums in Damascus, and its director Bassam Jammous and director of excavations Michel al-Maqdissi and their staff are thanked for their continuous cooperation, especially in exporting small pieces of sherds for thin-section analysis.

This study would not have come together without the support of Peter Akkermans, my supervisor and the director of the archaeological project at Tell Sabi Abyad. Without his permission to study the material and have free access to all the excavation files, this work would of course not have been possible. More importantly, I very much value the friendship that has grown between us over the years, and the many hours of interesting and fruitful discussions on pottery, Sabi Abyad, archaeology in general and life at large.

Over the years in the pottery shed, Tulip Abd-el-Hay, Lauren Brüning, Stefania Facco, Christian Greco, Ghazwan Hmeidy, Daan Isendoorn, Arwa Kharobi, Ewout Koek, Martin Makinson, Lubna Omar, Wendy Richter, Irene Sibbing, Audrey Starrenburg and Tonny de Wit spent many hours collating, glueing, describing, drawing and discussing the sherds. For some of them one season of pottery processing was more than enough; others returned for several seasons or continued with MA papers and PhD theses about pottery from Sabi Abyad or other sites. Most of the description and drawing work for this thesis was done by myself; however, I especially thank Ewout Koek and his team for providing me with databases and drawings of level 6 material from the N-O squares. José Limpens, who wrote her MA thesis on the Middle Assyrian pottery from Sabi Abyad in 1994, kindly provided me with her databases and drawings of material from the central tower. Drawings of several large or complicated shapes were made by Pieter Collet and Mikko Kriek. Mikko also kindly provided me with the site plans used in Chapter III. Salem al-Mukhlif, appointed as a guard for Tell Sabi Abyad but also a trustworthy friend, was responsible for counting the sherds. Moreover, he and his daughter Fatima, together with her cousins, took care of the washing, drying and packing of many thousands of prehistoric and Bronze Age sherds. Nouras al-Mohammed, the government representative at Sabi Abyad, made me part of his loving family and was responsible for many hours of jokes and laughing on site.

The excavations at Tell Sabi Abyad continue. This means that hardly any material is available in its final, published form, and that one has to work with data that are constantly being processed. For this study this was especially apparent in the availability of information on detailed stratigraphy and descriptions of architecture. In this context, my thanks are due to Merel Brüning who is responsible for the stratigraphical databases of the Sabi Abyad project. She has endured many a panicky appeal for more information, preferably to be delivered yesterday. In Damascus, Arwa Kharobi has worked hard to digitize thousands of drawings in Illustrator and prepare them for publication. Her perseverance in this rather mind-numbing job is appreciated a lot.

The archaeometric and technical parts of this study relied heavily on help from others. Bram van As and Loe Jacobs from the Department of Pottery Technology, Leiden University, came to the site in 1996 and performed an initial study of shaping techniques of the most important pottery shapes. They also prepared a detailed study of the properties of the raw materials used, based on sherds as well as unfired pottery samples. Both also provided me with critical comments on Chapter V. Gerwulf Schneider and Małgorzata Daszkiewicz of the Free University in Berlin kindly executed performance tests and chemical analysis on two samples of cooking-ware sherds. Moreover, Gerwulf trained me in using the polarizing microscope to describe the fabric of my sherds in thin section, and assisted in the compilation of the archaeometric part of this study. His patience, enthusiasm and culinary abilities were greatly appreciated and drew me through long hours of laboratory work. Abu Shaker from AFPC Damascus helped me in trying to find a possibility for making thin sections in Damascus. Niels Groot from Delft Technical University, kindly took it upon himself to photograph the fresh fractures of the sherds that were studied in thin section.

The hours of stimulating discussions about “the ancients” and their times with Frans Wiggermann were part of making the subject come to life. His contributions to Chapter VI, dealing with the function of the pottery, were invaluable. He also kindly agreed to publish two of the Sabi Abyad cuneiform texts related to pottery in this thesis (Appendix F), and has compiled the list of Middle Assyrian pottery names in Chapter VI. Frans has the rare ability to step over the boundaries of his field and interest archaeologists for the many jewels hidden behind all those tiny cuneiform signs. Ans Bulles corrected the English text.

Although the possibility to lock myself up with a full year of sabbatical time ahead of me was pure luxury, it has been healthy to stay in touch with archaeologist friends and discuss pottery and other subjects. Olivier Nieuwenhuyse, Lidewijde de Jong, Karin Bartl, Markus Gschwind, Verena Daiber, Heike Dohmann-Pfälzner and many others have contributed a lot in various ways. The thesis was finished in Damascus at a time when both my private and professional life were taking new directions. It feels therefore as if the thesis is the icing on the cake of living in Syria. The many friends, Syrian, Dutch and foreign, who made my stay in the magical city of Damascus such a wonderful time, must be thanked here as well. My parents and sister, who have always supported me whatever strange direction my life took, and my family and friends in the Netherlands have been more a part of this work than they imagine.

At the end of this long list of friends and colleagues stands Ivar Nijenhuis. Thank you for putting up with a “sherd-nerd”, for keeping me sane and well-fed, for encouraging me to continue and for keeping me from working too much. Your contribution to this thesis cannot be expressed in words. You are a true companion.

Damascus / Cairo
Kim Duistermaat

CHAPTER I: INTRODUCTION

"... die Gebrauchskeramik der mittanischen und mittelassyrischen Zeit [gilt] als eine der "langweiligsten" [...] aus dem Alten Orient..."
Peter Pfälzner (1995: 1)

This book aims to be an extensive presentation of the ceramics from Late Bronze Age Tell Sabi Abyad, Syria. Not only shall I present a formal description of the ceramics, but I will also make an attempt at a reconstruction of production processes and organization, and the function and use of ceramics at the site. In order to put the story of pottery at Sabi Abyad in the proper perspective it is useful to summarize the setting of the site and the historical backgrounds of the period. Also, I shall sketch the general organization and character of the settlement at Sabi Abyad and the region in general. A short account of previous work on the topic and a presentation of the research aims and questions of this thesis conclude the chapter.

I.1 The site of Tell Sabi Abyad

Tell Sabi Abyad I is a 5-hectare site in Northern Syria, and the largest of a group of four separate small tells (Sabi Abyad I-IV). This study only deals with the remains from Sabi Abyad I. The site is situated along the Balikh River, a small perennial stream that runs south from the plains of Urfa in Southern Turkey towards Raqqa on the Euphrates in Syria (fig. I.1). The climate in this region is semi-arid. The current 250 mm isohyet runs east-west approximately halfway the valley, about 25 km south of Sabi Abyad. In this steppe-like landscape rain-fed agriculture is practicable in the north, while in the southern part of the valley rain-fed agriculture is risky and irrigation is necessary on fields located away from the river. Sabi Abyad is therefore located at the edge of the dry-farming zone. In the Bronze Age, small canals perhaps led from the main river channel to the fields of settlements. However, major irrigation canals have not yet been attested before the end of the first millennium BC (Wilkinson 1998a, b). The Balikh Valley was inhabited more or less densely throughout the ages. Survey evidence[1] seems to indicate that during the first half of the Late Bronze Age (i.e. the 15th and 14th centuries BC), a shift in settlement took place away from the nucleated centres of the Middle Bronze Age into smaller, often newly founded rural settlements, pointing to renewed agricultural exploitation of marginal areas (fig. I.2a, Wilkinson 1998b: 72, 80). Middle Assyrian settlement (in the second half of the Late Bronze Age, from the 13th century BC onwards) in the valley seems to have followed a period of abandonment of settlements in the middle of the Late Bronze Age (fig. I.2b). It seems that the Assyrian colonization of the Balikh took place near the southern limit of dry-farming, in a virtual vacuum without any sedentary power structures or previously existing claims of land ownership. However, survey evidence does not give us any information on the presence of indigenous settled or nomadic inhabitants at this time (Lyon 2000: 101, 104), since their material culture has either not been recognized or been dated much earlier.

Sabi Abyad was first inhabited in the Late Neolithic period (Akkermans 1996; Akkermans et al. 2006). After the site had been deserted around 5800 cal BC, it was again occupied in the Late Bronze Age. The earliest Late Bronze Age remains consist of a square tower-like building, surrounded by structures of an as yet poorly-known nature. Most probably this tower has to be dated to the 14th or beginning of the 13th century BC (see also Chapter IV). At the end of the 13th century BC, and after a period of abandonment, the first tower was restored and used again, and a Middle Assyrian *dunnu* settlement was built (see below for a more elaborate description of *dunnu*s). The occupation probably lasted till the late 12th century BC and measured approximately 1 ha on average. After the *dunnu* had been abandoned, a house or farm probably dating from the Hellenistic/Seleucid

[1] Archaeological surveys in the Balikh Valley were carried out by P.M.M.G. Akkermans in 1983 (Akkermans 1984), T. Wilkinson in 1992 - 1995 (1996; 1998a and b) and J. Lyon in 1995 (Lyon 2000). See also Curvers 1991. A survey of the area west of the Balikh Valley including the wadi Qaramokh was carried out by B. Einwag (1993/4, Einwag and Otto in prep.). For a survey around Raqqa, see Kohlmeyer 1984.

period (Duistermaat and De Jong in prep.) was built on the summit. An Islamic graveyard probably dating from the 17-18th century AD represents the latest occupation of the site (Akkermans in prep.).

Archaeological research at Sabi Abyad was started in 1986. Work initially focussed on the prehistoric occupation. Since 1991, however, a large part of the excavation and research efforts is also devoted to the Late Bronze Age remains. The complete exposure of one or more building levels was one of the objectives, thereby providing ample opportunity for internal spatial analyses and analyses of the functions and roles of the site and settlement, both on a local and a regional level (Akkermans 1997, in press; Akkermans and Duistermaat 2001; Akkermans and Rossmeisl 1990; Akkermans and Wiggermann 1999, in press; Akkermans et al. 1993; Rossmeisl 1989).

I.2 The Late Bronze Age settlement

Historical background

In the 14th to the early 12th centuries BC the population of the Balikh valley witnessed important and far-reaching political changes. In this period the Assyrian state expanded its territory greatly, and eventually turned the area into an integral part of the Assyrian empire. Recent research in Middle Assyrian provincial settlements like Tell Sabi Abyad and Tell Sheikh Hamad/*Dur Katlimmu* has added a wealth of information to our knowledge of historical developments in Northern Syria in the 13th century. The situation in the 14th century, however, remains less well known. The Middle Assyrian occupation at Sabi Abyad dates from the late 13th and 12th centuries BC. However, to provide a background to the Middle Assyrian occupation of the site this summary of the history of the area will extend both into the 14th century and into the 11th century BC.

In the early 14th century BC the Balikh valley was part of the state of Mitanni/Ḫanigalbat. This kingdom consisted of tribes and city-states, and stretched from the Tigris to the region of Aleppo. The centre of government was located in the Khabur triangle, in the cities of Taidu (possibly Tell Hamidiya; Eichler et al. 1985: 53-70, Oates et al. 1997: 152, Röllig 1997: 282) and Waššukanni (perhaps Tell Fakhariya; Pruß and Bagdo 2002: 313). At the time the city of Aššur on the Tigris in present-day Iraq was a vassal of Ḫanigalbat, paying regular tribute. We hardly know anything about the political situation in the Balikh Valley at this time (Harrak 1987: 1-2; Jakob 2003: 5).

After King Aššur-uballiṭ I (1353-1318 BC) had acceded to the Assyrian throne, the position of Assyria towards Ḫanigalbat began to change. King Shuttarna III of Ḫanigalbat strengthened his ties with the Assyrians and relieved them of paying tribute. He moreover planned to murder his rival to the throne, Shattiwazza. The latter took refuge in Ḫatti and signed a treaty with the Hittite King Shuppiluliuma. In this treaty the cities on the banks of the Euphrates up to the confluence with the Balikh belonged to Carchemish and Ḫatti, while Mitanni/Ḫanigalbat was reduced to the Balikh and Khabur valleys. Shattiwazza and the king of Carchemish, Piyashshili, then set out to re-conquer Ḫanigalbat from Shuttarna. The Assyrian troops came to the help of their ally Shuttarna only when the Hittite troops had already reached Taidu. In the following years there were several confrontations between the Assyrians and the Hittites in Ḫanigalbat. After a battle between Ḫatti and Aššur at Carchemish, under the reign of Murshili II, there is no information of further Assyrian military campaigns in Ḫanigalbat. The expansion of Assyrian territory under Aššur-uballiṭ probably did not reach far beyond the Assyrian heartland (Harrak 1987: 31-58; Jakob 2003: 6). In the Balikh Valley, the situation may have been rather unstable, which perhaps accounts for the abandonment of the towns in this period.

We know little about Assyrian activities in Ḫanigalbat during the reigns of Enlil-narari I (1318 – 1308 BC) and Arik-den-ili (1307 - 1295 BC). Instead, they seem to have concentrated on problems with Babylonia. Ḫanigalbat seems to have been a rather independent state, probably paying tribute to Ḫatti (Harrak 1987: 59-60).

Starting with the reign of Adad-narari I (1295-1264 BC), the Assyrians tried to take immediate control of the lands of Ḫanigalbat for the first time. Shuttarna's successor Shattuara undertook several aggressive actions towards the Assyrians, probably by attacking Assyrian traders or plundering Assyrian border towns. Adad-narari, around 1285-80 BC, attacked Ḫanigalbat and brought Shattuara to Aššur. He forced him to pay tribute to Assyria "for as long as he lived". However, Shattuara was allowed to remain king of Ḫanigalbat. His land was now a vassal state of Assyria. The Hittites, too, seem to have acknowledged the Assyrian power over Ḫanigalbat. After some years the situation changed again. Shattuara's son Wasashatta revolted against the Assyrians when he came to power, and asked the Hittites for their support. This was reason enough for Adad-narari to undertake a second major campaign in Ḫanigalbat (around 1275-70 BC). This time, however, he took numerous cities and destroyed them. He deported the royal family of Ḫanigalbat to Aššur (but perhaps Wasashatta escaped). The cities that were taken by Adad-narari all seem to be located in the upper Khabur Valley and the northern range of the Balikh Valley up to Carchemish. After this major military success, Adad-narari addressed the Hittite king on a basis of equality, naming himself Great King and "brother" to the Hittite king. Hattushili III, however, reacted furiously to these Assyrian actions and seems not to have accepted the new status of the Assyrian king. After the campaign, Adad-narari began to set up Assyrian administration in Ḫanigalbat. He had a new palace built in Taidu, for example. It is not clear, however, whether Assyrian governors were installed in Ḫanigalbat and what the nature and duration of Adad-narari's control over the newly conquered lands was. Until now, archaeological excavations have not yielded any traces of an active Assyrian administration in the Balikh Valley in the days of Adad-narari. It is possible that Ḫanigalbat regained some of its independence towards the end of Adad-narari's reign (Harrak 1987: 98-131; Jakob 2003: 8).

There is no textual information for the first half of the Late Bronze Age pertaining to the Balikh Valley, and the local history can only be constructed on the basis of survey data. Sites with occupation from this period in the Balikh valley are Harran, Tell Hammam et-Turkman, Tell es-Semen, Tell Jittal, Tell Sahlan, and a large number of smaller villages and hamlets (Balikh VIIIA period, see Curvers 1991), a total of 41 sites (as compared to around 13 sites for the Middle Assyrian period; fig. I.2a; Lyon 2000: 99, 100). Balikh VIIIA remains have been excavated at Tell Hammam et-Turkman only, and include a large building identified as a palace by the excavators. The building consists of a cobbled courtyard, doors fitted with stone orthostats, and rooms organized in an official and a domestic wing. The palace was left unhurriedly, rooms were emptied carefully and doors were closed off before abandonment, as if the inhabitants planned to return, but never got the chance (Meijer 1988: 88-91). The *dimtu* building of level 7 at Sabi Abyad should most probably be dated to these unstable times as well (see Chapters III and IV).

From the reign of Shalmaneser I (1263-1234 BC) onwards more information about the situation in the area of Ḫanigalbat is available from cuneiform sources. Not only from the Assyrian royal inscriptions and texts from the capital Aššur, but now also from texts found in Assyrian settlements in Ḫanigalbat themselves. At the beginning of Shalmaneser's reign Wasashatta's successor Shattuara II, called "king of Ḫanigalbat", revolted against the Assyrian dominance and tried to regain power in his land with the help of the Hittites and the *Ahlamu*-nomads. Shalmaneser collected his troops and struck back, gaining a major victory over the Ḫanigalbateans and the Hittite army. This time the Assyrian troops reached the whole of the western Jezira, including Tell Sheikh Hamad and the confluence of Khabur and Euphrates, Carchemish and the eastern bank of the Euphrates. The relations with the Hittites seemed to have deteriorated, and Hattushili did not write to Shalmaneser or acknowledge his new position as Great King. When Tudhaliya IV acceded to the Hittite throne the relations relaxed somewhat, although there was a major clash between him and Shalmaneser in Nihriia north of Taidu. It is not clear whether a treaty was signed after Shalmaneser's victory in Nihriia, but relations improved and Tudhaliya actually acknowledged Shalmaneser as Great King. Shalmaneser was probably the first to establish actual Assyrian administrative control over the territory of Ḫanigalbat (Harrak 1987: 155-205; cf. also Heinhold-Krahmer 1988 for a discussion of the durability of Shalmaneser's victory and the suggestion that the control over the area west of the Khabur was not very stable during Shalmaneser's reign). The Assyrians seem to have largely adopted the Mitanni system of agricultural administration through *dunnu* settlements (*dimtu* in Mitanni), and a certain cultural continuity is also visible in material remains like ceramics (see chapter IV). A number of palaces and administrative centres were built in different parts of the area, populated by Assyrian officials. These centres had a variety of tasks, all carried out on the orders of the royal palace in Aššur through various officials. They took care of agricultural production, but also of tax collection, distribution, control, etc. However, Harrak suggests that we must not speak of Ḫanigalbat as an Assyrian province at this time, but that we should see the Assyrian settlements as colonies in otherwise foreign lands (Harrak 1987: 190-205).

The Assyrian hold over Ḫanigalbat was strengthened and consolidated when Tukulti-Ninurta I (1233-1197 BC) came into power. Although there were several clashes with Ḫatti and the king had to undertake a military campaign against conspiring Hurrian lands that bordered Ḫanigalbat to the north, the central area of Ḫanigalbat seems to have been under firm and peaceful control. Tukulti-Ninurta expanded the Assyrian empire to the north and north-east. He also took control over Babylonia by defeating the Kassite king Kashtiliash (Harrak 1987: 230-274). The Middle Assyrian kingdom reached its apex under this king. There is a wealth of information on the administration of Ḫanigalbat from cuneiform texts, from Aššur, Kar-Tukulti-Ninurta and Hattushas as well as from many sites in Ḫanigalbat itself such as Dur-Katlimmu, Tell Chuera and Tell Sabi Abyad. In Ḫanigalbat Tukulti-Ninurta seems to have continued the administration policies adopted by his father. Ḫanigalbat is now a regular province, and although the grand vizier carries the title of “king of Ḫanigalbat” the area is not autonomous anymore. The western border is probably located somewhere between the Balikh and Euphrates Rivers. The area was the main source of grain and agricultural products, and was ruled by Assyrian officials who were members of the royal family, in local Assyrian palaces and agricultural estates (*dunnus*). The Middle Assyrian *dunnu* at Sabi Abyad (level 6) was founded at the beginning of his reign (see also chapter IV). The local Hurrian population had little administrative or other power, and was exploited to work for the Assyrian state. Internal dynastic problems and unrest ended the reign of Tukulti-Ninurta I. His son and the nobles of Assyria took the king prisoner in Kar-Tukulti-Ninurta and killed him in 1197 BC (Harrak 1987: 267-274; Jakob 2003: 9).

After the death of Tukulti-Ninurta, the Assyrian administration of Ḫanigalbat continued under his successors Aššur-nadin-apli (1196-1194 BC), Aššur-narari III (1193-1188 BC) and Enlil-kudurri-uṣur (1187-1183) (Harrak 1987: 275-277). This is the best-documented period in the administration of Tell Sabi Abyad, when Ilī-padâ is Grand Vizier, King of Ḫanigalbat and owner of the *dunnu* settlement at the site until his death around 1185 BC (level 5; Wiggermann 2000; Wiggermann in prep.; Akkermans and Wiggermann in press). Information on the historical background of Assyria is, however, scarce. Nevertheless, the Middle Assyrian settlement at Sabi Abyad proves that the area up to the Balikh was still firmly held by the Assyrians (contra Jakob 2003: 11).

When Ninurta-apil-Ekur (1182-1170 BC), son of Ilī-padâ, seized the throne of Aššur, the title “King of Ḫanigalbat” seems to have disappeared. The Middle Assyrian settlement at Sabi Abyad did continue after 1182 (levels 4 and 3), but its relation to the Middle Assyrian administration becomes less clear. There is not a lot of historical information about the western province in the twelfth century. Middle Assyrian occupation continues in the Khabur region during the reign of Tiglatpileser I (1114-1076 BC), at the sites of Tell Bderi (*Dur Aššur-ketti-lešer*), Tell Taban (*Tabetu*), Tell Barri (*Kahat*) and Tell Brak (Pfälzner 1995: 114, 225-226; Ohnuma et al. 1998, 2000; Ohnuma and Numoto 2001). The recent finds of administrative texts from Giricano Höyük in south-eastern Turkey (dating from 1069/68 BC, Radner 2004; Schachner 2002, 2003) prove that the Middle Assyrian *dunnu* system for administrating agricultural lands was kept up in the north at least into the reign of Aššur-bel-kala (1073-1056), although perhaps on a smaller, more private, scale (or under local dynasties linking themselves to the Assyrians, cf. Masetti-Rouault 1998: 235). At some point the Assyrians lost their hegemony over the Balikh Valley and other parts of the Middle Assyrian kingdom to the Aramean tribes and city-states, until the 9th century and the emergence of the Neo-Assyrian empire. The reasons for the supposed collapse are still poorly understood, as are its size and impact. Equally, it is not certain whether or not it was connected with the increasing exploitation of the indigenous agricultural population and increasing pressure on marginal lands that formally were the realm of nomadic groups, and whether the dominance of local nomadic groups should be seen as the cause or rather as the outcome of this decline (cf. the contributions in Ward and Sharp Joukowsky 1992; McClellan 1992; Masetti-Rouault 1998). But by the early Iron Age the concept of *dunnu* administration of agricultural land had disappeared (Radner 2004: 70).

The Middle Assyrian administration of the provinces

Possibly in the days of King Shalmaneser, but definitely during the reign of Tukulti-Ninurta I, the Khabur and Balikh valleys were an integrated part of the Assyrian kingdom. The western province of Ḫanigalbat was administered by the highest official in the Assyrian hierarchy: the grand vizier (*sukallu rabû*). The grand vizier was second only to the king, and at the time when Sabi Abyad was occupied the grand viziers were relatives of the king and belonged to the royal family (Wiggermann 2000: 171; Jakob 2003: 23). To underline the important position of these grand viziers, and perhaps to ease the domination over the indigenous population of the western province, at least three of the grand viziers also carried the title "King of Ḫanigalbat" (*šar māt Ḫanigalbat*): they were Qibi-Aššur (a nephew of King Shalmaneser), his son Aššur-Iddin and his grandson Ilī-padâ. So, although Ḫanigalbat as a sovereign entity had ceased to exist, its unity and special position continued to be acknowledged. The title "King of Ḫanigalbat" appears no longer in texts anymore after Ninurta-apil-Ekur became King of Assyria in 1182 BC (Wiggermann 2000: 171).

The Assyrians administered the western province mainly for the agricultural income it yielded, but also for the position it occupied as a border region towards the neighbouring peoples and as a passage for trade routes with the west. The lands of Ḫanigalbat were part of the royal estate, as all land was, while part of it was granted to high-ranking officials for private exploitation (Wiggermann 2000: 173; for the distinction between public and private in this period, see Schloen 2001: 298-301). Apart from the grand vizier, there were also viziers (*sukallu*) responsible for parts of Ḫanigalbat. Villages and cities (*ālu*) were managed by a *hazi'anu* or mayor, who was responsible to the *bel pahete* or governor in his district capital (Jakob 2003: 14). High officials often administrated their land in the form of *dunnu* settlements, private agricultural estates in the countryside used for the extraction of agricultural products and surplus to support the activities of the official in Aššur or his city residence elsewhere. *Dunnus* could also have duties in border control, taxing and military action. A *dunnu* was managed by an *abarakku* or *abarakku rabû*, a steward or chief steward, who was responsible either to the owner of the *dunnu* or to the city under whose jurisdiction it fell (Wiggermann 2000: 172-3). *Dunnu* settlements were probably similar to the earlier *dimtu* settlements of the Mitanni period, and perhaps administrated on comparable principles (Koliński 2001). A *dimtu* or *dunnu* generally consisted of a wall with a gate, a courtyard, official and domestic buildings, grain storage, fields, gardens, a well, a threshing floor, stables, etc. (Koliński 2001, Wiggermann 2000: 172).

The work at the farms and in the towns was done with the help of "ten-men" (*rab ešarte*) and chief farmers (*rab ikkarāte*). They coordinated the work of farmers and craftsmen. Š*iluhlu* workers (mostly farmers but also craftsmen) were unfree workers who did not own any private land but received rations for their work (Jakob 2003: 39). Among these people were local Šubareans and people deported from other parts of the kingdom (Wiggermann 2000). During the Middle Assyrian administration of the provinces the local, Šubarean population lost its power completely and hardly played a role in the administration. The class of free workers included officials, temple functionaries and craftsmen. In remuneration for their work they received a plot of land for their sustenance. They were obliged to provide *ilku*-service, consisting of either a part of the profit of their land or services rendered to their lord (military service, for example) (Jakob 2003: 34-35). The payment of a "salary" is rarely attested in Middle Assyrian sources (Jakob 2003: 51). War hostages and slaves came at the bottom of the hierarchy (Jakob 2003: 41, 43-47).

The dunnu *of Tell Sabi Abyad and its role in the Balikh Valley*

The settlement at Sabi Abyad was a *dunnu*. Whether the first tower-like building at Sabi Abyad (level 7) was already a *dunnu* or *dimtu* remains to be investigated (cf. Koliński 2001: 60-61). But it is clear that from level 6 onwards the Middle Assyrian occupation was a planned and highly structured settlement, called a *dunnu* in the texts found at the site. Until 2006 approximately 400 cuneiform texts, envelopes and fragments have been found at the site (Akkermans and Wiggermann in press, Wiggermann in prep.), all of them related to the Assyrian administration of the *dunnu* and its surrounding lands. The different parts and functions of a *dunnu* can be reconstructed not only on the basis of textual evidence but also from the archaeological remains and the finds. In Chapter III a discussion of the architecture and stratigraphy will deal with the description of the *dunnu* as an architectural unit in more detail.

The *dunnu* at Sabi Abyad was the private property of Ilī-padâ, the grand vizier and king of Ḫanigalbat, and before him it was probably similarly the private property of his father Aššur-Iddin. The chief stewards at the *dunnu* were therefore directly responsible only to the highest official in the Assyrian kingdom. Between Aššur-Iddin and Ilī-padâ the *dunnu* at Sabi Abyad was briefly administrated by Šulmānu-mušabši, probably a member of the family. The ancient name of Sabi Abyad is as yet still unknown, although perhaps it simply was known as “the *dunnu*” (F.A.M. Wiggermann, pers. comm.). As is clear from the texts, farming was the main purpose of the *dunnu*. The total area of land, or catchment area, exploited by Sabi Abyad was probably around 3600 ha, including farmland for the *dunnu*, sustenance fields for its dependants, gardens, fallow land and pasture (Wiggermann 2000: 183). About 900 people were dependants of the *dunnu* administration. About 400 of them were so-called *šiluhlu* workers, usually with foreign names. They were agricultural workers, and rarely craftsmen. Another 440 or so belonged to the free-born *ālaju* villagers with Assyrian names, who received no rations but had their own sustenance fields to supply for their needs, in exchange for which they had to perform work for the *dunnu* (Wiggermann 2000: 174, 181). The administrative and domestic staff of the *dunnu* itself consisted of around 60 people[2], mostly Assyrians, living inside the *dunnu* complex. They were probably either *šiluhlu* or *ālaju*, while some of them may have been private landowners (Wiggermann 2000: 190-191). The domestic staff included specialists and artisans of various kinds, headed by the *abarakku* Mannu-ki-Adad, later Buriya and then Tammitte, and the “ten-men”. Professions that are attested in the texts include potters, brewers, oil-pressers, builders, leather-workers, bakers, perfume makers, hairdressers, singers, dressmakers, a smith, merchants, gardeners and shepherds, servants of the Temple of Aššur and scribes (Wiggermann 2000: 190). Next to farming, the *dunnu* also had tasks in border control, military support, control of caravans and collecting taxes. Trading and diplomatic contacts occurred not only with the home city of Aššur (and the unknown residence city of Ilī-padâ, Wiggermann 2000: 173), but also with Carchemish, Harran and faraway places like Sidon on the Mediterranean coast (Akkermans and Wiggermann 1999; Akkermans 1997).

Sabi Abyad was not the only Middle Assyrian settlement in the Balikh Valley (see fig. I.2b). The catchment area of Sabi Abyad probably included several (7?) subcentres or sub-*dunnus*, possibly including Tell Hammam et-Turkman, Khirbet es-Shenef and BS 161. The site of Tell Jittal was probably another larger *dunnu* and may be identified with the *Dunni-Dagal* from the texts (Wiggermann 2000: 184). Other Middle Assyrian sites identified by surveys include Tell Abyad (possibly *Dunni-Aššur*?), Tell Sahlan (*Saḫlalu*) and Tell Abbara (BS-327). Five other sites have been identified as minor Middle Assyrian occupations, including Tell es-Semen, BS-106, BS-199, BS-200 and BS-296. Thus a total of 13 Middle Assyrian sites in the Balikh Valley south of the Turkish border were identified by archaeological fieldwork (Lyon 2000: 100), some of them founded on previously inhabited sites (like Sahlan) but many newly established. Northeast of Sabi Abyad and outside the Balikh Valley, the site of Tell Chuera (*Ḫarbe*) is another Middle Assyrian settlement. The Middle Assyrian occupation seems to be limited mainly to the northern part of the valley. To the south of Sabi Abyad the valley is practically deserted. Texts mention the existence of the sites of *Gilma* and

[2] However, in a personal communication on 23-12-2006 Wiggermann informed me that this estimate (which was mainly based on the size of the built area) probably is too high and should rather be around 30 staff and several soldiers or servants.

Serda (perhaps to be identified with Tell es-Seman and Abbara?) and *Tuttul* (Tell Bi'a near Raqqa) in the south, but no Middle Assyrian material has been found on the latter site (although the presence of an Assyrian governor here is clear from the Sabi Abyad texts; Wiggermann 2000: 171). Other *dunnus* known from the Sabi Abyad texts, and possibly belonging to the catchment area of Sabi Abyad, are *Dunnu-ša-Kidin-ilāni*, *Dunnu-ša-Urdi, Dunnu-ša-Buriya*[3] and *Dunnu-ša-Šubrê* (the *dunnu* of the Šubareans). *Amimu* (not mentioned in the Sabi Abyad texts) and the cities of *Ḫuzīrānu* and *Sāwanu* (possibly located north of the Turkish border?) should also be located in the area, but are still unidentified on the map (Wiggermann 2000: 205, Cancik-Kirschbaum 1996: 231 (index) and further discussion, Koliński 2001: 32). According to the names known from texts several other Middle Assyrian sites, including the larger city of Harran, should be located north of the modern Syro-Turkish border. So, apart from Sabi Abyad, there were several other *dunnus* administrating part of the land in the Balikh Valley, for the benefit of high officials or cities. However, not all *dunnus* functioned on the same level as the royal *dunnu* of Sabi Abyad.

Middle Assyrians and other local groups in the provinces

Although the Assyrians expanded their empire into the "empty" territory[4] of the provinces in the 13th century BC, the texts from the capital and the provinces show that they were by no means the only people living in the area. "Empty" in this sense means that there may have been a political vacuum, only a few larger cities or permanent settlements or only few settled, organized populations claiming ownership of the land and opposing Assyrian dominance at the time of the Assyrian expansion. During the 13th and 12th centuries people from different tribes and ethnic backgrounds appear in the Assyrian texts as workers, deportees and hostages, couriers, traders or enemies. Their identity is either explicitly stated by the Assyrians or deduced by us from their personal (non-Assyrian) names. It is useful for this discussion on ceramic material culture to have at least a general understanding of their presence in the area and their relations to the Assyrians since often, albeit generally subconsciously, archaeologists tend to equal ceramic groups with cultural or ethnic groups (see also below).

The Hurrians (in Hittite), or rather Šubareans as the Assyrians called them (*šubri'u*), is a general term used by Assyrians for the people living outside the Assyrian core land, in Upper Mesopotamia or the lands of Šubartu. Whether Šubartu can be equalled with the land Ḫanigalbat that was conquered by Shalmaneser, or whether it is a generic name for all Hurrian lands including Ḫanigalbat is not completely clear (Heinhold-Krahmer 1988: 81-85). The question is outside the scope of this study. It does seem clear, however, that they are the indigenous, settled inhabitants of the territory incorporated in the Assyrian kingdom, including the Balikh Valley. Assyrian texts from Tell Chuera and Tell Sabi Abyad show that there were many contacts between Assyrians and Šubareans. At both sites Šubareans worked under Assyrian management in agriculture or in crafts, but also in positions with more responsibility, like a *rab ikkarāte* (chief farmer) or a courier (Jakob 2005). At Sabi Abyad, most of the unfree *šiluḫlu* workers (agricultural workers and craftsmen) were of Šubarean descent, according to their names (Wiggermann 2000: 189). The Assyrians also did business with Šubareans living outside the scope of their administration, and they generally tried to maintain good relations with them (Jakob 2005: 182-183). The fact that military actions against Šubareans were sometimes still necessary (Heinhold-Krahmer 1988) and that Šubareans are also mentioned as hostages (Jakob 2005: 183) shows that these relations were not always as peaceful as the Assyrians would wish them to be. Šubareans were regularly subject to deportation from one part of the kingdom to an other, as is clear from the resettlement of Šubarean deportees near Kar-Tukulti-Ninurta (Freydank 1980) and from a text from Sabi Abyad mentioning Šubarean deportees from Shadikanni (Wiggermann 2000: 187). Deportation is a well-known tactic to break local organization and resistance (Masetti-Rouault 1998: 1). Near Sabi Abyad a number of Šubareans seem to have lived together in a separate location, called the "*dunnu* of the Šubareans" (Wiggermann 2000: 192). It is

[3] Perhaps this is the dunnu of the same Buriya who acted as chief steward at Sabi Abyad for some years after (or replacing?) Mannu-ki-Adad (F.A.M. Wiggermann, personal communication 23-12-2006).
[4] Survey evidence (see note 1) indicates that it is not only royal Assyrian rhetorics suggesting this picture.

very well possible, and even likely, that the Šubareans still (partly?) used and produced their own material culture (for example ceramics) and adhered to their own traditions, derived from their former Mitanni / Ḫanigalbatean customs and more or less different from the Middle Assyrian royal or state traditions. However, we have little information on this aspect from archaeology as we cannot yet define the more subtle nuances and differences in materials, styles and techniques (for example in the case of ceramics). It is as yet unclear what their influences on the Assyrian (material) culture may have been, or how Assyrian and Šubarean culture and traditions were already part of one larger whole even before Assyrian political dominance in Ḫanigalbat (Masetti-Rouault 1998: 225).

Sutī'u is a term for the nomadic or semi-nomadic tribes roaming the steppes of Northern Mesopotamia. There are different groups of Suteans, who often worked together with the Assyrians. In Tell Chuera they delivered horses, and in Sabi Abyad a delegation of Suteans was received and treated to a meal and beer (Jakob 2005: 184; see also below in Chapter VI and Appendix F). Suteans also acted as messengers and informants for the Assyrians. The Suteans, like the Šubareans, had already lived in the area for a long time when the Assyrians took power, exploiting the steppe and the margins of the dry-farming zones. During Tukulti-Ninurta I's reign the relations with the nomads seem to have been good. But it has been suggested that the increasingly intensive agricultural exploitation of the area formerly used predominantly by semi-nomadic tribes could have resulted in more and more chaotic circumstances and resistance against the Assyrians from the side of the nomads, resulting in troubles when the king died (Masetti-Rouault 1998: 229).

There are also many non-local deportees living in the western provinces. In Chuera and Sabi Abyad groups of Kassites (Babylonians) appear among the names of personnel and hostages (Wiggermann 2000: 185; Jakob 2005: 183). In Chuera there was a group of 17 families from Elamite descent, working as builders, and some brewers were called Suhean, from near Mari on the Euphrates (Jakob 2005: 184-185).

The staff of the Assyrian *dunnu* administration had mostly[5] Assyrian names and is believed to have been moved to the provinces to manage the Assyrian assets, together with a large number of Assyrian free-born villagers and farmers. However, large numbers of non-Assyrians were very much needed, as workers or craftsmen. Some people with non-Assyrian names acquired positions with more responsibility within the Assyrian administration, like *bel pahete* or *hazi'anu* at other sites, or *abarakku* Tammitte at Sabi Abyad. Although it seems that in legal respect non-Assyrian workers were treated similar to the Assyrian staff of the same rank, it still seemed important to the Assyrians to mention descent, even after several generations of integration. On the other hand, many non-Assyrians over time gave their children Assyrian names, and names alone are not always a secure indication of ethnicity or cultural affiliation (Jakob 2005).

I.3 Previous work on Mitanni and Middle Assyrian ceramics

Archaeological excavations and surveys in the Balikh Valley

Until the start of the excavation project at Tell Hammam et-Turkman in 1981 by Maurits van Loon, the Balikh river valley was a neglected area in Syrian archaeology. Only small surveys and limited excavations had been undertaken in the valley. Concerning the Late Bronze Age the small trenches of Max Mallowan at Tell Jidle, Tell Sahlan and Tell Hammam Ibn Shehab were the first serious activities (Mallowan 1946). But Mallowan considered the Balikh drainage of little importance and left the valley again after these first explorations.

At the confluence of the Balikh and Euphrates, near modern Raqqa, the site of Tell Bi'a / *Tuttul* was first excavated in 1980 by Eva Strommenger, although most attention was directed to the Middle Bronze Age occupation, and no Middle Assyrian ceramics have been found (for the identification of Bi'a with Tuttul, see Strommenger 1977). Excavations at the multi-period site of Tell Hammam et-Turkman, located at 5 km from Sabi Abyad on the Balikh river, were started in 1981. Although work

[5] But not exclusively: chief steward Tammitte carries a non-Assyrian name.

focussed on the early second millennium BC, Late Bronze Age levels were reached in parts of the excavation (Van Loon 1988; for the ceramics, see Smit 1988). At the site of Tell Chuera/*Ḫarbe* about 40 km east of Sabi Abyad, Middle Assyrian levels were excavated on a modest scale (Klein 1995). At the tiny site of Khirbet esh-Shenef excavations have yielded evidence for Late Bronze Age occupation roughly contemporary with Sabi Abyad (Bartl 1990).

In 1983 Peter Akkermans undertook a systematic regional survey of sites in the Balikh valley. The survey data for the Late Bronze Age have been partly presented by Hans Curvers (1991), and have been studied in detail by Jerry Lyon (2000, n.d.) who included additional survey data gathered during a field season in 1995. A survey in the region between Balikh and Euphrates is in the process of publication (Einwag and Otto in prep., Einwag 1993/4). The Euphrates valley north and south of Raqqa was surveyed by K. Kohlmeyer (1984).

Ceramic studies

The Late Bronze Age ceramics from sites and surveys in the Balikh Valley have for the largest part been presented only in a very general manner. Middle Assyrian ceramics can be found in the publications on the Balikh survey (Curvers 1991), Khirbet esh-Shenef (Bartl 1990), Tell Sabi Abyad (Rossmeisl 1989; Akkermans and Rossmeisl 1990; Akkermans et al. 1993), Hammam et-Turkman (Smit 1988) and Tell Chuera (Klein 1995). However, in most of these publications discussion of the ceramics is confined to illustrations showing the most common shapes accompanied by a very short description of inclusions, techniques and comparisons. The main purpose of these publications is the general dating and characterization of the archaeological assemblage at the site. A more detailed study of Middle Assyrian ceramics from Sabi Abyad was presented by J. Limpens in her MA thesis (Limpens 1994), which has unfortunately remained unpublished.

Contrary to the Balikh valley, Mitanni and Middle Assyrian ceramics have been studied on a larger scale in the heartland of the Mitanni and Middle Assyrian regions: the upper and lower Khabur River valley and Northern Iraq. The most extensive publication of Mitanni and Middle Assyrian ceramics up to now is Peter Pfälzner's work on the ceramics from Tell Sheikh Hamad/*Dur Katlimmu* (Pfälzner 1995), which includes extensive discussions of chronology and regional distribution. Ceramics from stratigraphical contexts from other sites are generally presented in less elaborate reports or sections of excavation reports. A detailed overview of the Mitanni and Middle Assyrian pottery from excavations and surveys published until 1995 is given in Pfälzner 1995: 169-232, including references, and will not be repeated here. Pottery studies published after 1995 include material from Tell Barri (Anastasio 1997, 1998; D'Agostino 2005, 2006), Tell Chuera (Klein 1995), Tell Brak (Oates *et al*. 1997), Tell al Rimah (Postgate *et al*. 1997), Giricano Höyük (Schachner 2002, 2003), Tell Shioukh Faouqani (Bachelot 1999), Tell Jurn Kabir (Eidem and Pütt 1999), Tell Taban (Ohnuma *et al*. 1998, 2000, Ohnuma and Numoto 2001) and Emar (Attoura 2001). Middle Assyrian pottery is thus quite well-known. All these studies are "classical" presentations of pottery from an excavation, for purposes of dating, chronology and a general impression of the material, without further detailed discussions of the organization of production or the use of the pottery. Yet another presentation of shapes and types of Middle Assyrian pottery would perhaps not be the most useful contribution to the field. At Sabi Abyad, however, the scale of excavation, the enormous amount of material and its preservation, and the excellent textual and archaeological documentation of the settlement leave us in the position to present an integrated picture of ceramics at the site, surpassing the general presentation and moving to a deeper understanding of processes of production and use. In this way Middle Assyrian ceramics do not have to be boring masses of sherds but can turn into an intriguing source of information on Middle Assyrian culture and society.

I.4 Research aims

Pottery is by far the largest find category at Late Bronze Age Sabi Abyad, as at most other archaeological sites dating to the later prehistory or beyond, and therefore by definition one of the more important sources of information on ancient society. This study will present the Middle Assyrian pottery[6] concentrating on three different fields: typology and chronology, production, and function and use. In some aspects, these topics move from a data-based, object-oriented approach towards a more interpretative reconstruction of the place of pottery in the settlement. The unique results of the excavations at Sabi Abyad and the richness of the data set offer very good opportunities not only to publish descriptions of the pottery and offer comparisons, but also to look into more interesting problems such as the organization of pottery production and use. In chapter II, dealing with methodology, I shall explain how I want to reach these research aims; here they will only be briefly presented.

Typology, chronology and comparisons

A classic aim of pottery studies is simply the presentation of the material. Formal descriptions of shape, inclusions and technology, as well as dating and comparisons with other sites are nowadays becoming standard ingredients of archaeological publications of pottery. In this part of the study the pottery from Sabi Abyad will be described and presented according to a number of variables. The changes between the different stratigraphical levels (sequence) will be established and compared with other sites, to place the pottery in a chronological framework and to position the collection vis-à-vis other sites.

As will be shown in chapter IV, the first Late Bronze Age occupation level (7) contains pottery that is somewhat different from that in the later levels. Some of this pottery can be compared to a kind of pottery generally called “Mitanni” pottery and usually dated to the 14th century BC. Some pottery from this earliest level and almost all of the pottery from the later levels is typically defined as “Middle Assyrian”. The terms Mitanni and Middle Assyrian are not unproblematic, as different ethnic, political, geographical and chronological meanings have been attributed to them. P. Pfälzner suggested that the term “Mitanni” pottery should be used only in a geographical and chronological sense. It then indicates a ceramic tradition present in the Northern Jezira, from the Euphrates to the middle Tigris rivers, in the 14th century BC. The term “Middle Assyrian pottery” has a political meaning as well as a geographical/chronological meaning, because it occurred in all state-organized settlements of the Middle Assyrian empire (Pfälzner 1995: 230-232). Actually, all excavated Middle Assyrian settlements (recognized as such by the pottery) have proved to be state-organized until now.

This study is not the place for a detailed discussion of the connection between material culture (pottery, architecture, art, etc.) and ethnic, social or political groups (cf. Emberling 1997 for a useful summary of this field of study). The pottery suggests a “Mitanni” identification of level 7 (but not necessarily implying that it belonged to the Mitanni state politically), thereby dating it to the 14th

[6] Ceramic products other than vessels will barely be considered here. These include clay bread ovens, drainage pipes, architectural elements and bricks, figurines, miniature models and wheels, and baked clay molds for producing metal objects. However, it is very well possible that these objects were produced by the same potter, especially when made of the same materials or with similar techniques. Although some objects (figurines, for example) are rather unique and few in number, and may have been produced alongside the ceramic repertoire, others (especially baked bricks and architectural elements) require a substantial work effort of the producer. Drainage pipes are most probably wheel-turned with techniques similar to those used for vessels. It is noted that baked bricks are made of a different, more compact fabric with fewer inclusions than unbaked sun-dried bricks, and were perhaps produced by the potter as well. However, cuneiform sources from Sumerian and Old-Babylonian times seem to suggest that the production of bricks was not the work of the potter (Sallaberger 1996: 3, note 9). All objects at least have the firing stage in common with the ceramic vessels: perhaps they were made by others but fired by the potter. If the Sabi Abyad potters made other ceramic objects (especially bricks and drains) as well, next to vessels (cf. Barrelet 1968: 12), we would have to take into account the consequences for the conclusions reached in this volume concerning production organization, techniques, workshop size, output, time spent on production, etc. For reasons of feasibility, however, I have chosen not to include ceramic products other than vessels in the present analysis. These finds will be published in the forthcoming reports on the excavations.

century BC (see Chapter IV). The other levels are Middle Assyrian, not only in a geographical/chronological sense but also politically, as is clear from the texts from those levels.

Chapter IV will also describe in detail the ceramic sequence between the different Middle Assyrian levels at Sabi Abyad. I shall try to establish whether there is any typological development or change between levels. Moreover, I will try to tie the Sabi Abyad sequence to the detailed sequence presented by Pfälzner (1995), who defined three Middle Assyrian phases for his material. By comparison to other published ceramics, I will try to provide an approximate date for the later levels of Sabi Abyad (levels 4 and 3), which cannot yet be precisely dated by texts.

Pottery production at Tell Sabi Abyad: techniques and organization

Next to formal characteristics, the technological and organizational aspects of the production of pottery can be studied. Although it is not my aim to perform a complete technological analysis there is a lot of information available, even after a field study of the material such as performed for the Sabi Abyad pottery. This includes for example shaping, finishing and decoration techniques, firing, and tools used in production. Moreover, the excavations at Sabi Abyad have yielded a number of finds related to pottery production: pottery kilns, unfired sherds, wasters, and two potters' workshops. These all help to understand how pottery was produced at Sabi Abyad. Beyond the description of shaping techniques, workshops and other pottery-related finds, this part of the thesis will discuss how the organization of pottery production at Sabi Abyad can be reconstructed. Until now, the literature gave only general suggestions about how the production of pottery was organized in the Late Bronze Age Near East, and how the production of pottery was related to society at large (cf. Pfälzner 1995: 241-255). Data from a number of different sources, including the pottery and other finds at the site but also including textual and ethnographical information, will be used in a multidimensional manner to arrive at an understanding of the place of pottery production in Middle Assyrian society.

Function and use of ceramics

The pottery at Sabi Abyad was produced in a large variety of shapes and sizes, including some special shapes obviously designed for a particular function. Sometimes the way pottery was used can be deducted from particular use marks on the vessels, like scratches, damages or burnt patches. The context in which pottery was found, either within functionally recognizable spaces or as part of features or burials, as well as any preserved original contents of the pots give us clues about the use of ceramics at the site. Scarce information from texts and iconography is used to complete the picture of ceramic use and function at Middle Assyrian Sabi Abyad.

A discussion of ceramic use and function not only completes the extensive presentation of pottery as a find category; it also provides an important source of information for future spatial analyses of the finds at the site. Regarding the almost complete excavation and extensive settlement plans, the stratigraphical control and the good preservation of contexts, matched with textual information, Sabi Abyad offers a unique possibility for such spatial analyses of a *dunnu* settlement. Pottery, as a major find category, plays a central role in such an analysis. Spatial analysis of the ceramic finds is outside the scope of this study. However, this study may be seen as a preparatory work for a future project in this field.

I.5 Research questions

This study will specifically try to find answers to the following questions:

- What does the Late Bronze Age pottery from Sabi Abyad look like, including not only the "typical" Middle Assyrian shapes but the full range of ceramic vessels? Are there changes in shapes or production over time between different stratigraphical levels? Can we identify particular shapes or characteristics for different chronological stages, thus increasing the potential of survey data?

- How does the pottery from Sabi Abyad fit into the existing chronological sequences for ceramic material culture in Northern Mesopotamia, and how does it compare to pottery from other sites?
- How was pottery produced, where on the site was the production located, what materials and techniques were used and how was the pottery fired? How was the production organized, who produced the pottery and for whom? What does the reconstruction of the organization of pottery production tell us about the organization of the *dunnu* as a whole?
- What was the intended function of particular vessel types, and how was pottery used by the inhabitants of Sabi Abyad?

CHAPTER II: FIELD AND RESEARCH METHODS

"Dad, aren't they supposed to be broken?"
Jake (4), watching his archaeologist father excavate
a completely preserved jar, Tell Brak 1995.

The present study is based on ceramic data collected and recorded in the field (at the project's excavation house in the village of Hammam et-Turkman) during the excavation seasons. The choice of data to be recorded and the methods used to collect and process the data can influence the interpretation and the results. Therefore, it is important to specify which methods and procedures have been followed during all stages. They will be presented in this chapter. Also the technical terms used in this study will be defined here: in the text they appear in italics followed by a definition. Finally, a short description will be presented of archaeometrical analyses performed on the Sabi Abyad material and of the statistical tests and measures used to evaluate the data.

II.1 Excavation and sample selection

Excavation procedures

The excavations at Sabi Abyad take place within 9 x 9 m squares designated with capital letters from west to east and with numbers from north to south, with 1 m wide section baulks in between (cf. figs. III.2-6). Each square is administrated by a 'supervisor', an experienced student of archaeology. The supervisor directs the work of 5-6 workmen on average, makes decisions on where and how to dig, and administrates all procedures and finds. To secure comparable results and an overall standard of work, each supervisor has to work within the same excavation system and use the same administration procedures and recording forms.

The actual excavating is done by breaking the soil with small or larger picks or with trowels, and removing the loose earth. While removing the earth, all sherds, bone and flint pieces as well as any other finds are collected by hand. Then the surface is levelled and cleaned, and the square can be divided into different loci. In each square, the material is collected within these *loci*, which can be defined as spatial, confined units (e.g. a room, pit, soil layer, oven, etc.). Within each *locus* material is collected in *lots*. A *lot* is a collection unit within a locus. Each lot has a unique number within each square. The lot numbers are changed every day, as well as whenever the need of separating material arises, and after every 10-20 cm of digging, so that material can be kept apart if necessary. In the Sabi Abyad registration each object or collection unit is identified by the sequence "square – locus number – lot number" (for example: K8 24-134, see Appendix A). Locus and lot numbers are continuous: subsequent excavation seasons will start from where the numbers ended the previous season, and within squares numbers are never repeated.

All small finds (all artefacts other than flint implements, including complete ceramics or ceramics with a reconstructable profile, but not loose sherds) are given three coordinates: place in the square and absolute height. Flint, bones and loose sherds are collected within the lot without point location. All finds are picked out and collected by hand; sieving of deposits only takes place in special find circumstances. It is felt that sieving all deposits would take a lot of time and effort, while the information recovered in relation to the project's research questions does not justify this effort. For this pottery study I do not feel that sieving the deposits would have yielded substantially more or better information, as sherds are easily picked out and are of a size big enough to be recovered manually. In the worst case not sieving the deposits might have led to a minor under-representation of the very small shapes and fine wares. Each small find receives a unique "masterfile number". For ceramic objects, the masterfile numbers are composed of the capital P (for pottery) followed by the excavation year, followed by a sequence number (for example: P96-37).

The course of the excavation is recorded in a daily written report of the work and a daily drawing of the whole square on scale 1:50. In addition, a series of forms is used to facilitate and standardize the recording of deposits, features, finds, burials, etc. After excavation, the finds are processed in the excavation house in the nearby village.

I believe that the excavation techniques used at Sabi Abyad provide good circumstances for questions on ceramic typology and ceramic sequence. I also think that data on ceramic technology and function will not have been influenced much by the excavation techniques. No systematic sampling of vessel contents has been done, but then the earth inside complete vessels was only rarely (macroscopically) any different from the surrounding fill. For vessels that clearly contained charred seeds, charcoal or other material, a (botanical) sample was taken to be analysed by the archaeobotanical laboratory in Groningen or other laboratories (see Chapter VI). The used excavation system accounts for the exact position of complete vessels in the square. For many floor contexts detailed drawings are available, indicating the position of complete vessels and fragments, while the general position and elevation of loose sherds can be reconstructed with the lot numbers.

The various stratigraphical units are grouped within each square in a sequence of *strata*. Then the strata and strata groups are linked between squares, yielding overall levels and sublevels. A *level* delineates a coherent building phase. Strata and levels are numbered in order of excavation (top-down). Besides, for each locus and lot the nature of the unit (e.g. undisturbed or mixed), the kind of unit (e.g. room fill, pit fill, deposit on floor, burial, etc.) and the strata and level are indicated in the stratigraphical databases (Sabi Abyad files). This information is used as the basis for processing all the other finds, including the pottery. The stratigraphy of the complete Late Bronze Age settlement is currently being analysed by M. Brüning and P.M.M.G. Akkermans. Detailed but preliminary stratigraphical databases and descriptions of many contexts, providing information on the sequence and the nature of deposits, were kindly put at the disposal of the author for the preparation of the current study. Additionally I have processed several contexts in a less detailed manner since the stratigraphical databases were not all available yet. Chapter III will provide a summary overview of stratigraphy and architecture for the purposes of this study. However, a final publication is being prepared at the moment (Akkermans in prep.) and only that publication should be used for future reference on the topic of stratigraphy and architecture in Late Bronze Age Sabi Abyad.

Selection of the sample

I collected most data on the ceramics presented in this thesis during six two-month's fieldwork seasons in the autumns of 1994 to 1999. Several students of archaeology have assisted me. Selection of lots and objects took place according to the procedures described below ("collection in the field", paragraph II.2), and we tried to process all pottery from good contexts excavated in these and earlier seasons. However, due to the enormous quantities of pottery coming from the field, this was not entirely possible. Initially the intended topic for this thesis was the function and use of ceramics at the site, and the spatial distribution of ceramics over the different functional contexts in the *dunnu*. The focus of data collection was therefore less on the collection of material from the whole stratigraphical sequence, and more on the spatial distribution and *in situ* contexts of one level. However, there were two reasons to change the focus of the thesis to the present work. First of all it became clear that the detailed stratigraphy and architecture reports, as well as the reports on other find groups, would not be available in time to conduct a spatial study. Secondly, the discovery of pottery production locations and several kilns attracted my attention and greatly increased the value of a study into the organization of pottery production. An important consequence of this change in focus is that the recording of the ceramics in the field has not always been tailored to the research questions put in this thesis.

Part of the ceramics presented here were excavated in 1991 and 1992 and studied by J. Limpens (1994). From 1994 to 1999, I was responsible for the ceramic fieldwork. The excavations at Sabi Abyad have continued until today. For the field seasons after 1999, processing and recording of the pottery was the responsibility of a team of archaeology students not including myself, and headed by D. Isendoorn (2001, 2002) and E. Koek (2003, 2004). Although these data were all available as well, for reasons of feasibility and time I had to limit myself largely to the data collected until 1999, except for certain special contexts like the material from the level 6 pottery workshops (see chapter V, described in 2003 and 2004 by the team under the direction of E. Koek) or contexts important for chronological questions (see chapter IV). In Appendix A all material presented and processed for the current publication is listed. Moreover, the architectural plans (figs. III.2-6) indicate, for each level, from which contexts the pottery has been included in this study. In hindsight, and as is natural when processing material from an ongoing excavation project, the selection of the sample has for a large part been determined by factors of feasibility and the nature of the contexts as interpreted during the course of excavation. Also, the year of excavation rather than the nature of the finds of a particular context or level sometimes determined whether the material was included in the present study (some contexts are not included although they may have been useful, simply because the author was not involved in fieldwork anymore). It is felt, however, that the total sample size of 19,562 sherds and complete vessels is more than large enough to allow for meaningful conclusions.

II.2 Description of the pottery and typology

The system used to collect and describe the Late Bronze Age pottery from Sabi Abyad was initially based on the system used at nearby Tell Hammam et-Turkman (Meijer et al. 1988:14-18). During the excavations and processing of finds at Sabi Abyad, this system was expanded, refined and adapted to the Middle Assyrian ceramics and to our questions. Some of these adaptations had already been made by J. Limpens in her M.A. thesis on the Late Bronze Age pottery from the excavation seasons 1991 and 1992 (Limpens 1994). Originally this system was not directed towards any specific research question other than chronology and general publication of the pottery. Research questions concerning techniques and function as in this study were formulated during the work on the pottery. Occasionally this led to an adaptation of the way certain attributes were described (like firing circumstances) and to the addition of attributes like percentage of total vessel circumference (see below). In general, however, in order to guarantee the comparability of the data from different field seasons and from different field staff, the description and attributes were kept the same.

Collection in the field and subsequent treatment

When vessels were recognizable in the field as being complete or reconstructable (either by actually fitting the sherds or by reconstructing the shape on paper, i.e. when rim and base were at least partially present), their exact position in the field was noted. Other sherds were collected per lot. In the excavation house the sherds and vessels were all washed in water from a nearby irrigation pump, dried and numbered. Prehistoric (Late Halaf) sherds, included in the Late Bronze Age mud bricks and therefore present in small numbers and sizes in contexts rich in mud-brick debris, were counted and put aside (see Nieuwenhuyse 1996, 1997). Subsequently the sherds were sorted per lot in diagnostic and non-diagnostic fragments. *Diagnostic sherds* are rims, bases, handles, spouts and body sherds with decorations or other special attributes like holes. All body sherds without any features were called *non-diagnostic*. Then both categories of sherds were counted.[7] It is important to realize that these represent counts “before fitting”. Any estimation of original amounts of vessels based on the sherd counts will therefore almost certainly be too high (Rice 1987: 291). *All* sherds from all loci were counted systematically, whereas selections of material were made for the description (see below).

The pottery from selected loci (mainly floor contexts) was refitted as far as possible, per locus or group of loci.[8] The non-diagnostics that could not be refitted were then discarded. The time spent in

[7] The different *wares* were not counted at this stage. Inclusions are clearly visible only in a fresh fracture. It would have been too time-consuming to note inclusions for all the sherds including non-diagnostics. Instead I decided to record inclusions only for diagnostic sherds. More importantly, I felt that the described sample is statistically large enough to include all wares in a representative manner.

[8] Only for those loci that yielded well-preserved floor contexts, containing complete or reconstructable vessels. Often the

refitting sherds from a context varied between one and three weeks depending on the size of the loci and the amount of sherds and complete vessels, while refitting was done by one to three persons. The material was always sorted in fragments belonging to the same vessel. In most cases I felt that the material was refitted sufficiently. Sometimes it was necessary to limit refitting due to time constraints. Sometimes the refitting of sherds provided useful information concerning stratigraphical problems. For example, it could be proven that two rooms in square M9 originally were one but that a wall foundation trench had been cut through the room fill at a later stage. And in square L8 it became clear that a collapsed wall actually sealed the fill on the floor from the upper fill of the room. In general, refitting gave an impression of the degree of disturbance of the context or the fragmentation of the original material (Rosen 1986: 63): did the context originally contain many complete vessels, or mainly broken ones, and what is the relative amount of sherds not belonging to any vessel in the deposit? Fragments that clearly belonged to the same vessel but could not be refitted were kept together and described as one fragment or vessel. Therefore, the number of described diagnostics gives a more accurate basis for estimating original amounts of vessels than “before fitting” sherd counts.

Most work on the pottery was carried out in the open in the courtyard of the excavation house, in daylight but under a reed-matting shade roof (figs. II.1-5). Work that did not require daylight conditions was also often carried out inside the excavation house with electrical light (bulbs, gas lamps or neon), and sometimes outside in the evenings with the help of electrical light. This work included drawing and refitting.

Description and typology

Each diagnostic sherd was described according to a number of attributes (see below), and all information was entered on a standardized code-sheet (fig. II.6) and entered into computerized data files using the computer program Visual Dbase 5.5. A total amount of 19,562 diagnostic sherds was described.[9] About 25% of the described sherds and most complete vessels were drawn and some were photographed. The drawings include most complete shapes, all rare shapes, all sherds with remarkable features or with decoration, good examples for shape types and a sample of the remaining sherds from each lot. In this way, a large collection of drawings is available for every studied locus.

The description of the pottery presented in this study was done by several persons. Most pottery excavated in 1991 (from the central tower in squares K-L 10-11, see Chapter III) and most of the complete vessels excavated in 1992 (also from the central tower) were recorded by J. Limpens. A small amount of material from 1991, all remaining pottery from 1992, all material excavated in 1993 and a selection of the pottery excavated in 1996, 1997 and 1998 was recorded by myself (in 1994 and 1995 no excavations took place). The material from 2003 and 2004 used in this study was processed by E. Koek and his assistants. Within the various collections it can be assumed that recording was more or less consistent, although of course subjective. The differences in description between the persons processing the pottery were never studied, but since all used the same description system and were trained by their predecessors, differences should not be too big. The main differences in description between myself and E. Koek have been noticed in the description of fine sand inclusions, and groupings of the “ware” categories have been made accordingly when necessary (see below). Unavoidably, my own descriptions probably changed somewhat over time, due to more experience with the material, more background knowledge or other factors. All (computer) files containing descriptions and drawings of the material presented here are kept at the National Museum of Antiquities at Leiden.

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size, kind, fragmentation, amount of erosion, etc. of the sherds already indicated whether refitting would yield any complete shapes or not. Sherds from clear garbage contexts or contexts that only contained small eroded sherds (like most open areas) were therefore not refitted. In these cases the sherds were counted, after which the non-diagnostics were discarded.

[9] On average diagnostics comprise about 24% of the total amount of counted sherds.

The attributes used to describe the pottery are: *inclusions, texture, manufacture, shape, surface treatment, colours, firing, decoration*, *special features* and *measurements*. The attributes *level* and *provenance* were added afterwards according to the stratigraphical information contained in locus and lot numbers. For each sherd there is space for remarks on the recording forms. The following will include both the definitions of the used terms and a general overview of the different appearances each attribute has in the Late Bronze Age material at Sabi Abyad. In the next chapters, describing specific groups of pottery, I shall refer to the descriptions of the attributes as presented here.

The description of the pottery with the help of the above-mentioned attributes results in the formation of a descriptive classification. Each of the attributes can in their turn be divided into two or more states of the attribute. All of the attributes are recorded independently of each other. Any connection between attributes must be established during the analysis. Moreover, different questions require the study of different combinations of attributes (Pfälzner 1995: 10). Additionally, a description according to independent attributes allows a better comparison between the ceramics of Sabi Abyad and other sites, especially the Middle Assyrian ceramics from Tell Sheikh Hamad that are presented in roughly the same way (Pfälzner 1995). The pottery classification resulting from this description is of course a formal, modern classification and has no defined relation to vessel function or to the Assyrian names or classifications of vessels (cf. Chapter VI).

Many pottery studies use a typology in which each ceramic type is defined by a characteristic combination of two or more attributes, like decoration, surface treatment, used clays, size, geometric shape, etc. The resulting types are often called “wares” (Rice 1987: 215ff). For Late Bronze Age Syria this resulted in the use of terms like Khabur Ware, Nuzi Ware, etc. (cf. Hrouda 1989, 2001; Parayre 1986; Stein 1984; see also Duistermaat, in prep. a). In the case of Sabi Abyad a ware typology in this sense was not used while describing the sherds in the field, for several reasons. First of all, not all attributes are always visible on all sherds (like decoration, shape, etc.). Secondly, attributes like decoration or special surface treatment like burnishing do not occur very often and are not always connected with shape or inclusions. They can therefore easily, and preferably, be described separately. Thirdly, treating each attribute independently provides the possibility of comparing the Sabi Abyad material with other collections, thereby lessening the trouble of comparing ware types that have similar names but were defined according to different standards. Lastly, and most importantly, the characteristic combination of attributes that defines a type should be constructed *after* the evaluation of the individual attributes, and the interrelation of attributes should be demonstrated. Only when it can be proven that a group of pots shows the same combination of, for example, inclusions, decoration and shape, one can decide to call this group a “type” or “ware”. The notion of “ware” in the classical sense was therefore not used during the description of the ceramics (for the definition of “ware” in this study, see below).

Inclusions

Because in the field all sherds were analysed macroscopically only (but with 10x magnification), no distinction was made between non-plastics added by the potter and those naturally present in the clay. It was therefore decided to speak about *inclusions*, avoiding the word temper (Rye 1981: 31-32, Rice 1987: 411). Inclusions here are the non-plastics visible in a fresh fracture under magnification (10x), or the voids left by them (in the case of organic inclusions). See the illustrations in Appendix D for an impression of the fresh fractures.

The majority of the pottery from Sabi Abyad was most probably made of a clean clay, either without any additional temper material (but naturally containing fine grains of calcite and some fine sand) or with added organic inclusions (dung or chaff) and possibly salt (see also Chapter V and Appendix D). Few vessels show other inclusions, which were probably added in connection with the intended use of the vessel (e.g. as a cooking pot).

For describing the inclusions in the clay, the following general terms have been used. It must be stressed that this classification was set up before microscopical fabric analysis had been carried out. Therefore these terms were used only as generic names and not as chemical identifications (a more detailed description of the fabric and inclusions was made for those sherds analysed by thin-section analysis; see Chapter V and Appendix D). In describing the inclusions on the recording forms, only the main type of inclusion or combination of inclusions was written down. Remarkable secondary inclusions have been described in the ‘remarks’ on the forms, but this rarely occurred. In general, macroscopic descriptions of inclusions are very limited in value. With macroscopic analysis only one cannot expect to draw conclusions on, for example, different sources of clay (Schneider 2006). To solve such questions one needs thin-section analyses or chemical analyses. This being the case, I decided not to burden the typology with overly detailed descriptions of inclusions that are hard or impossible to identify macroscopically anyway, but instead to stick to some larger categories only.

<u>Macroscopic determination of inclusions</u>
Organic inclusions: these are small plant parts. Generally, they have burnt away and have left a void in the matrix. This void is longitudinal in shape or, occasionally, grain-shaped. Sometimes a whitish “skeleton” of the fibres is left in the void. Organic inclusions with even particle sizes are an added temper, as they do not occur naturally in the clay (Rice 1987: 409). L. Jacobs suggested (Appendix D) that because the organic inclusions in the clay of the LBA pottery from Sabi Abyad are often small and even in size, they may have come from animal dung mixed with the clay to enhance workability.
Calcite: very small to larger dull, white inclusions, with a rounded shape and no sharp fractures. As all clays in the Balikh region have a high calcareous content, it is no surprise that a lot of sherds contain visible, although small, particles of calcite. Especially the small calcite inclusions most probably occur naturally in the clay.
Coarse calcite: Larger, white, angular or crystalline particles with sharp fractures. Most probably these particles were added on purpose to influence the properties of the vessel. Calcite inclusions may lessen the thermal stress in cooking vessels, for example.
Fine sand: small rounded mineral inclusions of even sizes and with various, sometimes shiny or glittery, colours (reddish, brown, buff, black), mixed evenly in the matrix. Like calcite, fine sand was probably in most cases already naturally present in the clay.
Coarse sand: as above but with larger particle sizes, sometimes with angular, sharp fractures but mostly rounded, and shiny or translucent in colour.
“Grog”: larger and angular parts of clay or pottery (crushed sherds), mostly in a different colour or texture than the surrounding matrix. These inclusions are always added by the potter (Rice 1987: 409). Colours are mostly greyish, brown or reddish. The inclusions defined macroscopically as grog appeared in the thin-section analysis to be crushed shell (see below, ware F). With the benefit of hindsight it can therefore be stated that grog was most probably not used in the pottery at Sabi Abyad.

Ware

In this study, a *ware* is defined by the combination of the most important inclusions in the clay. In other pottery descriptions attributes like shaping, surface treatment, decoration and firing are often included in ware definitions (cf. above; Rice 1987: 287). Here, however, they are regarded as aspects that have to be studied independently, and therefore recorded independently. The following *wares* have been noted macroscopically (before thin-section analysis) in the pottery from Tell Sabi Abyad:

A	calcite = X	H	organic inclusions and calcite = Y	=
B	calcite and sand = X	I	organic inclusions and calcite and sand = Y	
C	fine sand = X	J	organic inclusions and fine sand = Y	
D	coarse sand	K	organic inclusions and coarse sand	
E	coarse calcite	L	organic inclusions and coarse calcite	
F	shell (originally “grog”)	M	organic inclusions and “grog”	
G	organic inclusions only = Y	N	no visible inclusions = X	

Thin-section analyses

Thin-section analyses (Appendix D, see also table V.2) showed that the distinction between finer calcite and sand inclusions has no basis in the petrography of the sherds. Basically, apart from the coarse wares, the presence or absence of organic inclusions was the only significant difference between clay mixtures.[10] Therefore, wares A, B and C occur together within one petrographically homogeneous ware group. Similarly, wares H, I and J are interchangeable from a petrographical perspective. On a finer scale, differences between fabrics and small inclusions other than quartz or calcite were distinguishable in the thin-sections, but they did not correlate with the macroscopic ware groups. The finer distinctions between different petrographical groups were determinable with the microscope only. In the following study wares A, B, C and N are therefore not only presented separately as described in the field, but often also grouped in ware group X (which is a more realistic group), while wares H, I, J and G are grouped in ware group Y.[11] Similarly, the distinction between ware groups D and E, although valuable in principle, often appeared to be wrong because calcite and sand were not properly identified in the field. The only cooking pot imported from far away was not recognized as having a different temper (although the shape was recognized as strange; sample J728 in Appendix D). One sherd of Ware F, originally tentatively described as “grog”, was identified in the thin-section as tempered with crushed shell (Appendix D, sample 34). Therefore, on the basis of the petrographical analysis, it can be stated that the minor differences between the descriptions of the various people participating in the Sabi Abyad pottery descriptions (most apparent in the identification of fine sand inclusions) are of no consequence for this analysis. The petrographically sound groupings in groups X and Y eliminate the most important differences between my descriptions and those of others. The identification of inclusions that *are* meaningful from a petrographical point of view, like basalt inclusions and the distinction between these and iron-rich clay aggregates, and the distinction between sand and calcite grains, appears to require a lot of experience and mineralogical knowledge that is generally not available in the team. For future work I would recommend the proper training of team members in these aspects so as to make them familiar with the fabrics and inclusions they will be likely to encounter. Moreover, a microscope and a small amount of hydrochloric acid for the determination of calcite inclusions would be valuable additions to the field equipment.

Texture

Three general groups of *texture* have been used: fine, medium, and coarse. A sherd with a fine texture has an even fracture surface and a compact fabric with little or no macroscopically visible inclusions or very small inclusions only. Walls are generally thin. Most Late Bronze Age ceramics from Sabi Abyad have a medium texture. This fabric shows an even fracture surface and macroscopically visible inclusions. Sherds with a coarse texture have an uneven or rough fracture surface and large, clearly visible inclusions. They include sherds from cooking pots and large trays. As a general guideline, the inclusions in the fine-textured sherds are visible only with a magnifying glass. Sherds with a coarse texture have inclusions that are generally larger than 1-2 mm.

The quantity of inclusions was not measured. Only when a sherd contained remarkably few or many of any type of inclusions, this was recorded in the remarks.

[10] The same was true for the differences between calcite and sand inclusions in the wares described at Tell Sheikh Hamad (Schneider 2006: 393, 401, 402, 403, and 404).

[11] Because the thin-section analyses were carried out at the end of this study, the use of ware groups A, B, C, N and H, I, J, G is generally maintained in the following chapters.

Manufacturing techniques

The shape and surface of the pottery give indications about the techniques of shaping the vessel. For all the described shaping methods, traces were found on the sherds or complete vessels. For all sherds it was recorded whether they were *hand-made* or *wheel-thrown*. Any marks pointing to specific manufacturing techniques were described in the remarks. A reconstruction of manufacturing techniques is presented in Chapter V. This reconstruction was made by carefully studying traces of manufacture on the sherds, with the assistance of the specialists from the Department of Pottery Technology at the Faculty of Archaeology of Leiden University. Where useful, information on traditional pottery techniques in ethno-archaeological and ethnographical studies is cited to clarify a specific technique. On the basis of this information, a large part of the diagnostics were classified in five technology groups.

Shape

The shape classification is based on four levels of description. On the first level the shape of the fragment is described: complete vessel, rim fragment, base fragment, body fragment, spout or handle. On the second level the general vessel shape is described: bowls, pots, jars, goblets, sieves, pot stands, bases, bottles, miniatures, trays, miscellaneous. These shape names are distinguished from each other by simple criteria (see Appendix B, with each vessel name). The shape names are not intended to designate vessel function. However, because words like “bowl” and “pot stand” are so widely used in archaeology, it is felt that using completely neutral names like geometric shapes or even numbers would only make the text less comprehensible. The third level then describes the general wall shape and direction: restricted shape, unrestricted shape, convex wall, carinated wall, straight wall, etc. The shape of the base is also described within the third level. The fourth level describes the rim shape (see table II.1). The second, third and fourth levels together form the shape-type number. This rather simple system was preferred because it was felt that the more criteria there are for classifying a vessel shape, the more difficult it becomes to work with the system in the field, the more different classes will come into existence and the more exceptions there will be. The Sabi Abyad system is easy to use and fairly straightforward. Moreover, classes can be added when new vessel, wall or rim shapes appear during fieldwork. In this way some shape numbers were added while others were discarded. For practical reasons, the shape numbers used in the field were retained here. Therefore, the sequence of numbers might not seem completely logical to the reader. The complete shape classification is presented in Appendix B.

The shape classification was checked through a comparison with all the drawings from Late Bronze Age ceramics at Sabi Abyad. It was designed and used completely independently from the other variables like temper or decoration. A “shape type” in this study refers to the shape of the vessel only. The shape classification is not *a priori* meant to be a classification in functional types. Because the classification is artificial rather than a reflection of any ancient “Assyrian” classification, the distinction between two classes may sometimes seem somewhat forced or subjective. Differences in wall orientation often change gradually, for example from slightly carinated to strongly carinated and from vertical to flaring. Compare for instance type 1.4.1 and the small vessels of type 2.2.1. The first are bowls because their walls are flaring and the vessel can be classified as an unrestricted shape. The second are pots because their walls are vertically oriented. However, the shapes of these two types are closely related and when considering vessel function, this similarity is taken into account.

1 **Shape of fragment**	2 **Vessel shape**	3 **Vessel shape**	4 **Rim shape**
Complete vessel Rim fragment Base fragment Body fragment Spout Handle	Bowl Pot Jar Goblet Sieve Pot stand Base (not part of a vessel) Bottle Miniature Tray Miscellaneous	Restricted shape Unrestricted shape Convex wall Carinated wall Straight wall Etc. Base shape	Rounded Square Pointed Flattened Etc.
	Type number		

Table II.1 The four levels of description in the Sabi Abyad ceramic typology.

After fieldwork, the shape classification was further elaborated upon by adding information on apparent size groups within rim types and on manufacturing technology. This was necessary to enable the comparison of similar groups (size groups, technological groups) in the analysis of production organization in Chapter V. The related information can be found in Chapter V or directly in Appendix B with the shape classification.

Surface treatment

After the initial shaping of the vessel, the surface could be treated further to improve the shape and properties of the vessel.

Most bases and lower vessel parts, especially those of larger, thick-walled vessels, show traces of *scraping* the surface with a sharp object to make the wall thickness more even throughout the vessel. Sometimes also the upper parts of vessels show traces of scraping. It is possible that scraping traces were smoothed away by the potter before drying the vessel. The surface of most vessels was *smoothed* with wet hands or a wet cloth. A small percentage of the pottery has a *burnished* surface: a shiny, smooth surface produced by rubbing the leather-hard surface with a hard tool.

A very small amount of the pottery is covered with a *slip*: a thin coating of clay covering the whole surface. A coating is called a slip when it is clearly different from the sherd itself, and different in colour. When the coating is very thin and of the same colour as the sherd, it is often called a “self-slip”. A self-slip may easily arise by just smoothing the vessel with wet hands while throwing the vessel, without the intention to cover the surface of the vessel with a second coating, and the term was therefore not used in this study. A very small percentage of the pottery is covered with a *glaze*: a coating of (coloured) glass. In the Late Bronze Age at Sabi Abyad, the glazed vessels had a greenish colour that quickly turned whitish after excavation and exposure to air and light. The chemical composition of the glaze was not studied. However, the thin-section analysis (see Appendix D) did not yield any evidence for the use of a colourant. Perhaps the green colour on excavation was the result of the humidity of the crackled glaze, showing the underlying greenish colour of the high-fired sherd. The glaze is certainly an alkaline glaze, as no lead or tin glazes have yet been identified in Mesopotamia before the Islamic period (Moorey 1994: 162). The majority of the pottery has no coating at all.

Colour and Firing

The temperature of firing and the firing conditions may be estimated with the help of the colour of the in- and outside surface of the sherd and of the core of the sherd (to be determined in a fresh fracture). Of course these are very rough estimates and should not be taken as definite values. Colours were not measured with Munsell charts, but instead divided in nine general and rather coarse categories: cream, buff, orange, red, black, grey, green, brown and white. In reality all colours are of course different shades of earthy colours. Because description was usually done by the same person each season and with the aid of a colour sample collection of sherds, I feel that the description of colour is detailed enough. Anyway, a colour will vary between different areas of the vessel and according to the place of the vessel in the kiln. Because of this, and because the estimates necessarily remain very general anyway, the use of Munsell charts was felt to be unnecessarily labour-intensive. The estimates of firing temperatures are based on firing tests with sherds and clays from Tell Sheikh Hamad (Middle Assyrian ceramics) and the Khabur region (Schneider 2006: 395), as well as on the thin-section analysis of the Sabi Abyad sherds (Appendix D). Because the chemical and physical characteristics of the clays in the Khabur and in the Balikh regions are similar and because the technical features of the Middle Assyrian Sheikh Hamad ceramics are similar to those found at Sabi Abyad, the relation between firing temperature and sherd colour can be expected to be roughly similar as well. Brownish and reddish sherds are estimated as having been fired at 700-800 °C (low temperatures), sherds with orange to buff colours at 800-950 °C (medium temperatures), and sherds with light buff to greenish colours at 950-1000 °C (high temperatures) (Schneider 2006: 399-400; Pfälzner 1995:35). Cooking pots were always fired at low temperatures below 700 °C. When lime spalling occurred, this indicates a firing temperature between about 750 and 950 °C (and an oxidizing or incompletely oxidizing atmosphere) (Rice 1987:429). Sherds with a brittle texture and bright-to-dark-green or green-greyish colours have been overfired, at temperatures above about 1100 °C. The cores of these often warped vessels are sometimes dark grey, because of the reduction of iron oxides (Rye 1981: 108-109). It has to be noted that these temperatures can only be approximate estimates, since the behaviour of the clay minerals and inclusions does not only depend on the temperature but also on the amount of time this temperature was kept, and on the kiln atmosphere (Schneider 2006: 399).

Sherds with light colours (reddish to greenish) and with a core of the same colour or of a different (but not dark-grey or black) colour are taken to have been fired under oxidizing circumstances. Sherds with a dark-grey or black core colour (“sandwich” effect) have been fired in incompletely oxidizing circumstances, and/or at lower temperatures. Sherds with grey, dark-grey and black inner and outer surfaces and dark cores have probably been fired at medium temperatures but in reducing circumstances. Cooking ware was most probably fired at temperatures around 800 °C in reducing atmospheres, or around 700 °C in oxidizing or incompletely oxidizing atmospheres, and for relatively short firing periods (Schneider 1994: 106). All this is summarized in the following table:

Surface / Core	brown, dark red	dark brown, grey, black	light red, orange, buff	buff, cream, greenish	green, warped
same core colour as surface	oxidizing, low temperature. +cooking ware.	reducing, medium temperature.	oxidizing, medium temperature.	oxidizing, higher temperature.	Over-fired
dark (grey/black) core	incompletely oxidizing, low temperature and/or shorter period	reducing, medium temperature	incompletely oxidizing, medium temperature.	incompletely oxidizing, higher temperature.	Over-fired
other (red, orange, buff) core	oxidizing, low or varying temperature or shorter period.	reducing in later stage of firing period, medium temperature.	oxidizing, medium or varying temperature.	oxidizing, higher or varying temperature	
Firing temperature estimates	700-800 °C	700-950 °C	800-950 °C	950-1000 °C	>1100 °C

Table II.2 Estimates of firing temperatures based on sherd colour.

The firing temperature estimates were checked afterwards by the analysis of a selected number of thin-sections from the Sabi Abyad sherds (see Appendix D). Sherds described in the field as having been fired at a high temperature indeed also appear to have been fired at such high temperatures when examined under the microscope (6 samples). Sherds described in the field as having been fired at medium temperatures, based on the colour of the surface, show a very diverse picture under the microscope. Of the 33 samples described as such, 5 appear to have been fired at high temperatures (and show buff and cream outer surface colours), 5 at medium to high temperatures, 6 at medium temperatures, 10 at low to medium temperatures, and 7 at low temperatures (and showing orange or reddish outer surface colours). Firing temperatures of sherds with a grey or other core colour were most often estimated too highly. Also it appeared that the outer surface colour of the sherd is more indicative of the original firing temperature than the core or inner surface colours. All sherds estimated in the field as fired at a low temperature (6 samples) indeed appeared to have been fired at low temperatures under or around 700 °C. The thin-section analysis therefore showed that both sherds that had been fired at very high temperatures and sherds fired at very low temperatures were easily recognizable in the field. Other field estimates were generally in the right direction, but often too low for sherds with lighter colours and often too high for sherds with more orange-reddish colours. This again underlines the very rough nature of firing-temperature estimates on the basis of colour only. In general, the thin-section analysis confirmed that firing temperatures varied between 700 and 1000 °C.

Decoration

Little pottery in the Late Bronze Age assemblage of Sabi Abyad is decorated, and when, decoration is mostly confined to a limited number of patterns and techniques. The techniques most often used for decoration are *incision*, *impression*, *applied decoration* or *painting*, or combinations of them.

Simple horizontal incised lines and wavy incised lines are common decorations. In most cases these lines have been drawn while the vessel was rotating and while the clay was in an almost leather-hard or a leather-hard stage of drying. Incisions applied on stationary vessels include wavy lines, crosses or other “signs”, and notches at the base and on the rim.

Impressions occur mostly in the shape of finger or nail impressions on appliqué bands. These impressions give the appliqué bands the appearance of thick cables. Also, circles and crescents or S-shapes are impressed. Sometimes impressed circles and triangles are filled with a white substance, probably calcite, enhancing the decorative effect on the mostly dark burnished bowls. Exceptional occurrences of impressions are represented by a cylinder-seal rolling on the wall of a goblet, a stamp-seal impression on a bowl, impressed cuneiform signs and by a small impression perhaps depicting a schematized human being. Rope impressions occur on larger vessels but are connected with the shaping method and were probably not meant as a decoration.

An applied decoration is a separate band or piece of clay attached to the surface of the vessel. Applied decoration mostly takes the shape of horizontal bands or cables, most often in combination with wavy incised lines on large vessels. The cables sometimes mask joints between clay slabs or vessel parts. Sometimes vertical appliqués are attached to the rim of the vessel. The handles of some large cooking vessels were decorated by applied curves. Somewhat more artistic but very exceptionally applied decorations take the shape of animals or humans.

Painted decoration is not very common and it was mostly used in the earlier phases of Late Bronze Age occupation at Sabi Abyad. Mostly a dark red or red-brown clay-based iron-rich “paint” was used, made of clay slurry perhaps mixed with pigments.[12] Also a non-clay substance, probably bitumen, was used to create dark brown or brown-black figures. Horizontal bands, along the rim or on the wall of the vessels, as well as circles-with-crosses or Y-shapes are among the most frequent painted motifs. Crescents, circles, triangles, squares, vertical lines and “scratchy” bands as well as irregular motifs occur less often. A special type of painted decoration is represented by the so-called “Nuzi” decoration: fine, white-painted motifs (geometrical or vegetal patterns) on dark-brown or dark-red painted bands.

Some incised, impressed or painted figures, especially when occurring alone and on restricted parts of the vessel, might represent potters’ marks rather than decorations. See Chapter V and Appendix E for a more detailed discussion of these marks.

Special features

Any characteristic of a vessel other than its basic shape and appearance has been described under the heading of “special features”. They are burning traces, gypsum/lime crusts, bitumen crusts, base cracks and other damages, repairs, deformations, rope impressions and warping.

Burning traces, blackened areas, are often visible on sherds from burnt contexts. Sometimes the traces suggest that they arose during or because of the use of the vessel. The burning traces on the rims of some bowls may indicate their use as oil lamps, for example.

Gypsum/lime crusts are white, calcareous crusts or coatings. Generally they were applied to repair cracks or other damages in the base or wall of the vessel. As the material re-hydrated during deposition in the ground, the damages often became worse because of the lime crust. Some bowls contain a thick layer of lime, and they were probably used to prepare or contain the lime for the repair of other vessels.

Bitumen, a black, shiny and brittle substance similar to asphalt, was often used to repair cracks and damages. Bitumen was also used on the inside and outside of vessels to improve the impermeability of the vessel wall. In that case the complete surface of the vessel was covered with a bitumen layer.

Base cracks are often present, especially in the smaller bowls. In most cases they are S-shaped or straight. They are caused by the manufacturing techniques. The bowls were thrown from the cone, and therefore the bases could not be pressed to strengthen them. This caused cracks in the base during the drying stage (L. Jacobs, personal communication). Other cracks sometimes appear in the walls of

[12] The paint of three “Nuzi”-style vessels and a red-slipped jar is discussed in Appendix D (archaeometric results), samples 38, 40, 43, 45. Iron-rich clays do not occur in the region of Sabi Abyad, but the fabric of the vessel is very similar to the rest of the locally made pottery. Perhaps only the raw materials for the paint were imported?

vessels (horizontally or spirally, parallel to the throwing ridges) and vertically in the rim. These damages might have arisen during both drying and firing of the vessel, although in the case of more serious fractures it is more logical for them to have arisen during firing. An already heavily damaged vessel would not have been fired. Some vessels have serious damages or holes in the vessel wall. Most probably they came about during the use of the vessel.

Repairs of damages mostly took place as described above, with lime or bitumen fillings. It is only rarely that fractures were repaired by drilling holes on both sides of the fracture and then securing the fracture with rope.

Deformations of the vessel before firing include dents in the wall, slanted cutting from the cone, oval rims, etc. Sometimes these deformations were repaired or reshaped. Sometimes another object touched the still wet vessel, which would leave impressions from textile or sharp objects on the wall. Rope impressions occur mostly on very large vessels. During the shaping and drying of the vessel, ropes were wound around the vessel to support the heavy weight of the wet clay.

Vessels that were completely over-fired have started to melt. Their walls were warped and seriously deformed. Their texture became very brittle and often these vessels could not be used anymore. They are called *wasters*.

Measurements

Several measurements were taken, all in millimetres. Rim diameter and base diameter were measured either directly on the vessel or, for fragments, with the help of a diameter chart. For rim fragments comprising less than half of the circumference, the diameter could be measured up to about 400 mm with a diameter chart with lines at 10 mm intervals. For smaller rim fragments with a diameter larger than 400 mm, it could only be noted that the rim diameter was larger than 400 mm. Because of the diameter chart measurements at 10 mm intervals are overrepresented. Rim thickness (at the rim), wall thickness (for body sherds and complete shapes) and base thickness (not including the ring in the case of ring bases) were measured with callipers, while the total vessel height (complete shapes only) was measured with a measuring rod.

Moreover, to get some idea of the amount of pottery and the fragmentation, the percentage of the total rim or base circumference was recorded for each sherd. In this way, a 360° rim or base is complete (100%), while a 90° rim is only preserved for 25%. This was measured in 5° intervals. The sum of this attribute per shape, divided by 360, gives a very rough indication of the minimum number of original vessels. The mean percentage per type may give an indication of the fragmentation of the sample. Moreover, these measurements proved that sherds with a rim portion less than 5° do not give reliable information on the rim diameter. By recording this attribute, these sherds can be left out when analysing rim diameters.

Other aids for estimating vessel numbers are sherd count, sorting and refitting (see above). The difference between the amount of rims counted before mending and described after mending gives a second rough indication of the fragmentation of the pottery.

The estimated capacity of complete vessels was calculated from the drawings using the “stacked cylinders” method (Fig. II.8). With this method the inside diameter is measured at regular intervals from rim to base, as if the vessel is divided horizontally in a number of slices of equal height. The volume of the vessel is then estimated by calculating the volume of each cylindrical slice, and adding the resulting volumes, with the formula $V=(\sum \mathbf{r}^2)\boldsymbol{\pi}\mathbf{h}$ (where V = volume in cc, r = radius of the slices in cm, h = height of the slices or the distance between measurements in cm; Rice 1987: 222). The capacity is given in litres with an accuracy of 1dl. This measurement must remain an estimate, however. First of all, the calculation presumes a perfectly round vessel while most vessels are not. Secondly, the capacity is calculated up to the rim of the vessel, because it is mostly impossible to know up to which level a vessel was filled in antiquity (and so the resulting estimate is nearly always too high). Finally, the smaller the intervals between the measurements, the more measurements have to be taken and the more accurate the result. For reasons of feasibility, however, it was decided to measure at 0.5 cm intervals for very small vessels, at 1 cm intervals for small, middle and large vessels, and at 2 or 3 cm intervals for vessels drawn to scale. This limits the number of measurements and speeds up the calculations, but it yields a somewhat less accurate result. For reasons of feasibility, it was decided to measure several smallest, largest and middle-size vessels for each type group to obtain average values for capacity, instead of measuring all complete shapes.

Level and provenance

For each sherd it was recorded to which level in the Sabi Abyad stratigraphy it belongs. This might be one level, but when the context of the sherd was mixed or disturbed, more level numbers have been recorded. Through the use of the level numbers, contemporary batches of pottery can be analysed separately from batches dating from another level.

At the same time the provenance of every sherd was recorded. This attribute describes the context: a room in a specific building, or the pit, burial, street, courtyard, oven or other area where the sherd was found.

II.3 Statistics and computer programs

For matters of readability and convenience, the discussion of methods and theory pertaining to each of the subjects dealt with in chapters IV - VI will be presented in their respective chapters. The methods used in the archaeometric studies of a selected sample of sherds are presented in Appendix D. Here a short presentation will follow of statistical methods and computer programs used in evaluating the data.

For the processing of all data and the writing of the thesis, several computer programs were used. Plain text was written in Word (2003) for Windows XP. The databases with data on the ceramics were organized using Visual DBase 5.5. Stratigraphical databases were available in Access format, while Excel was used for the calculation of some data (both Microsoft Office). The drawings of the pottery and the site plans were digitized using Adobe Illustrator 9.0 and a Genius digitizing tablet and pen. Pictures were scanned or taken with a digital camera and processed in Adobe Photoshop CS 8.0. The figures were compiled using Adobe Indesign 3.0. For statistical procedures, the computer program SPSS 9.0 for Windows was used. Shannon's H and E were calculated by hand.

Measures of variation and diversity

When describing an assemblage, the diversity and the variation or standardization within an assemblage is important. For this several measurements have been used:

- The minimum, maximum and mean value of the measurement, and simple percentages.
- The standard deviation, indicating the dispersion of values around the mean. The smaller the standard deviation, the more values are close to the mean value.
- The Coefficient of Variation (CV) in percent. Because the size of the standard deviation depends on the size of the mean value, it is impossible to compare two assemblages with different mean values. Therefore, the CV is expressed as a percentage of the mean value: CV = (standard deviation / mean value) x 100. Although the statistical testing of similarity between CV values is not very straightforward, the CV has been proven to be the most reliable statistic in studies of variation (Eerkens and Bettinger 2001; idem p. 499 for a statistical test using CV).
- Shannon's H and E. This diversity index (H) and equitability index (E) are measures derived from biology and ecology. They are used to measure the richness and evenness of species in a community. For example, biologists use them to express the biodiversity in a plot of pristine

rain forest and compare it with the biodiversity in a plot of cultivated land. In archaeology they are used to form an idea of, for example, the typological richness of a ceramic assemblage. How do we compare an assemblage with a thousand diagnostics and 50 different rim types with another assemblage, having 40 rim types but only 600 diagnostics? It is clear that assemblage size matters: the more diagnostics, the higher the chance that more types are included. The evenness of the assemblage also matters: how do we compare two assemblages with each five types and 100 diagnostics, when in the first assemblage each type is represented by 20 sherds while in the second assemblage 90% of the sherds is of one type? Shannon's H and E are indices used to express these differences in a number so that assemblages of different sizes can be compared. Diversity (H) is calculated as

$$H = -\sum_{i=1}^{s} p_i \ln p_i$$

where p_i is the proportion of the type relative to the total number of cases. p_i is then multiplied by the natural logarithm of this proportion ($\ln p_i$). The resulting products per type are summed and multiplied by -1. The value of H can vary between 0 for assemblages with one type only, to large for assemblages with many different types of which each type is only represented a few times. The equitability or evenness of the assemblage can be measured with Shannon's E_H:

$$E_H = H / H_{max}$$

H_{max} is the natural logarithm of the total number of types in the assemblage. E_H can assume values between 0 and 1, with 1 being complete evenness and values close to 0 indicating extreme unevenness.

It can be useful to test whether observed patterns are statistically significant, or whether a suggested association between variables is statistically meaningful and how strong this association is. The test is briefly described here, to ease the understanding of test scores as presented in the various chapters (based on Fletcher and Lock 1994, Schreuder 1991).

Chi-Square Test

The Chi-Square Test is used to answer the following questions:

- Is there a significant difference between an *observed* distribution of frequencies and an *expected* distribution of frequencies? In other words, does a value of a variable occur significantly more or less than was expected? (Goodness-of-fit test).
- Is there a significant association between two categorical variables? In other words, are two variables related statistically?

In both cases the test calculates the expected distribution of frequencies in a random situation and compares it with the observed values. If the observed values differ a lot from the expected values the value of Chi-Square will be high, suggesting that the distribution is not random but due to some cause. Whether the differences are statistically relevant can be looked up with the help of a table that is provided in statistics textbooks. Next to the Chi-Square value, the "degrees of freedom" (d.f.) and the desired level of significance (90%, 95%, 99%) are needed to decide whether differences in an observed pattern are significant or not. To establish whether a statistically significant association between variables is a strong or a weak association, the value "Phi" and "Contingency Coefficient (CC)" can be calculated. For both values, 0 indicates absolutely no association, while 1 indicates a maximal association (very strong association).

The Chi-Square test works best with categorical data. If data are continuous (such as measurements), other tests are better suited to see whether variables are associated.

It is important to realize that archaeological questions and supposed patterns and meaningful relations must always be at the basis of statistical tests. If the results of a test cannot be translated into an archaeologically meaningful conclusion, the test results are useless.

CHAPTER III: THE ARCHAEOLOGICAL CONTEXT

"The preservation of the fortress as we see it today is impressive,
yet it is little more than a faint representation of what
the stronghold must have really looked like in antiquity".
Peter Akkermans (in press).

This chapter will provide the reader with a very general introduction to the stratigraphy and the archictecture of the Late Bronze Age levels at Tell Sabi Abyad. Awaiting the final publication of the excavations at the site (Akkermans in prep.), the information in this chapter and the accompanying plans (figs. III.2-6) may function as a guideline when levels, buildings or square numbers are mentioned in the following chapters.[13] Moreover, this chapter will include a general overview of the areas from which pottery has been processed for this study. In the site plans of each level these areas are indicated with a pink background colour. A detailed list of processed lots is available in Appendix A, but will mainly interest those working with the original excavation files. Likewise, throughout this volume, original square-locus-lot information has occasionally been added in footnotes for future reference. The stratigraphy and architecture of the areas where pottery production took place (workshops, kilns) will be dealt with in more detail in Chapter V. In the absence of a published stratigraphy and architecture report, this chapter is partly based on the information from internal records of the excavation administration (Sabi Abyad files).

III.1 Summary description of the stratigraphy

The site of Sabi Abyad is approximately 5 hectares in size. Although the top of the mound is almost six metres above the modern fields and extends to around 4.5 meters below the plains, the majority of these archaeological deposits dates from prehistoric periods (Akkermans 1996, Akkermans et al. 2006). The remains dated to the Late Bronze Age are concentrated on the central-western part of the mound, more or less within the 325 m contour line, and are approximately 1 hectare in size (fig. III.1). On all sides, the Late Bronze Age remains have eroded out of the slope, suggesting that the originally occupied area may have been larger than the area preserved now. Five building levels are dated to the Late Bronze Age (levels 7-3), numbered from the top down. The upper two levels (level 1 and 2) most probably date from much later periods, possibly Hellenistic and Islamic, based on the pottery found in these levels. They will be dealt with in a separate publication (Duistermaat and De Jong in prep.). The Late Bronze Age levels will be briefly presented here in order of building sequence.

Level 7

The earliest Late Bronze Age remains on the site probably date from the late 14th or first half of the 13th century BC, the Mitanni period (see Chapter IV). Directly on top of the eroded prehistoric layers a square, towerlike building (*dimtu*) was erected (fig. III.2). Deposits dated to level 7 have also been found to the east of the tower in square N9. The level 7 remains have all been reached only within the confines of later rooms and spaces.

Before building the level 7 tower, the builders partly levelled the ancient prehistoric mound, either by cutting away the prehistoric occupation layers or by depositing extra soil. However, these levelling activities were of a limited nature (Akkermans et al. 1993: 9). The various rooms of the building had nice lime-plaster floors, sometimes with a pebble layer underneath. Simple loam floors and mud-brick floors were used as well. Several floors were renewed over the course of time, occasionally resulting in more than 23 different floor layers. A thin deposit of finds and light brown soil and ashes may be related to the last occupation phase of the building. Later, a fire raged through parts of the building and probably marked the end of its occupation. This destruction left a thick (up to

[13] However, in future only the reports published by Akkermans (in prep.) should be used for reference.

31 cm) layer of burnt material including a lot of pottery on the lime-plaster floors in some of the rooms. After the destruction, the building must have stood empty for some time. Mud-brick debris and other rubble, about 25 cm thick, filled up the rooms. This fill is not completely preserved due to levelling activities in level 6, when the tower was renovated (Sabi Abyad files). As yet, no sublevels have been distinguished within the level 7 deposits, while at least three different strata are present (the material from these strata is lumped together for this study). The pottery processed for this study came mainly from rooms 1, 2, 5 and 6, while only very small amounts of sherds were recovered from the other rooms (cf. fig. III.2, highlighted in pink). All ceramic material comes from the latest phase of use and the destruction and abandonment phase. In square N9 a loose brown-grey fill of about 50 cm thick on top of a loam floor was found, just outside the later fortress wall (not on fig. III.2). The nature of the occupation in this area of the site is not well known.

Level 6

After a hiatus of unknown duration, in which the level 7 tower deteriorated and gradually filled up with debris, the site saw major renovations and new building programmes with the arrival of the Middle Assyrian inhabitants. It is probably at this moment that extensive levelling of the prehistoric mound took place, including the construction of terraces to create a more or less horizontal building space for a planned settlement (fig. III.3, Akkermans in press; Akkermans and Wiggermann in press). Possibly some ruins of earlier level 7 buildings around the tower were cleared away at this point. A dry moat was dug in a roughly rectangular shape around an area of approximately 80 x 80 m, within which the settlement was planned. The moat was apparently only used at the outset of the building programme, and during the course of level 6 it gradually filled up with garbage and debris. Inside this space the thick outer wall of the fortress proper was built in this level, measuring approximately 60 x 60 m. The preliminary stratigraphy report (Sabi Abyad files) distinguishes numerous strata grouped into 5 different sublevels for level 6 (6E – 6A, 6E being the earliest one). The number of strata and sublevels illustrates the organic and flexible nature of the settlement in level 6, with constant rebuilding and alterations of the architecture. All through the settlement a continuous alternation of use, abandonment, renovation, removing or adding of walls, floors and features seems to have occurred. Inside rooms this led to a succession of floor levels and debris on floors. The areas outside the buildings, mainly used as courtyards, also witnessed an accumulation of garbage and waste, resulting in the gradual elevation of the walking surfaces. At the end of level 6, many buildings seem to have been abandoned or severely neglected, leading to their gradual decay. The dates from cuneiform texts suggest that level 6 may have had a duration of around 30 years (Akkermans and Wiggermann in press; see also Chapter IV). It seems that most of the described pottery diagnostics come from the earliest phase of level 6 occupation. Not all diagnostics have been attributed to a sublevel yet. In this study the pottery from secure level 6 contexts was grouped together irrespectively of the sublevel. The pottery ascribed to level 6 comes from different contexts, including fill on floors (possibly *in situ* deposits), room fill and debris, fill from outer areas, etc. (fig. III.3, highlighted in pink). The efforts during pottery processing have focussed on pottery from floors and room fills. No pottery from the fill of the moat has been included in this study.

sublevel	*No.*	*%*
No sublevel assigned yet	1112	48.5
6B/6C mixed	5	0.2
6C	16	0.7
6D	270	11.7
6D/6E mixed	119	5.2
6E	773	33.7
Total	2295	100.0

Table III.1: Diagnostic sherds in sublevels of level 6.

Level 5

At the start of level 5 an extensive programme of renovation and rebuilding was carried out. Although the basic lay-out of the settlement stayed the same, there were numerous changes as well (fig. III.4). Apart from the major renovations and changes in the architecture described below, the settlement seemed to be focussed more on the area inside the fortress walls. The previously densely occupied area between the former dry moat and the wall was now almost completely cleared of any standing architecture. This area was still used for ovens, kilns and pits, and only a few buildings were situated in the north and east outside the walls. Again, over the course of level 5 numerous changes and renovations were carried out in individual buildings. The end of the level 5 occupation was more dramatic than that of level 6. In level 5 the central tower, the residence and buildings in their vicinity show traces of a violent fire, resulting in collapse and destruction. Other buildings were left to their fate and collapsed as well (Akkermans and Wiggermann in press). The dates from cuneiform texts suggest that the occupation in level 5 may have lasted for ca. 15 years (Akkermans and Wiggermann in press, see also Chapter IV). The preliminary stratigraphy (Sabi Abyad files) divides level 5 into three sublevels, and diagnostic sherds were available for this study from two sublevels: 5B and 5C (5C being the earliest sublevel). It appears that most described diagnostics can be attributed to the end of level 5 (sublevel 5B). In this study, however, all material from undisturbed level 5 contexts was grouped together. Level 5 yielded the most completely preserved contexts regarding architecture, textual evidence and small finds including pottery. The numerous *in situ* floor contexts, caused by the partly violent destruction of the buildings, illustrate the enormous potential of the site for spatial analysis. This is especially so since the function of the settlement (a *dunnu*) is also illustrated in textual sources (cf. Akkermans in press). It is for this reason that initially all efforts during the pottery processing focussed on the description of undisturbed floor contexts from level 5. Less effort was spent on processing material from pits, street fills, garbage dumps and mixed contexts.

Sublevel	*No.*	*%*
No sublevel assigned yet	170	2.2
5B	5358	70.4
5B/5C	1299	17.1
5C	787	10.4
Total	7614	100.0

Table III.2: Diagnostic sherds in sublevels of level 5.

Level 4

After the destruction of the level 5 settlement in a fire, the central buildings in the fortress (the tower, residence and adjacent buildings) filled with massive amounts of mud-brick debris and rubble. The ruins were left to their fate in level 4, allowing for more accumulation of debris and garbage. The parts of the ruins that were still standing were used for the construction of bread ovens, the disposal of garbage and the burial of the dead. However, in the north and north-western part of the settlement some buildings were renovated or reconstructed (fig. III.5). Before this could be done, the ruins of the level 5 buildings in this area were levelled (Akkermans and Wiggermann in press). The preliminary stratigraphy (Sabi Abyad files) divides level 4 into four sublevels, all of which have yielded diagnostic sherds for analysis: 4A – 4D (4D being the earliest sublevel). It appears that most diagnostics are attributed to one of the later sublevels in level 4: 4B. Sherds from both level 4 and level 3 come from rooms as well as from outside areas, pits and garbage dumps.

Sublevel	*No.*	*%*
No sublevel assigned yet	881	43.7
4A/4B or 4A/4B/4C mixed	118	5.9
4B	467	23.2
4B/4C or 4B/4C/4D mixed	205	10.1
4C	247	12.3
4D	98	4.9
Total	2016	100.0

Table III.3: Diagnostic sherds in sublevels of level 4.

Level 3

Occupation in level 3 retained the general character of the settlement in level 4 (fig. III.6). Open areas were still used for a variety of outdoor activities, resulting in the accumulation of garbage and debris. Small ovens and bins were built there. Older ruins collapsed and filled with rubble as well. New floors were laid in the houses in the north and north-west. In the yards smaller irregular structures were built, containing hearths and storage bins (Akkermans and Wiggermann in press). The preliminary stratigraphy (Sabi Abyad files) divides level 3 into two sublevels, 3A and 3B. Most diagnostics come from the later of the two: 3A.

Sublevel	*No.*	*%*
No sublevel assigned yet	24	3.1
3A	648	83.0
3A/3B	63	8.1
3B	46	5.9
Total	781	100.0

Table III.4: Diagnostic sherds in sublevels of level 3.

III.2 Summary description of the architecture

This study is not the place to discuss in detail all the architecture and features excavated in the various levels. However, for a general understanding of the site and the context of the pottery, a summary overview is presented here.

Level 7

The level 7 remains mainly consist of a square tower-like building. Since level 7 remains were found only within the confines of later walls, the level 7 building itself was never fully uncovered. Several wall faces were hidden behind or within later renovation walls, while other walls had been cut away. Consequently, the ground plan of the building is largely reconstructed on the basis of the analysis of the renovation activities that took place in level 6.[14] The level 7 tower consisted of 8 rooms and a stairwell to a second storey. The northernmost and middle row of rooms had hard lime-plaster floors. Room 6 was divided into two separate areas, with a toilet in the northernmost half. The southern row of rooms had either mud-brick floors (the western half of room 7, and room 9) or simple loam floors. Rooms 1, 2, 4 and 5 had hearths or fireplaces. The southern wall of room 4 had a row of 13 small rectangular niches built into the wall. It has been suggested (Akkermans et al. 1993: 9, 13; Akkermans and Wiggermann in press) that these niches could have been used for the storage of cuneiform tablets. Since the area around the building and the character of the upper floor are not known, it is difficult to

[14] The plan presented in fig. III.2 is based on the reports in the excavation files and unpublished stratigraphical reports (Sabi Abyad files). The plan published in Akkermans et al. (1993) for this phase is incomplete.

draw conclusions with reard to the function and character of the building. It may have been a mansion or *dimtu* (cf. Koliński 2001: 60-63).

Level 6

The settlement in level 6 was the first Middle Assyrian occupation. It also was the largest. Within the rectangular area bordered by the dry moat a rather systematic building plan had been carried out (fig. III.3). A thick mud-brick defensive wall enclosing an area of approximately 60 x 60 m formed the main fortress area. The main entrance to this area was located in the north, while the crossing over the moat was located in the north-west (Akkermans and Wiggermann in press). Buttresses and doorposts formed a solid construction for the wooden door that could be closed with a horizontal wooden beam. From the main gateway a broad corridor led to the inner areas of the fortress. A door to the right led into a large square courtyard that was paved with baked bricks, which in its turn gave access to the "residence" described below. A door to the left led to the entrance of the tower and to the area between the tower and the fortress wall.

In level 6 the ruins of the level 7 tower were thoroughly renovated: many walls were cut away, others were strengthened with extra walls set against them. The outer wall of the tower was also reinforced (Sabi Abyad files). Consequently, the level 6 tower is larger and has thicker walls (up to 2 m) than its level 7 predecessor, and perhaps also the functions of the building and its rooms had changed. The tower still had a second storey, as is proven by the spiral stairwell in the north-east (Akkermans in press).

West of the tower was the second major building inside the fortress enclosure: the "residence" or "palace". This large square building was built immediately against the western wall of the tower. It had a very regular plan around a longitudinal central hall measuring 15 x 4 m. On either side of this central space, doors led to a row of smaller rooms with a similar lay-out both on the west and east side. To the north, and perpendicular to the orientation of the central hall, a rectangular private courtyard measuring 15 x 5 m was located, partly paved with baked bricks (Akkermans and Wiggermann in press). The smaller rooms at the southern end were bathrooms and toilets with baked brick floors, suggesting that the two wings were residential apartments (Akkermans in press). The western wing, showing some decoration on the walls and having an extra means of access to the courtyard, seems to be more public than the eastern apartment.

In the area between the fortress wall and the main buildings (tower and residence), large rectangular rooms or barracks had originally been built aligning the fortress wall. A building in the north-eastern corner had a large staircase with an estimated height of approximately 5 metres, proving that these buildings had upper storeys as well. The area between the rectangular buildings and the tower and residence seems to have been left empty originally, probably serving as courtyards. However, over time this area was more and more built up with smaller rooms and structures. Walls were generally thin here and many of these spaces were probably not roofed (Akkermans and Wiggermann in press).

Outside the fortress area, but within the area surrounded by the dry moat, a number of workshops and houses was built. There is evidence for bead-making or stone-cutting workshops (in the north west) as well as for pottery workshops and kilns (in the east). The pottery workshops will be discussed in detail in Chapter V. The buildings to the north of the fortress seem to have been normal houses. Sometimes they were built outside the moat as well, suggesting that the total settlement area may have been substantially larger than the area enclosed by the moat.

Level 5

At the start of level 5, the neglected and partly collapsed buildings of level 6 were for a large part levelled. Many were rebuilt in the same place, although the internal divisions often changed (fig. III.4). The outer defensive wall was partly levelled and rebuilt as well. The long staircase in the northeastern corner had fallen into disrepair and was not used as a stairwell again. Instead, it was turned into a lavatory belonging to a series of rooms built here (see below). Now a new staircase was built against the eastern fortress wall. The northern outer wall was moved some distance further to the north, expanding the inside fortress area. The main entrance to the fortress was moved to a spot in the north-west of this new northern wall, turning the former main entrance into a normal internal doorway. The new main entrance was again flanked by buttresses. Upon entering the fortress, a rectangular courtyard led to a small bathroom and toilet. From the entry court one could enter the main square courtyard in the north-west, which became the crossroads of all traffic in the fortress. All doors leading from the courtyard could be closed by wooden doors.

A small building consisting of a few small rooms and a bathroom and toilet was located to the west of the main courtyard. A large number of cuneiform tablets were found in this building, identifying it as the office of the *abarakku* Tammitte. Sealings and fragmentary tablets in the yard indicate that the opening of sealed goods took place in front of Tammitte's office.

From the main courtyard one could also reach the "residence", located in the same place as in level 6. During much of level 5 the building retained its original lay-out and function. However, towards the end of the period, it seems that the building was no longer used as a residential building. Instead, there is evidence that points to the use of the building as a threshing floor and as a storage for bulk amounts of grain. The change of a representative building into a barn is still not fully explained, but may be related to the dwindling of Assyrian authority in the area.

A third door led from the courtyard into the inner areas of the fortress. In the northern area the rooms that were added to the north of the former fortress wall, together with new rooms inside, now formed a large building consisting of a series of interconnected rooms. The building was supplied with a bathroom and toilet. Near the entrance to the tower a square room had been turned into a large kitchen, with a series of fireplaces along the wall. These facilities, the size of the building and rooms, and the find of numerous cuneiform tablets in this area led to the identification of the building as the housing of the *dunnu* staff. In the kitchen perhaps communal meals for the staff were prepared. This building had its own access from the outside as well.

The tower was also thoroughly renovated. Again walls had been fortified or changed, room partitionings had been changed and the outer wall had been reinforced with an extra surrounding wall. New floors had been laid in the rooms. The texts suggest that the tower may have been used as housing or as a prison, while the archaeological finds point to the additional function as a storage area. In front of the tower a vaulted door-less square room may have functioned as a silo for the bulk storage of grain.

The space between the official buildings and the outer fortress wall, which had been left comparatively empty in level 6, was now heavily built upon. Older buildings had been renovated and expanded, or completely levelled, after which the remaining space was filled with new buildings. The texts indicate that these buildings were mainly workshops and offices of officials and staff. A room in the north was thus identified as the office of the brewer, while a building to the east of the tower was identified as the house of the scribe. A pottery workshop was located in this area as well (see Chapter V). Interestingly, not only the potter's workshop but also most of the pottery kilns had moved to areas inside the fortress walls, often making use of spaces that were (momentarily) not in use for other activities. Several of the buildings to the south of the tower and residence were occupied by the baker, who was responsible for the production and distribution of all products made from cereals (see for the whole paragraph Akkermans in press; Akkermans and Wiggermann in press).

Level 4

In level 4 the character and the lay-out of the settlement changed radically (fig. III.5). The "official" buildings including the residence and the tower were left to decay and turned into a field of ruins. The wall around the settlement was probably still standing, but it is unknown what state it was in. The former gate in the north was blocked, and access to the area was now probably from the east. Buildings in the north and north-west that were still considered suitable for living were renovated and altered. Two, perhaps three, houses of more or less equal size were situated next to each other. Each house had a larger room, some smaller rooms and a bathroom. In the courtyard to the south of the houses, leading up to the field of ruins where the residence used to be, a small room with fireplaces perhaps served as a kitchen (Akkermans and Wiggermann in press). Pottery was still produced in level 4, as is attested by the large pottery kiln to the north of the houses, in front of the blocked former gate (Akkermans and Duistermaat 2001), and a smaller kiln in square K8 (see Chapter V). Also the cuneiform evidence, although meagre, suggests that Sabi Abyad was somehow still part of the Assyrian administration. However, its character and role had probably changed profoundly.

Level 3

The buildings of level 4 were still used in level 3 (fig. III.6). They were repeatedly renovated and new floors were constructed. The courtyards were used as before as areas for the construction of bins, ovens and for burials. Also smaller structures with walls only one mud-brick wide were constructed around the houses (Akkermans and Wiggermann in press). The flimsy architecture and the proximity to the surface of the tell did not promote a very good preservation of the remains in this level. The character of the settlement in this period is that of a rural farmstead, and it is not certain whether it still was part of the Middle Assyrian administration at this time. There is no evidence for local pottery production from level 3. Similarly, it is not known until what date the occupation of level 3 continued.

CHAPTER IV: THE CERAMIC SEQUENCE

Pottery is an archaeologist's delight.
D.P. Braun (1983: 108).

This chapter will deal with the presentation, description and chronological attribution of the Late Bronze Age ceramics from Tell Sabi Abyad. I will provide a general overview of their physical appearance, as well as some indications of how these ceramics compare to those of other contemporary sites in the region. I will also discuss whether, and how, the ceramic corpus changes from level to level.

I will not discuss the *reasons* for ceramic change. Pottery production is often said to be a very conservative craft, not very open to changes. Over time, however, change did occur. The reasons behind changes in materials, technology, shape, style or decoration are many, and may include a changing organization of the craft, a change in the tastes and demands of the market or consumer group, more or less involvement of authorities in production, a change of diets and food habits, coincidental changes over time, and so on (e.g. Rice 1987: 459-468; McGovern 1989; Gosselain 1998; Eerkens and Lipo 2005). Chapters V and VI will discuss some of the possible mechanisms related to changes in the ceramic production at Sabi Abyad, mainly with regard to production organization and function or use.

IV.1 The sample

The ceramic sequence of Sabi Abyad is based on all sherds from undisturbed, unmixed contexts only. As has been described in Chapters II and III, the levels distinguished in the stratigraphy of Sabi Abyad represent coherent building phases. For the chronological picture of the ceramics only material securely ascribed to a single level and undisturbed contexts are used. Material from mixed levels and contexts is not included unless a special shape or feature is involved. It is then illustrated in the catalogue for reasons of comparison with other sites, but this material is kept out of the discussion of chronology in this chapter.

At the moment of writing, the stratigraphical information available could not yet be used to discern between *in situ* contexts and other contexts, so this information is not included here. There are two other reasons not to base the chronological sequence on *in situ* floor contexts only, but to include secondary fills of streets, rooms, pits, etc. as well. First, the inclusion of these contexts increases the sample size, which is especially important for levels 7 and 3. Second, the inclusion of different contexts reduces a functional bias in the sample and therefore reduces the risk that differences between assemblages are more related to the use of space than to chronological position.

It is expected that in each level a small portion of the material will be intrusive from other levels even if no disturbances were noted. Since, as we will see, the Middle Assyrian ceramics show a lot of similarities between levels, it was impossible to filter out these intrusive sherds. Prehistoric sherds included in the mud bricks made by the Assyrians were easily recognizable and already taken out of the sample before description (this material was partly published in Nieuwenhuyse 1997). Islamic and Hellenistic / Roman pottery derived from levels 2 and 1 was often recognized when single fragments were intrusive in earlier levels, although this proved difficult when shapes and/or wares resembled the Middle Assyrian pottery. These ceramics will be published elsewhere (Duistermaat and De Jong in prep.).

A total number of 13,050 diagnostic sherds that are securely attributed to one of the five Late Bronze Age levels at Sabi Abyad was used for this chronological analysis. This is two-thirds of the total amount of sherds described. The distribution of these sherds over the different levels is as follows:

Level	No.	% of total	% of secure prov.
7	344	1.7	2.6
6	2295	11.7	17.9
5	7614	38.9	58.3
4	2016	10.3	15.4
3	781	3.9	5.9
Total secure prov.	**13050**	**66.7**	**100.0**
Mixed levels	3229	16.5	
No level assigned	3283	16.8	
Total not included	**6512**	**33.3**	
Total	**19562**	**100.0**	

Table IV.1: Amount of sherds from secure contexts.

It is clear that the differences in sample size between levels 6 to 4 on the one hand and levels 7 and 3 on the other are very big. The differences in sample size are caused by the limited exposure, small settlement size and/or limited preservation of the settlement in levels 7 and 3 compared to the extensive occupation in levels 6 to 4. In addition, as was described in Chapter II, the original focus of data collection did not aim at a chronological cross-section but rather at a complete assessment of one single level (5), resulting in an overproportional amount of described diagnostics for this level.

The architectural and stratigraphical sequence has been discussed in Chapter III. Level 7 predates the presence of the Middle Assyrian administration at the site, and is most probably of Mitanni date. Levels 6 to 4 comprise the main occupation at the site, when the Middle Assyrian grand viziers ran a *dunnu* estate at the site. In level 3 some isolated houses are built on the site, but they still date from the Late Bronze Age.

IV.2 Research methods

The ceramics are first described per level, characterizing the different aspects of the pottery. These descriptions include information about clay and inclusions, shaping techniques, rim and base shapes and types, surface treatment and decoration, and firing. The illustrations in figures IV.1 – IV.120 are chosen to form a representative collection of shapes and decorations for each level. Next, the continuity or changes between levels are discussed.

The relative dating of the Sabi Abyad material is based on comparisons with published material from other sites. The elaborate and detailed discussion of the Middle Assyrian ceramics from Tell Sheikh Hamad / *Dur Katlimmu* (Pfälzner 1995) concentrated mainly on the ceramic sequence at the site and the comparisons with other sites. One of the most important results of Pfälzner's study was the definition of a ceramic chronology for the Mitanni and Middle Assyrian periods, the division of the Middle Assyrian period in three ceramic stages on the basis of shapes and wares ("mittel Assyrisch I, II, III", here called Middle Assyrian (MA) I, II, III) and the study of the geographical spread of these ceramic traditions in Northern Mesopotamia. The present study builds on these foundations. In presenting the relative chronology references are made to Pfälzner's Middle Assyrian ceramic phases. Comparisons with material from other sites are included only for important sites published after 1995,[15] or for special cases in which a detailed comparison is more informative than a general reference to Pfälzner's framework. Comparisons with the Sheikh Hamad material are so numerous that mentioning them all in the text with each shape would unnecessarily burden the text. They are usually listed with the illustrations in figs. IV.1-120. Comparisons with other sites, especially non-Middle Assyrian sites, are mentioned in the text and with the illustrations. Finally, several absolute dates obtained from cuneiform texts and ^{14}C samples are presented.

IV.3 The Mitanni ceramics

[15] Most important are the publications of ceramics from Tell Brak (Oates et al. 1997) and Tell Rimah (Postgate et al. 1997). New excavations at Tell Taban (Ohnuma et al. 1998, 2000, Ohnuma and Numoto 2001), Ziyaret Tepe (Matney et al. 2003, 2002, Matney and Rainville 2005) and Giricano Höyük (Schachner 2003, 2002) now contribute especially to our knowledge of the end of the Late Bronze Age. The ceramic assemblages from these sites still await full publication, as is the case with Tell Barri and Tell Chuera (Boesze in prep.).

Level 7 (figs.IV.1 – IV.11).

A total of 344 diagnostic sherds could be assigned to the first Late Bronze Age occupation at Tell Sabi Abyad. As we have seen in Chapter III, the settlement at that time consisted of a tower and some minor buildings surrounding it, most probably representing a *dimtu* (Wiggermann 2000: 184, cf. also Koliński 2001). Level 7 has only been reached within the limits of the Middle Assyrian tower walls, where excavation continued inside the Middle Assyrian rooms until the prehistoric tell was reached, and at isolated spots outside the tower. The settlement was clearly much smaller than the later Middle Assyrian occupation. No sub-levels were distinguished in the stratigraphy for level 7.

Clay and inclusions

In level 7 the majority of the ceramics has organic (chaff) inclusions (wares H, I, J, together 84.6%). Almost 15% has mineral inclusions only. Coarse wares D, E and F, with large mineral inclusions, are represented by approximately 6% of all cases. Wares D and E are cooking wares, and exclusively consist of closed pots (fig. IV.5). Fine wares A, B and C occur in 9% of all cases.

Two sherds show unidentified inclusions not classified in one of the existing groups. One (fig. IV.6.h) has a rather coarse mixture of possibly grog and calcite inclusions. The other, a handle fragment (fig. IV.9.j), includes calcite and shiny deep-black particles with a "molten" appearance.[16]

A base fragment (fig. IV.10.j) also has some black glimmering particles, apart from calcium and fine sand (B) inclusions. For two sherds in this group it was noted that the amount of inclusions is very large. About half (5) of the sherds in ware group H has relatively many calcite inclusions. These include two bases and 3 rims,[17] of which at least two are singular and untypical shapes at Sabi Abyad. In ware group I, the largest group, 5 sherds were noted to have relatively many calcite inclusions.[18] The results of the thin-section analyses (Appendix D) have shown that the occurrence of large amounts of calcite aggregates is typical for the level 7 pottery. Two sherds have many sand inclusions and two have very few inclusions.[19] These sherds come from rounded bowls, jars, and bases. In group J, one flat base was noted to have large orange and black particles next to the organic and sand inclusions, and one unidentified rim sherd was noted to have very few inclusions.

So, in total, the inclusions could not be identified in 2 sherds, while in 19 sherds (5.5%) the inclusions are a bit different from the rest of their group, mainly concerning the amount of inclusions. A group of 18 sherds from level 7 was selected for thin-section analysis of the fabric. These sherds come from ware groups A, B, C, D, E, F and I.[20] The results of the thin-section analyses showed that most level 7 sherds analysed are made of a slightly different clay than the locally produced vessels from later levels (Appendix D). A rather large proportion of the pottery in level 7 seems to have been imported to the site from sites nearby or further away.

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[16] Both of these sherds were not further analysed.
[17] Fig. IV.6.a; fig. IV.4.d; fig. IV.8.a.
[18] Fig. IV.2.j; fig. IV.8.i (= thin-section sample 42, thin-section ware group A1a), fig. IV.3.d (= thin-section sample 39, thin-section ware group B2 and not local to the Balikh).
[19] Fig. IV.3.a.
[20] Sample nos. 02, 05, 32-44, 46-48 in Appendix D and Table V.2.

			No.	%	
A		Calcium	2	0.6	
B		Calcium and sand	21	6.1	
C		Fine sand	8	2.3	
	X Subtotal				9.0
D		Coarse sand	7	2.0	
E		Coarse calcite	12	3.5	
F		Shell	1	0.3	
	Subtotal				5.8
H		Organic inclusions and calcium	12	3.5	
I		Organic inclusions and calcium and sand	242	70.3	
J		Organic inclusions and fine sand	37	10.8	
	Y Subtotal				84.6
?		Unidentified inclusions	2	0.6	
Total			344	100.0	

Table IV.2: Inclusions in level 7

Shapes

When looking at the general shape classes, we see that more than one third of all fragments belongs to bowls, while about 10% comes from pots. If we look at rim sherds only, about two-thirds of all rims are from bowls. Especially the cooking pots are numerous in the group of pots.

	No.	%	% of rims
Bowls	126	36.6	58.9
Pots	35	10.2	16.4
Jars	39	11.3	18.2
Goblets	10	2.9	4.7
Bottles	1	0.3	0.4
Loose base fragments	114	33.1	
Diagnostic bodysherds and others	16	4.6	
Total	344	100.0	100.0

Table IV.3: Shapes in level 7

A total number of 36 different rim types were distinguished in the assemblage (Table IV.9). The “top ten” of the most popular rim types is made up of the following types: 111 (14.9%), 122 (11.1%), 212 (9.1%), 123 (7.7%), 125 (6.3%), 322 (6.3%), 131 (5.3%), 132 (4.3%), 315 (3.4%), 411 (3.4%). These ten types together form 71.6% of the whole assemblage. Five rim types occur only in level 7 and no longer in later levels (117, 1213, 312 (this particular rim shape with incision, fig. IV.8.a) 1214 (this particular shape) and 319). They are shaded in table IV.9. For three types (129, 2211 and 326), all but one example occur in level 7. Types that do occur in later levels have then often slightly different. There are very few large storage vessels from level 7.

	No.	%
Carinated bowls	36	28.6%
Rounded bowls	59	46.8%
Straight-sided bowls	20	15.9%
Deep bowls	8	6.3%
Total	126	100.0%

Table IV.4: Different bowl shapes in level 7

Bowls

The group of rounded bowls is largest in level 7, including almost half of all bowls, while the group of deep bowls is comparatively small. The most popular shape among bowls is the carinated bowl type 111 (n=31, or 14.5% of all rims, 24.6% of all bowl rims). The smaller examples of this type (111a, n=13, six are completely preserved, cf. fig. IV.1.a, b) are identical to the Middle Assyrian small carinated bowls in later levels at Sabi Abyad and at other sites, with flat string-cut bases and simple rounded rims. The larger carinated bowls (fig. IV.1.e-i) are a bit different from their later counterparts (and not all are locally produced; cf. Appendix D sample 41, fig. IV.1.e). Their rims are slightly thickened on the outside, and the carination on the outside is relatively shallow. The bowls are rather shallow and the inside is smoothly curved and not carinated. One bowl is exceptional (fig. IV.1.c, thin-section sample 48 in Appendix D, not from the Balikh Valley), showing a sharp carination and a thickened rim, a ring base and a carefully burnished surface.

Carinated bowls with a straight, rather high part of the wall above the carination (type 113) occur in small numbers in level 7. One of them is decorated with some low thin ridges on the part above the carination. At other sites bowls like these have occurred since the beginning of the Late Bronze Age. However, in the earlier part of the LBA the rims of these bowls are more often squarish, hammer-headed, while in the later part of the Mitanni period rims are simply rounded as they are here (cf. Oates et al. 1997, Duistermaat in prep.). The level 7 type 113 bowls (fig. IV.1.j-l) are buff and reddish in colour and simply smoothed, not burnished, but their shapes are comparable to the grey or other-coloured (red, buff, brown) burnished bowls of the Mitanni period. We will see more examples of these bowls in later levels. Carinated bowls with their walls above the carination turning inward (type 117) are characteristic of the later Mitanni period, and occur only in level 7 at Sabi Abyad. The rims are folded over (fig. IV.1.m, n). A thin-section sample (no. 32 in Appendix D) of the bowl in fig. IV.1.n proved that it was made locally in the Balikh Valley.

Rounded bowls are a characteristic of the level 7 assemblage. Eight different rim types of rounded bowls exist, but most rounded bowls belong to rim types 122, 123 and 125 (together n=52, 24.3% of all rims, 41.3% of all bowl rims). Only one of them is burnished (fig. IV.2.e), and nine (17.3% of types 122, 123 and 125 together, fig. IV.2.b, e, j-l, fig. IV.3.m, u) show the characteristic Mitanni dark-red or red-brown painted stripes on the rim, inside or on both in and outside.[21] At Tell Bderi about 21% of "conical bowls" has a red painted band along the rim (Pfälzner 1995: abb. 79a, Ware 8). At Tell Brak the number of red-rimmed bowls is steadily increasing from levels 5 to 2, but it is not clear what their share is among rounded bowls. It is, however, clear that at all sites unpainted bowls are more numerous. Also at Brak burnishing of red-rimmed bowls seems to be a characteristic of the earlier Mitanni levels, while in the later levels burnishing almost disappears (Oates et al. 1997: 73). These characteristic red-rimmed bowls appear no more in the later levels at Sabi Abyad. Rounded bowls of the same shape, however, are also part of the Middle Assyrian assemblages (see below). A thin-section sample (no. 44 in Appendix D) of one of the smaller type 122 bowls shows that it was most probably made in the Balikh Valley.

Another connection with the Middle Assyrian assemblage at Sabi Abyad is formed by the occurrence of straight-sided bowls type 131 and 132 in level 7. Like the small carinated bowls type 111a, these straight-sided bowls are identical to their Middle Assyrian counterparts. Twenty bowls of these two types occur in level 7 (9.3% of all rims, 15.9 % of all bowl rims). No illustrations were available for type 131 bowls from this level, the most popular among straight-sided bowls in level 7. Type 132 is illustrated in figs. IV.4.e, f. A thin-section sample from a type 132 bowl (sample no. 02 in Appendix D) suggested that it was made locally in the Balikh Valley.

Deep bowls (type 145) in level 7 have a rather rounded shape, and are decorated with a plain applied horizontal band (fig. IV.4.j, k).

Pots

Closed pots with types 211 and 212 in level 7 are mainly pots made of "cooking ware", with coarse mineral inclusions. Of the twenty pots of these types, only three are made of wares H, I and J, and they are slightly different in shape as well (fig. IV.6.a, b), while the remaining 17 are made of wares D and E. Wares D and E are exclusively used for closed pots.[22] Thin-section analyses of four cooking pots (sample nos. 33, 35, 36, 46 in Appendix D, fig. IV.5.a, e, i, l) show that two could come from the Balikh region while two (nos. 33, 36, fig. IV.5.a, i) are imported from further away. All four are different from each other, pointing to several different workshops. All show slightly incurving rims that are thickened on the outside (fig. IV.5). The

[21] One plain type 123 bowl (fig. IV.3.d) was not of local origin, cf. Appendix D sample 39.

[22] Two other diagnostics had coarse mineral inclusions: a rough platter (fig. IV.7.j) and a body sherd, probably from a cooking pot (fig. IV.9.g).

number of cooking pots is relatively high (9.3% of all rims, 57.1 % of all pot rims), especially considering that more than half of them (n=12) were found in the tower.

Only two fragments of large storage vessels (type 213, fig. IV.6.c, d) were found in room 1 of the tower. These are most probably handmade. One of them (fig. IV.6.c) shows numerous carelessly applied blackish lines on the shoulder (see below).

Thirteen rims come from pots with an open shape and straight, vertical walls (6% of all rims, 37.1% of all pot rims). Five have squarish, almost hammer-shaped rims that will become more popular in the Middle Assyrian levels, although the rims in level 7 are generally a bit plumper (fig. IV.6.e).

Five examples of the well-known small cylindrical pots called “grain measures” (type 225) have been found in level 7. These pots with thin walls and bent or folded thin rims occur as early as in Old Babylonian or late Middle Bronze Age times in Northern Mesopotamia, and we will see that at Sabi Abyad they continue into the Middle Assyrian levels. Often they are decorated. The decoration, more than the shape, is characteristic for the period as we shall see below. In level 7 one type 225 pot is decorated with Nuzi-style decoration (fig. IV.7.a), two with parallel horizontal red bands and stripes on the rim (fig. IV.6.b, d), and one with applied bands of clay with finger impressions (fig. IV.6.e). One pot is left undecorated (fig. IV.6.c).

Three pots have slightly thickened and smooth rims with an oval section (type 2211). Only four fragments of this type were found at Sabi Abyad, and all except one were found in level 7 (the fourth example came from level 6). This shape therefore seems to be characteristic for level 7. The thin-section analysis made of one of these pots (fig. IV.7.h, sample 34 in Appendix D) proves that it is a cooking pot with crushed shell inclusions, possibly made in the region.

Jars

A total of 39 rim sherds belong to jars (18.2% of all rims). In level 7 a majority of jars has a clear neck (n=21, 53.8% of all jar rims), while a smaller number has a “ribbon” rim sitting directly on the shoulder of the vessel without a clear neck (n=17, 43.6% of all jars). The latter group becomes more popular in Middle Assyrian times, as we will see below. Jars with handles do not occur in level 7.

Among jars with a neck there are seven different rim types. A characteristic shape is the small, thin-walled jar with Nuzi style decoration (type 314, fig. IV.8.b). Thin-section analyses (sample 40 in Appendix D) showed that it was most probably locally made. Most popular is the jar with a squarish or flattened rim, type 315 (fig. IV.8.d-i). Sometimes these jars show a raised ridge along the transition from shoulder to neck. Thin-section analyses of four type 315 jars (samples 05, 37 (fig. IV.8.g), 42 (fig. IV.8.i) and 47 (fig. IV.8.d) in Appendix D) indicate that one (no. 37) was not locally produced but possibly came from the Euphrates area. Jar type 319, with a strongly outward-bent and slightly pointed rim (fig. IV.8.k-m), occurs only in level 7 and may be characteristic of the period.

In the group of jars with a ribbon rim the oval rims with a vertical outer side (type 322) are the most popular (n=13). Although they are very similar to the later Middle Assyrian typical jar rims, they generally tend to be a little more squarish in section (fig. IV.9.a, b). Rims with concave sides (type 321) or slanting rims (type 323) each occur only once. A special shape is represented by two rims of jars with strongly inward-sloping, pointed rims (type 326, fig. IV.9.c, d). Only one other example of this shape occurred at Sabi Abyad, in level 5. And so this type may be characteristic for level 7 as well.

Goblets

Ten rims and eight bases (fig. IV.10.a-f) belong to goblets. Both the V-shaped goblet as well as the S-shaped goblet are present in level 7, and the rims are very similar to their later Middle Assyrian counterparts. Shouldered goblets, with a sharp transition from a globular body to a straight neck, do not occur at Sabi Abyad. However, they are typical for the Mitanni period at, for example, Tell Brak (up to level 3, cf. Oates et al. 1997: 71). At Brak in level 2 they no longer occur (*ibid.*). At Sabi Abyad V-shaped goblets (type 411) seem to be more popular than S-shaped goblets (type 421). Straight-sided, U-shaped goblets are at Sabi Abyad only represented by two pedestal base fragments. Pedestal bases on goblets are characteristic of this period, and occur no more in Middle Assyrian times. One of these is painted in Nuzi-style and was most probably produced locally (fig. IV.10.e, thin-section sample no. 43 in Appendix D). As to goblet bases, the almost complete absence of the typical Middle Assyrian nipple base is interesting. All but one goblet have smaller or larger knob-shaped bases.

Base type	No.	%
?	2	1.4
711	1	0.7
712	5	3.6
721	7	5.1
731	49	35.5
741	74	53.6
Total	138	100.0

Table IV.5: Base types in level 7,
loose bases and complete shapes included.

Bases

The greater majority of bases in level 7 is of the ring-base kind (type 741, fig. IV.11). Small and larger bowls, pots and jars all show ring bases. In general, the ring is well-shaped and rather pronounced in comparison with later Middle Assyrian shapes, and often the ring is a bit squarish in section. Flat bases occur a lot as well, with all shapes and sizes (fig. IV.10.g-m). Many of them are simply string-cut, but a rather large proportion is carefully scraped and flattened after string-cutting. In three cases holes were made in the flat base, twice before firing (fig. IV.10.h, k) and once after firing (fig. IV.10.g).

Body sherds

Several diagnostic body sherds (fig. IV.9.e-m) show interesting decorations or shapes. One fragment of a bottle neck with a handle and a body fragment of a small jar have a dark-red slip and vertical burnish (fig. IV.9.l, m, see also below). One other body sherd is vertically burnished. One body fragment shows impressions of a rope made before firing, probably during the shaping process, while another shows an impression or potters' mark (fig. IV.9.i, see also Chapter V). Among the painted body fragments, one fragment has Nuzi-style decoration (fig. IV.9.e), one has dark-brown painted horizontal bands (fig. IV.9.f), and one cooking pot fragment has brown and orange painted blobs (fig. IV.9.g). The irregular "crayon" lines described above occur as well. Other body sherds show horizontally applied ridges (fig. IV.9.k) or incised lines.

<u>Surface treatment and decoration</u>

In level 7, only two sherds show a dark-red slip (see above, and fig. IV.9.l, m). One of them, as is clear from the thin-section analysis, was not produced at Sabi Abyad but came from further away (fig. IV.9.m, Appendix D sample 38; moreover, raw materials for red slips are not available in the Jezira region). At Brak slipped sherds seem to date mainly from the later levels (level 2, see Oates et al. 1997: fig. 110 and fig. 204), but in small numbers (up to 15 sherds in level 2), and it is also suggested there that red-slipped pottery is not local but comes from Anatolian regions (*ibid.*: 74). All other pottery at Sabi Abyad is not slipped. However, the surfaces are generally carefully smoothed and some are very smooth indeed. A total of 12 diagnostics, or 3.5% of all diagnostics, is burnished. These include a carinated bowl (type 111 fig. IV.1.c), a rounded bowl (type 122, fig. IV.2.e), five "cooking pots" (type 212, fig. IV.5.j-n) and a "grain measure" (type 255, fig. IV.7.d), as well as a bottle fragment (fig. IV.9.l). Apart from the cooking pots, where the burnishing was perhaps done for functional reasons, burnishing seems to be rare in level 7. Traces of scraping are rare, since they were mostly obliterated by very careful smoothing during the shaping process.

Most pottery in level 7 is undecorated. However, 31 diagnostics show different types of decoration (9% of all diagnostics). Most popular is the characteristic painted red band decoration along the rims of bowls or on the body of type 225 pots. On bowls this type of decoration seems to be typical for the Mitanni period, but on goblets and small jars the style continues well into the Middle Assyrian period and even into the Early Iron Age (see below, and also Duistermaat in prep, Pfälzner 1995: 46, 239, Postgate et al. 1997: 53, 54). The very easily recognizable Nuzi-style decoration occurs in level 7 as well. It consists of geometrical motifs (mainly mmm-shapes and spiralling bands, but perhaps also birds? Cf. fig. IV.7.a) in whitish paint on a background of dark-red or dark-brown, painted bands. It occurs on a "grain measure" (type 225), a small jar and a goblet base as well as on a body sherd probably from a small jar. This type of decoration seems to be chronologically limited to the Mitanni period, until the 13th century BC (cf. Postgate et al. 1997: 54, 55). Nuzi decoration catches the eye, but it must be remembered that at all sites it occurs in very small numbers only. At Brak, at the height of the occurrence of Nuzi style decoration in level 2, still only 38 sherds show this kind of decoration (Oates et al. 1997: figure 92). The presence of several sherds at the small settlement of Sabi Abyad, all of them made from local materials (samples 40, 43, 45 in Appendix D, figs. IV.8.b, IV.10.e, IV.98.c), is therefore interesting.

	No.	%
Painted horizontal red bands	13	41.9
Painted Nuzi style decoration	4	12.9
Painted "crayon lines"	5	16.1
Painted blobs	1	3.2
Incised horizontal line(s)	2	6.4
Applied horizontal band(s)	6	19.3
Total decorated	31	100.0

Table IV.6: Decoration in level 7.

A peculiar kind of "decoration" is formed by parallel or crossing, carelessly applied lines of a blackish material. It looks as if they were made by lightly rubbing a crayon over the surface, or by some kind of material rubbing the surface. Perhaps they were caused by the use of the vessel (e.g. by ropes or bands tied to the vessel?) and are not really a decoration. These traces were found on a large storage vessel, a jar base (fig. IV.6.c, IV.11.j) and several body sherds (fig. IV.9.h).

Incised horizontal lines occur in small numbers, and horizontal applied ridges or bands are applied to a large bowl, a jar and a "grain measure" (fig. IV.4.j, IV.7.e, IV.8.d) as well as to several body sherds (fig. IV.9.k).

Firing

In level 7 the majority (84%) of the ceramics was well fired at medium temperatures. More than 89% of these are made of wares with organic inclusions (wares H, I, J), which is in line with the general predominance of these ware groups (see above). Only 23 sherds have light cream or greenish (n=21) surface and core colours and were fired at higher temperatures, but only one body sherd had been fired at very high temperatures, causing the clay body to sinter.[23] 30% of high-fired sherds are made of fine wares (wares A, B, C). A total of 32 diagnostics has dark-brown surface colours and brownish or grey core colours, and was fired at a lower temperature. Almost half of these (n=14) are pots made of wares D and E, with coarse mineral inclusions, probably cooking pots. The others are mainly base fragments (both types 731 and 741), and six rims of bowls. Fine-ware sherds (wares A, B, C) were never fired at low temperatures.

	No.	%
High	23	6.7
Medium	289	84.0
Low	32	9.3
Total	344	100.0

Table IV.7: Firing temperatures in level 7.

Lime spalling occurred in 9 sherds (2.6%), all made of ware I except one (ware B). All were fired at medium temperatures, except P93-30 (fig. IV.1.m), which was fired at a higher temperature.

A small majority (64.5%) of the ceramics was fired in completely oxidizing kiln circumstances. Fine-ware sherds (wares A, B, C) were fired only in completely oxidizing circumstances. Surface colours range from reddish to orange and buff. Characteristic for the period, however, are the relatively large amounts of sherds with deep orange to orange-red surface colours and grey cores, made of wares with organic inclusions (wares

[23] No kiln wasters (or any other indication of local pottery production) were found in level 7.

H, I, J) (cf. Duistermaat in prep., Oates et al. 1997: 157, appearing from level 5 onwards at Brak). In level 7 approximately 75% of the ceramics fired in incompletely oxidizing circumstances shows this characteristic.[24] Shapes fired in a reducing atmosphere, with completely grey colours, include several bowl types (types 111, 123, 131, 145), pots (212, 2211), jars (315, 322) and loose bases (731). So-called “grey-burnished bowls”, which are rather common in earlier Mitanni levels at other sites and which also appear in Middle Assyrian Sabi Abyad, are absent from level 7 (as they are from Brak level 2; cf. Duistermaat in prep., and Oates et al. 1997).

	No.	%
Oxidizing	222	64.5
Incompletely oxidizing (grey core)	112	32.6
Reducing	10	2.9
Total	344	100.0

Table IV.8: Firing atmospheres in level 7.

[24] The thin-section analyses (Appendix D) seem to suggest that the pottery in level 7 was generally fired at slightly lower temperatures than the vessels from later levels, especially level 4. The lower temperatures may therefore account for the darker reddish and orange surface colours.

Table IV.9: Level 7, proportions of ware per type, frequencies of types.
Shaded types occur only in level 7

	?	A	B	C	D	E	F	H	I	J	Total	% of rims
111			2 6.5%					1 3.2%	28 90.3%		31 100.0%	14.5%
113									3 100.0%		3 100.0%	1.4%
117									2 100.0%		2 100.0%	0.9%
121									2 100.0%		2 100.0%	0.9%
122			1 4.3%	2 8.7%					13 56.5%	7 30.4%	23 100.0%	10.7%
123								2 12.5%	12 75.0%	2 12.5%	16 100.0%	7.5%
125									8 61.5%	5 38.5%	13 100.0%	6.1%
129									2 100.0%		2 100.0%	0.9%
1210									1 100.0%		1 100.0%	0.5%
1213									1 100.0%		1 100.0%	0.5%
1214								1 100.0%			1 100.0%	0.5%
131									11 100.0%		11 100.0%	5.1%
132									7 77.8%	2 22.2%	9 100.0%	4.2%
143									4 100.0%		4 100.0%	1.9%
144									2 66.7%	1 33.3%	3 100.0%	1.4%
145									1 100.0%		1 100.0%	0.5%
All bowls			3 2.4%	2 1.6%				4 3.2%	100 79.4%	17 13.5%	126 100.0%	58.9%
211						1 100.0%					1 100.0%	0.5%
212					6 31.6%	10 52.6%		1 5.3%	1 5.3%	1 5.3%	19 100.0%	8.9%
213									2 100.0%		2 100.0%	0.9%
221									2 100.0%		2 100.0%	0.9%
222	1 33.3%								1 33.3%	1 33.3%	3 100.0%	1.4%
225									4 100.0%		4 100.0%	1.9%
225?									1 100.0%		1 100.0%	0.5%
2211							1 33.3%		2 66.7%		3 100.0%	1.4%
All pots	1 2.8%				6 16.7%	11 30.6%	1 2.8%	1 2.8%	13 36.1%	3 8.3%	36 100.0%	16.8%
311									1 100.0%		1 100.0%	0.5%
312									2 100.0%		2 100.0%	0.9%
312?								1 100.0%			1 100.0%	0.5%

	?	A	B	C	D	E	F	H	I	J	Total	% of rims
313									1 100.0%		1 100.0%	0.5%
314									3 100.0%		3 100.0%	1.4%
315			1 14.3%						6 85.7%		7 100.0%	3.3%
315?				1 100.0%							1 100.0%	0.5%
318									2 100.0%		2 100.0%	0.9%
319									3 100.0%		3 100.0%	1.4%
321									1 100.0%		1 100.0%	0.5%
322									13 100.0%		13 100.0%	6.1%
323									1 100.0%		1 100.0%	0.5%
326								1 50.0%	1 50.0%		2 100.0%	0.9%
All jars			1 2.6%	1 2.6%				2 5.1%	35 89.7%		39 100.0%	18.2%
411			6 85.7%	1 14.3%							7 100.0%	3.3%
421			1 33.3%	2 66.7%							3 100.0%	1.4%
All rims												214 100.0%
												% of bases
711			1 100.0%								1 100.0%	0.7%
712			5 100.0%								5 100.0%	3.6%
721		1 14.3%		1 14.3%					4 57.1%	1 14.3%	7 100.0%	5.1%
731		1 2.0%	3 6.0%	3 6.0%				2 4.0%	35 70.0%	6 12.0%	50 100.0%	36.5%
741			2 2.7%					3 4.1%	60 81.1%	9 12.2%	74 100.0%	54.0%
All bases		2 1.5%	11 8.0%	4 2.9%				5 3.6%	99 72.3%	16 11.7%	137 100.0%	100.0%
Loose bases		2 1.8%	8 7.0%	1 0.9%				5 4.4%	83 72.8%	15 13.2%	114 100.0%	-
Bottles									1 100.0%		1 100.0%	-
Trays					1 100.0%						1 100.0%	-
Miniatures			1 50.0%	1 50.0%							2 100.0%	-
Other diagn.	1 6.7%		1 6.7%			1 6.7%			10 66.7%	2 13.3%	15 100.0%	-
Total diagn.	2 0.6%	2 0.6%	21 6.1%	8 2.3%	7 2.0%	12 3.5%	1 0.3%	12 3.5%	242 70.3%	37 10.8%	344 100.0%	

IV.4 The Middle Assyrian ceramics

Level 6 (figs. IV.12 – IV.35).

In total 2295 diagnostics in the database are securely attributed to level 6. However, part of this collection was not described by myself. In Chapter II and in Appendix D it is argued that the differences between my own descriptions and those of others do not have a basis in the petrography of the sherds. However, especially with the identification of fine-sand inclusions, the data looks different in my database and that of others. To keep the information on the level 6 corpus presented here (and based on databases compiled by others) comparable to that of the other levels, the sections discussing the clay and inclusions and the firing circumstances will be based on database information from 842 diagnostics described by myself only. Because ware groups X and Y are petrographically sound groupings that can be made with both databases, the data on these larger groups has been included for all sherds from level 6 irrespective of who described them (see also Chapter II for more information).

The level 6 occupation represents the first Middle Assyrian settlement at the site. After a hiatus following the level 7 occupation, the inhabitants rebuilt the level 7 tower, dug a square moat and built the first *dunnu*. The level 6 occupation at the site was the largest in the Late Bronze Age history of the site (cf. Chapter III).

<u>Clay and inclusions</u>
As in level 7 the majority of the ceramics has organic (chaff) inclusions (wares H, I, J, together 90.7%). The amount is a bit higher than in level 7, mainly due to the now only very rare occurences of wares with coarse mineral inclusions.[25] As in level 7 fine wares (A, B, C) are used in 9% of all cases.

In level 6 the clays that were used seem to be a little more homogeneous in composition than in level 7. Now only 2.2% of all sherds were noted to have more (calcium or sand) inclusions than the average. This is especially true for wares H (around 10% contain many calcium inclusions) and C (approximately 10% has many sand inclusions). The only coarse-ware sherd contains organic inclusions as well as coarse calcite consisting of very coarse, large (6 mm) angular white and grey calcite/stone particles. It is not clear what the original vessel shape of this coarse body sherd was.

Only one sherd from level 6 was analysed in thin section.[26] This is a sherd from a grey-burnished carinated bowl with straight walls above the carination (type 113), with impressed circle decoration (Fig. IV.17.b). This bowl was most probably made locally (see Appendix D).

			No.	%
A		Calcium	18	2.1
B		Calcium and sand	48	5.7
C		Fine sand	11	1.3
	X subtotal	(n=242; 10.5%)		9.1
H		Organic inclusions and calcium	38	4.5
I		Organic inclusions and calcium and sand	687	81.6
J		Organic inclusions and fine sand	39	4.6
	Y subtotal	(n=2040; 88.9%)		90.7
D		Coarse sand	(1)	
E		Coarse calcite	(2)	
K		Organic inclusions and coarse sand	(2)	
L		Organic inclusions and coarse calcite	1 (2)	0.1
	Coarse total	(n=7; 0.3%)	1	0.1
Total			842	100%

Table IV.10: Inclusions in level 6.

[25] In the collection described by myself only one coarse-ware sherd was found (ware L, having both coarse calcite and organic inclusions, 0.1%), while the collection described by others contains 3 examples of wares D and E (0.1 %) and 2 examples of ware K (0.1%).

[26] M13 2-30: P93-184 (sample no. 16 in Appendix D); a sample of 15 sherds was selected for thin-section and chemical analysis by Ewout Koek, coming mostly from level 6, described in 2005 and not included in this thesis. These sherds will be analysed by Ildiko Boesze in the framework of her thesis on the Middle Assyrian ceramics from Tell Chuera (Boesze in prep.).

Values for the corpus described by the author (values for all level 6 sherds are added between brackets).

Shapes

In level 6 two-thirds of all rims belong to bowls, while the group of jars is the second-largest shape group. The number of pots has decreased when compared to level 7, mainly due to the almost complete absence of cooking pots in level 6. The number of goblets and pot stands has increased.

	No.	%	% of rims
Bowls	1079	47.0	66.0
Pots	129	5.6	7.9
Jars	255	11.1	15.6
Goblets	115	5.0	7.0
Pot stands	49	2.1	3.0
Strainers	7	0.3	0.4
Bottles	1	0.0	0.0
Trays	2	0.1	0.1
Loose base fragments	595	25.9	
Diagnostic bodysherds and others	65	2.8	
Total	2295	100%	100%

Table IV.11: Shapes in level 6.

The number of different rim types increased sharply to 52 different types. This is probably mainly due to the sharp increase of the sample size rather than to an increase in diversity, since many of the new types occur only once or twice (cf. Table V.20: the diversity actually decreased in level 6). There are 23 new types in level 6 that did not occur in level 7 (bold underlined in Table IV.17). Moreover, ten types did occur before in level 7, but either had a slightly different shape from their counterparts in level 6, or occurred in such small numbers compared to the later levels that they may be considered intrusive in level 7. This is the case for types 113, 121, 145, 211, 221, 222, 311, 312, 321 and 323. One rim type, 1416, occurs only in level 6 (shaded in Table IV.17). For rim types 118, 1217, 1410, 1412, 1413, 2110, 227 the majority comes from level 6, while isolated other sherds of the same types occur either in mixed contexts or in contexts to which no level has been assigned yet, or in other Middle Assyrian levels (5 or 4).

In level 6 the "top ten" of the most popular rim types is made up of the following types: 111 (41.8%), 131 (7.5%), 322 (6.9%), 311 (4.4%), 411 (3.9%), 421 (3.2%), 221 (3.1%), 611 (2.8%), 132 (2.3%), 222 (2.1%). These ten types, all typical of the Middle Assyrian period, together form 78% of all rims in level 6. Notably, rounded bowls (types 122, 123, 125), so popular in level 7, still occur in level 6 but are not represented in the "top ten" anymore. Instead, carinated and straight-sided bowls (types 111, 131, 132), jars with simple rims and with rolled rims (311, 322), and goblets (411, 421) are now the most popular shapes.

	No.	%
Carinated bowls	744	68.9%
Rounded bowls	75	6.9%
Straight-sided bowls	166	15.4%
Deep bowls	92	8.5%
Total	1079	100.0%

Table IV.12: Different bowl shapes in level 6.

Bowls

In the Middle Assyrian levels, starting from level 6, carinated bowls become far more popular than rounded bowls. Now almost 70% of all bowls is of the carinated type. The most popular shape among bowls (n=681, or 41.5% of all rims, 63.1% of all bowl rims, 91.5% of all carinated bowls) is the carinated bowl type 111. This shape occurs in three distinct size groups: 111a (small bowls, n=178; 26.1% of type 111),[27] 111b (middle-sized bowls, n=162; 23.8% of type 111) and 111c (larger bowls, n=322; 47.3% of type 111).[28] The

[27] This subgroup is similar to the "Knickwandnäpfe" at Tell Sheikh Hamad, cf. Pfälzner 1995.
[28] These two subgroups are similar to the "Standard Knickwandschalen" at Tell Sheikh Hamad; cf. Pfälzner 1995.

small type 111a bowls are characterized in level 6 by rounded or often pointed or thin rims, and rather straight walls above the carination (figs. IV.12, 13). Concave walls above the carination do occur, but in small numbers only (fig. IV.12.ak-av). The carinations themselves are generally not very sharp, and are often placed in the lower half of the bowl. Squarish rims are rare in these bowls, as are rims thickened on the outside. The middle-sized and larger bowls 111b and 111c sometimes have rounded rims, but more often rims that are squarish or triangular in section (fig. IV.14.p-ad). A few rims of larger bowls have rather pronounced but rounded carination and a rim slightly thickened on the inside (fig. IV.16.g-h, m, comparable to a rim from Tell Hammam et-Turkman VIIIB, Smit 1988: pl. 154 no. 8). Carinated bowls type 112 are basically a variant of the more common type 111 bowls. The rims of the type 112 bowls are strongly bent over outwards (fig. IV.16.o-q). They are new in level 6, just like two single examples of types 114 (an almost rounded bowl with the rim bent over outwards in a sharp carination) and 118 (a carinated bowl with relatively thick wall and pronounced but rounded carination, and thickened rounded rim) (fig. IV.17.k, IV.17.l-n). No comparisons were found for the latter two shapes.

Carinated bowls with a straight, rather high part of the wall above the carination (type 113, fig. IV.17.a-j) occur in all levels at Sabi Abyad, but are most popular in the Middle Assyrian levels 6 to 3 (with the maximum in level 5). They are not only more numerous than in level 7 (13.2% of this rim type occurs in level 6, against 1.2% in level 7), but they also differ in shape details. In level 6 these bowls have simple rounded or slightly squarish rims, or sometimes rims slightly thickened on the outside. About 12% have burnished surfaces, and about a quarter of these bowls is grey/black or dark-brown in colour and decorated with impressed circles on the wall, sometimes combined with impressed triangles on the rim that were originally filled with a white gypsum/lime paste (fig. IV.17.b,d; see also below; a good comparison comes from Tell Hammam et-Turkman VIIIA, Smit 1988: pl. 153 no. 88). Other bowls are buff or orange in colour. These bowls always have ring bases. A thin-section sample (no. 16 in Appendix D, fig. IV.17.b) showed that this bowl was probably made locally.

The number of rounded bowls decreased sharply in level 6, to only 6.9% of all bowls. There are now six different rounded-bowl rim types, two of which are new in level 6 (types 127 and 1217[29] (fig. IV.18.e-f); furthermore, these two types occur in mixed contexts or level 5 only). Most rounded bowls still belong to types 122, 123 and 125, but these types together now only represent 5.6% of all bowls (compared to 41.3% in level 7). These bowls are now completely undecorated, and the painted red rims characteristic for level 7 no longer occur (fig. IV.18.a-d). Rounded bowls with a pinched rim (type 121) occur in all levels, but are most popular in levels 6 to 3 (with the maximum in level 5). Two examples of this type occurred already in level 7, but 9.8% of all 121 bowls occurs in level 6 and this number increases later in level 5.

As in level 7, about 15% of all bowls is of the straight-sided type. In level 6 two new types appear: 134 and 135 (fig. IV.20.m-p, IV.20.q). The large majority of straight-sided bowls, however, is made up by bowl types 131 with outward-sloping rim (11.3% of all bowls, 73.5% of all straight-sided bowls, fig. IV.18.g-l, IV.19) and 132 with outward-sloping rim thickened on the inside (3.4% of all bowls, 22.3% of all straight-sided bowls). Type 131 rims are smooth, sloping outward, thickened on the outside and sometimes also a bit thickened on the inside, with a generally triangular section. Some rims are a bit “rilled” on top (fig. IV.18.j, IV.19.c, g). Type 132 rims are thickened on the inside, with mostly rounded or pointed shape, and triangular sections (fig. IV.20.a-h).

Deep bowls begin to occur in larger numbers in level 6. In level 7 there were a few examples of deep bowls, but although the types are similar to several types in level 6, the vessels show minor differences in rim shape. In level 6 there are 13 different types of deep bowls, a sharp increase compared to level 7. Especially characteristic are deep bowls type 141 and 142, with square or rectangular hammer rims running horizontally or sloping inward respectively (30.8% and 13.0% of all deep bowls respectively, fig. IV.21, IV.22.a-c), new in level 6 and typical for the Middle Assyrian period. Other typically Middle Assyrian shapes are type 143 (15.2% of all deep bowls, fig. IV.22.d-e), with an outward-sloping rim strongly thickened on the inside and outside, and large bowls type 145 (14.1% of all deep bowls, fig. IV.23), with a thickened upper wall and rim. Type 145 bowl P96-118 is a lot less deep than its later counterparts, which are generally more closed in shape (fig. IV.23.a). The decorations typical for these bowls, incised wavy lines and applied rope bands, occur from level 6 onwards with this type. New type 148 (fig. IV.24.a-b) occurs in small

[29] No comparisons could be found for the type 1217 bowl, of which another identical example was found in square L12 (P93-376, no level assigned yet).

numbers and is only shortlived, appearing mainly in levels 6 and 5, just like types 1410, 1411, new type 1414 with a rounded rim thickened on the outside and often incised decoration on the upper wall, and new type 1415 with outward-sloping, squarish hammer rim (fig. IV.24.c-d, IV.24.e-f, IV.25.a-c, IV.25.d). Type 1413 (fig. IV.24.h), with a thickened ridge just under the rim, and type 1416 (fig. IV.25.e), with a strongly bent-over rim, are unique in level 6. All these types (148 – 1416) are as yet without comparisons from other sites.

Pots

In level 6 almost one quarter of all pots is of the closed type, while three-quarters has straight walls. This is a marked contrast with level 7, where most pots were of the closed type. Although there was one example of a closed pot with inward-sloping rim in level 7, it was made of cooking ware and was different in shape from the same type 211 pots in level 6. Type 211 pots in level 6 are now globular in shape, with rounded rims sloping inward (fig. IV.25.f-i). Most closed pots in level 6 are of type 212, with a rim thickened on the outside. Pot P96-487, with one ribbed handle (or originally perhaps two?) and incised decorations, attracts the attention, and is closely comparable to a similar pot in level 5 (fig. IV.26.a, cf. fig. IV.64.g). This pot, unknown at other Middle Assyrian sites, is reminiscent of shapes found at Late Bronze Age sites along the Euphrates, although close comparisons have not been found.[30] Type 2110, closed pots with a very low, upwards-bent pointed rim, occurs only once in level 6 (fig. IV.26.d) and once in level 5. In contrast with level 7, there are only few possible cooking pots among the level 6 closed pots (fig. IV.26.b, c).

Most pots in level 6 have straight walls and an open shape (75.9% of all pot rims). The majority is of type 221 (40.6% of all pots, 53.1% of all straight-walled pots), with a rectangular, horizontal hammer-shaped rim (fig. IV.26.f-i). The large variant of this type (221b) belongs to a large storage vessel (fig. IV.27.a). This type (221b) is the straight-walled counterpart of deep bowls type 145. Next are the type 222 pots (28.1% of all pots, 36.7% of all straight-walled pots), with similar hammer-shaped rims that slope inwards (fig. IV.27.b-e, IV.28.a-d). Both these types (221 and 222) are comparable to the deep bowls type 141 and 142 respectively, and often the distinction between the two classes is difficult to make. The 221 and 222 pots are characteristic of the Middle Assyrian assemblage at Sabi Abyad, and although examples of these types occur in all levels, the majority occurs in levels 6 to 4. Type 226, a large thick storage-vessel rim thickened both inside and outside, is new in level 6 and from now on appears in all later levels, with a maximum in level 4. Type 227 is a rare shape at Sabi Abyad and until now without comparison. Two examples occur in level 6 (fig IV.27.g).

Jars

In level 6 the number of jars decreased slightly compared to level 7, and comprises now about 15% of all rim sherds. However, it is the second-largest shape group. A marked difference with the level 7 jars is that in level 6 most jars have no neck and a “ribbon rim” sitting directly on the shoulder of the vessel (around 55% of all jars, compared to 44% of jars with a clear neck).

Among jars with a clear neck, types 311 and 312 with simple rounded rims are most popular (65.5% and 15% of all jars with neck, 29.2% and 6.7% of all jars, respectively) (fig. IV.28.e-j, fig. IV.29.a-b). Although isolated examples of these types occurred in level 7 they are characteristic of the Middle Assyrian assemblages, and are most popular in levels 6 to 4. As in later levels, the 311 jars can be divided into two size groups, small and large. They have either ring bases or disc-shaped bases. Other jars with necks belong to types 315 (13.3% of jars with necks, fig. IV.29.f-h) and 318 (3.5% of jars with neck, fig. IV.29.i-k), with squarish rim either horizontal or sloping inwards. These types already occurred in level 7 and continue into Middle Assyrian times. The type 314 jar in fig. IV.29.e has a possible comparison in a jar from Tell Shioukh Fawqani (Bachelot 1999: pl. 10 no. 2).

In the group of jars without a neck, the oval rim with vertical or slightly rounded exterior (322) is still most popular (80.7% of all jars without neck), while smaller numbers of rims with concave sides (321) or with sloping sides (323) occur (approximately 10% each). In 321 rims the concave part of the ribbon rim starts rather low, while the rim in general is oriented vertically (fig. IV.29.l-p, especially IV.29.n). Type 322 rims are more oval and rounded than in level 7, and sometimes a bit triangular in section (fig. IV.30, IV.31.a-

[30] Tell Fray (Pfälzner 1995: taf. 185a), but with mineral inclusions only; Emar Oberstadt phase II (Finkbeiner et al. 2001: abb. 11, i), but not decorated like the Sabi Abyad pots; Hadidi (Dornemann 1981: fig. 8 no. 5), but that one is much bigger.

d). A remarkable type 322 jar in level 6, found in the potter's workshop in square O12, is a kiln waster with a completely warped rim (fig. IV.30.h). Jars with outward-sloping rim (type 323) are depicted in fig. IV.32.a-e.

Goblets
The goblets in level 6 are of the typical Middle Assyrian type. More than half (55%) of all goblets is of the V-shaped type, while about 45% is of the S-shaped type. The rims of V-shaped goblets are simple rounded or slightly pointed; bases are the typically Middle Assyrian nipple bases (base type 711, fig. IV.33.a-n). The nipples are either smoothly triangular or very small and rounded in shape. The V-shaped goblets in level 6 seem to be more slender than the goblets from levels 5 and 4. Two V-shaped goblet bases are painted with horizontal red bands (fig. IV.33.i-j). S-shaped goblets have simple rounded rims, and a rather globular shape. Only the upper part of the rim is bent outwards, creating a rather low "neck" (fig. IV.33.q-v, especially IV.33.q, r). S-shaped goblets always have knob bases (base type 712).

Strainers and pot stands
These shapes were not found in level 7, but appear in level 6 for the first time. They then occur in all subsequent levels, but again mostly in levels 6 to 4. In level 6 strainers are rounded bowl-shaped vessels with holes pierced through the walls, and rounded or squarish, slightly bevelled rims (fig. IV.33.z-aa). Pot stands in level 6 generally have triangular rims bent outwards, rather smoothly rounded in shape. The walls are either straight and conical, or more concave (fig. IV.34.a-l).

Pilgrim flasks and special shapes
New in level 6 are the so-called "pilgrim flasks", globular vessels made in a particular technique (cf. chapter V), with a narrow neck and handle. One flask was found in level 6 (fig IV.33.ab), but the majority was found in level 5. The level 6 example is a bit more squat in shape than the level 5 flasks. A miniature burnished globular jar, a kind of drinking bottle with a spout for a base, and a rough platter are among the more special types (fig. IV.31.e-h).

Base type	No.	%
?	3	0.4%
611	13	1.5%
711	84	9.7%
712	39	4.6%
721	30	3.5%
731	340	39.7%
741	340	39.7%
751	7	0.8%
Tray	1	0.1%
Total	857	100.0%

Table IV.13: Base types in level 6,
loose bases and complete shapes included.

Bases
In level 6 flat bases and ring bases are represented equally, both comprising about 40% of all bases. Ring bases are rounded or triangular in shape. With the latter, the ring is sometimes aligned with the vessel wall and cannot be seen from the outside when the vessel is standing, and the base is thinner than the lower vessel wall (as in fig. IV.18.l). Holes in bases appear in ring bases as well as in flat bases. They are sometimes made before firing or sometimes drilled after firing, both in small carinated bowls (fig. IV.13.y, IV.35.a) and in large pots (fig. IV.23.a, IV.35.b, k). In the latter case, the hole is sometimes closed again with a gypsum or bitumen plug.

Surface treatment and decoration
In level 6 only three fragments were noted to have a slip applied to the surface (0.1% of all diagnostics). A carinated bowl (P92-93, fig. IV.15.o) and a type 721 pedestal base are covered in a whitish slip, whereas a ribbon-rim jar fragment (K10 43-94:8, fig. IV.31.c) with horizontal incisions on the shoulder perhaps has a blackish slip. The red-slipped sherds from level 7 no longer occur. The rest of the pottery is just smoothed.

Burnishing hardly occurs in level 6. Thirteen fragments, or 0.6% of all diagnostics, are burnished. These include a carinated bowl burnished on the inside only, four type 113 carinated bowls with straight walls above the carination, a type 211 closed globular pot, a jar rim and a miniature vessel (fig. IV.17.a-d, IV.24.f, IV.25.g, IV.31.e).

While decoration was already rare in level 7, the amount of decorated sherds drops further in level 6. Now only 3.9% (n=90) of all diagnostics show some kind of decoration. In level 6 as in other Middle Assyrian levels, decoration is generally of a very simple nature.

	No.	%
Painted horizontal lines	12	13.3%
Painted other	2	2.2%
Total 15.5%		
Incised horizontal line(s)	13	14.4%
Incised wavy lines(s)	6	6.7%
Incised horizontal+wavy line(s)	7	7.8%
Total 28.9%		
Applied	3	3.3%
Applied horizontal band(s)	20	22.2%
Applied wavy band(s)	5	5.5%
Total 28.0%		
Incised + applied, horizontal	1	1.1%
Incised + applied, wavy	3	3.3%
Incised + applied, horizontal + wavy	5	5.5%
Total 10.0%		
Impressed white-filled decoration	13	14.4%
Total 14.4%		
Total decorated	90	100.0%

Table IV.14: Decoration in level 6.

About 15% of all decorated sherds are painted. Twelve fragments show painted horizontal lines. In three cases these are dark blackish lines, possibly painted with bitumen on body fragments. All other nine fragments are V-shaped goblets (n=5), one S-shaped goblet and nipple bases (n=3), which show dark-red painted bands (fig. IV.33.i-j). Other painted sherds include a body fragment that was painted solidly black on the outside, and a body fragment with bitumen lines applied criss-cross. The bodysherds in fig. IV.32.f and h have painted signs on their outsides and are discussed in Chapter V and Appendix E. The majority of decorated sherds in level 6 (67.0%) show incised or applied decoration, or a combination of the two. This is a marked difference with level 7, where most decorated sherds were painted. Simple designs including horizontal and wavy lines are used. Horizontally incised lines are used on deep bowls, ribbon-rim jars (type 322, on the shoulder) and closed pots (type 212) (fig. IV.21.d, IV.31.c). Wavy incised lines are used on a large, deep type 145 bowl, closed type 212 pots and straight-sided type 221 pots, as well as on a so-called “grain measure” type 225 pot (fig. IV.23.a, d, IV.26.a). Combinations of horizontal and wavy incised lines are used mainly on type 221 straight-sided pots, as well as on a deep bowl type 1414 (fig. IV.25.b). Applied horizontal bands are sometimes simple but more often they take the shape of ropes, made by impressing the band with the thumb (fig. IV.23.a). Combinations of incised and applied decoration also occur. A special and very easily recognizable decoration technique is formed by double impressed circles, often accompanied by impressed or excised triangles on the rim. The impressions are then filled with a white gypsum paste, creating a striking decorative effect. At Sabi Abyad this decoration is new in level 6 and was used in 14% of all decorated sherds, mainly on type 113 carinated bowls (fig. IV.17.b, d) and once on a fragment of a “grain measure”. This type of decoration is not found at contemporary Tell Sheikh Hamad, Tell Barri, or at Tell Brak Mitanni level HH2 or Middle Assyrian level HH1. Examples of this decoration from Brak (mostly HH5, cf. Oates et al. 1997: nos. 588-590) and Rimah (C5, C3, Postgate et al. 1997: pl. 100) come from much earlier contexts and the vessels differ in shape from those found at Sabi Abyad. One good comparison comes from Hammam VIIIA, probably also much earlier (Smit 1988: pl. 153 no. 88). Perhaps we are dealing here with a local tradition that continued to be made during the presence of the Assyrians in the region, or with heirlooms preserved from an earlier age.[31]

Firing

As with clay and inclusions, the discussion of the firing of the level 6 ceramics will be based on the collection of 842 diagnostics described by myself only.

The greater majority, more than 80% of all diagnostics, was fired at medium temperatures. Of these, more than 90% is made of wares with organic inclusions (wares H, I, J), completely in line with the general distribution of ware groups (see above). In comparison with level 7 the number of sherds fired at relatively high temperatures has increased to about 15%. Interestingly, the amount of fine wares (wares A, B, C) among sherds fired at higher temperatures has decreased to 6.4%, indicating that the common wares with organic inclusions are more often fired at higher temperatures than in level 7. The number of sherds fired at relatively low temperatures is rather small, most probably due to the absence of cooking wares. Indeed, 83.9% of these sherds is made of clay with organic inclusions (wares H, I, J). Interestingly, this group includes five sherds of fine ware (ware B and C). However, most of the fine-ware sherds (wares A, B, C) were fired at medium (83.1%) or higher (10.4%) temperatures.

	No.	%
High	125	14.8%
Medium	686	81.5%
Low	31	3.7%
Total	842	100.0%

Table IV.15: Relative firing temperatures in level 6.

Lime spalling was only recorded twice, both in base fragments made of ware I, fired at medium temperatures.

	No.	%
Oxidizing	768	91.2%
Incompletely oxidizing (grey core)	61	7.2%
Reducing	13	1.5%
Total	842	100.0%

Table IV.16: Firing atmosphere in level 6.

In level 6 a large majority (91.2%) of the ceramics was fired in completely oxidizing kiln circumstances. Fine-ware sherds (wares A, B, C) were fired only in completely oxidizing circumstances, with one exception, showing a grey core and two fragments having been fired in reducing circumstances yielding a grey surface and core colours (one goblet fragment and one type 113 bowl body fragment decorated with impressed circles). Among sherds fired in oxidizing circumstances, the majority has buff (37.8%), greenish (17.8%) or orange (17.1%) surface colours. Sherds fired in incompletely oxidizing circumstances, showing grey core colours, predominantly show orange (72.1%) or buff (13.1%) surface colours. Only a very small percentage of all diagnostics was fired in reducing circumstances yielding dark-grey or black colours throughout the sherd, and these comprise mainly carinated bowls type 111.[32]

[31] In this context it is remarkable that the Assyrians at Sabi Abyad also kept a complete Halaf jar (P93-155) once, which they probably came across while digging in one of the prehistoric tells of Sabi Abyad, as well as several fossils of sea-urchins and pecten shells (e.g. V98-39).

[32] However, thin-section analyses (cf. sample no. 16, Appendix D) have casted doubts on whether these sherds were really fired in reducing circumstances, or rather in incompletely oxidizing circumstances at low temperatures.

Table IV.17: Level 6, proportions of ware per type, frequencies of types.
Shaded types occur only in level 6. Bold underlined types are new in level 6.
Total (1): the collection described by myself only.
Total (2): the complete collection from level 6.

	A	B	C	H	I	J	L	Total (1)	Total (2) no.	% from rims
111		2 0.9%		21 9.1%	203 87.5%	6 2.6%		232 100.0%	681	41.5%
111?					1 100.0%			1 100.0%	19	1.1%
112					5 100.0%			5 100.0%	8	0.5%
113		1 5.9%			14 82.4%	2 11.8%		17 100.0%	33	2.0%
113?					1 100.0%			1 100.0%	1	0.1%
114					1 100.0%			1 100.0%	1	0.1%
118					1 100.0%			1 100.0%	1	0.1%
121				1 33.3%	2 66.7%			3 100.0%	12	0.7%
122					1 100.0%			1 100.0%	8	0.5%
123					3 75.0%	1 25.0%		4 100.0%	20	1.2%
123?									1	0.1%
125					4 100.0%			4 100.0%	32	2.0%
127									1	0.1%
1217		1 100.0%						1 100.0%	1	0.1%
131				2 4.0%	46 92.0%	2 4.0%		50 100.0%	122	7.4%
132					14 100.0%			14 100.0%	37	2.3%
134					4 100.0%			4 100.0%	5	0.3%
135						1 100.0%		1 100.0%	1	0.1%
13?									1	0.1%
141					10 90.9%	1 9.1%		11 100.0%	28	1.7%
141?					1 100.0%			1 100.0%	1	0.1%
142					8 100.0%			8 100.0%	12	0.7%
143					2 66.7%	1 33.3%		3 100.0%	14	0.9%
144									4	0.2%
145					5 100.0%			5 100.0%	13	0.8%
148					1 100.0%			1 100.0%	1	0.1%
148?									1	0.1%
1410									4	0.2%

	A	B	C	H	I	J	L	Total (1)	Total (2) no.	% from rims
1411					2 100.0%			2 100.0%	3	0.2%
1412									1	0.1%
1413									2	0.1%
1414					3 100.0%			3 100.0%	3	0.2%
1415									1	0.1%
1416					1 100.0%			1 100.0%	1	0.1%
14?					1 100.0%			1 100.0%	3	0.2%
All bowls		4 1.1%		24 6.4%	335 88.9%	14 3.7%		377 100.0%	1079	66.0%
2?									3	0.2%
211					2 66.7%	1 33.3%		3 100.0%	6	0.4%
212					5 100.0%			5 100.0%	18	1.1%
213					1 100.0%			1 100.0%	2	0.1%
2110	1 100.0%							1 100.0%	1	0.1%
221				2 16.7%	10 83.3%			12 100.0%	52	3.2%
222					12 92.3%	1 7.7%		13 100.0%	36	2.2%
225					1 100.0%			1 100.0%	5	0.3%
226									3	0.2%
227									1	0.1%
2211									1	0.1%
All pots	1 2.7%			2 5.4%	32 86.5%	2 5.4%		37 100.0%	129	7.9%
311				2 6.3%	29 90.6%	1 3.1%		32 100.0%	74	4.5%
312					4 80.0%	1 20.0%		5 100.0%	17	1.0%
313					1 100.0%			1 100.0%	2	0.1%
314			1 100.0%					1 100.0%	1	0.1%
315			1 16.7%		5 83.3%			6 100.0%	15	0.9%
318					4 100.0%			4 100.0%	4	0.2%
321					6 100.0%			6 100.0%	13	0.8%
322				5 9.8%	43 84.3%	3 5.9%		51 100.0%	113	6.9%
323					10 100.0%			10 100.0%	14	0.9%
All jars			2 1.7%	7 6.0%	102 87.9%	5 4.3%		116 100.0%	255	15.6%
411	4 33.3%	6 50.0%	2 16.7%					12 100.0%	63	3.8%

	A	B	C	H	I	J	L	Total (1)	Total (2) no.	% from rims
421	5	15	3		1			24	52	3.2%
	20.8%	62.5%	12.5%		4.2%			100.0%		
511					3	1		4	7	0.4%
					75.0%	25.0%		100.0%		
611					27	2		29	47	2.9%
					93.1%	6.9%		100.0%		
911									1	0.1%
tray									1	0.1%
mini			1					1	1	0.1%
			100.0%					100.0%		
?					1	1		2	9	0.5%
					50.0%	50.0%		100.0%		
All rims									1639	100.0%
										% of bases
611					10			10	13	1.5%
					100.0%			100.0%		
711	7	12	1					20	84	9.8%
	35.0%	60.0%	5.0%					100.0%		
712	2	9	1					12	39	4.6%
	16.7%	75.0%	8.3%					100.0%		
721		2		2	10			14	30	3.5%
		14.3%		14.3%	71.4%			100.0%		
731		1		5	73	3		82	340	39.7%
		1.2%		6.1%	89.0%	3.7%		100.0%		
741		2	1	2	161	10		176	340	39.7%
		1.1%	0.6%	1.1%	91.5%	5.7%		100.0%		
751			1		1			2	7	0.8%
			50.0%		50.0%			100.0%		
All bases	9	27	4	9	255	13		317	853	100.0%
	2.8%	8.5%	1.3%	2.8%	80.4%	4.1%		100.0%		
Loose bases	8	23	2	4	169	12		218	595	-
	3.7%	10.6%	0.9%	1.8%	77.5%	5.5%		100.0%		
Other diagn.			1	1	18	2	1	23	62	-
			4.3%	4.3%	78.3%	8.7%	4.3%	100.0%		
Total	18	48	11	38	687	39	1	842	2295	100.0%
	2.1%	5.7%	1.3%	4.5%	81.6%	4.6%	,1%	100.0%		

Level 5 (figs. IV.36 – IV.98)

A total of 7614 diagnostic sherds was securely attributed to level 5. In level 5 the settlement seems to have contracted largely to within the *dunnu's* fortress walls. The main functions of the *dunnu* remained similar to its functions in level 6, but it is level 5 for which we have most information on the daily business at the *dunnu* from cuneiform texts.

Clay and inclusions

The percentages of the different ware groups in level 5 are identical to those of level 6. As before, the majority of sherds have organic inclusions (ware group Y, wares H, I, J, together 90.4%). Fine wares (ware group X, wares A, B, C and now also some sherds without any inclusions, N) were used in 9.1% of all cases. In level 5 there is a small amount of pottery with coarse sand/quartz or calcite inclusions (wares D, E, F, together only 0.35%), almost exclusively closed pots (cooking pots, fig. IV.62) and an even smaller amount of relatively coarse pottery that has organic as well as coarse mineral inclusions (wares K, M). Ware K includes two pots (possibly cooking pots? Fig. IV.63.d), a type 111 carinated bowl rim and a course tray. Ware M includes two jar rims (fig. IV.75.i). Three sherds have unidentified inclusions, possibly crushed sherds or shell. They are a type 721 base, a type 111 carinated bowl rim, and a small jar with a simple rim but with a rounded base (fig. IV.74.a), which perhaps was made in a different tradition not at Sabi Abyad.

The composition of the clays, macroscopically viewed, is rather homogeneous. In wares A, B, C, H, I and J together it was noted for only 4.7% of all cases that the amount of mineral (calcium, sand) or organic inclusions differed from the average. Especially wares A and H often seem to contain many calcium inclusions (A: 6.9%, H: 13.2%).[33] Perhaps the raw material in these cases was slightly different from the other ware A and H sherds. The sherds of ware C that contained a lot of sand inclusions (13.5%) were mainly fragments of so-called "pilgrim flasks", which also differ from the rest of the corpus regarding the shaping techniques used. They have perhaps been imported to the site (see below and Appendix D).[34]

Twelve sherds from level 5 were studied in thin section (see Appendix D, sample nos. 06, 07, 08, 12, 13, 23, 24, 25, 31, 45, J728 and J730). The results are discussed below with each shape, but it is remarkable that five of the samples were of a non-local origin, mostly including the more special shapes.

			No.	%
A		Calcium	130	1.7
B		Calcium and sand	464	6.1
C		Fine sand	89	1.2
N		No visible inclusions	8	0.1
	X subtotal			9.1
H		Organic inclusions and calcium	642	8.4
I		Organic inclusions and calcium and sand	5891	77.5
J		Organic inclusions and fine sand	319	4.2
G		Organic inclusions only	19	0.3
	Y subtotal			90.4
D		Coarse sand	23	0.3
E		Coarse calcite	3	0.04
F		Shell (?)	1	0.01
	subtotal			0.35
K		Organic inclusions and coarse sand	4	0.1
M		Organic inclusions and grog (?)	2	0.01
?		Unidentified inclusions	3	0.04
Total *			7598	100.0

Table IV.18: Inclusions in level 5.
* without 16 cases where inclusions could not be coded.

[33] In the case of ware A, these are mainly goblet fragments. In the case of ware H, all common shapes are represented in this group.

[34] This group furthermore includes type 124 bowl P97-171 (fig. IV.48.g) and type 212 pot P93-446 (fig. IV.63.c), both of which are different in shape from the Sabi Abyad corpus and may have come from elsewhere.

Shapes

In level 5 the number of bowls decreases slightly (to 54.4% of all rims), largely in favour of an increase in the number of jars and pot stands. The number of pots has remained more or less the same.

	No.	%	% of rims
Bowls	2918	38.3	54.4
Pots	390	5.1	7.3
Jars	1466	19.3	27.3
Goblets	309	4.1	5.7
Pot stands	234	3.1	4.3
Strainers	28	0.4	0.5
Bottles	18	0.2	0.3
Trays	5	0.1	0.1
Loose base fragments	1994	26.2	
Diagnostic bodysherds and others	252	3.3	
Total	7614	100.0	100.0

Table IV.19: Shapes in level 5.

The number of different rim types increases a bit to 65 types. Since the sample size has almost tripled compared to level 6, this is only a relatively slight increase. Many types occur only once or twice, as was the case in level 6. Eighteen types are new in level 5 (bold underlined in Table IV.25), while five of the new types occur only in level 5 and no longer in later levels (types 219, 2214, 224, 233, 234, shaded in Table IV.25). Types 1217, 1412, 1413, 1416, 227 and 2211 were present in level 6 but no longer occur in level 5 (but sometimes isolated examples occur in mixed contexts, contexts for which no level has been assigned, or later levels). For rim types 114, 119, 124, 127, 1210, 1215, 135, 149, 1415, 1417, 151, 213, 215, 2110, 228, 324, 326, 333, and 911 the majority of fragments come from level 5, while isolated other examples of the same types occur in mixed contexts, contexts for which no level has been assigned yet, or in other levels.

In level 5 the "top ten" of the most popular rim types is made up of the following types: 111 (33.3%), 322 (12.6%), 311 (7.2%), 131 (6.5%), 611 (4.3%), 421 (2.9%), 411 (2.9%), 221 (2.6%), 141 (2.4%), 222 (2.2%). These ten typically Middle Assyrian types together form 76.8% of all rim types in level 5. In comparison with level 6 we see that ribbon-rimmed jars 322 and simple rim jars 311 become more popular in level 5, as well as pot stands. In contrast, straight-sided bowls type 131 decrease in popularity, while straight-sided bowls type 132 are not in the "top ten" anymore in level 5. Deep bowl type 141 has taken its place.

	No.	%
Carinated bowls	1915	65.6%
Rounded bowls	132	4.5%
Straight-sided bowls	475	16.3%
Deep bowls	381	13.0%
Other bowls	15	0.5%
Total	2918	100.0%

Table IV.20: Different bowl shapes in level 5.

Bowls

In level 5 the relative number of carinated bowls decreases a little bit, in favour of an increase in the number of straight-sided bowls and especially deep bowls. Still, carinated bowls form almost two-thirds of all bowls in the corpus. Rounded bowls further decrease in level 5, continuing the trend that was started in level 6.

The most popular bowl shape in level 5 is still the carinated bowl type 111, but its popularity has decreased slightly compared to level 6 (n=1786, 33.3% of all rims, 61.2% of all bowl rims, 93.3% of all carinated bowls). As in level 6, type 111 can be divided into three size groups: 111a (small bowls, n= 334; 18.7% of type 111), 111b (middle-sized bowls, n= 394; 22.1% of type 111), and 111c (larger bowls, n=962;

53.9% of type 111). Compared to level 6, there are slightly more larger bowls and slightly fewer small ones. In small type 111a bowls (fig. IV.36-38.a-w) rounded and pointed rims still occur. Rims a bit thickened on the outside, sometimes almost bead rims (fig. IV.38.l-r), and squarish or almost triangular rims (fig. IV.37.r-u) now occur in larger numbers as well. The wall above the carination can be straight, but is more often slightly concave. In addition in level 5 walls that are strongly concave above the carination (fig. IV.37.as-av, fig. IV.38.a-k) occur in larger numbers than before. Bases are flat or disc shaped. One exceptional type 111a bowl is P98-4, not only with a pedestal foot and an incision at the carination, but also painted in reddish rather irregular horizontal bands (fig. IV.38.w). In level 5 the rims of type 111b and type 111c bowls can be rounded, squarish or, less often, triangular in shape (fig. IV.38.x-aq, figs. IV.39, 40, 41, 42, 43.a-k). As to the shape of the carination and the wall above the carination, there seems to be a rather wide variety, ranging from very shallow carinations and straight walls above the carination (e.g. fig. IV.38.aj-am, fig. IV.40.p-aa) to rather pronounced carinations with strongly concave walls above the carination (e.g. fig. IV.40.e-g, fig. IV.42.t-u). Generally, the carination is placed rather high in the vessel wall. Both ring bases and flat bases occur in these bowls. One exceptional type 111c bowl fragment has a few cuneiform signs impressed on the outside vessel wall above the carination. Unfortunately, the reading is far from clear (fig. IV.43.j, see also Appendix F).

The second most often occurring carinated bowl in level 5 is the type 113 bowl with a straight and rather long wall part above the carination (fig. IV.43.r-t, figs. IV.44, 45). More than 30% of the bowls of this type occur in level 5. There these bowls have squarish or sometimes triangular rims that are thickened on the outside. Now 30% of these bowls (n=24) are burnished, a sharp increase compared to level 6. Burnished bowls can have a range of colours, just like their non-burnished counterparts: from cream and buff to orange, reddish or brown. However, grey bowls are always burnished. Six type 113 bowls (7.5%) are decorated with white-filled impressed circles, sometimes combined with triangles on the rim (fig. IV.45.i-m, cf. the discussion of this decoration above, level 6). The relative amount of this decorative style has decreased compared to level 6, but it still occurs in level 5. Bowls with this decoration are always burnished. Six type 113 bowls (7.5%) are decorated with horizontal incisions at the rim, the carination or both (fig. IV.45.a, e-h). All except one of them are burnished as well, and they are either grey or greenish, buff or cream in colour. This style of decoration in type 113 bowls did not occur in level 6 and is new in level 5. The type occurs at other Middle Assyrian sites (Tell Barri, Tell Brak, Kar-Tukulti-Ninurta) as well, and has been discussed in detail by D'Agostino (2005).[35] Three bowls are carinated, have a long and straight wall part above the carination but are different from the type 113 bowls.[36] Two of them have strongly thickened rims (fig. IV.45.o, q), and are comparable to a shape from Tell Rimah A1 (Postgate et al.1997: pl. 38 no. 181), while one has a rim thickened inside and outside and an extremely deep shape. The latter is also made of a rather fine paste with fine mineral inclusions (ware B; fig. IV.45.n). Carinated bowl type 119 is new in level 5 and so far without comparisons. The wall above the carination is vertical and slightly concave (fig. IV.45.r).

In level 5 the number of rounded bowls decreases further, to only 4.5% of all bowls. The variety of rounded bowls increases a little bit, there now being eight different rounded bowl types of which two are new in level 5 (types 124, 1215, fig. IV.48.f-i, t-w). The relative number of rounded bowls with pinched rim type 121 increases in level 5. Now they form 23.5% of all rounded bowls, compared to 16.4% in level 6 (fig. IV.46.d-m). They become characteristic of the Middle Assyrian rounded bowls. About equal shares are taken up by rounded bowls type 122 and 123 (25.7% and 26.5% of all rounded bowls, fig. IV.47.a-p, q-y, fig. IV.48.a-e), while rounded bowls with squarish, bevelled rim type 125 decrease in popularity (now 11.4% of all rounded bowls, fig. IV.48.j-m). In level 6 type 125 rounded bowls were still the most popular rounded bowl type, with 43.8% of all rounded bowls. New type 124 - shallow bowls with thin, rather straight walls and made of fine wares - almost all occur in level 5 and may therefore be typical of the period (fig. IV.48.f-i). However, comparisons[37] suggest an Iron Age or even later date, and perhaps these bowls must be considered intrusive in level 5. Bowl type 127, with an overhanging bent rim (fig. IV.48.n-r), no longer

[35] D'Agostino suggested that they may belong to a slightly different production tradition, although he does not elaborate on the nature of this other tradition or the reasons for the differences.
[36] They have been given type number "113?" for the moment.
[37] H8 27-225:4: Nimrud (Hellenistic; D. and J. Oates 1958: pl. XXIV no. 9), although it is mentioned that there are Assyrian prototypes for this particular shape; Nimrud (Neo-Assyrian; Oates 1959); Tille Höyük IV-V (Middle Iron Age; Blaylock 1999: fig. 4 no. 10); Jurn Kabir B (Iron Age; Eidem and Ackerman 1999: fig. 6 no. 7).

occurs after level 5 and is characteristic of levels 6 and 5. Comparisons for this shape can be found at Tell Brak, HH1 (Oates et al. 1997: fig. 181 nos. 7 and 28). New type 1215, with a triangular rim bevelled on the outside and a rather deep shape,[38] occurs mostly in level 5, with the only other example coming from level 3. The only type of decoration in rounded bowls is a horizontal incised line under the rim, once in a type 122 bowl (fig. IV.47.p) and once in a type 125 bowl. This is reminiscent of the use of the same decoration in type 113 carinated bowls (see above), and did not occur before in level 6.

The relative number of straight-sided bowls increases a little bit in level 5. As in level 6, almost three-quarters of straight-sided bowls is represented by type 131, with outward-sloping rim, while about one quarter is of type 132 with outward-sloping rim thickened on the inside. Rims of type 131 are similar to the same type in level 6, while some rims are a bit thinner or more pointed in level 5 (figs. IV.49, 50, e.g. fig. IV.49.n, o). In type 132, rims are generally still pointed on the inside, but more rounded rims are also present. New in level 5 are type 132 bowls where the rim is thickened just on the inside and not on the outside, and has a much-rounded triangular shape and rather thick vessel wall (fig. IV.51, e.g. fig. IV.51.l, o, p). A special example of a type 132 bowl is represented by a fragment of a glazed bowl (fig. IV.51.q). Together with a base fragment which may well be of the same type (fig. IV.51.r) and a peculiar cup with a handle (see below), this is the only occurrence of glazed pottery at Sabi Abyad. The results of the thin-section analyses of the base fragment (sample no. 23, Appendix D) showed that this bowl was most probably not made in the Balikh Valley. Type 136, a small bowl with straight sides and a squarish rim that is concave on top, occurs for the first time in level 5, but only one example has been preserved (fig. IV.52.f).

The number of deep bowls is still increasing in level 5. There are 12 different types of deep bowls, while types 149 and 1417 are new in level 5 (and as yet without comparisons). Types 141 and 142, with flat or inward-sloping hammer-shaped rims, are still most popular among deep bowls, and their share is similar as in level 6 (fig. IV.52.n-p, IV.53, fig. IV.54.a-d, 34.1% and 18.1% of all deep bowls respectively). Some rims are longer (e.g. fig.IV.53.g) while others are shorter (e.g. fig.IV.52.o) than their counterparts in level 6. As in level 6, these types should be compared to their cousins, pot types 221 and 222 (see below). Similarly, type 143 bowls (fig. IV.54.f-j, IV.55.a-e), with rims sloping outwards and thickened both inside and outside, are closely comparable to the larger type 131 bowls, although much deeper. In level 6 only represented by one fragment, the number of deep bowls with straight sides and simple rims (type 144, fig. IV.55.j-n) now increases in level 5. At Sabi Abyad they are rather typical for level 5, with only very few examples in level 4. Although the relative share of large deep bowls with thickened upper rim part (type 145) in level 5 stays similar to that of level 6 (now 15.2% of all deep bowls, fig. IV.55.f-i, fig. IV.56, 57), it is remarkable that more than 40% of all type 145 bowls occurs in level 5. Rim shapes vary considerably, ranging from simple squarish rims as thick as the thickened rim part (e.g. fig. IV.56.e), to triangular, thickened, sloping, or bevelled rims (e.g. fig. IV.55.g, fig. IV.56.a). As in level 6, these bowls should be compared with similar but more closed and sometimes much larger shapes in the group of large type 221(b) pots (see below). Many type 145 bowls are decorated with wavy incised lines, applied rope bands or both, all positioned below the thickened rim part. Deep bowl type 149, with a straight wall and a rectangular bevelled rim that slopes inwards, is new in level 5 and disappears again after level 4, and is therefore typical for these two levels (fig. IV.58.d). A very interesting example of a deep bowl type 1414 is fig. IV.59.a, with a hole made in the base and a strainer constructed upside down inside the bowl covering the base hole. The strainer was joined to the bowl by making incisions in the still wet inside wall, and then attaching the strainer to the bowl, while carefully smoothing the joint between them. A base sherd of a similar bowl was found in level 4 (fig. IV.113.k). This bowl must have been made for a particular purpose (see also Chapter VI and Appendix G). The bowl is also the only complete example of this particular rim type, therefore I do not exclude the possibility that this particular “strainer-bowl” was connected with this particular rim type and wavy incised decoration, and that more of these “strainer-bowls” existed in levels 6 and 4 as well. Rim type 1415, a deep bowl with outward-sloping, squarish hammer rim, occurs a bit more often than in level 6, but stops occuring after level 5 and is therefore typical for these two levels (fig. IV.59.e-g). Rim type 1417, comparable to type 144 but with a slightly thickened rim, is new in level 5 and no longer occurs after level 4 (fig. IV.59.h-j). The huge type 1411 bowl (fig. IV.58.f), of which one complete example was found in a mixed context (level 2/5) but which probably dates to level 5, looks like a gigantic carinated type 111 bowl. It was handmade in coils

[38] The only, weak, comparison that could be found for K9 105-409:4 (fig. IV.48.t) is at Tell al-Rimah C1 (Neo-Assyrian; Postgate et al. 1997: pl. 55 no. 486).

or slabs, and cracks at the carination occurred both before and after firing probably due to the weight of the thick vessel walls. These cracks were repaired with gypsum, while damages on the outside wall of the base were repaired with bitumen paste.

A very remarkable, easily recognizable and functionally interesting bowl type, new in level 5, is represented by the deep rounded bowls with a handle and a spout (type 151, fig. IV.60, IV.61.a-c). In level 5 there are eight examples of these, five of them completely preserved, one rim fragment comes from a mixed level 5/6 context, while two rims possibly belonging to this type come from level 5 and mixed context level 4/5. They are therefore characteristic for levels 6 to 4, if not for level 5 only. Thin-section analysis of one of them (sample no. 08, Appendix D, fig. IV.61.b) shows that it may have been made locally at the site, or at a neighbouring site. All except two[39] are carefully burnished on the inside and outside, and buff, greenish or orange in colour. In all examples the inside surface at the base up to about where the spout begins is heavily abraded, so that the burnished surface is removed. This is most probably due to the use of the vessels (see also Chapter VI and Appendix G). The bowls either have two handles on opposite sides, but not aligned with the spout (e.g. fig. IV.60.a), or one handle opposite the spout. The spout is sometimes made directly by squeezing the rim to a pointed funnel shape (e.g. fig. IV.60.a, b, e), or is a real spout attached just under the rim (e.g. fig. IV.60.d, IV.61.a). Even the rim, slightly squarish and a bit thickened, is exclusively used in this type. Interestingly, all complete ones and most fragments come from one area at the site only: squares K9, K8 and L8, suggesting that this area may have been functionally different from other areas at the site (cf. also Chapter VI). A possible comparison for this shape is the originally green-glazed, spouted bowl no. 1221 from Middle Assyrian Tell Rimah. The photograph shows that in this bowl, too, the glaze has completely disappeared from the inside of the bowl (Rimah level A1, Postgate et al. 1997 plate 101, plate 25a).

Pots

Exactly similar to level 6, three-quarters of all pots in level 5 have straight, almost vertical walls, while almost one quarter has a closed vessel shape. Among closed pot shapes, types 211, 212 and 213 are most popular in level 5.

Type 211 pots, with an inward-sloping rim and a globular or sometimes slightly squatted shape, are roughly divided into two size groups: 211a (with rim diameters smaller than 290 mm, see Appendix B) and 211b (for larger pots). Within both groups we can distinguish pots made of the common wares with organic inclusions (wares H, I) and the coarse wares with mineral inclusions (D, E). The latter are most probably cooking pots and are probably handmade, with carefully burnished surfaces. These cooking pots are sometimes decorated with elaborate curved applications below the small loop handles (fig. IV.62.a, b). This shape of cooking pot seems to be rather common in the Late Bronze Age, and finds close comparisons at, for example, Tell al-Rimah level C4 (Postgate et al. 1997: pl. 63 no. 589, 590, although without the curved applied handles). However, the curved applied handles are unique, and no comparisons have been found as yet. A sample from a type 211 cooking pot (sample no. J728, Appendix D, fig. IV.62.a) studied with thin-section analyses shows clearly that it was imported to the site from the region around Ugarit, although no close comparisons have been found yet. Among type 211 pots made from common wares with organic inclusions (fig. IV.61.d-k), there are several rather thick-walled specimens that show small, straight, solid lugs attached just below the rim (fig. IV.61.e-g). A close comparison for this form comes from Rimah level A1 (Postgate et al. 1997: plate 83 no. 961). A comparison for a type 211 pot without lugs was found in Shioukh Fawqani (Bachelot 1999: pl. 13 no. 1). One type 211 pot (fig. IV.61.k) is handmade, and larger and coarser in shape than its wheelmade counterparts.

The group of closed pots with rims thickened on the outside (212) can also be divided into two size groups: 212a for smaller ones, and 212b for large, often huge, storage vessels. The smaller type 212 (a) pots can be again divided into two groups: those made of the common wares with organic inclusions (wares H, I, J) or of finer wares with mineral inclusions (wares B, C) in one group, and pots with coarse mineral inclusions (ware D) in the other. The latter group comprises the cooking wares (fig. IV.62.c-m). These pots are possibly handmade, but they are seldom burnished (this is in contrast to the type 211 cooking-ware pots that are always burnished; in level 7, the closely comparable type 212a cooking-ware pots are rarely burnished, while the larger counterparts 212b often are burnished). One type 212 cooking pot was analysed

[39] One of these had a surface that was so damaged that it was impossible to decide if it had been burnished or not.

in thin section (fig. IV.62.i, sample J730, Appendix D), and proved to have been imported from elsewhere in the Jezira. The majority of type 212a pots are made of the common wares with organic inclusions (mainly ware I, fig. IV.63.a-j, IV.64), and are sometimes decorated with horizontal incisions or applied rope bands (cf. Shioukh Fawqani, Bachelot 1999: pl. 7 no. 4). A special example is a pot with two handles, an applied rope band and wavy incised lines on the upper vessel wall (fig. IV.64.g). This pot has an almost exactly similar counterpart in level 6 (fig. IV.26.a), but otherwise it does not occur at the site and is a rare shape.[40] Another very special pot is fig. IV.64.b, with a unique applied decoration representing what is possibly a dog following (or chasing?) a deer-like animal. Undertneath an applied band indicates a river, path or snake. Although no direct comparisons could be found for such a vessel, Caubet (1982: 75) describes the occurrence of applied animal decorations on Late Bronze Age ceramics from Emar, and this type of vessel may be part of a tradition present in the Euphrates region rather than a Middle Assyrian feature. A very interesting pot of a similar shape (fig. IV.64.a) has four applied human figures on the neck, and may belong to the same tradition. Unfortunately, this pot could not yet be assigned to a level with certainty. Applied decoration in the shape of a human being was also used on the bowl fragment in fig. IV.54.j, a unique straight-sided type 131 bowl with a small type 111 bowl attached to the rim. The small bowl is held by a person sitting on the rim. This fragment came from an upper fill in square J12 and could not be assigned with certainty to a stratigraphical level. Another type 212a pot that is definitely uncommon is fig. IV.63.c. It is a rather thin-walled vessel with an elaborate bevelled rim. To the side a cylindrical spout is attached. Inside the broken spout the space is filled with a gypsum paste in which two holes have been pierced. To the side of the vessel a handle was attached but it has now broken off. The vessel was made of a heavily sand-tempered clay, different from the other pots in this shape class and from most of the ceramics at Sabi Abyad in general. We may therefore be dealing with an imported pot. A comparison could be a pot from Tell Hadidi on the Euphrates (Dornemann 1981: fig. 4 no. 4 and fig. 10 no. 7, although the rim shape is a bit different). The huge type 212b storage vessels (fig. IV.65, fig. IV.66.a-d) are generally handmade, and have flat or rounded bases. They are built in slabs and often decorated with an applied rope band on the upper body, sometimes combined with incised wavy lines. A fragment of a type 212 large storage vessel studied in thin section (sample 13, Appendix D) proves that they have been made locally at the site. Close comparisons are reported from Middle Assyrian Giricano Höyük (Schachner 2002: abb. 26a). Type 212b large pots are comparable to their type 213 and 215 storage-vessel cousins. Among the type 213 vessels some have incised cuneiform signs on the shoulder (fig. IV.67.b, e, see also below, Appendix F). Type 215 (with horizontally flattened rims, fig. IV.68.a-c) is new in level 5 and disappears after level 4. However, the variation in rim shapes among large storage vessels is rather large, and may not have any chronological significance. Rather, it is likely that this variation is linked to the shaping methods (handmade) and to the relatively rare occasions when a potter would make these huge vessels. Type 219 pots are also new (and uniquely represented) in level 5. They are pots with a closed shape and a concave or ribbed ribbon rim (fig. IV.68.d, e). Comparisons for type 219 again come from the Euphrates region (Shioukh Fawqani: Bachelot 1999: pl. 13 no. 3 but there made of cooking ware?; Tell Hadidi: Dornemann 1981: fig. 4 no. 12).

Most pots in level 5 have straight or almost straight walls and an open shape (75.4% of all pot rims). As in level 6, almost 90% of straight-walled pots is of type 221 (fig. IV.69.a-e) or type 222, with hammer rims, now almost equally represented. The larger variant of type 221 (b) are large storage pots, again comparable to their sometimes smaller and more open-shaped cousins deep bowls type 145. Likewise, they show applied rope bands and wavy incised lines (fig. IV.69.h-j). Type 222 pots show hammer rims that are completely identical to their level 6 counterparts (fig. IV.70, IV.71.a-h). Type 225 pots, the so-called "grain measures", continued to be used in level 5. They are cylindrical in shape with a carination near the base in the lower vessel part. One fragment is burnished and painted with red horizontal bands and stripes on the rim, in the style of the level 7 pots (fig. IV.72.g). Others are undecorated (fig. IV.72.e, p) or, more often, decorated with incised horizontal or wavy lines (fig. IV.72.a-d, f, j-o). Colours are orange, buff, cream or greenish. There is one dark grey fragment with white-filled impressed circles (fig. IV.72.h). A bigger type 225 rim decorated with narrow applied rope bands is reminiscent of a level 7 example (fig. IV.72.q). The new type 2214 rims, which were found only in level 5, have straight cylindrical walls and triangular rims that

[40] See footnote 16 for comparisons.

are slightly bent inwards, but bevelled outwards. The bevelled surface of the rims has ridges (fig. IV.72.s, t). These rims are very different from any of the other shapes found at Sabi Abyad.[41]

Pots grouped under type number 23x are pots with S-shaped, curved wall profiles. There are only a few examples of pots in this group, and perhaps they do not belong to the Middle Assyrian tradition but rather to traditions in the Euphrates region (cf. Hadidi, Dornemann 1981: fig. 5 no. 1, but larger than the Sabi Abyad pot). In level 5 type 233 with S-shaped wall profile and a rim strongly rolled inwards (fig. IV.72.u, perhaps a cooking pot?), and type 234 with S-shaped wall profile and mushroom-shaped rim bent outwards (fig. IV.72.v) have been found. They were not found in other levels and are each unique.

Jars

With more than 27% of all rims, the number of jars has increased strongly in level 5. Again, the jars were divided into two groups: those with clear necks (38.9% of all jars) and those with a ribbon rim sitting directly on the vessel shoulder (60.5% of all jars). In level 5 a third group, jars with handles, has appeared (0.4% of all jars).

The number of jars with a clear neck has further decreased compared to level 6. Jars with simple rounded rim (type 311, 67.5% of all jars with neck) and with oval rims a bit thickened on the outside (type 312, 9.8% of all jars with neck) are the most popular shapes in this group. The larger variants (311b, fig. IV.74.e-k, IV.75.a-e, g) of this type have ring bases, and some jars have an incision at the neck creating some sort of collar effect (fig. IV.74.h-k, IV.75.a-b). One 311b jar is different from the rest of the corpus: it is globular in shape, and the surface is burnished (fig. IV.75.e). It has very fine inclusions (ware J) and the inside is black, while the outside is dark brown. The base is very wide and flat. Comparisons can be found in the west (Shioukh Fawqani, Bachelot 1999: pl. 9 no. 2) as well as in the east (Tell al-Rimah level C4, Postgate et al. 1997: pl. 87 no. 1007 but not burnished). The smaller 311a jars (fig. IV.73, IV.74. a-d) have mostly ring bases or disc-shaped flat bases, although there is one example of a knob base and one example of a rounded base on a small 311 jar (fig. IV.73.g, IV.74.a). The latter also has an unknown kind of mineral inclusion in the clay, perhaps grog or shell, and perhaps it was not made at the site. Type 313 jars, with pointed rims bent outwards, become much more popular in level 5 (fig. IV.76.c-j; in level 6 there was only one example, now 16, representing 2.8% of all jars with neck). Type 315 jars, with a squarish rim, are still popular in level 5 (fig. IV.76.k, IV.77; 9.3% of all jars with neck; 36% of all sherds of this type occurred in level 5). For the first time there are some complete examples, showing ring bases (fig. IV.77.a, c). Three examples of this type are burnished. Close comparisons come from the Middle Assyrian levels at Tell Barri (Anastasio 1993: fig. 15 no. 4) and Giricano Höyük (Schachner 2002: Abb. 25 a, b). Type 318 jars with rims sloping inwards also still occur in level 5 (fig. IV.78), but become much less popular in level 4 and later. In level 5 they still represent 5.4% of all jars with necks (while 54.4% of all type 318 jars occur in level 5). Type 318 vessels are made of the common wares with organic inclusions, and occur in all surface colours. Vessel P97-292 is burnished on the outside (fig. IV.78.a). Close comparisons come from Tell Barri (Anastasio 1993: fig. 17 no. 1), Tell al-Rimah level C3 (Postgate et al. 1997: pl. 85 no. 978 with red slip) and Shioukh Fawqani (Bachelot 1999: pl. 10 no. 5). The small type 318 jar in fig. IV.78.e was perhaps not made at Sabi Abyad. Its slender, elongated shape, the vertical and horizontal burnishing on the outside surface, its dark-brown colour and the fine mineral inclusions (ware C) all make it stand out from the rest of the group. A remarkable body of a jar with a neck was found in a mixed level 4/5 context (fig. IV.98.l). This jar is painted with horizontal bands and vertical, rather careless lines, in a dark-red paint. The surface of the jar is burnished. The jar may have been of type 315 or 318 as suggested by the horizontally applied band around the neck. It is reminiscent of “Habur ware” jars, but no close comparisons were found.

In the group of jars without a neck, the oval ribbon rim with vertical side (type 322) is the most popular rim, although a little less than in level 6 (now 76.1% of all jars without a neck). Jars with ribbon rims that have a sloping surface (323, 12.5% of all jars without a neck, fig. IV.86, 87, 88.a-e) and jars with ribbon rims with concave sides (321, 10.8% of all jars without a neck) also still occur in large numbers. In type 321 jars the detailed shape of the rim has a rather wide variation (fig. IV.79, IV.80.a-i). Some rims are strongly bent outwards (e.g. fig. IV.79.c, k) while others are more straight and slender or thick and bulging (e.g. fig.

[41] No comparisons have been found for this shape. The rims are reminiscent of late Roman or early Islamic shapes (cf. Konrad 2001: Taf. 84 no. 25 or Logar 1992: abb. 5, 7) and may therefore be intrusive, but the later rims are made of different wares with mineral inclusions only while the Sabi Abyad examples are made of wares I and J with organic inclusions.

IV.79.a, i, j). In type 322 rims (figs. IV.80.l-n, IV.81, 82, 83, 84, 85) the transition from rim to shoulder seems to be rather sharp in the case of the more oval rims (e.g. fig. IV.80.n, IV.82.e, IV.83.k), while in the case of the more triangular rims the transition is sloping rather than sharp (e.g. fig. IV.85.a, d). The jar in fig. IV.85.i is different from the other type 322 jars (and therefore listed as type "322!"). It was handmade, and although it has an oval ribbon rim sitting directly on the shoulder, the rim diameter is much larger than that of the rest of the type 322 jars. It has a decoration of an applied rope band on the shoulder, something that has never occured with jars of this type. It was made of clay with very fine inclusions (ware I), and was perhaps not made at the site. No comparisons were found for it. Almost all the large tall jars have ring bases, often with the ring aligned with the outside vessel wall (and invisible from the side, as in fig. IV.81.d, e, fig. IV.84.f). Jars without a neck often have a painted or impressed/incised mark on the shoulder or rim (see below, Chapter V, potters' marks and signs). Of the jars with inward-sloping rim type 326 (fig. IV.88.g), the last example now occurs in level 5 (two other examples were found in level 7). Type 324, a jar with a ribbon rim that is concave on the inside (fig. IV.88.f), is new in level 5 and has only one other example in level 4. At Sheikh Hamad this shape is new in MA III (Pfälzner 1995: 136).

From level 5 onwards there is a small percentage of jars with a neck and with a handle attached to the body and either rim or neck (type 333 (fig. IV.89.c-h). Mostly these jars have simple rims sometimes a bit thickened. The handles are rather thick and round or oval in section. Not many complete examples have been preserved, but the jar in fig. IV.89.c is remarkable because of its pointed base that otherwise hardly occurs in jars in this level. This jar can be compared to an example from Emar (Caubet 1982: no. 31), but jars with handles may be part of the Middle Assyrian tradition as well.

Goblets

In level 5 exactly half of the goblets is of the V-shaped type (411, fig. IV.90), while the other half has S-shaped curved walls (421, fig. IV.91). Rims of V-shaped goblets are rounded or, less often, pointed. Remarkably, the rims of goblets from the workshop in M11 are often a bit thickened and a bit bent outwards. They also have peculiarly thick nipple bases (e.g. fig. IV.90.aa, ab; cf. Sheikh Hamad phase MA IIa/b, Pfälzner 1995: Taf. 130 e). Small rounded nipple bases still occur, but mostly they are smooth and pointed in level 5 (e.g. fig. IV.90.d-h). Two thin sections of nipple bases (samples 24, 25, Appendix D) show that goblets were made locally at the site. Four V-shaped goblets are painted: three with horizontal bands in dark-red paint, one with thin oblique lines at the rim, and one with the whole surface painted dark brown (fig. IV.90.o, p, ae). S-shaped goblets in level 5 have simple rounded or sometimes slightly pointed rims. Mostly the walls are curved smoothly and the goblet is globular in shape (e.g. fig. IV.91.f, m, q), but in some examples the curve is more like a carination. Also the curvature seems to be positioned a little bit lower on the vessel than in level 6, creating longer "necks". Type 421 goblets nearly always have knob bases that are either squarish or a bit triangular in section (e.g. fig. IV.91.g, h). There are several examples of type 421 goblets that attract attention. First, two goblets have a clear carination at the neck, while the wall above the carination is rather straight (fig. IV.91.v, w). These "shouldered" beakers are generally typical for the later stages of the Middle Assyrian period (Sheikh Hamad phase MA III: Pfälzner 1995: 135; Tell Taban: Ohnuma and Numoto 2001: fig. 8 no. 23; Giricano Höyük: Schachner 2002: abb. 22k; Tell Brak HH1: Oates et al. 1997: fig. 194 nos. 314, 315). Another unique vessel is illustrated in fig. IV.91.ad, a very slender and elongated goblet with a carination low on the wall. The paste included a lot of fine calcite, and the colour is brown (as opposed to the generally buff, orange or greenish other goblets). No comparisons were found. Several rather small S-shaped goblets have a rounded base and a small spout made in the side (fig. IV.91.z-ab; cf. Sheikh Hamad phases MA I and MA IIc: Pfälzner 1995: Taf 78e, 114h; Emar: Caubet 1982: no. 25; Hadidi: Dornemann 1981: fig. 10 no. 6). One goblet has a pointed base with a hole in it, that served as a spout, and is comparable to a vessel from level 6 (fig. IV.91.af, cf. fig. IV.31.f). A remarkable goblet with an elaborately carinated wall was found in a mixed level 4/5 context (fig. IV.91.ae), and is without comparisons so far. A drinking vessel that does not fit any category is the beaker with handle in fig. IV.91.ag. It is a cup with slightly flaring walls and a rounded base, with one large handle. The surface was originally probably covered in a glaze, the remnants of which have turned whitish now. The inside and outside surface was carefully burnished as well. This shape is without comparison so far.

Strainers and pot stands

Strainers in level 5 resemble their counterparts in level 6. They are rounded bowl-shaped vessels with holes pierced from the outside before the clay was dry (fig. IV.91.ah-ak). The unique strainer jar in fig. IV.95.k has a comparison in Tell al-Rimah level C4 (Postgate et al. 1997: pl. 92 no. 1074). Pot stands in level 5 are of the typical Middle Assyrian shape (fig. IV.92, 93). The top rims are either squarish, or more often triangular, sometimes pinched or overhanging. The walls are conical and straight or a little bit curved, while the base part is wider than the top part. Base rims are similar to the top rims, but often more pronounced, more bent over or more rounded. A pot-stand kiln waster (sample 31, Appendix D) was studied in thin section and proved to have been locally made at the site. There are a few handmade, large pot stands with closed bases and windows in the vessel wall (fig. IV.92.k; cf. Tell al-Rimah level C3: Postgate et al. 1997: pl. 95 no. 1155). The pot-stand fragment in fig. IV.92.l with windows and applied decorations comes from a mixed level 4/5 context.

Pilgrim flasks

The so-called “pilgrim flasks” that occurred in level 6 for the first time are most frequently found in level 5 (fig. IV.94). Actually, they hardly occur anymore at the site after level 5, except for some fragments from mixed contexts. They can therefore be considered typical for levels 6 and 5. All flasks have a spout and a handle, and are made of a rather gritty fabric with lots of sand inclusions. Most of them are burnished on the outside. Colours are generally dark, brown or orange, but buff examples exist as well. They were made in the “thrown-closed” technique, which differs from the techniques used for the rest of the Sabi Abyad corpus (see below, Chapter V). The differences in paste, surface treatment and shaping techniques, suggest that these flasks were possibly not manufactured at the site itself. Three thin-section samples of flasks from level 5 (nos. 06, 07 and 12, Appendix D, figs. IV.94.h, d) showed that one of them may have come from somewhere in the region, but the two others are definitely not local to the Balikh and may have come from the Upper Euphrates area or further away. The only comparisons found indeed come from the Euphrates (Emar: Caubet 1982: fig. 30 and p. 74), and there they are thought to belong to a western, coastal tradition.

Special shapes

Several special shapes have been found in level 5 that do not fit any vessel group. Among these are several miniature vessels,[42] as well as the only two ceramic lids that have been found (fig. IV.95.d, e; the small 111 bowls were also often used as lids; see Chapter VI). A handmade square box with small holes in the wall, in which an inner ledge suggests that it was once covered with a (wooden?) lid, was found in the central tower building (fig. IV.95.h). The large and tall stand in fig. IV.95.f, with an inner ledge at the top, is perhaps part of an incense burner. The strainer-jar fig. IV.95.k is unique, as well as the strange pot with a hole in the side (fig. IV.95.i), perhaps a model, a mouse trap, or part of some industrial construction. The large handmade square tray in fig. IV.96.i, with a semi-spherical depression in the middle of the vessel, has eluded any functional interpretation so far. It was found high up in the fill of the “palace” building. The outside is completely covered in bitumen, as if it had been fixed in some kind of installation or as if it was meant to be watertight.

Base type	No.	%
611	55	1.9%
711	168	5.8%
712	162	5.6%
721	125	4.3%
731	901	31.2%
741	1433	49.6%
751	43	1.5%
Total	2887	100.0%

Table IV.21: Base types in level 5, loose bases and complete shapes included.

[42] On of these (fig. IV.95.b) has a close comparison at Middle Assyrian Mohamed Diyab (Faivre 1992: fig. 26 no. 12).

Bases
In level 5 the relative amount of ring bases increases. Now, almost half of all bases are ring bases. The shape of ring bases is similar to those in level 6: rounded or triangular in shape, while with the triangular ones the ring is often “aligned” with the vessel wall so that the ring is invisible from the outside. Holes in bases occur equally often in flat bases and ring bases, generally made before firing but sometimes drilled in the base after firing. Base holes occur both in small bowls (type 111a, cf. fig. IV.36.u, ai) and in larger (storage) pots (fig. IV.56.a, 57.d, 59.a, 69.h, i). The relative amount of knob bases has increased slightly in level 5. Now nipple bases and knob bases are equally represented with approximately 6% each. This mirrors the equal representation of type 411 and type 421 goblets.

Surface treatment and decoration
In level 5 the amount of pottery with a slip increases slightly to 0.2% of all diagnostics (n=16). Slipped vessels are bases, body fragments as well as bowls (types 111, 112, 121, 143) and jars (types 311, 322). Slips are orange, buff, cream or dark brown. Moreover, there are three glazed fragments: two bowls (a rim and a base) and one cup with a handle (fig. IV.51.q, r, fig. IV.91.ag, see also Appendix D). The relative amount of burnished sherds also has increased a bit compared to level 6, now 1.2% of all diagnostics is burnished. Burnished vessels include mainly the carinated type 113 bowls (25.5% of all burnished fragments, e.g. fig. IV.45), but also the “pilgrim flasks” type 911 (fig. IV.94), the deep bowls with handle and spout type 151 (fig. IV.60, fig. IV.61.a-c), some carinated type 111 bowls and some jars with necks (type 315, 318, fig. IV.78.a, d, e). It is remarkable that the burnished pottery often differs from the rest of the corpus in shape or paste composition as well, suggesting that burnishing was not part of the production tradition at Sabi Abyad.

In level 5 the relative amount of decorated sherds increases slightly to 4.8% (n=367). As in level 6, the decoration is generally of a very simple nature. The number of painted sherds now has dropped to about 10% of all decorated sherds. Designs often consist simply of horizontal bands (n=7), on bodysherds, goblets (fig. IV.90.o, ae, fig. IV.91.x), a “grain measure” type 225 pot (fig. IV.72.g), once on a small carinated bowl with pedestal base (fig. IV.38.w) and once on a jar (type 314, fig. IV.75.m). Other painted sherds include a body fragment in Nuzi style, probably intrusive in this level (fig. IV.98.c),[43] sherds with carelessly applied vertical or criss-cross lines, bitumen blobs and marks, or with a paint covering the whole surface (e.g. fig. IV.96.a). A vast majority of decorated sherds in level 5 shows incised, applied, or incised + applied decoration, in total almost 85% of all decorated sherds. Most of these show simple incised horizontal lines, in bowls (mainly carinated type 113 bowls, e.g. fig. IV.45.e-h, but also deep bowls), in pots (types 222 and 225 mainly, fig. IV.70.e, f, IV.72.a-d), and jars (types 311, 315, 318 with neck (e.g fig. IV.74.i, IV.75.g) but also types 322, 323 without neck (e.g. fig. IV.82.c-e, IV.84.a, e, IV.86.c, IV.88.d). In the latter, the lines are placed on the shoulder. Incised wavy lines, on the contrary, almost exclusively occur on large type 145 deep bowls (e.g. fig. IV.55.f, g, IV.56.a-c) and large storage pots (types 212, 221, e.g. fig. IV.66.c, IV.67.f, IV.69.h-j). The combination of both horizontal and wavy incised lines is typical for the type 1414 bowls and for type 225 “grain measures” (e.g. fig. IV.59.a-d, fig. IV.72. j-o). Other incised patterns include notches (perhaps these are potters’ marks, see below, Chapter V and Appendix E), incised crosses (fig. IV.52.j, IV.87.c), lunar-shaped impressions (e.g. fig. IV.72.j, n) and a star (fig. IV.98.h, k). A combination of painted and incised decoration is very rare (fig. IV.84.d, IV.87.g). Applied decoration, as in level 6, generally takes the shape of horizontally applied bands that are impressed with the thumb before the clay was dry, creating the impression of a thick, cabled rope. These cable appliques occur mainly on large, deep type 145 bowls (fig. IV.56.b, d-e, IV.57), and on large type 212, 213 or 215 storage vessels (fig. IV.65.b-e, IV.66.d, g, IV.67.a, e-f, IV.68.c). These cable appliques are often combined with incised wavy lines, also mainly in large storage vessels (type 212, 213, 221) and deep bowls type 145. Thin smooth horizontally applied bands sometimes occur on the neck of type 315 and type 318 jars (fig. IV.77.b, IV.78.a, c, d). Other applied decorations include the vertical lugs (fig. IV.61.e-g) and the curved appliques on type 211 (cooking) vessels, discussed above (fig. IV.62.a-b). A very special applied decoration is found in the applied animal scene on a type 212 pot discussed above (fig. IV.64.b; cf. also the applied decorations in fig. IV.64.a, IV.54.j). The characteristic impressed, white-filled circles, sometimes combined with white-filled triangles on the rim, also occur in

[43] Thin-section analysis of this sherd (sample no. 45, Appendix D) showed that it was most probably made in the Balikh Valley.

level 5, although relatively much less (now only in 3.5% of all decorated sherds, fig. IV.45.i-m, IV.72.h, i). As in level 6, this type of decoration is characteristic for carinated type 113 bowls and type 225 "grain measure" pots. See above with level 6 for a more extensive discussion of this decorative style.

	No.	%
Painted horizontal lines	15	4.1%
Painted wavy lines	1	0.3%
Painted other	22	6.0%
Painted + incised/impressed, horizontal	1	0.3%
Painted + incised/impressed, circles	1	0.3%
Total 10.9%		
Incised horizontal line(s)	126	34.3%
Incised wavy lines(s)	40	10.9%
Incised horizontal+wavy line(s)	20	5.4%
Incised other	9	2.4%
Total 53.1%		
Applied	5	1.4%
Applied horizontal band(s)	67	18.3%
Applied wavy band(s)	4	1.1%
Total 20.7%		
Incised + applied, horizontal + wavy	38	10.4%
Incised + applied, other	1	0.3%
Total 10.6%		
Impressed white-filled decoration	13	3.5%
Impressed other	1	0.3%
Total 3.8%		
Glazed	3	0.8%
Total decorated	367	100.0%

Table IV.22 : Decoration in level 5.

Firing

Exactly similar to level 6, the majority (more than 80%) of all diagnostics was fired at medium temperatures. Of these, more than 90% was made of common wares with organic inclusions (wares H, I, J), as was to be expected. The amount of sherds fired at relatively high temperatures has increased a little, now to over 16% of all diagnostics. The amount of fine wares (wares A, B, C) among the diagnostics fired at higher temperatures is about the same as in level 6 (now, almost 8%). The amount of diagnostics fired at relatively low temperatures is a bit lower than in level 6, although in level 5 there are more cooking-ware vessels (these are generally fired at low temperatures). Apart from the cooking-ware pots, the diagnostics fired at relatively lower temperatures (resulting in brown colours) include vessels from almost all major vessel and rim types.

	No.	%
High	1260	16.5%
Medium	6112	80.3%
Low	226	2.9%
No inform.	16	0.2%
Total	7614	100.0%

Table IV.23: Relative firing temperatures in level 5.

Lime spalling was noted for 84 diagnostics, or 1.1% of the whole corpus. Spalling occurs generally in all shapes, whether made of fine mineral wares (A and B) or of common wares with organic inclusions (H and I). In 85% of all cases where spalling occurred the vessel was fired at medium-high temperatures, and in the majority of cases the vessel was fired in completely oxidizing circumstances. Lime spalling did not occur in vessels fired at relatively low temperatures.

	No.	%
Oxidizing	6716	88.2%
Incompletely oxidizing (grey core)	765	10.0%
Reducing	118	1.5%
No information	15	0.1%
Total	7614	100.0%

Table IV.24: Firing atmospheres in level 5.

As in level 6, the majority of the ceramics in level 5 was fired in completely oxidizing kiln circumstances. However, the amount of ceramics fired in incompletely oxidizing circumstances, showing a grey core, has increased a little to about 10%. Among sherds fired in oxidizing circumstances, the majority has greenish (19.6%), buff (35.6%) or orange (19.8%) colours, with rare reddish examples. Sherds fired in incompletely oxidizing circumstances have a greyish core and are a bit darker than the completely oxidized sherds, having mainly orange (58.8%) or reddish (17.3%) colours, but buff (13.1%) colours do occur as well. Sherds fired in reducing circumstances mainly had dark grey surface colours. This group includes all major shape-type groups present in level 5.

Table IV.25: Level 5, proportions of ware per type, frequencies of types.
Shaded types occur only in level 5. Bold underlined types are new in level 5.

	-	?	A	B	C	N	D	E	F	H	I	J	G	K	M	Total	% of rims
111	4 0.2%	1 0.1%	3 0.2%	3 0.2%	1 0.1%	1 0.1%				176 9.9%	1529 85.6%	65 3.6%	2 0.1%	1 0.1%		1786 100.0%	33.3%
111!				1 100.0%												1 100.0%	0.02%
111?											3 100.0%					3 100.0%	0.05%
112										3 8.8%	29 85.3%	2 5.9%				34 100.0%	0.6%
113				4 5.0%	2 2.5%					5 6.3%	64 80.0%	5 6.3%				80 100.0%	1.5%
113?				1 33.3%							2 66.7%					3 100.0%	0.05%
114										4 57.1%	1 14.3%	2 28.6%				7 100.0%	0.1%
<u>119</u>											1 100.0%					1 100.0%	0.02%
121										5 16.1%	25 80.6%	1 3.2%				31 100.0%	0.6%
121?											2 100.0%					2 100.0%	0.03%
122	1 2.9%			2 5.9%	1 2.9%					4 11.8%	24 70.6%	2 5.9%				34 100.0%	0.6%
122?												1 100.0%				1 100.0%	0.02%
123										1 2.9%	32 91.4%	2 5.7%				35 100.0%	0.6%
123?											1 100.0%					1 100.0%	0.02%
<u>124</u>			2 50.0%	2 50.0%												4 100.0%	0.07%
125				1 6.7%							12 80.0%		2 13.3%			15 100.0%	0.3%
127											2 100.0%					2 100.0%	0.03%
127?											2 100.0%					2 100.0%	0.03%
1210											1 100.0%					1 100.0%	0.02%
<u>1215</u>				1 25.0%							3 75.0%					4 100.0%	0.07%
12?											2 100.0%					2 100.0%	0.03%
131	8 2.3%									22 6.3%	309 89.0%	8 2.3%				347 100.0%	6.5%
131?											1 100.0%					1 100.0%	0.02%
132	1 0.9%									7 6.5%	97 90.7%	2 1.9%				107 100.0%	2.0%
134										1 10.0%	9 90.0%					10 100.0%	0.2%
135											9 100.0%					9 100.0%	0.2%
<u>136</u>											1 100.0%					1 100.0%	0.02%

	-	?	A	B	C	N	D	E	F	H	I	J	G	K	M	Total	
141	1									16	110	3				130	2.4%
	0.8%									12.3%	84.6%	2.3%				100.0%	
141?											1					1	0.02%
											100.0%					100.0%	
142										4	60	5				69	1.3%
										5.8%	87.0%	7.2%				100.0%	
143										13	64	6				83	1.5%
										15.7%	77.1%	7.2%				100.0%	
143?											1					1	0.02%
											100.0%					100.0%	
144											7	1				8	0.1%
											87.5%	12.5%				100.0%	
145										7	51					58	1.0%
										12.1%	87.9%					100.0%	
148											2	1				3	0.05%
											66.7%	33.3%				100.0%	
149										1	2					3	0.05%
										33.3%	66.7%					100.0%	
1410											1					1	0.02%
											100.0%					100.0%	
1411											10					10	0.2%
											100.0%					100.0%	
1414											4					4	0.07%
											100.0%					100.0%	
1415											3					3	0.05%
											100.0%					100.0%	
1417											3					3	0.05%
											100.0%					100.0%	
14?										2						2	0.03%
										100.0%						100.0%	
151											8					8	0.1%
											100.0%					100.0%	
151?											1					1	0.02%
											100.0%					100.0%	
1?										1	5		2			8	0.1%
										12.5%	62.5%		25.0%			100.0%	
All bowls	15	1	5	13	5	1				272	2493	106	6	1		2918	54.4%
	0.5%	0.03%	0.2%	0.4%	0.2%	0.03%				9.3%	85.4%	3.6%	0.2%	0.03%		100.0%	
211							2	1		1	10		1	1		16	0.3%
							12.5%	6.3%		6.3%	62.5%		6.3%	6.3%		100.0%	
212				1	1		12			2	36	1		1		54	1.0%
				1.9%	1.9%		22.2%			3.7%	66.7%	1.9%		1.9%		100.0%	
212?							1	1		1	1					4	0.07%
							25.0%	25.0%		25.0%	25.0%					100.0%	
213					1					1	10	1				13	0.2%
					7.7%					7.7%	76.9%	7.7%				100.0%	
215											3					3	0.05%
											100.0%					100.0%	
219					1						1					2	0.03%
					50.0%						50.0%					100.0%	
2110			1													1	0.02%
			100.0%													100.0%	
21?											1					1	0.02%
											100.0%					100.0%	
221										17	118	8				143	2.7%
										11.9%	82.5%	5.6%				100.0%	
222										5	110	4				119	2.2%
										4.2%	92.4%	3.4%				100.0%	
222?										1	1					2	0.03%
										50.0%	50.0%					100.0%	

	-	?	A	B	C	N	D	E	F	H	I	J	G	K	M	Total	
224											3					3	0.05%
											100.0%					100.0%	
225										4	11					15	0.3%
										26.7%	73.3%					100.0%	
226											9					9	0.2%
											100.0%					100.0%	
228											1					1	0.02%
											100.0%					100.0%	
2214											1	1				2	0.03%
											50.0%	50.0%				100.0%	
233							1									1	0.02%
							100.0%									100.0%	
234										1						1	0.02%
										100.0%						100.0%	
All pots			1	1	3		16	2		33	316	15	1	2		390	7.3%
			0.3%	0.3%	0.8%		4.1%	0.5%		8.5%	81.0%	3.8%	0.3%	0.5%		100.0%	
311			1	3	1					41	306	27	5		1	385	7.2%
			0.3%	0.8%	0.3%					10.6%	79.5%	7.0%	1.3%		0.3%	100.0%	
311!		1									1	1				3	0.05%
		33.3%									33.3%	33.3%				100.0%	
311?											1					1	0.02%
											100.0%					100.0%	
312			1	3	1		1			4	45				1	56	1.0%
			1.8%	5.4%	1.8%		1.8%			7.1%	80.4%				1.8%	100.0%	
313				1						1	14					16	0.3%
				6.3%						6.3%	87.5%					100.0%	
314					1					1	10					12	0.2%
					8.3%					8.3%	83.3%					100.0%	
315					1					6	41	5				53	1.0%
					1.9%					11.3%	77.4%	9.4%				100.0%	
315?											1					1	0.02%
											100.0%					100.0%	
318					1					3	25	2				31	0.6%
					3.2%					9.7%	80.6%	6.5%				100.0%	
318?					1						1					2	0.03%
					50.0%						50.0%					100.0%	
31?									1		2					3	0.05%
									33.3%		66.7%					100.0%	
321			1	1	3					10	74	5	2			96	1.8%
			1.0%	1.0%	3.1%					10.4%	77.1%	5.2%	2.1%			100.0%	
322				1						72	570	31	1			675	12.6%
				0.1%						10.7%	84.4%	4.6%	0.1%			100.0%	
322!											1					1	0.02%
											100.0%					100.0%	
322?					1						1					2	0.03%
					50.0%						50.0%					100.0%	
323				1						11	94	5				111	2.1%
				0.9%						9.9%	84.7%	4.5%				100.0%	
324											1					1	0.02%
											100.0%					100.0%	
326											1					1	0.02%
											100.0%					100.0%	
333				1	1						5					7	0.09%
				14.3%	14.3%						71.4%					100.0%	
All jars		1	4	13	14		1		1	150	1196	76	8		2	1466	27.3%
		0.1%	0.3%	0.9%	1.0%		0.1%		0.1%	10.2%	81.6%	5.2%	0.5%		0.1%	100.0%	
411			22	122	3	3				1	2					153	2.8%
			14.4%	79.7%	2.0%	2.0%				0.7%	1.3%					100.0%	
41?				1												1	0.02%
				100.0%												100.0%	
421			33	108	7	3				1	2					154	2.9%
			21.4%	70.1%	4.5%	1.9%				0.6%	1.3%					100.0%	

	-	?	A	B	C	N	D	E	F	H	I	J	G	K	M	Total	
4?			1													1	0.02%
			100.0%													100.0%	
511										2	19	1				22	0.4%
										9.1%	86.4%	4.5%				100.0%	
611					1					11	205	12	2			231	4.3%
					0.4%					4.8%	88.7%	5.2%	0.9%			100.0%	
611?											2	1				3	0.05%
											66.7%	33.3%				100.0%	
911				1	4		2					1				8	0.1%
				12.5%	50.0%		25.0%					12.5%				100.0%	
911?					1						1					2	0.03%
					50.0%						50.0%					100.0%	
?				1	1					1	1	2				6	0.1%
				16.7%	16.7%					16.7%	16.7%	33.3%				100.0%	
mini				2						1						3	0.05%
				66.7%						33.3%						100.0%	
tray											2	1		1		4	0.07%
											50.0%	25.0%		25.0%		100.0%	
varia				1						1	3					5	0.1%
				20.0%						20.0%	60.0%					100.0%	
All rims	15	2	66	264	39	7	19	2	1	473	4241	215	17	4	2	5367	100.0%
	0.3%	0.04%	1.2%	4.9%	0.7%	0.1%	0.3%	0.04%	0.02%	8.8%	79.0%	4.0%	0.3%	0.1%	0.04%	100.0%	
																	% of bases
611										4	49	1				54	1.9%
										7.4%	90.7%	1.9%				100.0%	
61?											1					1	0.03%
											100.0%					100.0%	
711			25	129	10	1					2	1				168	5.8%
			14.9%	76.8%	6.0%	0.6%					1.2%	0.6%				100.0%	
712			36	105	13	1				2	5					162	5.6%
			22.2%	64.8%	8.0%	0.6%				1.2%	3.1%					100.0%	
71?				1							1					2	0.07%
				50.0%							50.0%					100.0%	
721		1	1	7	4					12	92	8				125	4.3%
		0.8%	0.8%	5.6%	3.2%					9.6%	73.6%	6.4%				100.0%	
731	2		4	4			1			74	787	28	1			901	31.0%
	0.2%		0.4%	0.4%			0.1%			8.2%	87.3%	3.1%	0.1%			100.0%	
741			3	7	7		1			127	1217	71				1433	49.3%
			0.2%	0.5%	0.5%		0.1%			8.9%	85.0%	4.9%				100.0%	
751		1		6	10		3				23					43	1.5%
		2.3%		14.0%	23.3%		7.0%				53.5%					100.0%	
76?											2					2	0.05%
											100.0%					100.0%	
?											2	1				3	0.1%
											66.7%	33.3%				100.0%	
Tray											1	1		1		3	0.1%
											33.3%	33.3%		33.3%		100.0%	
varia										1	2					3	0.1%
										33.3%	66.7%					100.0%	
All bases	2	2	69	259	46	2	5			220	2186	111	1	1		2900	100.0%
	0.1%	0.1%	2.4%	8.9%	1.6%	0.1%	0.2%			7.6%	75.3%	3.8%	0.0%	0.0%		100.0%	
Loose bases	1	1	60	190	35	1	2			152	1454	97	1			1994	-
	0.1%	0.1%	3.0%	9.5%	1.8%	0.1%	0.1%			7.6%	72.9%	4.9%	0.1%			100.0%	
Other diag.			3	12	9			1		18	187	9	1			240	-
			1.2%	5.0%	3.7%			0.4%		7.5%	78.0%	3.7%	0.4%			100.0%	
Total	16	3	130	464	89	8	23	3	1	642	5891	319	19	4	2	7614	-
	0.2%	0.0%	1.7%	6.1%	1.2%	0.1%	0.3%	0.0%	0.0%	8.4%	77.4%	4.2%	0.2%	0.1%	0.0%	100.0%	

Level 4 (figs. IV.99 – IV.113).

A total of 2016 diagnostic sherds was attributed securely to level 4. In level 4 the *dunnu* still seems to function, but the occupation has further contracted. Now only the buildings in the north and west of the site seem to be in use, while the rest of the site is more or less abandoned. The settlement seems to have changed its function, and although the people are still in touch with the Assyrian administration, it is not clear what the exact nature of the settlement was.

Clay and inclusions

In level 4 the number of diagnostics with organic inclusions increases a little, now reaching more than 92% of all diagnostics. The amount of fine-ware sherds (wares A, B, C) decreases a little. The fragments made of coarse mineral wares (D and E) are almost exclusively type 212 cooking pots, except for a type 314 jar rim. As in level 5, the macroscopically visible composition of the used clays is rather homogeneous. For wares A, B, C, H, I and J together it was noted in 4.8% of all cases that the clay contained a lot of mineral inclusions or, rarely, few mineral or organic inclusions. Especially wares A and H seem to contain many calcium inclusions: this was noted for more than 20% of all ware A and H fragments. Thirteen sherds were selected for thin-section analysis, only including the common Middle Assyrian shapes. The samples will be mentioned with each shape below; all were made from local Sabi Abyad clays.

		No.	%	
A	Calcium	24	1.2	
B	Calcium and sand	99	4.9	
C	Fine sand	21	1.0	
X subtotal				7.1
H	Organic inclusions and calcium	133	6.6	
I	Organic inclusions and calcium and sand	1658	82.2	
J	Organic inclusions and fine sand	70	3.5	
G	Organic inclusions only	2	0.1	
Y subtotal				92.4
D	Coarse sand	4	0.2	
E	Coarse calcite	2	0.1	
subtotal				0.3
K	Organic inclusions and coarse sand	2	0.1	
M	Organic inclusions and grog (?)	1	0.05	
Total		2016	100.0	

Table IV.26: Inclusions in level 4.

Shapes

In level 4 the distribution of shape classes is largely similar to that in level 5. Bowls again take the largest share of all fragments, with 56.6% of all rims. The amount of pots has increased a little to 10.7%, while there are slightly fewer jars.

	No.	%	% of rims
Bowls	780	38.7	56.6
Pots	148	7.3	10.7
Jars	330	16.4	23.9
Goblets	38	1.9	2.7
Pot stands	69	3.4	5.0
Strainers	7	0.3	0.5
Bottles	1	0.05	0.07
Trays	4	0.2	0.3
Loose base fragments	549	27.2	
Diagnostic bodysherds and others	90	4.5	
Total	2016	100.0	100.0

Table IV.27: Shapes in level 4.

The number of different rim types in level 4 is 53. Since the sample size has now decreased to a quarter of that in level 5, it is not surprising that there are fewer rim types represented in level 4. We will see, however, that most of the common types are still present in level 4. Many types occur only once or twice, as in the previous levels 6 and 5. Seven types occur for the first time in level 4 (types 128, 214, 229, 2210, 231, 232, 331, bold underlined in Table IV.33), while five of them were found in level 4 only and consequently are unique to this level (all of the above except 128 and 231, shaded in Table IV.33). Several types are represented for the last time in level 4 within the sequence of Sabi Abyad, and no longer occur in level 3: types 125, 129, 135, 148, 149, 1411, 1412, 1414, 1417, 215, 318 and 324.

In level 4 the "top ten" of the most popular rim types is made up of the following types: 111 (33.2%), 322 (8.2%), 131 (7.9%), 311 (5.8%), 221 (5.2%), 321 (4.7%), 611 (4.6%), 222 (2.7%), 132 (2.1%) and 112 (2.0%). Together, these types form 76.5% of all rim types in level 4. In comparison with level 5, we see a largely similar group of types and the first four types are identical. However, both goblet types 411 and 421 no longer appear in the level 4 "top ten", nor do deep bowls with hammer rims type 141. Instead jars with ribbon rims slightly concave on the outside (type 321), straight-sided bowls rims turned inwards (type 132) and carinated bowls with rims strongly bent over (type 112) have entered the "top ten" in level 4.

	No.	%
Carinated bowls	511	65.5%
Rounded bowls	46	5.9%
Straight-sided bowls	144	18.5%
Deep bowls	79	10.1%
Total	780	100.0%

Table IV.28: Different bowl shapes in level 4.

Bowls

The distribution of bowl shapes is similar to that in level 5. In level 4 still almost two-thirds of all bowls are of the carinated type. There are a few more rounded bowls and straight-sided bowls than in level 5, but the differences are very small.

The popularity of the carinated bowl type 111, still by far the most popular carinated bowl in level 4 as expected, again decreases a little (n=455, 33.0% of all rims, 58.3% of all bowl rims, 89.0% of all carinated bowls). The three size classes are distributed as follows: 111a (small bowls): n= 75, 16.5% of all 111 bowls; 111b (middle bowls): n=113, 24.8% of all 111 bowls; 111c (larger bowls): n=247, 54.3% of all 111 bowls. This distribution is similar to the one in level 5. In the small type 111a bowls rims are generally rounded (fig. IV.99.a-q). Some examples have rather thick vessel walls and rims (e.g. fig. IV.99.b, c, o), while others are more like the bowls from the previous levels. The carinations are generally not very sharp, and the wall part above the carination is either straight or slightly concave, but the strongly concave walls that were present in level 5 hardly occur any longer. Bases are flat or disc-shaped. A painted and incised small type 111 bowl was found in a mixed level 3/4 context (fig. IV.99.r), and is similar to a painted bowl found in level 5 (fig. IV.38.w). In the larger type 111b and 111c bowls (fig. IV.99.s-ag and IV.99.ah-am, IV.100.a-m), rims are either oval or rounded and thickened (e.g. fig. IV.99.v, ab, IV.100.i), or triangular and sometimes even a bit pinched (e.g. fig. IV.99.u, ai, IV.100.k). Again the carinations are not very sharp and the part of the wall above the carination is either straight or a little concave, but rarely very concave or pronounced. Both ring bases and flat bases occur.[44] Five thin-section samples (nos. 03, 14, 18, 22 and 26 (fig. IV.99.ae, Appendix D) proved that these bowls were made of local clays at Sabi Abyad.

In level 4 remarkably more bowls have type 112, with a strongly bent-over rim (fig. IV.100.n-u). In level 5 these bowls represented only 1.8% of all carinated bowls, but in level 4 they grow to 5.5% of all carinated bowls and have even entered the "top ten". Consequently this shape is rather characteristic for level 4, and still occurs in relatively large numbers in level 3. Comparisons were found at Sheikh Hamad phase MA III (Pfälzner 1995: Taf. 139f), Tell Taban levels 6, 8 and 9 (Ohnuma et al. 1998: fig. 10 no. 23, 25, Ohnuma et al. 2000: fig. 8 no. 20, Ohnuma and Numoto 2001: fig. 7 no. 10) and Kar Tukulti Ninurta Bauphase 1 (Schmidt 1999: Abb. 3a no. 14). A thin-section sample (no. 17, Appendix D) proves the local origin of this shape at Sabi Abyad.

The relative amount of bowls with a long, straight wall above the carination, type 113, is more or less constant in level 4 (5.1% of all carinated bowls now, compared to 4.2% in level 5). Rims are rounded, squarish, triangular or slightly thickened on the outside, just as in the previous level (fig. IV.100.v-ad). The number of burnished bowls in this group has decreased slightly to about 20%. Colours are reddish, buff, orange and greenish or grey-green. The decoration of this type of carinated bowls in level 4 is limited to two examples with incised horizontal lines at the carination (fig. IV.100.w, ac, cf. Tell Brak HH1, Oates et al. 1997: fig. 181 no. 23). The white-filled impressed circles no longer occur (although the only three fragments with this type of decoration are body fragments and may have come from type 113 bowls). A thin-section sample (no. 29, Appendix D, fig. IV.100.v) shows that these bowls were made locally at the site.

Among rounded bowls relatively equal shares are taken up by bowls with pinched rims (type 121, fig. IV.101.a), with rounded rims (type 122, fig. IV.101.b-e) and with rims thickened on the outside (type 123, fig. IV.101.f-j). The relative amount of type 125 with rims bevelled outwards decreases, and this type will disappear after level 4. Two other rounded bowls are type 128 and 129, of which the former is new in this level. Type 128 is a bowl with a rather thin wall, a rounded and incurving rim (fig. IV.101.l). It occurs in very small numbers at Sabi Abyad in levels 4 and 3. A weak comparison can be found in Rimah level C4 (Postgate et al. 1997: pl. 38 no. 183), but type 128 incurved-rim bowls may also be intrusive from later (Hellenistic) levels 2 or 1.

The distribution of straight-sided bowls stays more or less similar to that of level 5, with more than three-quarters belonging to the straight-sided bowl type 131 with outward-sloping rim (fig. IV.101.n-w, IV.102.a-e). Rims are generally similar to the type 131 rims in level 5, but there are some examples of rims that are strongly thickened on the outside and bent over with a stronger gradient (e.g. fig. IV.101.w, IV.102.b). Bowls with rather thick walls and thicker rounded sloping rims seem to be typical for the later Middle Assyrian period (e.g. fig. IV.101.n; Sheikh Hamad phase MA III: Pfälzner 1995: Taf. 137a; Tell Taban level 8: Ohnuma et al. 2000: fig. 8 no. 25). Type 132 bowls (fig. IV.102.f-k), with rims thickened on the inside, also resemble the level 5 bowls of this type. Sometimes in level 4 rims are only very slightly thickened. Rims wich are very rounded and thickened only on the inside still

[44] The bowl with rim type "111!" in Table IV.33 has no rim anymore; the rim had broken off after which the bowl was reused as a gypsum container.

occur as well (fig. IV.102.k). Bowl type 135, with horizontally flattened rim, only occurs twice in this level, and is no longer found after level 4 (fig. IV.102.l-m).

In level 4 the relative amount of deep bowls has decreased slightly. The very typical Middle Assyrian types 141 and 142, with hammer-shaped rims, do not occur in the "top ten" anymore. More importantly, their shape is also slightly different from their level 5 counterparts. In level 4 the rims have a less squarish or pronounced hammer shape, become more rounded and sometimes a bit curved (fig. IV.103.a-e, especially IV.103.b, e). The same phenomenon is not so clear in related pot types 221 and 222, where rims continue to have a squarish hammer shape (see below). Rim types 148, 149, 1411, 1412, 1414 and 1417 each only occur once in level 4, and were no longer found in level 3 at Sabi Abyad (fig. IV.103.k-o, fig. IV.104.d). This is especially interesting in the case of the very thick-walled deep bowl type 1411, which still occurred ten times in level 5.

Pots

The relative amount of pots with a closed shape has decreased in level 4 to only about 13% of all pots. Now more than eighty per cent of all pots have vertical vessel walls. Among pots with a closed shape, those with rims thickened on the outside (type 212) are the most popular: almost three-quarters of all closed pots have this shape (fig. IV.105). Four of these are cooking pots (fig. IV.105.a, b). The rims of these cooking pots are different from those in earlier levels. In level 4 cooking-pot rims are rolled over and triangular or flattened, not so rounded anymore as in level 5. There are some larger storage pots among types 211, 212 and 215 (fig. IV.104.e, fig. IV.105.i, fig. IV.106.h), but the number of closed large storage vessels seems to have decreased. Rim type 215 is no longer found in level 3. A very interesting new type in level 4 is type 214, a small closed pot with strongly incurving, rounded rims and a globular shape. Another example of this type comes from a mixed context (fig. IV.105.h, levels 0/2/3/4).

Among pots with vertical walls type 221 with horizontal rims becomes more popular (58.1% of all pots with vertical walls) than type 222 with inward-sloping rims (29.8% of all pots with vertical walls). In level 5 they were still equally represented. The smaller type 221 rims have hammer-shaped squarish rims or more rounded, thickened rims (fig. IV.106.a-d). One of these (sample no. 11, Appendix D) was studied in thin section and turned out to be of local origin. The larger variants 221b are mainly very large storage vessels, handmade and decorated with applied rope bands and incised wavy lines (fig. IV.106.e-g). Type 222 pots still have the characteristic Middle Assyrian hammer-shaped rims (fig. IV.107.a-c, e-f). The cylindrical pots, the so-called "grain measures" type 225, still occur in level 4 and 3 but in very small numbers only (fig. IV.107.d). Among large storage vessels type 226 with rims strongly thickened inside and outside now seem to become more popular (fig. IV.107.h-j). New types 229 and 2210 occur only once each and are not found in other levels. Perhaps they are intrusive from later levels (fig. IV.107.k, l).

As in level 5, there are two examples in level 4 of pots with an S-shaped wall profile (type 231 and 232), both of them new to level 4 and the latter not found in other levels (fig. IV.107.m).

Jars

The number of jars with a clear neck and jars without a neck is similar to level 5 (37.9% of all jars has a clear neck, 61.8% has no neck). Jars with handles are also still present.

Jars with a simple rounded rim (type 311, 64.0% of all jars with neck, fig. IV.108.a-h) and with a simple rounded rim that is slightly oval (type 312, 11.2% of all jars with neck, fig. IV.108.i) are the most popular shapes among jars with a neck, as was the case in levels 6 and 5. In the smaller type 311 (311a) jars the most important feature in level 4 is in the shape of the base. In level 6 and 5 bases of these jars were either ring bases or flat disc-shaped bases. In level 4, however, the bases of these jars are mostly narrow pedestal bases (type 721, cf. fig. IV.108.a-d). This development was also noted for Tell Sheikh Hamad and other later Middle

Assyrian sites. However, the Sabi Abyad jars are not as slender and long-drawn as the typical late Middle Assyrian small jars from other sites (cf. Pfälzner 1995: 136 with references to examples from Barri, Brak, Assur, Kar-Tukulti-Ninurta and Zubeidi; Giricano Höyük: Schachner 2002: abb. 22f). A thin-section sample (no. 01, Appendix D) shows that type 311 jars were produced locally. Jars with pointed rims bent outwards (type 313, fig. IV.108.j-k) and jars with squarish rims (type 315, fig. IV.108.m-n) are represented in almost equal amounts as in the previous level. A thin-section sample (no. 04, Appendix D) of a type 313 jar rim shows that it was made locally. An interesting example of a type 315 jar is illustrated in fig. IV.108.n, coming from a cremation burial in a mixed level 4/5 context. The triangular ridge on the neck can be compared to an early Iron Age jar from Tell Jurn Kabir (Eidem and Ackermann 1999: fig. 5 no. 17). Jars with squarish, inward-sloping rim type 318 decrease slightly in popularity in level 4 (fig. IV.108.o-s), and they are hardly found in level 3.

In the group of jars with ribbon rims without a neck, the typical oval ribbon rim with vertical sides (type 322, fig. IV.109.k-n) is still the most popular shape, but its relative amount has again decreased in level 4 to 54.9% of all jars without a neck. The shapes also seem to differ from the previous level, the rims now being slightly more squat (fig. IV.109.k) or oval (fig. IV.109.m). Smooth oval rims with a shallow transition to the shoulder are parallelled at Sheikh Hamad phase MA IIb and MA III (Pfälzner 1995: Taf. 121g, 152e). A thin-section sample (no. 21, Appendix D) shows that it was made locally. Especially jars with a ribbon rim that is slightly concave on the outside (type 321, fig. IV.108.t-y, IV.109.a-j) have become more popular, and now comprise more than 30% of all jars without a neck. Type 321 rims occur in different shapes. Some are rather squarish (e.g. fig. IV.108.v), others are thick and rounded (fig. IV.109.a), some are strongly bent outwards (e.g. fig. IV.108.x). A rare occurrence of decoration is a wavy incised line on the shoulder of the jar in fig. IV.109.i (which was also noted to have a fragment of shell in its paste). Of rim type 324, with a slightly concave inside surface of the ribbon rim, one example was found in level 4, after which this type was no longer found at the site (fig. IV.109.t).

A small jarlet with a handle and a spout from the body (type 331) is decorated with a painted horizontal band (fig. IV.109.u). One other jar rim with a handle (type 333) was found as well (fig. IV.109.v). A fragment of a jar with a handle and a trefoil mouth (fig. IV.109.w) was found in a mixed level (levels 0/2/3/4), but may date to level 4 or level 3. Comparisons for this shape could be found at 11th century BC Tille Höyük (Blaylock 1999: fig. 2), as well as at Shioukh Fawqani (Bachelot 1999: pl. 11), Hadidi (Dornemann 1981: fig. 6 no. 3) and Emar (Caubet 1982: no. 29).

Goblets

As remarked above, the relative amount of goblets in level 4 has decreased, and both goblet types are no longer present in the “top ten”. More interestingly, the S-shaped goblets have strongly increased in popularity, now forming 71.0% of all goblets, while the share of V-shaped goblets has decreased to 29.0% (in level 5 each type was equally represented). V-shaped goblets type 411 generally resemble their level 5 predecessors, and horizontally painted bands still occur as well (fig. IV.110.a-h). When looking at the S-shaped goblets type 421, shapes are in general similar to level 5 as well, with several goblets showing a more or less pronounced carination in the body (fig. IV.110.i-t). Two thin-section samples of goblets (nos. 09 and 10, Appendix D) show that they were produced locally. Two goblets must be remarked upon here: fig. IV.110.o and IV.110.p. The former is larger than the other type 421 goblets, while the latter has an incised line at the neck and a very pronounced pedestal base atypical for goblets until now. This shape has a close parallel at Tell Taban level 8 (Ohnuma et al. 1998: fig. 10 no. 30).

Pot stands

Pot stands, although still typically Middle Assyrian in shape, do show some differences with level 5. In level 4 stands are conical in shape, with the vessel wall only bending outwards just below the triangular rim (cf. fig. IV.110.y, IV.111.c). Or they are more cylindrical in shape, with strongly thickened, oval or rounded rims and straight walls (e.g. fig. IV.111.h-i). There are several examples of large, handmade pot stands with closed bases (in which a hole had been made for ventilation) and with rounded or squarish windows made in the side walls (fig. IV.111.k-n). Especially fig. IV.111.l with a carefully shaped, triangular rim with incisions on the outside surface, and a rectangular window in the wall, attracts attention.

Special shapes

"Pilgrim flasks" are no longer found in level 4. A miniature handmade bowl (fig. IV.112.b)[45] and a fragmented but unique bird-shaped miniature vessel (fig. IV.112.d) are among the special shapes in this level. Jars and body fragments show painted and impressed marks and signs comparable to level 5 (fig. IV.112.g-p; see below, Chapter V, potters' marks and signs).

Base type	No.	%
611	10	1.4%
711	31	4.2%
712	61	8.3%
721	43	5.8%
731	331	44.8%
741	248	33.6%
751	8	1.1%
Other	5	0.6%
Total	738	100.0%

Table IV.29: Base types in level 4, loose bases and complete shapes included.

Bases

In level 4 the relative amount of ring bases has decreased again to 33.6% of all bases, now even less than in level 6. Mostly the rings are rounded and clearly set off from the vessel wall, in contrast to level 5 where they were often aligned with the vessel wall. The number of flat bases is now much higher than before. Holes in flat or ring bases occurred only five times in level 4, both shaped before firing or drilled after firing (fig. IV.99.n, IV.106.f, IV.113.f, k). The smaller amount of nipple bases mirrors the decrease in the relative amount of V-shaped goblets type 411, for which these bases are typical. The number of pedestal bases, mainly those on small type 311 jars, has increased a little.

Surface treatment and decoration

In level 4 only one fragment (a flat base fragment) was covered in a slip (0.05%), and the amount of slipped pottery is therefore almost reduced to nothing now. Glazed pottery no longer occurs. Burnishing has also virtually disappeared, with only 17 burnished diagnostics (0.8%). Burnished fragments are mainly carinated bowls type 113 (n=7), rounded bowls type 122, and three body fragments with white-filled impressed decoration.

[45] Cf. Tell al-Rimah level C1-2 (Postgate et al. 1997: pl. 101 no 1232).

	No.	%
Painted horizontal lines	6	5.5%
Painted other	4	3.7%
Total 9.2%		
Incised horizontal line(s)	21	19.3%
Incised wavy lines(s)	19	17.4%
Incised horizontal+wavy line(s)	9	8.3%
Incised other	2	1.8%
Total 46.8%		
Applied	2	1.8%
Applied horizontal band(s)	17	15.6%
Applied wavy band(s)	1	0.9%
Total 18.3%		
Incised + applied, horizontal	1	0.9%
Incised + applied, wavy	1	0.9%
Incised + applied, horizontal + wavy	23	21.1%
Total 22.9%		
Impressed white-filled decoration	3	2.8%
Total decorated	109	100.0%

Table IV.30: Decoration in level 4.

In level 4 the amount of decorated sherds again increases a little, to 5.4% of all diagnostics. The style of decoration stays similar to what was typical in levels 6 and 5, with predominantly incised and applied decorations. Painting is used a bit less than in level 5, and now comprises mainly horizontal dark-red bands on a goblet base and a small spouted jar (fig. IV.110.g, fig. IV.109.u), or horizontal black lines or paint blobs (possibly made with bitumen) on body fragments. One fragment from a mixed level 4/5 context (fig. IV.112.r) may find comparisons in the 11th century material from Tille Höyük (Blaylock 1999: fig. 1). The relative amount of fragments that show only incised decoration has decreased a little. Horizontal lines stay favourite on type 113 bowls (fig. IV.100.w, ac), deep bowls, pots (fig. IV.105.c, e) and jars with a neck (fig. IV.108.j, k), and now also twice on S-shaped goblets type 421 (fig. IV.110.q, r). However, wavy lines have increased in popularity, being applied in almost equal quantities as horizontal lines now, mainly on large deep bowls type 145 (fig. IV.104.a, c) and large storage pots type 221 (fig. IV.106.c, d), on which combinations of horizontal and wavy incised lines also occur. Almost all applied decorations consist of horizontal applied bands, the majority of them resembling thick cabled ropes, but some are plain. They mostly occur on large storage vessels or body fragments thereof (e.g. fig. IV.106.e-g, IV.105.i). Some unique applied decorations are found in the fragmented bird-shaped vessel, with a tail and “wings” applied to a squatted goblet shape (fig. IV.112.d), and in a relief application to a fragment of a fenestrated pot stand (fig. IV.112.c). Combinations of applied and incised decoration occur more often than in level 5, and most often consist of horizontal applied rope bands combined with wavy incised lines, on large vessels type 145, 215, 221 and 222. The attractive white-filled impressed circle decoration that was used on type 113 carinated bowls in level 6 and 5 was found only on three body sherds in level 4, perhaps from type 113 bowls.

Firing

The relative amounts of sherds fired at higher, medium or lower temperatures are similar to those in level 5, with the majority (almost 80%) fired at medium kiln temperatures. Of these, more than 92% was made of common wares with organic inclusions (wares H, I, J), exactly mirroring the relative amounts of these wares in the complete corpus. The number of sherds fired at relatively high temperatures has increased a little to almost 18%. The number of fine ware (wares A, B, C) fragments among sherds fired at high temperatures has decreased a little to 6.4%, indicating that common wares with organic inclusions are fired at higher temperatures rather often. Fragments with coarse mineral inclusions (cooking wares) were rather often fired at medium temperatures (as indicated by their reddish and orange colours) as opposed to the lower temperatures characteristic for the cooking pots of earlier levels.

	No.	%
High	360	17.8%
Medium	1595	79.1%
Low	61	3.0%
Total	2016	100.0%

Table IV.31: Relative firing temperatures in level 4.

Lime spalling was noted for only five fragments (0.2% of all diagnostics), in jars without a neck and in a pot stand, all made of ware I with organic inclusions, most of them fired at medium temperatures.

	No.	%
Oxidizing	1650	81.8%
Incompletely oxidizing (grey core)	327	16.2%
Reducing	39	1.9%
Total	2016	100.0%

Table IV.32: Firing atmospheres in level 4.

As in levels 6 and 5, the majority of all diagnostics were still fired in completely oxidizing kiln circumstances. However, the relative amount of sherds fired in incompletely oxidizing circumstances, showing a grey core, has increased again and now reaches 16%. Among sherds fired in oxidizing circumstances, the majority has greenish (22.8%), buff (37.0%) or orange (23.8%) surface colours. Sherds fired in incompletely oxidizing circumstances have grey cores and are generally a bit darker, with mainly orange (58.4%) or reddish (11.6%) surface colours. Sherds fired in reducing circumstances are rare and have dark-grey colours throughout.

Table IV.33: Level 4, proportions of ware per type, frequencies of types.
Shaded types occur only in level 4. Bold underlined types are new in level 4.

	A	B	C	D	E	H	I	J	G	K	M	Total	
													% of rims
111		1				30	404	19			1	455	33.0%
		0.2%				6.6%	88.8%	4.2%			0.2%	100.0%	
111!							1					1	0.1%
							100.0%					100.0%	
112						6	21	1				28	2.0%
						21.4%	75.0%	3.6%				100.0%	
113						3	19	4				26	1.9%
						11.5%	73.1%	15.4%				100.0%	
113?							1					1	0.1%
							100.0%					100.0%	
121						1	11	1				13	0.9%
						7.7%	84.6%	7.7%				100.0%	
122			1			2	8					11	0.8%
			9.1%			18.2%	72.7%					100.0%	
123						1	13					14	1.0%
						7.1%	92.9%					100.0%	
125						1	5					6	0.4%
						16.7%	83.3%					100.0%	
<u>128</u>		1										1	0.1%
		100.0%										100.0%	
129						1						1	0.1%
						100.0%						100.0%	
131						5	102	2				109	7.9%
						4.6%	93.6%	1.8%				100.0%	
132						1	27	1				29	2.1%
						3.4%	93.1%	3.4%				100.0%	
134							4					4	0.3%
							100.0%					100.0%	
135							2					2	0.1%
							100.0%					100.0%	
141						1	25					26	1.9%
						3.8%	96.2%					100.0%	
142						1	6					7	0.5%
						14.3%	85.7%					100.0%	
143						1	26	1				28	2.0%
						3.6%	92.8%	3.6%				100.0%	
144						1	1					2	0.1%
						50.0%	50.0%					100.0%	
145							10					10	0.7%
							100.0%					100.0%	
148							1					1	0.1%
							100.0%					100.0%	
149							1					1	0.1%
							100.0%					100.0%	
1411							1					1	0.1%
							100.0%					100.0%	
1412							1					1	0.1%
							100.0%					100.0%	
1414							1					1	0.1%
							100.0%					100.0%	
1417							1					1	0.1%
							100.0%					100.0%	
All bowls		2	1			55	692	29			1	780	56.5%
		0.3%	0.1%			7.1%	88.7%	3.7%			0.1%	100.0%	
211			1				2					3	0.2%
			33.3%				66.7%					100.0%	

	A	B	C	D	E	H	I	J	G	K	M	Total	
212			1	3	1		8	1				14	1.0%
			7.1%	21.4%	7.1%		57.1%	7.1%				100.0%	
214		1										1	0.1%
		100.0%										100.0%	
215							1					1	0.1%
							100.0%					100.0%	
221						7	63	2				72	5.2%
						9.7%	87.5%	2.8%				100.0%	
222						3	34					37	2.7%
						8.1%	91.9%					100.0%	
225							2					2	0.1%
							100.0%					100.0%	
226			1				9	1				11	0.8%
			9.1%				81.8%	9.1%				100.0%	
229							1					1	0.1%
							100.0%					100.0%	
2210								1				1	0.1%
								100.0%				100.0%	
231							1					1	0.1%
							100.0%					100.0%	
232						1						1	0.1%
						100.0%						100.0%	
All pots		1	3	3	1	11	124	5				148	10.7%
		0.7%	2.0%	2.0%	0.7%	7.4%	83.8%	3.4%				100.0%	
311		1	1			9	66	3				80	5.8%
		1.3%	1.3%			11.3%	82.5%	3.8%				100.0%	
312						1	13					14	1.0%
						7.1%	92.9%					100.0%	
313							6					6	0.4%
							100.0%					100.0%	
314				1			2					3	0.2%
				33.3%			66.7%					100.0%	
315							13					13	0.9%
							100.0%					100.0%	
318							5					5	0.4%
							100.0%					100.0%	
31?			1									1	0.1%
			100.0%									100.0%	
321						7	53	4				64	4.6%
						10.9%	82.8%	6.3%				100.0%	
322						7	97	7		1		112	8.1%
						6.3%	86.6%	6.3%		0.9%		100.0%	
323						3	23		1			27	2.0%
						11.1%	85.2%		3.7%			100.0%	
324			1									1	0.1%
			100.0%									100.0%	
331		1										1	0.1%
		100.0%										100.0%	
333		1										1	0.1%
		100.0%										100.0%	
All jars		4	4	1		27	278	14	1	1		330	23.9%
		1.2%	1.2%	0.3%		8.2%	84.2%	4.2%	0.3%	0.3%		100.0%	
411	2	7	2									11	0.8%
	18.2%	63.6%	18.2%									100.0%	
421	5	18	1				3					27	2.0%
	18.5%	66.7%	3.7%				11.1%					100.0%	
511							6					6	0.4%
							100.0%					100.0%	
611						2	61					63	4.6%
						3.2%	96.8%					100.0%	
611?			1				4					5	0.4%
			20.0%				80.0%					100.0%	

	A	B	C	D	E	H	I	J	G	K	M	Total	
911?			1									1	0.1%
			100.0%									100.0%	
?							6	1	1	1		9	0.7%
							66.7%	11.1%	11.1%	11.1%		100.0%	
mini							1					1	0.1%
							100.0%					100.0%	
tray							1					1	0.1%
							100.0%					100.0%	
All rims	7	32	13	4	1	95	1174	49	2	2	1	1380	100.0%
	0.5%	2.3%	0.9%	0.3%	0.1%	6.9%	85.1%	3.6%	0.1%	0.1%	0.1%	100.0%	
													% of bases
611						1	9					10	1.4%
						1.0%	90.0%					100.0%	
711	3	28										31	4.2%
	9.7%	90.3%										100.0%	
712	13	40	2			1	5					61	8.3%
	21.3%	65.6%	3.3%			1.6%	8.2%					100.0%	
721		2				2	38	1				43	5.8%
		4.7%				4.7%	88.4%	2.3%				100.0%	
731	1	3	2			22	292	11				331	44.8%
	0.3%	0.9%	0.6%			6.6%	88.2%	3.3%				100.0%	
741		1	1			20	219	7				248	33.6%
		0.4%	0.4%			8.1%	88.3%	2.8%				100.0%	
751		2					6					8	1.1%
		25.0%					75.0%					1000%	
?							3			1		4	0.5%
							75.0%			25.0%		100.0%	
trays							1					1	0.1%
							100.0%					100.0%	
All bases	17	76	6			46	573	19		1		738	100.%
	2.3%	10.3%	0.8%			6.2%	77.6%	2.6%		0.1%		100.0%	
Loose	15	64	6			31	414	19				549	-
Bases	2.7%	11.7%	1.1%			5.6%	75.4%	3.5%				100.0%	
Other	2	3	2		1	7	71	3	1			90	-
diagn.	2.2%	3.3%	2.2%		1.1%	7.8%	78.9%	3.3%	1.1%			100.0%	
Total	24	99	21	4	2	133	1658	70	2	2	1	2016	
	1.2%	4.9%	1.0%	0.2%	0.1%	6.6%	82.2%	3.5%	0.1%	0.1%	0.0%	100.0%	

Level 3 (figs. IV.114 – IV.120).

A total of 781 diagnostic sherds was securely attributed to level 3. In level 3 the architecture and occupation seems to be not much more than a few isolated houses, while the ruins of the *dunnu* were used for all kinds of domestic activities. Architectural remains dated to level 3 have mainly been found in the northwestern part of the site. Although level 3 seems to date from after the presence of the official Middle Assyrian *dunnu* at the site, it can certainly still be dated to the end of the Late Bronze Age and the Middle Assyrian period.

Clay and inclusions

The inclusions were not described in 79 diagnostics. A vast majority (89%) of all diagnostics have organic inclusions combined with different types of mineral inclusions. Especially ware K (organic inclusions and coarse sand) is interesting. Ware K could perhaps be a kind of cooking ware, in the case of the pot in fig. IV.116.i, but there is also a jar rim (fig. IV.118.n) with similar inclusions. Thin-section analyses were not performed for ware K, nor for any other sherd from level 3. Only one sherd (fig. IV.115.k) is made of ware M, but it is uncertain whether the mineral inclusions are really grog (crushed sherds) or something else. This sherd was not analysed further. In diagnostics with organic inclusions (wares H, I, J) the majority contains calcite, while the number of sherds without visible calcite particles is relatively small. It was rarely noted within this group that the sherds contained a lot (2.0%) or very few (1.3%) mineral inclusions.

A total of 10.8 percent of all level 3 diagnostics has mineral inclusions only. The greater majority of these (10.1 %) are fine wares (A, B, C and one sherd without any visible inclusions). In this group 10% (n=7) was noted to have a lot of mineral inclusions, while 4.3% (n=3) has very few mineral inclusions. Only very few examples of coarse minerally-tempered wares are present in level 3. One of them is a large cooking pot (fig. IV.116.h), while one other fragment is perhaps also a cooking pot (fig. IV.116.g). A jar rim with a short handle attached is made of ware D, but most probably this is not a cooking pot. One jar rim has unidentified, mineral inclusions.

		No.	%	
A	Calcium	16	2.3	
B	Calcium and sand	40	5.7	
C	Fine sand	14	2.0	
N	No visible inclusions	1	0.1	
X subtotal				10.1
H	Organic inclusions and calcium	100	14.2	
I	Organic inclusions and calcium and sand	487	69.4	
J	Organic inclusions and fine sand	35	4.9	
K	Organic inclusions and coarse sand	2	0.3	
M	Organic inclusions and grog (?)	1	0.1	
Y subtotal				88.9
D	Coarse sand	4	0.6	
E	Coarse calcite	1	0.1	
subtotal				0.7
?	Unidentified inclusions	1	0.1	
Total *		702	100.0	

Table IV.34: Inclusions in level 3.
* Excluding 79 cases where inclusions were not coded.

Shapes

In level 3 the distribution of shape classes resembles that of level 4. There are slightly more bowls, now more than 60% of all rims, and pot stands. The number of pots and jars has decreased a little.

	No.	%	% of rims
Bowls	340	43.6	60.7
Pots	46	5.9	8.2
Jars	119	15.2	21.2
Goblets	15	1.9	2.7
Pot stands	36	4.6	6.4
Strainers	1	0.1	0.2
Trays	2	0.3	0.3
Loose base fragments	203	26.0	
Diagnostic bodysherds and others	18	2.4	
Total	781	100.0	100.0

Table IV.35: Shapes in level 3.

The number of different rim types in level 3 is 38. Only three types are new in level 3 (type 133, 146 and 431), but they occur only once each and are otherwise found only in mixed contexts in very small numbers.

In level 3 the "top ten"of the most popular rim types is made up of the following types: 111 (33.9%), 131 (8.3%), 322 (6.5%), 611 (6.5%), 321 (5.2%), 113 (3.6%), 221 (3.6%), 311 (3.4%), 143 (3.1%), 141 (2.5%).These ten types together form 76.5% of all rim types in level 3. In comparison with level 4 these are largely the same types. In level 3 type 112 bowls and type 222 pots no longer occur in the "top ten". Their places have been taken by type 113 bowls and type 141 deep bowls. All "top ten" rim types still belong to the typically Middle Assyrian shapes.

	No.	%
Carinated bowls	224	65.7%
Rounded bowls	12	3.5%
Straight-sided bowls	60	17.6%
Deep bowls	43	12.6%
Total	341	100.0%

Table IV.36: Different bowl shapes in level 3.

Bowls

The distribution of bowl shapes stays remarkably similar to that of level 4 and the previous levels. About two-thirds are carinated bowls, while the number of deep bowls has increased a little and there are slightly fewer rounded bowls. As in previous levels, the differences are small.

The popularity of carinated bowl type 111, still the most important bowl shape at the site, remained the same when looking at all rims, but decreased again a little when looking at the carinated bowls only (n=189, 33.7% of all rims or 84.4% of all carinated bowls). The three size classes still exist and are distributed as follows: 111a (small bowls) n=21, 11.1% of all type 111 bowls; 111b (middle bowls) n=48, 25.4% of all type 111 bowls, 111c (larger bowls) n=79, 41.8% of all type 111 bowls. It seems that there are slightly fewer small carinated bowls in level 3. In small type 111a bowls, rims are generally smoothly rounded. Triangular rims do not occur very often. Generally, they are similar to the level 4 small carinated bowls (fig. IV.114.a-h). Interestingly, the larger type 111b and 111c carinated bowls do seem to differ from their level 4 counterparts. In level 3 the usual carinated bowls occur, similar as in level 4 (e.g. fig. IV.114.j, m). Next to these, there are some that show rather shallow carinations and relatively short wall sections above the carination, with triangular rims thickened on the outside (e.g. fig. IV.114.n, p). Other bowls show pronounced rounded carinations. The carination on the inside of the bowl is very slight, and the wall section above the carination becomes thicker towards the rounded triangular rim (e.g. fig. IV.114.r). These two shapes were not found in level 4 and before.

In level 3 although they are no longer part of the “top ten”, the relatively large amount of type 112 carinated bowls is continued, now 5.8% of all carinated bowls. Shapes resemble the type 112 bowls in level 4, with rounded or slightly triangular bent overhanging rims (fig. IV.114.v-aa). Comparisons come from Tell Taban levels 6, 8 and 9 (see above, level 4).

The relative amount of type 113 bowls, with a long straight wall part above the carination, increases in level 3. Now 9.4% of all carinated bowls is of this type (compared to 5.1% in level 4). Rims are either squarish or thickened on the outside, similar to level 4 (fig. IV.114.ab-ag, IV.115.a-d). About 24% of the type 113 bowls is burnished. Decoration includes a few examples of incised horizontal lines (fig. IV.115.d), and one very small example of the white-filled impressed decoration that was so characteristic of this vessel shape in earlier levels (see above, cf. also Tell Brak HH1 Oates et al. 1997: fig. 181 no. 27). Colours are mainly reddish and orange, with one buff example.

In the group of rounded bowls the majority is now of type 123, with a rounded wall and a rim slightly thickened on the outside (fig. IV.115.f). Other rounded bowl types that were popular in earlier levels (type 121, 122, 125) occur only once or twice or have completely disappeared in level 3. Type 128 with incurving wall and rounded rim, introduced for the first time in level 4, is still found in level 3, although only once. There is also one example of the type 1215 bowl (fig. IV.115.g), with triangular outward-bevelled rim, that was first found in level 5 in small numbers. Comparisons for this shape come from Sheikh Hamad phase MA IIc and MA III (Pfälzner 1995: Taf. 102a, 137c) but also from (early) Iron Age contexts at Sheikh Hassan (on the Euphrates; Schneider 1999: abb. 6 no. 7,1) and Tell al-Rimah level C1 (Postgate et al. 1997: pl. 55 no. 486).

In level 3 again more than three-quarters of all straight-sided bowls belong to the well-known type 131 with outward-sloping rim (fig. IV.115.h-n). Rather thick rims still occur as in level 4, and some rims are a bit pinched (fig. IV.115.k). The amount of type 132 rims thickened on the inside has decreased a bit in level 3. A new rim is type 133, with a horizontally flattened top and thickened on the inside (fig. IV.115.o, p). It was found only once in level 3, once in a level 3/4 mixed context and once in a context that was not yet assigned to a level. It can be compared to a bowl from Tell Brak HH1 (Oates et al. 1997: fig. 181 no. 12). Two rims of type 136, with a groove on top (fig. IV.115.q-s), seem to be more characteristic for level 3 than for level 5 in which the first example of this type was found. One other example of this type comes from a mixed level 3/4 context.

Among deep bowls the type 143 bowl with outward-sloping rim thickened inside and outside becomes the most popular shape in level 3, with 39.5% of all deep bowls (fig. IV.116.c). The types 141 and 142 with hammer-shaped rims that were typical for levels 6 and 5, are found less in level 3 (similar to level 4, fig. IV.116.a, b). As in level 4, the rim shapes in these types are also different from earlier levels, showing rims that are more rounded or that thicken gradually from the wall, forming a more triangular shape.

Pots

The relative amount of pots with a closed shape has decreased again a little in level 3. Now only about 10% of all pots has a closed shape. Pots with inward-sloping rim (type 211, fig. IV.116.e-f) and pots with rims thickened on the outside (type 212, fig. IV.116.g-i) are equally popular. A close comparison for the type 211 rim in fig. IV.116.f was found at 11th century BC Tille Höyük levels I-III (Blaylock 1999: fig. 2 no. 8). Type 212 pots are most probably all cooking pots. Although one of these has a rounded, thickened rim like earlier cooking pots, another resembles the level 4 cooking pots with a long thickened but flattened rim (fig. IV.116.h). A third one has a rim that is well thickened on the outside (fig. IV.116.g). The variety of rims in pots with a closed shape has decreased, as only two rim types were distinguished in level 3.

As in level 4, type 221 horizontally flattened rims are much more popular (with 54.1% of all pots with vertical walls) than type 222 inward-sloping rims. The smaller type 221a pots still have hammer shapes. Whereas in level 4 they were more rounded than in earlier levels, in level 3 they gradually become thicker from the wall and then horizontally flattened at the rim, resulting in an only slightly thickened triangular shape (fig. IV.117.a-d, especially a, c). In level 3 there are four examples of pots with S-shaped wall profiles and mushroom-shaped rims (type 231, fig. IV.117.f).

Jars

The relative distribution of jars with and without neck is similar to that in level 4 (34.7% of all jars has a neck, while 61.9% of all jars has a rim that sits directly on the shoulder of the vessel, without a neck). Among jars with a neck those with a simple rounded rim (type 311, fig. IV.117.g, i) are still the most popular, although their relative share has decreased (in level 4, they still represented 64% of all jars with neck; in level 3 this amount has gone down to 46.3%). Unfortunately, not many complete examples have been preserved from level 3, but the trend of narrow pedestal bases on these jars seems to continue in this level. A similar example of a small jar with a pedestal base is represented by a type 721 base (fig. IV.120.e) and by a completely preserved type 313 jar (with a pointed rim thickened on the outside, fig. IV.118.a). This jar also shows that the vessel shape of small jars is becoming more narrow and slender than in, for example, level 5 where plumper and wider shapes were predominant. Among other rim types of jars with a neck especially type 315 with squarish flattened rim is important (fig. IV.118.g, h). Rims are less squarish than in earlier levels, and now seem to thicken more gradually from the lower wall.

In jars without a neck the trend set in level 4 continues for level 3. Jars with an oval ribbon rim with vertical sides (type 322, fig. IV.w-z, ab) are still the most popular shape, but their relative share among neckless jars decreased again until it reached 49.3% of all jars without a neck. Shapes are varied, either long and thin (fig. IV.118.w), or round and thick (fig. IV.118.x), or rather squarish (fig. IV.118.z), and are no longer very reminiscent of the typical type 322 rims that were so popular in level 5. Jars with a ribbon rim that is concave on the outside (type 321, fig. IV.118.aa, ac) again become more popular in level 3, now taking a share of almost 40% among jars without a neck. Similar as in level 4, rims show a rather large variation in shape. A small number of jars with a simple rounded rim and a handle attached to the rim and upper body was found in level 3 (fig. IV.119.a-d).

Goblets

The relative amount of goblets has remained constant when compared to level 4. Similarly, S-shaped goblets type 421 are more popular (now 60% of all goblets, fig. IV.119.f, g) than the V-shaped goblets type 411 (fig. IV.119.e). New in level 3 is a rare type of goblet with conical, closed walls (type 431). The one example found in this level also shows the beginning of a narrow handle (fig. IV.119.h, i). It has a comparison at Sheikh Hamad phase MA III (Pfälzner 1995: Taf. 146g). Decoration on goblets no longer occurs, with the exception of one incised horizontal line at the neck of an S-shaped goblet (fig. IV.119.f).

Pot stands

Pot stands (fig. IV.119.j-m) are similar in shape to their level 4 counterparts (see above). One exceptional fragment, possibly of a pot stand, is a handmade part of a cylindrical shape decorated with relief figures of an unknown nature (fig. IV.119.p). Another special shape is represented by a handmade coarse, oval tray (fig. IV.119.n). A fragmented globular jar with a handle and rounded base (fig. IV.120.l) has comparisons at Tell Hadidi (Dornemann 1981: fig. 6 no. 5, fig. 7).

Base type	No.	%
611	1	0.4
711	16	6.3
712	17	6.7
721	16	6.3
731	134	52.5
741	66	25.9
751	2	0.8
Other	2	0.8
Total	255	100.0

Table IV.37: Base types in level 3,
loose bases and complete shapes included.

Bases

In level 3 the trend of decreasing amounts of ring bases continues. Now only one quarter of all bases has the shape of a ring attached to the vessel bottom. The rings are rounded and clearly set off from the vessel wall, and a bit longer than in earlier levels. The number of flat bases has increased further to more than 50%. Holes in bases were not found among the diagnostics from level 3.

<u>Surface treatment and decoration</u>

In level 3 two fragments were covered in a slip (0.3%): one of them a type 111 carinated bowl with flat base, covered in a cream-coloured slip. Eight diagnostics (or 1%) were burnished. Except for a base fragment and a body fragment (possibly of the same pot), all are type 113 carinated bowls with long straight walls above the carination.

	No.	%
Painted horizontal lines	1	3.6%
Painted other	2	7.1%
Total 10.7%		
Incised horizontal line(s)	12	42.9%
Incised wavy lines(s)	1	3.6%
Incised horizontal+wavy line(s)	2	7.1%
Incised other	1	3.6%
Total 57.1%		
Applied horizontal band(s)	3	10.7%
Applied wavy band(s)	1	3.6%
Total 14.3%		
Incised + applied, horizontal + wavy	3	10.7%
Incised + applied, other	1	3.6%
Total 14.3%		
Impressed white-filled decoration	1	3.6%
Total decorated	28	100.0%

Table IV.38: Decoration in level 3.

In level 3 the relative amount of decorated sherds is very small: only 3.6% of all diagnostics was decorated. The style and kind of decoration remains similar to that of level 4, with mainly incised and applied decorations in simple patterns. In level 3 the relative amount of decorations that are incised only increased, while the amount of applied decorations and combinations of applied and incised decorations has decreased slightly. Painted decoration is now limited to careless lines made with bitumen. Paint made from a clay slurry is no longer used. Incised horizontal lines were used on carinated type 111 and type 113 bowls (fig. IV.115.c, d), but also on large jars (type 312, 322, fig. IV.117.h, j) and once on a goblet. Incised "other" decoration describes multiple horizontal lines combined with lunar impressed shapes. Horizontally applied decorations are of the "cable applique" type, and were found on body fragments of large storage vessels just like the combination of horizontal applique and wavy incised lines. Incised and applied "other" decoration was used on the fragment of a unique pot stand with relief decoration (fig. IV.119.p), the nature of which is unfortunately not clear.

Firing

The number of sherds fired at medium kiln temperatures increased in level 3 to more than 90%, while the number of sherds fired at higher temperatures became less. This indicates that ceramics were generally fired at slightly lower temperatures than in level 4 and before. Almost 15% of sherds fired at higher temperatures were made of fine wares A, B or C, which also indicates that common wares (H, I, J) were now generally not so often fired at higher temperatures anymore.

	No.	%
High	48	6.8%
Medium	632	90.1%
Low	21	2.9%
Total	701	100.0%

Table IV.39: Relative firing temperatures in level 3.

Lime spalling was noted for only one sherd (fig. IV.118.a), a small jar made from ware I and fired at high temperatures.

	No.	%
Oxidizing	576	82.2%
Incompletely oxidizing (grey core)	120	17.1%
Reducing	5	0.7%
Total	701	100.0%

Table IV.40: Firing atmospheres in level 3.

The relative amount of sherds fired in incompletely oxidizing kiln atmospheres has increased again a little bit: now more than 17% of all diagnostics show a grey core. Pottery fired in reducing atmospheres hardly occurs anymore in level 3. Among sherds fired in oxidizing circumstances, most have buff colours (45.3%), but orange, reddish or greenish also often occur. Sherds fired in incompletely oxidizing circumstances are again a bit darker, with almost half fired to an orange colour and about one quarter to reddish colours. The few fragments fired in reducing atmospheres are fired to black or very dark-grey colours.

Table IV.41: Level 3, proportions of ware per type, frequencies of types.
Bold underlined types are new in level 3.

	-	?	A	B	C	N	D	E	H	I	J	K	M	Total	% of rims
111	8								36	131	14			189	33.7%
	4.2%								19.0%	69.3%	7.4%			100.0%	
111?										1				1	0.2%
										100.0%				100.0%	
112	1								2	10				13	2.3%
	7.7%								15.4%	76.9%				100.0%	
113				1	1				1	15	3			21	3.7%
				4.8%	4.8%				4.8%	71.4%	14.3%			100.0%	
121										2				2	0.3%
										100.0%				100.0%	
122	1													1	0.2%
	100.0%													100.0%	
123	1								1	3				5	0.9%
	20.0%								20.0%	60.0%				100.0%	
128				1										1	0.2%
				100.0%										100.0%	
1215			1											1	0.2%
			100.0%											100.0%	
12?			1		1									2	0.3%
			50.0%		50.0%									100.0%	
131	5								4	35	1		1	46	8.2%
	10.9%								8.7%	76.1%	2.2%		2.2%	100.0%	
131?										1				1	0.2%
										100.0%				100.0%	
132										8				8	1.4%
										100.0%				100.0%	
133										1				1	0.2%
										100.0%				100.0%	
134										2				2	0.3%
										100.0%				100.0%	
136										2				2	0.3%
										100.0%				100.0%	
141	5									7	2			14	2.5%
	35.7%									50.0%	14.3%			100.0%	
142	1									4				5	0.9%
	20.0%									80.0%				100.0%	
143	2								6	9				17	3.0%
	11.8%								35.3%	52.9%				100.0%	
145	3								1	2				6	1.1%
	50.0%								16.7%	33.3%				100.0%	
146											1			1	0.2%
											100.0%			100.0%	
All bowls	27		2	2	2				51	234	21		1	340	
	7.9%		0.6%	0.6%	0.6%				15.0%	68.8%	6.2%		0.3%	100.0%	
211										2				2	0.3%
										100.0%				100.0%	
212							1	1				1		3	0.5%
							33.3%	33.3%				33.3%		100.0%	
221	2								2	15	1			20	3.6%
	10.0%								10.0%	75.0%	5.0%			100.0%	
222	1								1	10				12	2.1%
	8.3%								8.3%	83.3%				100.0%	
225									1	1				2	0.3%
									50.0%	50.0%				100.0%	
226					1					2				3	0.5%
					33.3%					66.7%				100.0%	
231										4				4	0.7%
										100.0%				100.0%	

	-	?	A	B	C	N	D	E	H	I	J	K	M	Total	
All pots	3				1		1	1	4	34	1	1		46	
	6.5%				2.2%		2.2%	2.2%	8.7%	73.9%	2.2%	2.2%		100.0%	
311	2								2	15				19	3.4%
	10.5%								10.5%	78.9%				100.0%	
312									2	3				5	0.9%
									40.0%	60.0%				100.0%	
313						1			1	2				4	0.7%
						25.0%			25.0%	50.0%				100.0%	
314?										2				2	0.3%
										100.0%				100.0%	
315										7				7	1.2%
										100.0%				100.0%	
31?				2	1									3	0.5%
				66.7%	33.3%									100.0%	
321	2								2	21	3	1		29	5.2%
	6.9%								6.9%	72.4%	10.3%	3.4%		100.0%	
321?										1				1	0.2%
										100.0%				100.0%	
322	9								3	23	1			36	6.4%
	25.0%								8.3%	63.9%	2.8%			100.0%	
323										6	1			7	1.2%
										85.7%	14.3%			100.0%	
333					3		1							4	0.7%
					75.0%		25.0%							100.0%	
All jars	13	1	1	2	4	1	1		10	80	5	1		119	
	10.9%	0.8%	0.8%	1.7%	3.4%	0.8%	0.8%		8.4%	67.2%	4.2%	0.8%		100.0%	
411			1	3						1				5	0.9%
			20.0%	60.0%						20.0%				100.0%	
421			2	6	1									9	1.6%
			22.2%	66.7%	11.1%									100.0%	
431			1											1	0.2%
			100.0%											100.0%	
511										1				1	0.2%
										100.0%				100.0%	
611	5								5	26				36	6.4%
	13.9%								13.9%	72.2%				100.0%	
?		1		1						1				3	0.5%
		33.3%		33.3%						33.3%				100.0%	
tray										1				1	0.2%
										100.0%				100.0%	
var										1				1	0.2%
										100.0%				100.0%	
All rims	48	1	7	14	8	1	2	1	70	378	27	2	1	560	100.0%
	8.6%	0.2%	1.3%	2.5%	1.4%	0.2%	0.4%	0.2%	12.5%	67.5%	4.8%	0.4%	0.2%	100.0%	
															% of bases
611									1					1	0.4%
									100.0%					100.0%	
711	1		2	11	2									16	6.3%
	6.3%		12.5%	68.8%	12.5%									100.0%	
712			5	9	2				1					17	6.7%
			29.4%	52.9%	11.8%				5.9%					100.0%	
721	3								2	9	2			16	6.3%
	18.8%								12.5%	56.3%	12.5%			100.0%	
731	15								30	82	7			134	52.5%
	11.2%								22.4%	61.2%	5.2%			100.0%	
741	11		1	3	3				11	35	2			66	25.9%
	16.7%		1.5%	4.5%	4.5%				16.7%	53.0%	3.0%			100.0%	
751			1							1				2	0.8%
			50.0%							50.0%				100.0%	
tray										1				1	0.4%
										100.0%				100.0%	

	-	?	A	B	C	N	D	E	H	I	J	K	M	Total	
varia										1				1	0.4%
										100.0%				100.0%	
All bases	30		9	24	7				45	129	11			255	100.0%
	11.8%		3.5%	9.4%	2.7%				17.6%	50.6%	4.3%			100.0%	
Loose	30		9	23	6				30	98	7			203	-
bases	14.8%		4.4%	11.3%	3.0%				14.8%	48.3%	3.4%			100.0%	
Other				4			2			11	1			18	-
Diagn.				23.5%			11.1%			61.1%	5.5%			100.0%	
Total	79	1	16	40	14	1	4	1	100	487	35	2	1	781	-
	10.1%	0.1%	2.0%	5.1%	1.8%	0.1%	0.5%	0.1%	12.8%	62.4%	4.5%	0.3%	0.1%	100.0%	

IV.5 Ceramic chronology at Tell Sabi Abyad

In this paragraph we will look into how the ceramics change from level to level through the stratigraphical sequence of levels 7 to 3. The aspects discussed are the same as in the first paragraphs of this chapter; in this sense this paragraph may be seen as a summary of the information presented above. For the discussion of the specific characteristics of all aspects and individual shapes in each level, the reader is referred to the first part of this chapter.

Developments through occupation levels

In level 7 9% of all pottery had fine mineral inclusions, almost 85% was made of clays with organic inclusions, and about 6% was made of a fabric characterized by coarse mineral inclusions, including the cooking wares. In levels 6 to 3 this trend is generally continued, although the amount of pottery with organic inclusions now increases to around 90%, mainly due to the almost complete absence of coarse wares and cooking wares. The percentages of the different ware groups are remarkably similar in levels 6 and 5. In levels 4 and 3, although still showing the same general picture, the percentages are a bit different.

Wares	7	6	5	4	3
Fine mineral incl.	9.0%	9.1%	9.1%	7.1%	10.1%
Organic (+ mineral) incl.	84.6%	90.7%	90.4%	92.4%	88.9%
Coarse mineral incl.	5.8%	-	0.35%	0.3%	0.7%

Table IV.42: Comparison: inclusions in levels 6 – 3.

In level 7 a remarkably high percentage of all rims belonged to pots. Again this is related to the relatively high number of cooking vessels when compared to the Middle Assyrian levels 6 to 3. Pot stands and strainers were not found in level 7, but that is most probably due to the small sample size. In all levels the greater majority of all rims belongs to bowls of different shapes and sizes. Although the percentage of bowls is generally rather constant at approximately 60%, we see a marked increase in the number of bowls in level 6. In that level there are relatively many goblets as well. The number of jars increased strongly in level 5, to 27.3% of all rims. The number of pot stands is steadily increasing over time, perhaps related to the relatively larger amounts of pots and jars in levels 5 to 3 as compared to level 6. Strainers are a stable and small part of the collection throughout the Middle Assyrian levels, while bottles (“pilgrim flasks”) occur mainly in level 5.

Shapes, % of rims	7	6	5	4	3
Bowls	58.9%	66.0%	54.4%	56.6%	60.7%
Pots	16.4%	7.9%	7.3%	10.7%	8.2%
Jars	18.4%	15.6%	27.3%	23.9%	21.2%
Goblets	4.7%	7.0%	5.7%	2.7%	2.7%
Pot stands		3.0%	4.3%	5.0%	6.4%
Strainers		0.4%	0.5%	0.5%	0.2%
Bottles	0.4%	0.04%	0.3%	0.07%	
Trays		0.1%	0.1%	0.3%	0.3%

Table IV.43: Comparison: shape groups in levels 6 – 3.

When we have a closer look at the different groups of bowls, we see remarkable differences between level 7 on the one hand and levels 6 to 3 on the other hand. In level 7 the majority of the bowls has rounded, curved walls. Carinated bowls, however, are characteristic of the Middle Assyrian levels (although they already occurred in level 7). In level 6 the number of carinated bowls is highest, with almost 69% of all bowls, aftwards settling on approximately 65% of all bowls in levels 5 to 3. Rounded bowls are still present in Middle Assyrian times, but their share is small and gradually diminishing. The number of straight-sided bowls and deep bowls increases slightly in levels 5 to 3.

Bowl shapes	7	6	5	4	3
Carinated bowls	28.6%	68.9%	65.6%	65.5%	65.7%
Rounded bowls	46.8%	6.9%	4.5%	5.9%	3.5%
Straight-sided bowls	15.9%	15.4%	16.3%	18.5%	17.6%
Deep bowls	6.3%	8.5%	13.0%	10.1%	12.6%

Table IV.44: Comparison: bowl shapes in levels 6 – 3.

A similar break between level 7 on the one hand and levels 6 to 3 on the other hand is visible in the shape groups of pots. In level 7 the greater majority of the pots had a closed shape. In level 6 this is radically different. Now pots with straight walls are more popular, making up more than three-quarters of all pots, and this percentage only increases towards level 3, until closed pots almost disappear.

Pot shapes	7	6	5	4	3
Closed shapes	62.8%	23.2%	24.1%	12.8%	10.9%
Straight shapes	37.4%	75.9%	75.4%	83.8%	80.4%

Table IV.45: Comparison: pot shapes in levels 6 – 3.

Similar remarks can be made about the shape of jars. In level 7 jars with a clear neck were a bit more popular than in the following levels. In level 6 jars without a neck, with the rim sitting directly on the vessel shoulder, become more popular, and this picture becomes more sharply visible in levels 5 to 3.

Jar shapes	7	6	5	4	3
Jars with a neck	55.3%	44.7%	38.9%	37.9%	34.7%
Jars without a neck	44.7%	55.3%	60.5%	61.8%	61.9%

Table IV.46: Comparison: jar shapes in levels 6 – 3.

In the case of goblets a similar change in general shape preferences can be seen as well. Whereas V or U-shaped goblets were still by far the most popular shape in level 7, the number of S-shaped goblets is slowly increasing from level 6 onwards. In level 5 each shape group forms half of all goblets, but in level 3 the number of S-shaped goblets outweighs the V-shaped goblets by far.

Goblet shapes	7	6	5	4	3
V/U-shaped goblets	70.0%	54.8%	49.5%	29.0%	33.3%
S-shaped goblets	30.0%	45.2%	49.8%	71.0%	60.0%

Table IV.47: Comparison: goblet shapes in levels 6 – 3.

Parallel to the developments in the group of goblets, the nipple bases (belonging mostly to V-shaped goblets) decrease over time while the knob bases (belonging mostly to S-shaped goblets) increase. The number of pedestal bases (type 721) has declined in level 6 compared to level 7, but the number increases again over the following levels. The use of this base type in small jars (type 311) is especially characteristic of level 4 and later. Ring bases are most popular in levels 7 and 5, while flat bases outnumber them in levels 4 and 3.

Bases, all bases included	7	6	5	4	3
611 pot stand bases		1.5%	1.9%	1.4%	0.4%
711 nipple bases	0.7%	9.7%	5.8%	4.2%	6.3%
712 knob bases	3.6%	4.6%	5.6%	8.3%	6.7%
721 pedestal bases	5.1%	3.5%	4.3%	5.8%	6.3%
731 flat bases	35.5%	39.7%	31.2%	44.8%	52.5%
741 ring bases	53.6%	39.7%	49.6%	33.6%	25.9%
751 rounded bases		0.8%	1.5%	1.1%	0.8%

Table IV.48: Comparison: base shapes in levels 6 – 3.

In levels 7 to 3 together handles were only rarely used on the pottery. In level 3 we see an increase in the number of handles.

Handles	7	6	5	4	3
Relative amount of handle fragments	0.6%	0.3%	0.7%	0.6%	1.3%

Table IV.49: Comparison: handles in levels 6 – 3.
(including loose handle fragments and handles attached to other diagnostics)

Distinctions between level 7 and the subsequent levels are also apparent in the surface treatment of the pottery. In all levels most pottery was left untreated after the initial shaping stage, with the surface smoothed or turned and smoothed. In level 7 a small amount of pottery was covered in a (mostly dark-red) slip layer, while 3.5% of all diagnostics were burnished. Apart from burnishing many of the non-burnished vessels were very carefully smoothed, resulting in rather soft surfaces when compared to the Middle Assyrian vessels from level 6 and later. In level 6 both slips and burnishing almost disappear. This is not only due to the almost complete disappearance of cooking vessels, since also bowls and other shapes are now hardly burnished any more. The occurrences of slip and burnishing stay generally low during levels 6 to 3, with a slight increase of burnishing in level 5 related to the appearance of the "pilgrim flask" (type 911) and several special types (like type 151) in this level.

Surface treatment, % of all diagnostics	7	6	5	4	3
Slip	0.6%	0.1%	0.2%	0.05%	0.3%
Burnishing	3.5%	0.6%	1.2%	0.8%	1.0%

Table IV.50: Comparison: surface treatment in levels 6 – 3.

An interesting pattern is also visible when we look at the decoration of the pottery through time. If we look at the total number of decorated sherds in each collection we see that in level 7 9% of all diagnostics was decorated. In Middle Assyrian times this low percentage decreased further, settling at a value between around 3.5 and 5.5% in levels 6 to 3. Decoration never completely disappeared, but became less frequent. Apart from its occurrence, we also see differences in the kind and complexity of the decorations used. In level 7 the greater majority of all decorated sherds was painted. Four different ways of painted decoration were used, of which the characteristic "Nuzi" style and the painted red bands along the rim of bowls or on the body of goblets and small jars are the most important. Incised decoration was hardly used at all, and the combination of applied and incised decoration did not occur in level 7. Applied decoration, if used, consisted exclusively of simple horizontal bands. With the start of the Middle Assyrian occupation of the site this picture changes radically. Now only 15% of all decorated ceramics is painted, and this amount decreases further in the following levels. The painted red bands, that were characteristic in level 7, still occur, but in small numbers only and no longer on the typical rounded bowl rims. They almost disappear in the following levels 5 and 4. Painted decoration is now largely limited to simple horizontal lines. Instead, decorations in level 6 consist mainly of incised or applied motifs. Patterns are limited to horizontal or wavy lines or a combination thereof. Combinations of incised and applied decorations are less frequent, and mostly concern the large vessels with cable appliqué bands and wavy incised lines. Catching the eye in level 6 are the characteristic decorations consisting of impressed circles and triangles filled with a white paste, mostly on grey and burnished bowls and 'grain measures'. This typical decoration (discussed in more detail above) has an archaic feel to it both in the style and in the type of vessels it was used on, and it is much less used in the following Middle Assyrian levels. In level 5 painted decoration decreases even more, while incised patterns become most popular. One "Nuzi" style sherd is probably intrusive in this level. A combination of incised and applied decorations is now limited almost exclusively to the cable bands with wavy incised lines on large vessels. In level 5 the only two glazed bowls were found. Levels 4 and 3 show a picture similar as level 5. The popularity of applied decoration further decreases in favour of incised and incised+applied motifs.

Decoration	7	6	5	4	3
Painted horizontal red/brown bands	41.9%	10.0%	1.9%	0.9%	
Painted Nuzi style decoration	12.9%		0.3%		
Painted "crayon lines"	16.1%				
Painted blobs	3.2%		1.1%	1.8%	
Painted horizontal lines		3.3%	2.2%	4.6%	3.6%
Painted wavy lines			0.3%		
Painted + incised/impressed			0.6%		
Painted other		2.2%	4.6%	1.8%	7.1%
Total painted	74.1%	15.5%	11.0%	9.1%	10.7%
Incised horizontal line(s)	6.4%	14.4%	34.3%	19.3%	42.9%
Incised wavy lines(s)		6.7%	10.9%	17.4%	3.6%
Incised horizontal+wavy line(s)		7.8%	5.4%	8.3%	7.1%
Incised other			2.4%	1.8%	3.6%
Total incised	6.4%	28.9%	53.0%	46.8%	57.2%
Applied		3.3%	1.4%	1.8%	
Applied horizontal band(s)	19.3%	22.2%	18.3%	15.6%	10.7%
Applied wavy band(s)		5.5%	1.1%	0.9%	3.6%
Total applied	19.3%	31.0%	20.8%	18.3%	14.3%
Incised + applied, horizontal		1.1%		0.9%	
Incised + applied, wavy		3.3%		0.9%	
Incised + applied, horizontal + wavy		5.5%	10.4%	21.1%	10.7%
Incised + applied, other			0.3%		3.6%
Total incised + applied	0.0%	9.9%	10.7%	22.9%	14.3%
Impressed white-filled decoration		14.4%	3.5%	2.8%	3.6%
Impressed other			0.3%		
Glazed			0.8%		
Total	100%	100%	100%	100%	100%
Total % of decorated diagn.	9.0%	3.9%	4.8%	5.4%	3.6%

Table IV.51: Comparison: decoration in levels 6 – 3.

We have already seen that the clay and inclusions used were fairly similar throughout the sequence at Sabi Abyad, with level 7 being slightly different from the Middle Assyrian corpus from levels 6 to 3, but not much. When we look at the firing technology, a similar picture emerges. In level 7 relatively more vessels were fired at relatively low kiln temperatures. This is probably directly related to the higher number of cooking vessels, which were generally fired at lower temperatures. After level 7 percentages are remarkably constant, with only a marked decrease of vessels fired at relatively high temperatures in level 3.

Estimated firing temperatures	7	6	5	4	3
High	6.7%	14.8%	16.5%	17.8%	6.8%
Medium	84.0%	81.5%	80.3%	79.1%	90.1%
Low	9.3%	3.7%	2.9%	3.0%	2.9%

Table IV.52: Comparison: firing temperatures in levels 6 – 3.

When comparing the kiln atmospheres between levels, it becomes clear that in level 7 a remarkably large amount of pottery is fired in an incompletely oxidizing atmosphere, resulting in the characteristic vessels with grey cores and orange or reddish surface colours. In level 6, in contrast, the greater majority of the pottery is fired in completely oxidizing circumstances. From level 6 towards level 3, however, the number of sherds fired in incompletely oxidizing circumstances again increases. The amount of pottery fired in reducing circumstances was small in all levels.

Kiln atmosphere	7	6	5	4	3
Oxidizing	64.5%	91.2%	88.2%	81.8%	82.2%
Incompletely oxidizing (grey core)	32.6%	7.2%	10.0%	16.2%	17.1%
Reducing	2.9%	1.5%	1.5%	1.9%	0.7%

Table IV.53: Comparison: firing atmospheres in levels 6 – 3.

Continuity and discontinuity: "Mitanni" and Middle Assyrian

Summarizing, we see both continuity and discontinuity between level 7, the "Mitanni" period, on the one hand and the Middle Assyrian levels 6 to 3 on the other hand. Although the pottery in either period is generally made in the same traditions, in largely comparable shapes and with similar techniques (see also Chapter V below), there are marked differences. These differences can be detected in all aspects discussed in this chapter (and see Chapter V below for other aspects), including paste composition, firing techniques, shape details and types, surface treatment and decoration. Apart from the chronological distance between the two assemblages, other factors may account for the continuity in traditions as well as for the changes. One of the possible factors, the organization of pottery production, will be looked at in detail in Chapter V.

IV.6 Relative chronology: comparison with other sites

This section discusses some general comparisons with ceramics from other sites, in order to position the Sabi Abyad sequence within the regional ceramic sequences available. This thesis does not intend to focus on chronological matters, and therefore this section will necessarily be of a limited nature. Table IV.57 illustrates the sequences as published for other key sites in the region and their position relative to Sabi Abyad. The dates used in the left column of Table IV.57 are of course approximate at best, and should not be taken as absolute dates, especially not for sites that have not yielded any absolute dating evidence. The table uses the short chronology as it is used at Sabi Abyad, and dates for projects that use the middle chronology have been adjusted accordingly. However, the position of the levels of other sites are given largely according to the opinion of the various excavators. Adjustments, such as lowering the dates of a sequence or suggesting a different dating, are only suggested for Tell Hammam VIII and not for other sites, as this would fall outside the scope of the present thesis.

Level 7

A general search for comparable ceramics[46] from other sites shows that for the shapes from level 7 at Sabi Abyad most comparable shapes could be found at Tell Brak HH2, but also at Tell Bderi South 5 and Tell Rimah A1 and C4. Other comparisons came from Tell Hammam VIII A and B and Barri VI, and also from earlier levels at Tell Brak (HH 3, 4) and Middle Assyrian levels at Sabi Abyad itself as well as at Sheikh Hamad and Brak. This would suggest a date at the end of the Mitanni period. A radiocarbon date from the final level of the Mitanni palace at Brak (level 2) gives a date of 1293 ± 37, while it is argued that the palace may have been destroyed during the campaigns of Shalmaneser I in the second quarter of the 13th century BC (Oates et al. 1997: 127 and 152, 153). Considering the stratigraphy at Sabi Abyad, the stratigraphical hiatus between levels 7 and 6, and the reuse of the tower walls in level 6, level 7 should end some time (but not too long) before the beginning of the Middle Assyrian occupation in level 6. The earliest dates from cuneiform texts from level 6 are from the early years of Tukulti-Ninurta I (see below). Level 7 then probably has to be dated somewhere between ca. 1375 and ca. 1250 BC. The occurrence of typically Middle Assyrian shapes in level 7, more than in HH2 at Brak or in Bderi, could suggest that level 7 dates at the very end of this time span. Although the Mitanni tower building itself is of a substantial nature, there is only one phase of occupation at the site and hardly any other surrounding buildings were found. The level 7 occupation seems to have been of a limited nature and a rather short duration.

Levels 6 to 3

The sequence from levels 6 to 3 is mainly compared with the framework put forth by P. Pfälzner (1995) and with selected other sites, with the purpose of positioning the Sabi Abyad sequence within the relative ceramic chronology of the region. It should be kept in mind that all other publications use different systems of describing, classifying and presenting shape and ware, which often makes the comparison of “grouped” data difficult.

If we look at the percentages of the different ware groups, we see that at Sheikh Hamad, just as at Sabi Abyad, the majority of the pottery has organic inclusions (Pfälzner 1995: abb. 115, pp. 129-132, Ware 1-16). Level 6 and 5 at Sabi Abyad, with approximately 90% of pottery with organic inclusions (wares H, I, J), compare best to Sheikh Hamad phase MA IIa. The strong increase of wares with organic inclusions at Sheikh Hamad in phases MA IIb and IIc up to 96% is not so strong at Sabi Abyad. Here, only a small increase is noted for level 4 (to 92.4%), after which in level 3 the percentage settles again at approximately 90% (comparable to Sheikh Hamad MA III with 90%). If we look at wares with only fine-sand inclusions, a similar picture emerges. At Sheikh Hamad (Ware 21) the percentage of these wares is small in MA I, then increases a bit in MA IIa (1.2%) after which the amount decreases towards 0.9% in MA IIb. In MA IIc and MA III the percentage has increased again (2% and 3.1%). At Sabi Abyad the percentage of pottery with fine-sand inclusions (ware C) shows the same

[46] Comparisons and references are cited with the illustrations in figs. IV.1-120.

pattern. From level 6 the percentage decreases from 1.3% to 1% in level 4, after which it increases to 2% in level 3. As at Sabi Abyad, cooking wares hardly occur at Sheikh Hamad. Whereas at Sheikh Hamad the amount of cooking wares decreases over time, at Sabi Abyad there is an increase towards level 3.

The comparison of general shape categories is less straightforward, mainly because the shape groups are defined differently at Sheikh Hamad[47] (Pfälzner 1995: 132-161). Notwithstanding these difficulties, comparisons can be made. At Sabi Abyad we see rather constant amounts of bowls, but percentages are a bit higher in levels 6 and 3 (more than 60%) and a bit lower in levels 5 and 4 (approximately 55%). This is reflected in slightly higher percentages of "Schalen" at Sheikh Hamad MA IIa and MA IIc (approximately 47%) as compared to slightly smaller amounts in MA IIb (approximately 45%). The group of "Leichte Knickwandschalen" at Sheikh Hamad is roughly comparable to types 111b+c, 112 and 113 at Sabi Abyad. At Sheikh Hamad we see a rather constant and high percentage of these bowls during MA II, with a slight increase in phase MA IIb (MA IIa: 77.4%, MAIIb: 81%, MA IIc 72.5%). In phase MA III the amount drops sharply to 44%. At Sabi Abyad these shapes together show a pattern similar to MA IIa-c: for levels 6 to 3 respectively, these shapes comprise 49%, 50.4%, 53.2% and 47.6% of all bowls. If we look at the typical "mittelassyrische Standardknickwandschalen", comparable to our types 111b and c, we see that rather high percentages of all "Schalen" at Sheikh Hamad are of this type in phases MA IIa and b, while the percentage drops sharply in MA IIc. At Sabi Abyad a similar pattern is visible, where types 111b and c comprise approximately 46% of all bowls in levels 6 to 4 but only 37.6% in level 3. The decreasing amounts of "Standardknickwandnäpfe", the smallest carinated bowls, at Sheikh Hamad is mirrored at Sabi Abyad, where this type (111a) decreases from 16.5% of all bowls in level 6 to 6.2% of all bowls in level 3. The percentages of straight-sided bowls, gradually rising at Sabi Abyad from 15.4% of all bowls in level 6 to 17.6% in level 3, are mirrored at Sheikh Hamad in phase MA II for "Konische Schalen" (Pfälzner 1995: 132, abb. 116a).

In jars a similar picture emerges. At Sabi Abyad jars form a rather low percentage (15%) of all shapes in level 6. This increases sharply in level 5 to 27% after which the percentage decreases again gradually towards 21% in level 3. At Sheikh Hamad a similar jump from 11% in MA IIa to 23% in MA IIb is visible, but here the percentage of jars keeps on rising to 33% in MA III. The predominance of jars without neck over jars with neck at Sabi Abyad is mirrored at Sheikh Hamad ("Eingezogene Flaschen" and "Flaschen mit abgesetzten Hals" + "Ausladende Flaschen"), cf. Table IV.54.

The decreasing percentages of goblets at Sabi Abyad are not reflected at Sheikh Hamad, where the amount of goblets steadily increases over time. Also, exactly contrary to Sabi Abyad, at Sheikh Hamad the V-shaped goblets ("Steile Becher") seem to be more popular than the S-shaped goblets. At Sheikh Hamad the correlation between nipple bases and straight-sided goblets and between knob bases and s-shaped goblets, is not clear, whereas at Sabi Abyad this correlation is very strong.

	MA I	MA IIa	MA IIb	MA IIc	MA III
Jars with neck	33.7%	55.0%	36.7%	47.7%	18.0%
Jars without neck	64.9%	45.0%	63.3%	52.4%	82.0%

Table IV.54: Jar shapes at Tell Sheikh Hamad (after Pfälzner 1995: 132-161).

When we look at the bases, comparisons are less clear but can still be made. At Sheikh Hamad ring bases occur mostly in phase MA IIa. At Sabi Abyad these bases are typical of level 5. The number of flat bases steadily increases over time at Sheikh Hamad, but not as strongly as at Sabi Abyad. At Sheikh Hamad it was noted that "Scheibenfüsse" are mostly

[47] For example, shapes that are grouped under "bowls" at Sabi Abyad appear at Sheikh Hamad in the group of "Schalen" as well as the group of "Schüsseln", while small bowls are grouped under "Näpfe".

characteristic of phases MA IIb and later. This can be compared to the popularity of our type 721 bases in small jars from level 4 onwards.

When we look at surface treatment, it is interesting to note that at Sheikh Hamad phase MA IIa the amount of sherds with a slip is as small as at Sabi Abyad. However, at Sheikh Hamad from phase MA IIb and later, this percentage increases sharply to more than 15%, a development that is not present at Sabi Abyad. Small percentages of burnished pottery at Sheikh Hamad phase MA IIa and IIb are mirrored in the Sabi Abyad sequence, but again an increase at Sheikh Hamad MA IIc to more than 6% is not present at Sabi Abyad.

The comparison of decoration with the corpus of Sheikh Hamad is more difficult, since decoration was not discussed separately in Pfälzner's (1995) work. It is interesting to note that a few isolated examples of "Jüngere Khaburware" still occur in phase MA IIa and b (1995: 131).

Summarizing, the comparison of ware groups and general shape categories suggests that the levels of Sabi Abyad and the ceramic phases of Sheikh Hamad correlate in the following manner:

Sabi Abyad	Sheikh Hamad
6	MA IIa
5	MA IIa, MA IIb
4	MA IIb, MA IIc
3	MA IIc

Table IV.55: Correlation of Sabi Abyad and Sheikh Hamad sequences.

When comparing individual shapes[48] it becomes clear that more or less the same correlation can be made. The comparisons of the illustrated pottery from Sheikh Hamad with the shapes from Sabi Abyad yield the following correlations (phases from which most comparisons come are underlined):

Sabi Abyad	Sheikh Hamad
6	MA I, IIa, IIb
5	MA I, IIa, IIb, IIc
4	MA IIa/b, IIb, IIc, III
3	MA IIc, III

Table IV.56: Correlation of Sabi Abyad and Sheikh Hamad sequences, comparing individual shapes.

Although the general chronological outline seems to be clear in comparison with the Tell Sheikh Hamad sequence and through the absolute dating evidence discussed below, comparisons with material from other sites can help us to further characterize the Sabi Abyad sequence. This is especially helpful for shapes not present at Sheikh Hamad or special shapes. Comparisons are presented in the captions to the illustrations (figs. IV.1-120) for a number of Middle Assyrian and non-Middle Assyrian Late Bronze Age sites in Northern Syria, Iraq and Southern Turkey: Tell Hammam et-Turkman, Tell Shioukh Fawqani, Emar – Meskene, Tell Fray, Tell Hadidi, Jurn Kabir, Tell er-Rimah, Tell Brak, Tell Barri, Mohamed Diyab, Kar-Tukulti-Ninurta, Giricano Höyük, Tell Taban, Sheikh Hassan (on the Euphrates) and Tille Höyük. These comparisons show that, although the majority of the ceramics at Sabi Abyad was made in the well-known Middle Assyrian tradition, there are a number of more rarely occuring shapes that have closer connections to non-Middle Assyrian sites on the Euphrates. This shows that the inhabitants of Sabi Abyad had regular contacts with the west and with

[48] For comparisons and references, see the text in the first part of this chapter and the captions to the illustrations in figs. IV.1-120.

non-Assyrian sites.[49] Also, some shapes from level 4 and 3 can be compared, although not always very closely, to sites dating from the Early Iron Age. Although hardly anything is known archaeologically about the period between the end of the 11th and the beginning of the 9th century (cf. Roaf 2001), these comparisons suggest a certain continuity with later ceramic traditions. For more detailed information on these shapes and comparisons the reader is referred to the paragraphs above, which discuss the pottery from each level in detail.

IV.7 Absolute dating of the Late Bronze Age sequence at Tell Sabi Abyad

Dates from cuneiform tablets

A number of *limmu* dates is available from cuneiform texts found in levels 6 to 4. Although the dates and texts will be published elsewhere (Wiggermann in prep., Akkermans and Wiggermann in press), general dates can be presented here. The earliest *limmus,* from level 6, date from the first decade of the reign of the Middle Assyrian king Tukulti Ninurta I (1233-1197 BC). There is no evidence for an earlier Middle Assyrian settlement at the site, nor for the presence of an Assyrian administration at the site before the Grand Vizier Aššur-iddin took office, so the beginning of level 6 is dated roughly at 1225 BC. The end of level 6 may have occurred around the death of Tukulti Ninurta I in 1197 BC, according to a text referring to that event found in the rubble of a ruined level 6 building. Level 5 started around 1196-1194 BC, and *limmu* dates illustrate the duration of this level during the reigns of kings Aššur-nādin-apli (1196-1194 BC), Aššur-nīrārī III (1193-1188 BC), Enlil-kudurri-uṣur (1187-1183 BC), and part of the reign of Ninurta-apil-Ekur (1182-1170 BC). The *limmu* dates do not prove until when level 5 was in use. However, the death of the *dunnu's* owner Ilī-padâ during the reign of Enlil-kudurri-uṣur may be suggested as a reason for the decline of the level 5 settlement. The end of this level is suggested to be dated at ca. 1180 BC. The dating of level 4 is more difficult, since substantially fewer texts were preserved in this level. However, it is clear that some sort of Middle Assyrian administration was still in place at the site. Parts of the level 6 and 5 administration were kept until it became buried in level 4, and both the content and language of the texts written during level 4 fit well in the Middle Assyrian administrative tradition. A broken *limmu* might, with many reservations, be dated to ca. 1125 BC, but this text is not without problems. In the light of the ceramic comparisons with Tell Sheikh Hamad (discussed above), a date for the end of level 4 around this time is certainly possible.

Radiocarbon dates

Two samples of charred grain were analysed in the Centre for Isotope Research at Groningen University,[50] but they are not very helpful in providing an absolute date for the Middle Assyrian occupation at Tell Sabi Abyad. The first sample (GrN-19369 / Tell Sabi Abyad 3) comes from a level 5 floor in the central room of the tower (K11 12-30). The second sample (GrN-19370 / Tell Sabi Abyad 4) comes from the floor of the mansion built east of the dry moat, but cannot be assigned to a specific level as yet.[51]

The radiocarbon dates for sample "Tell Sabi Abyad 3" span a very broad period and encompass almost all of the Middle Assyrian occupation history of the site, especially if we look at the dates that fall within the 95% probability range. Although the dates do not contradict the textual dating evidence, and the *limmu* dates all fall within the 95% probability range, the radiocarbon dates are not very specific and of not much use for our discussion here.

[49] This is also clear from the cuneiform texts found at Tell Sabi Abyad; cf. Akkermans and Wiggermann in press.
[50] Calibration based on the radiocarbon calibration program OxCal from Oxford University.
[51] Although fig. III.3 suggests that this building dates to level 6.

The dates for sample "Tell Sabi Abyad 4" seem to be a bit younger than the level 5 sample, but the range is equally broad and not very specific.

Radiocarbon dates for samples from Middle Assyrian Sabi Abyad:

GrN-19369/ Tell Sabi Abyad 3 (level 5):
2985±25 BP → 1320 – 1120 BC (95.4% probability).

GrN-19370/ Tell Sabi Abyad 4 (level ?):
2940±20 BP → 1260 – 1050 BC (95.4% probability).

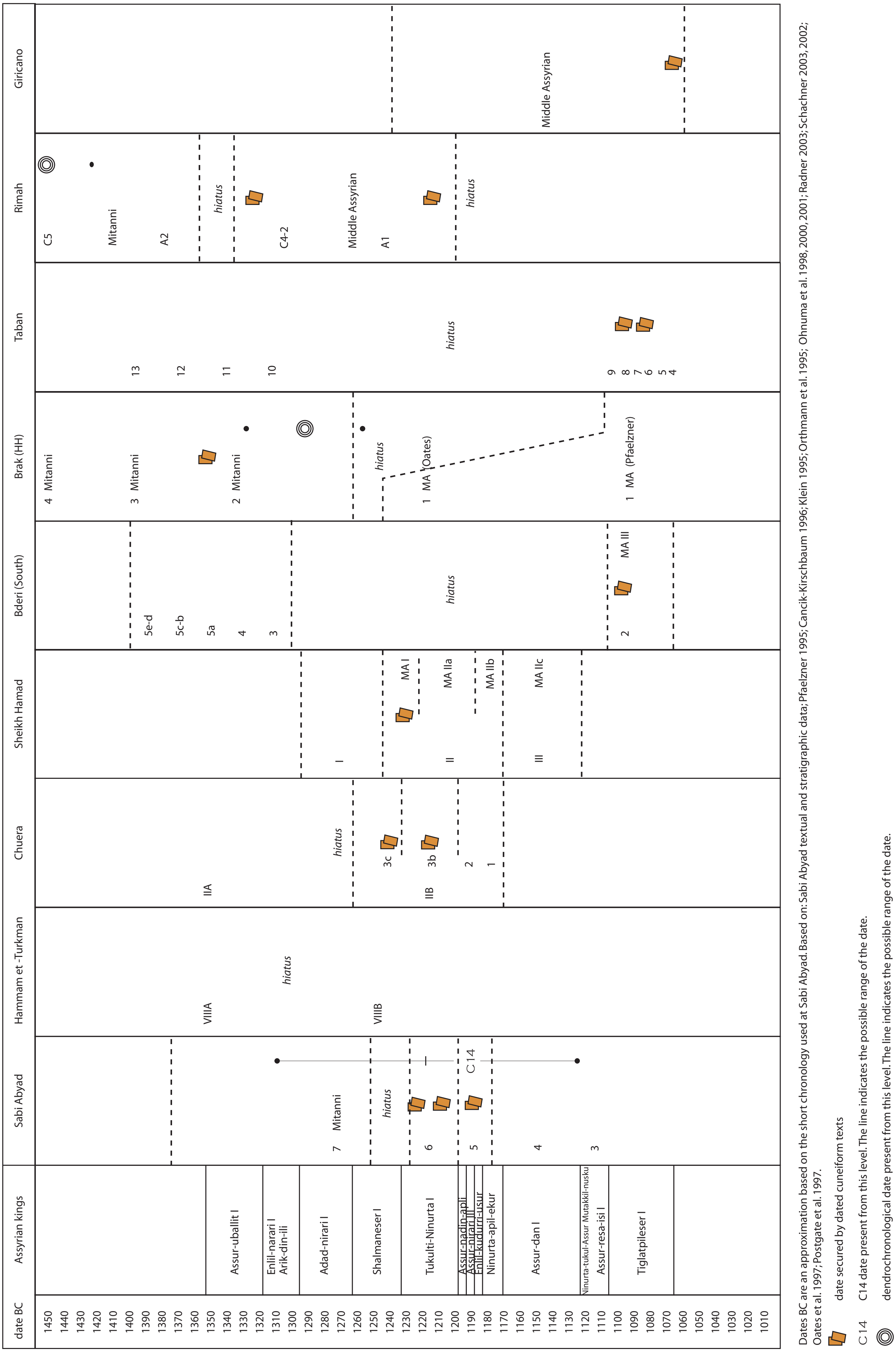

Table IV.57: Relative sequences of Sabi Abyad and other sites.

CHAPTER V: THE TECHNIQUES AND ORGANIZATION OF POTTERY PRODUCTION.

"No man ever wetted clay and then left it,
as if there would be bricks by chance and fortune."
Plutarch

V.1. Introduction

Although many Middle Assyrian texts deal with the organization and administration of agricultural produce, information on the organization of craft production within the state is scarce (but see Jakob 2003). Information from archaeology is even less abundant, as almost no workshops, tools and other direct evidence of craft production from this period have been excavated or published before. The discovery of pottery workshops and kilns at Sabi Abyad therefore offers a unique possibility for a better insight into the techniques and organization of Middle Assyrian pottery production. This chapter deals with both topics in detail.

Various sources of information are available for the reconstruction of techniques and organization of pottery production at Sabi Abyad. In this chapter we look at the natural environment of production to see which resources were available and how the climate may be related to production organization. I summarize the little evidence we have on the social position of the potters in Middle Assyrian times. Next, this chapter presents a detailed discussion of the architecture and artefacts found in the different locations where pottery production took place at the site. Workshops, tools, kilns and other related finds are presented and their implications for the techniques and organization of pottery production discussed. The section on technology (paragraph V.6) focusses on raw materials, shaping techniques, firing procedures, repair of damaged vessels and the use of potters' marks. The next two paragraphs (V.7 and V.8) deal with more interpretative aspects of pottery production: the quality of the vessels, the scale of production, output and demand, variability and standardization, and the distribution of the products. Appendices C, D and E contain many of the raw data pertaining to this chapter. Drawing on various studies in ethno-archaeology, a reconstruction is presented of the techniques and organization of pottery production at the site. We shall see that the potters at the site were skilful artisans working in an individual workshop related to the Middle Assyrian *dunnu* organization, and producing large amounts of utilitarian, multi-functional ceramics.

The organization of pottery production in the Middle Assyrian period: previous work.

One of the aims of P. Pfälzner's (1995) elaborate and informative study of the Middle Assyrian ceramics of Tell Sheikh Hamad and Tell Bderi was to draw conclusions on the organization of pottery production in Late Bronze Age northern Syria. He suggested that in the Middle Assyrian period at Sheikh Hamad both a state-organized (official) and a domestic production of pottery existed. He based this conclusion on formal differences between two collections of pottery, one found inside and one outside the governor's palace at Sheikh Hamad. The database used by Pfälzner for distinguishing a domestic production from the official tradition is in my opinion not sufficient, and the existence of a domestic production at Sheikh Hamad is not convincingly proved (for a discussion, see Duistermaat 1999). Pfälzner (1995, 1997) also concluded that the pottery from Sheikh Hamad was made in a "manufactory". He based this on his conclusions that the pottery from Sheikh Hamad consisted of a limited range of standardized,[52] "mass-produced" vessel types made in one

[52] "Standardized" in his study meant that there was a limited range of shapes, and that there is evidence for the existence of size groups. The actual standardization of each of these shapes (like the amount of variation around the mean size) was not investigated.

workshop (Pfälzner 1997: 339). The uniformity of used clays and inclusions, the limited range of shapes produced, and the existence of size classes within the group of carinated bowls were at the core of his conclusions. His classification of the Middle Assyrian production organization as a "manufactory" was mainly based on the list of "modes of production" in D. Peacock's work on Roman pottery (Peacock 1982: 6-11, see also below). However, Peacock stated that the difference between a workshop and a manufactory lies mainly in the scale of the two organizations and the injection of capital in the case of the manufactory. The manufactory would then be archaeologically recognizable by the size of the premises (comprising more than twelve workers at least), the degree of *specialization* (not: standardization) of the products, the scale of the output and the evidence for worker specialization. Besides, the term manufactory in his work refers to conditions just preceding the Industrial Revolution (Peacock 1982: 9-10, 43-46). At Sheikh Hamad the size of the workshops is unknown since no workshops have been found.[53] If most of the pottery was made in one workshop, as is claimed by Pfälzner based on the homogeneity in the pastes used, this workshop did obviously not specialize in one product but produced a wider range of vessels (even if the bulk of the output consisted of a limited number of shapes only, these shapes were of different nature, function and size and required different production techniques). The standardization of each of these shapes (i.e. to what extent the potter was striving to make exact copies of a "standard" shape or size) was not really investigated by Pfälzner. The scale of the output and evidence for worker specialization was not investigated in Sheikh Hamad, and the injection of capital by the authorities in a pottery manufacture is unlikely in the light of what we know of the organization of the Middle Assyrian crafts (cf. Jakob 2003). It is therefore unlikely that pottery production was organized in a manufactory in Sheikh Hamad or elsewhere in the Middle Assyrian empire. On the other hand the *standardization* of the products, an aspect of Middle Assyrian pottery that is often seen as typical, is mentioned by Peacock not in his description of manufactories but in his discussion of individual or nucleated workshop organizations (Peacock 1982: 6-11). So, how was pottery production organized in the Middle Assyrian empire?

Since Pfälzner's work is the only extensive study so far that explicitly deals with production organization of Late Bronze Age pottery in Syria, it is often quoted in other publications on Middle Assyrian pottery, and the verdict that Middle Assyrian pottery was mass-produced in manufactories has started to lead a life of its own (most recently Schneider 2006:392). However, as is clear from the above, many aspects of the organization of pottery production still need to be studied in detail. The material from Sabi Abyad offers the opportunity to do so.

V.2 Studying the organization of pottery production

The organization of pottery production can only partly be studied by looking at the ceramics themselves, including the study of raw materials, manufacturing techniques, vessel form and decoration. Ideally, information is also needed on the natural environment, climate and available raw materials; the number, title, status and sex of the potters; the number, size and spatial arrangement of production facilities within a site and/or a region; the technology, scale, seasonality and intensity of production; the existence of labour divisions; the consumers or market and the distribution of the products; craft specialization; standardization, function and quality of the products, as well as the organization of society in general and the position of the potter in it, and the degree of administrative control over production (Annis 1996;

[53] However, unfired pottery fragments have been found at Sheikh Hamad (Schneider 2006: 394, sample nos. 1834, 1863, 1864, Tabelle 2). It is likely that these come from the "Governor's Palace" building P (but from the table it is not clear from which room or stratum). If so, this would suggest that pottery production could have taken place in the building or nearby.

Peacock 1982, Rice 1987: 168-206, 1989; P. Arnold 1991; Costin and Hagstrum 1995, Costin 2000). This approach, originally part of a direction in ceramic studies named "ceramic ecology" (Matson 1965, Rice 1987: 314-17, P. Arnold 1991), wants to study ceramics not so much from the culture-historical or chronological point of view. Instead, it tries to place the production and consumption of ceramics in a larger environmental and social context.[54] Next to the study of the ceramics on various analytical levels, the study of other archaeological, contextual and historical data must therefore be included.

The study of the organization of pottery production involves the study of the relations between the potters, the production location and the users of the pottery (Annis 1996: 143). Some aspects may be studied in the archaeological record, for example when a workshop or kiln has been found. Other questions may be answered by studying the products themselves, for example to establish what kinds of techniques were used. To establish the links between the information on tools, workshops, techniques, etc. on the one hand and inferences on how the production might have been organized on the other hand models can be used to guide interpretation.

Such models have been developed mainly on the basis of ethno-archaeological observations (Costin 2000). Different ways of organizing production are classified in a number of types or *modes* of production. They are summaries of the aspects of organization encountered in contemporary pottery workshops. Often the models list increasingly "complex" modes of production, while we recognize that the actual situation may not completely fit any of the types, that it may show an overlap of different types or that several different production systems were in use in the same area at the same time (for an example of the latter, cf. Annis 1996). It is therefore important to retain a certain flexibility in using a model. The models make use of different variables (e.g. location of production, part of the total family income generated by pottery production, etc.). For each production type it is listed what the state of each variable usually is. It is tried to include especially those variables that can be recognized in the archaeological record. Then, by looking at the archaeological record and by trying to assess what the state of these variables is, the model is used to formulate hypotheses about the organization of ancient pottery production. Ideally, several different cases of production are compared with each other. This is because terms like "degree of specialization", "intensity" and "scale" are basically relative terms and not absolute ones. So, a production system could be "large-scale", but this term is meaningful only when compared to other systems of a different scale (Costin 1991).

Several fairly similar models have been developed in the past years, based on ethnological, archaeological and textual data. Each model has its own particular focus (e.g. Peacock 1982, Rice 1987, Costin 1991, Costin and Hagstrum 1995, Pfälzner 1995: 27-30; for a critical discussion of the use of these models see P. Arnold 1991). It is useful here to familiarize the reader with some frequently used terms in archaeological and ethno-archaeological literature on (pottery) production organization. The model that is perhaps quoted most in Near Eastern archaeology is the one presented by D. Peacock (1982: 8-11), based on his study on pottery production in the Roman world. He distinguishes eight modes of production, described below. Table V.1 summarizes his model, with adaptations by Rice (1987) and Pfälzner (1995).

Household or domestic production
In this mode of production each household makes its own pottery. Vessels are only produced when the need arises, so the frequency of production is low (once a year?) and the output per

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[54] I want to stress here that this study is not envisaged as a "ceramic ecological" study in the traditional sense of the word, limiting the analysis to environmental or functional restraints that determine the outcome of the potter's efforts (cf. Gosselain 1998). Rather, I advocate a multi-dimensional approach incorporating as many sources of information as possible, to arrive at a deeper understanding of the work of the potter and the functioning of Middle Assyrian society.

potter small. The producers are mostly women. The technology is simple; pots are often handmade and fired in open fires.

Household industry
In this mode of production the first evidence for craft specialization becomes visible. Potting is a part-time or seasonal activity next to other subsistence activities, and involves skilled potters. Products are sold for profit to consumers outside the private household, and potting is often a substantial but secondary source of household income. A household industry is often seen to emerge *in situ*ations where the normal family income does not suffice, for example when agricultural yields are meagre. Production is mostly the task of women, and the technology is still simple although a turntable may be used. Vessels are fired in an open fire or a simple kiln or oven.

Individual workshop
The main difference with the household industry is that in the individual workshop potting is the main source of income. This is often difficult to establish archaeologically. Pottery production can still be a part-time or seasonal activity, next to, for example, agriculture. Since it has become economically important, the craft is practised mainly by men. There is more investment in technology and the fast wheel and professional kilns are expected to have been used. Usually the workshops are isolated, and the production is oriented towards a market. The potter may work alone or employ a small number of assistants, most likely members of his own family.

Nucleated workshops
In this type several individual workshops are located together. This may be for reasons of availability of materials, labour, and markets or for the economical use of kilns. Potting is now a major source of income, mostly practised by men and year-round if possible. Other sources of income may be present, but are all of a secondary nature. All available technological aids are used. The products are often fairly standardized and of a high quality. There is both cooperation and competition between workshops. The scale of production is large and this can attract middlemen who distribute the pottery over wide areas.

In both individual and nucleated workshops there is often a division of labour: there is a master potter, there are people for preparing the clay and finishing the vessels, and boys or untrained workers for treading the clay, turning the wheel and performing other tasks. The workshop layout shows a clear division into different activity areas for shaping, drying and storage, as well as living areas (Rice 1987: 184, Annis 1988).

Manufactory
Manufactories are large production facilities in which a number of professionals produce a single often highly specialized product. The production process is divided into many different steps, and workers specialize in one of them. The distinction between the manufactory and the large workshop is for the rest mainly to be found in the scale of the enterprise: D. Peacock suggests that we speak of a manufactory if the workshop contains more than 12 workers. Archaeological evidence for a manufactory will include the size of the production facilities, the degree of specialization in the products, the scale of the output and evidence for individual worker specialization.

Factory
The factory typically is a large-scale enterprise that groups specialized workers in a special building. Above all, a factory makes use of machinery driven by something other than human or animal force. Therefore this mode of production falls outside the scope of this study of Middle Assyrian pottery production.

Estate production
The distinguishing factor in this mode of production is the organization by, dependence on, and orientation towards the estate. To avoid unnecessary expenses, all possible products are produced by the estate itself. The organization of production on an estate was meant to fulfil internal needs, but could partly be oriented towards an external market as well.

The organizational shape of this mode of production can vary. Sometimes it is comparable to the household mode of production, sometimes to a more complex workshop organization. Although Peacock (1982) suggests that ceramic production of this kind would mainly have involved brick production, the production of pottery or any other commodity could have been organized along similar lines just as well.

Military and official production
Military production seems to have taken place especially when local production in a newly conquered area could not meet the demands of the garrison. It is expected that military production would be organized very efficiently, using the available manpower as economically as possible. In that way, the same people could be employed for other, more specifically military, tasks as well when necessary. Production would show signs of efficient planning. Technologically it would use the best available methods.

Municipal and state organized productions are also grouped under this mode of production. The organization of state production may vary. Sometimes it may have been organized under very strict control, while the produce was destined for official use only. In other cases, the work could have been left to an independent producer while the produce was delivered or sold to the state as well as perhaps to private persons.

Most important in distinguishing estate production as well as military/state production from other modes is that the production organization as well as the destination of the produce is controlled by the estate, army or state administration. The potters are then “associated” specialists or “administered” specialists. The word “attached specialists” (Rice 1987: 186, Costin 1991: 6, 7) cannot be used here, because it has been reserved for a specific type of association with the authorities in which luxury, status or elite items are produced, and not the day-to-day pottery vessels (cf. Stein and Blackman 1993: 50).

An example of a model with a different focus is the one developed by C.L. Costin (1991, and Costin and Hagstrum 1995), using eight types of production organization based on four parameters. The four aspects that describe how production is organized are:
1. the context of production (the nature of elite or government control over production)
2. the concentration of production (the degree of nucleation of the production facilities within a region)
3. the scale of the production units (from small kin-based production to factories)
4. the intensity of the production (from part-time to full-time production)

The eight types of production, taking into account these four parameters, are (Costin 1991:8):

Individual specialization
Autonomous individuals or households producing for unrestricted local consumption.

Dispersed workshop organization
Larger workshops producing for unrestricted local consumption.

Community specialization
Autonomous individual or household-based production units, aggregated within a single community, producing for unrestricted regional consumption.

Nucleated workshops
Larger workshops aggregated within a single community, producing for unrestricted regional consumption.

Dispersed corvée
Part-time labour producing for elite or government institutions within a household or local community setting.

Individual retainers
Individual artisans, usually working full time, producing for elite patrons or government institutions within an elite (for example a palace) or administrative setting.

As we shall see in this chapter, the organization of pottery production at Tell Sabi Abyad does not completely and neatly fit any of these types. Any reconstruction of production organization needs to use models in a flexible way. However, these two models are still useful because they clarify what is meant by terms like “individual workshop” or “individual specialization”. These and other models help in thinking about the relations between artefacts and workshop layouts on the one hand, and patterns of social organization on the other. Also, they indicate what kind of evidence may be useful for the reconstruction of production organization. Basically, all information on the different aspects that determine how ceramic production was organized can be gathered by trying to answer five basic questions (Annis 1996:143):

1. Who produced pottery?
2. Where was pottery produced?
3. How was pottery produced?
4. What was produced?
5. Whom was it made for?

In this chapter these questions are addressed for the material from Tell Sabi Abyad.

Mode of production	*Location*	*Frequency and income*	*The potters*	*Labour division*	*Technology*	*Variability*	*Scale*	*Distribution*
Household production	Private household	Occasional or seasonal, no extra income	Mostly women	No	Simple, no wheel or kiln	High	Small quantities	Private household
Household industry	Private household	More regular or seasonal, small income through sale	Mostly women	No	Simple	High	Small surplus	Private household and others within the community
Individual workshop industry	Workshop with inner spatial divisions, isolated	Part time or full time, major family income	Mostly men	Yes	Wheels, kilns	Standardized or serial production, and special shapes	Medium to large	Markets and peddling, local and regional
Nucleated workshop industry	Several workshops in one location, workshops with inner spatial divisions	Full time, major income	Mostly men	Yes	Wheels, kilns, high technological investment	Standardized or serial production, and special shapes	Medium to large	Markets and middlemen, local and regional
Manufactory	Specialized manufactory, large scale	Full time, profit oriented	Large number of workers under a supervisor	Yes	Complex, often specialized in one product	Standardized production, high worker specialization	Mass production	Very wide distribution , supra-regional
Estate production	On the estate premises	Full time or part time, not for profit	Mostly men	Most probably yes	Wheels, kilns	Standardized and functional?	Medium to large	Estate
Military or official production	On military or state premises	When possible part time, not for profit	Mostly men	Yes	Efficient use of technology	Standardized and functional?	Medium to large	Military organization or state institution

Table V.1: Overview of the different modes of production after Peacock (1982: 8-11), Rice (1987: 183-186), Pfälzner (1995: 27-30).

V.3 The natural environment of pottery production

To understand the environmental possibilities and limitations of pottery production at Sabi Abyad, it is necessary to look into the environment and climate at the site in more detail than was done in the introduction in Chapter I. The environment and climate strongly influence the availability of raw materials and fuel and the possibilities for year-round production (Rice 1987: 314-17). The available raw materials in their turn influence the possible techniques of shaping and firing, as well as the properties of the end products (Van As 1984, Rice 1987: 226).

Geology, and sources and properties of raw materials

Sabi Abyad is located in the Balikh Valley, which runs north-south from ‘Ain el-Arus on the Turkish border in the north to the Euphrates River in the south. The river valley is bordered by “low rolling hills of Tertiary limestone and gypsum, with occasional expanses of Pliocene marls and related deposits” (fig. V.1; Wilkinson 1998a: 152). These are locally covered by Pleistocene gravel and sandy silt deposits (Boerma 1988: 1-2). The river valley itself is covered with Holocene fluviatile deposits of calcareous silts and some gravel, that have developed into calcareous, clayey soils covered with sandy loam (Boerma 1988: 2, 6; also Schneider 2006: 391; Van Daele 2005: 25).

The Balikh flood plain is between 4 and 6 km wide. The river itself is only about 6 m wide and meanders heavily. In rainy seasons a number of swampy areas occasionally form alongside the river due to flooding (Akkermans 1993: 15-20). Several perennial side streams contribute to the Balikh, as well as many wadis that only flow after heavy rains. The long wadi al-Kheder drains most of the eastern plateau and joins the Balikh just south of Sabi Abyad, carrying its own alluvial deposits (Wilkinson 1998a: 152-4). Although the Balikh River frequently changed its flow channel, it does not seem to have been very close to Sabi Abyad in Middle Assyrian times. Certainly from the Bronze Age on it flowed west of Tell Hammam, about 5 km west of Sabi Abyad (Wilkinson 1998a: 154). Clay sources therefore seem to have been present throughout the river valley, although it will probably never be known where the clay for the Middle Assyrian pottery was mined exactly. Sandy deposits can be found along the river or in the river valley, while gypsum and calcite would have been present on the higher terraces. Water could be fetched from the river or from wadis in the rainy season, or could be taken from wells dug to the groundwater (between 4 and 9 m deep, sometimes less; Boerma 1988: 6).

Local clays in the Balikh region, as elsewhere in the Jezira, are marly or calcareous, containing a percentage of CaO between 10% and 30% (Duistermaat and Schneider 1998:93, Schneider 1994, 2006). This is due to the geological formation of clay beds in the Jezira: the rivers Balikh and Khabur cut through limestone terraces and deposit marly clay as a sediment. The composition of local clays used for pottery production at Sabi Abyad, as determined by X-ray Fluorescence analysis, is illustrated by the composition of unfired pottery fragments from the Middle Assyrian workshops in square M11 at Sabi Abyad (level 5 East, see Table D.1 in Appendix D, samples V404-V407). These are very well comparable to that of a modern clay sample collected south of Tell Hammam near the place where a small bridge used to cross the Balikh River (sample 1744) and to unbaked-clay jar stoppers and sealings from prehistoric levels at Sabi Abyad (published in Duistermaat and Schneider 1998), proving that local clays were used to make pottery at Sabi Abyad. Clay samples from the Khabur and Tell Sheikh Hamad (in Schneider 1994, 2006) show that, although the Sabi Abyad clays are not exactly the same, the differences are small and clays all over the Jezira are very similar.

The properties of these clays influence the production and firing processes and the qualities of the fired product.[55] In order to evaluate the properties of local clays in pottery production, the Department of Pottery Technology at Leiden University collected several samples of clay from the modern Balikh River bed[56] in 1996 and tested them for workability.[57] In 2006 the Department studied two samples of unfired Middle Assyrian pottery from the workshops at Sabi Abyad. The clays proved to be not very plastic (they are "short"), but with good firing properties. They showed a drying shrinkage more or less equal to their total shrinkage after firing at 700˚C, between 6 and 10%. A shrinkage of more than 5 to 7% will lead to cracks during drying and firing, which can be prevented by adding additional temper. The leanness of the clay also leads to tearing during forming, especially when throwing vessels from one piece of clay or from the cone. To reinforce the structure of the clay body, up to 15% of organic material can be added (cf. the report in Appendix D. See also Nieuwenhuyse 2006, Franken and Van As 1994: 508). Organic inclusions can also be added to make a more porous fabric, yielding lighter vessels that, for example, cool water more effectively (Schneider 2006: 393). The organic material could be chaff or chopped straw, or dung from cattle or sheep. In the latter case the dung also increases the plasticity of the clay, making it easier to shape vessels on a fast wheel (Van As and Jacobs 1992: 535-536; Franken and Van As 1994: 508).[58] Other temper was not needed to produce a workable clay, and the analyses presented in Appendix D indeed confirm that normally the potter added no other inclusions.

The available clay resources put limits on the maximum firing temperatures that can be reached. Kiln temperatures higher than about 1100-1150 °C will cause the clay to vitrify and fuse, yielding kiln wasters (Schneider 1994: 103; 2006: 399-400). In firing calcareous clays care has to be taken to reach the right temperatures for a long enough period, to prevent the risk of *lime spalling*. When pottery is fired at about 750-850°C or above, the calcium carbonate in the clay decomposes to form calcium oxide. When the vessel has cooled off, the calcium oxide starts to absorb moisture from the air, forming calcium hydroxide which has a larger volume than calcium oxide. Especially when the calcium particles are large, this causes serious damages or complete crumbling of the wall. At the surface of the vessel, this feature is recognizable by a conical hole created by the expanding particle, with a white grain in the middle. The problem can be solved by firing below about 750°C or above about 1000°C or by firing in a reducing atmosphere (Rice 1987: 98, Rye 1981: 114). Apart from controlling firing temperatures and circumstances, this problem can also be solved by adding salt or salty water to the clay, which lowers the temperature at which the clay starts to sinter. This was apparently done by the modern potters in Buseira near the Euphrates river, Syria (Schneider 1994: 103; 2006: 395; Rice 1987: 119), as well as by modern potters in North Africa (Hudson 1997: 136), but not by potters in Qamishly, northern Syria, where the clay already contained enough salt of its own (Taniguchi 2003: 146). The thin-section analyses of sherds from Sabi Abyad suggest that a certain amount of salt may occasionally have been present in the clay, creating a "salt effect" (see Appendix D; none of the sherds analysed in thin section showed lime spalling). However, neither petrographical nor chemical analysis can prove whether any

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[55] A description of the properties of the Balikh region clays, or of the chemical composition of the pottery found at Sabi Abyad, does not tell us anything about what the potter knew about the clay composition or clay properties, how the potter chose his clay and what characteristics he was looking for in choosing a clay bed (Van As 1984: 143-144). It can only give us some information on the technical possibilities and limitations of local clays, to further our understanding of the choices the potter had to make in shaping and firing.

[56] Villagers in the nearby village of Hammam et-Turkman claim that their mothers and grandmothers used to fetch clay from the Balikh to make pottery at home.

[57] These tests were organized within the framework of O. Nieuwenhuyse's PhD thesis on the prehistoric ceramics of Tell Sabi Abyad (Nieuwenhuyse 2006).

[58] Cuneiform sources from Sumerian and Old Babylonian periods seem to mention only the addition of straw or chopped straw, and do not mention dung (Sallaberger 1996: 14).

salt was added on purpose, or whether salt was naturally present in the clay or water used by the potter at Sabi Abyad. Texts tell us hardly anything about the price of salt in Mesopotamia in general (cf. Potts 1984: note 94) and we have no information relating specifically to Middle Assyrian times. Salt is not mentioned in the cuneiform texts from Sabi Abyad.[59] If salt was expensive or hard to come by, it is unlikely that the potter would have added substantial amounts of it to his clays. However, salt seems to have been rather commonly available in salines all over the northern Mesopotamian region (Potts 1984), and perhaps the Balikh river itself or nearby wadis contained slightly brackish water. Perhaps the potter was aware of the salt effects and selected clays with a naturally high salt content from particular locations. Or it is also possible that brackish water was preferred for pottery production because sweet drinking water would be more difficult to obtain in these arid regions.

The gypsum or lime used for repairing small cracks in the pottery after firing and the coarse crushed calcite used for the surface of rough platters (see below) was most probably also obtained in the immediate surroundings of Sabi Abyad, although perhaps a bit further away on the terraces. Bitumen, used to give vessels a watertight coating and also used to repair cracks after firing, must have been imported from further away. The closest sources of bitumen are located in Jebel Bishri in the steppe west of the southern Euphrates valley in Syria.[60] The bitumen used as decoration on the prehistoric pottery from Sabi Abyad came from Zakho or Kirkuk, both in North Iraq and at a distance of approximately 500 km (Nieuwenhuyse et al. 2003). Although the bitumen found on the Middle Assyrian pottery was not analysed, several samples of bitumen used in Middle Assyrian architecture (where it was used to create watertight seams between floor tiles) indicate that in this period, too, the bitumen was imported from Northern Iraq.[61] It is most likely that the potters at Sabi Abyad did not go to fetch the bitumen themselves, but that it was sent to the site through the Assyrian administrative networks.

Climate and vegetation

The area around Sabi Abyad has a dry, steppe-like climate that has not varied much over the last 6000 years (Boerma 1988: 9). Rainfall per year is low (around 250 mm annually). In the summer, between June and November, no rain falls at all, while in the rest of the year the mean rainfall per month and per year varies greatly. Most rain falls in heavy cloudbursts (Boerma 1988: 2). Consequently, even the winter is characterized by periods of dry weather. Summers are hot, with mean summer temperatures around 30°C (average maximum 39°C), while the mean winter temperature is about 8°C. The prevailing winds from March to October are westerly, while the winter months show predominantly easterly winds (Boerma 1988: 2 and table 1), possibly influencing the location of workshops in a settlement. Rainfall and temperature influence the possibilities to make ceramics. From late spring to autumn potting would have been very well possible at Sabi Abyad. The only concern would be to keep the pots in the shade while drying, because drying too quickly in the sun can cause cracks. In the winter potting would probably still have been possible, with the exception of drying on rainy days (cf. Rice 1987: table 10.1). It would have been less comfortable to work outside in the cold and damp weather, and vessels would have taken much longer to dry. Therefore a large indoor-area would have been needed for working, drying and storing fuel and clay. Firing would also have been less easy in cold, damp weather. Ethnographic studies of traditional potters in Syria and the Eastern Mediterranean show that potters in this part of the world

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[59] Personal communication by F.A.M. Wiggermann, 9-10-2005.

[60] These bitumen mines are still exploited in modern times for road-building (Van Daele 2005: 125).

[61] Personal communication by e-mail of J. Connan, 21-3-2006.

usually only work between April and October (e.g. Taniguchi 2003, Ionas 2000, London 1989a, b, Bresenham 1985, Hankey 1968).

Another consideration concerning the climate would be the interference of craft production with the agricultural season. This is especially important when potters were not working full time, but spent some of their time in agriculture as well. Sabi Abyad is situated just at the margin of the area where rain-fed agriculture is possible. Crops that depend on rainfall would have to be winter crops, to be harvested around May (Akkermans 1993: 24-25). Rain-fed agriculture was supplemented by the cultivation of irrigated crops. Irrigation took place with the help of channels diverted from the river or from wadis (Wilkinson 1998a, b). The existence of irrigation at Sabi Abyad is not only clear from the cuneiform texts, but also from botanical material. The presence of high-quality wheat which (unlike barley) demands well-watered conditions is a strong indication for irrigation practices. Next to winter crops and irrigated crops, there were also gardens around Sabi Abyad where summer crops like sesame and cress were grown in large quantities, as well as some herbs (Wiggermann 2000:177-178). Gardens need regular attendance most of the year. The bulk of agricultural production, however, was grain. Craft producers other than potters working at Sabi Abyad probably received rations, and possibly also had their own sustenance fields and some animals to supplement their income (Wiggermann 2000: 190). It is not expected that craftsmen were very much involved in the state's grain production, but perhaps they assisted in the harvest. The main labour demand from agriculture therefore seems to be in late spring. However, since potters would not be alone but have their families to assist with any field of their own and any agricultural service, it is expected that they could spend most of their time on the production of pottery as well as have the income of their own field as a supplement (see also below).[62] In any case, it is expected that potting activities were coordinated with and adjusted to other requirements the potter had to fulfil, to the agricultural (and cultic?) calendar and to the seasons (Underhill 2003: 205-206; Ionas 2000: 211; Rice 1989: 110; Kramer 1985a: 117). Pottery-making would probably have stopped in the coldest rainy months of December-February.[63]

Generally the landscape would have been more humid than it is now, drained as it is now by extreme irrigation and pumping of groundwater. At the time of the Assyrian occupation of Sabi Abyad, the surrounding lands would have been intensively used for agricultural activities, while parts of the land would temporarily have lain fallow (Wiggermann 2000). Land that was not cultivated would have been characterized by steppe vegetation. Not many trees were present in this landscape. The Balikh flow channel, however, must have been bordered by a dense vegetation of reeds and marsh plants as well as a thin riverine "forest" of some poplar and willow along the river banks (Akkermans 1993: 21). The steppe showed characteristic steppe-shrubs, dominated by *Artemisia herba-alba*, but this plant has now disappeared largely due to grazing, ploughing and fuel gathering. This vegetation was also present in wadi beds (Akkermans 1993: 23-24). The fallow land after harvest and the surrounding steppe must have been perfect grazing grounds for the herds of sheep and goats.

Organic raw materials therefore seem to have been plentiful in the surroundings of Sabi Abyad. Straw and other agricultural by-products like (wind-blown) chaff as well as animal dung would have been readily available to serve as temper material. Straw, animal

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[62] Texts from Ugarit suggest that potters working in royal service there could also be employed in other activities when necessary, such as in agricultural or military work (Heltzer 1996: 279). Perhaps this was also the case at Sabi Abyad.

[63] In fact, the seasonality of many aspects of life in agricultural communities results in an idea of "seasonality" or "part-time" work quite different from our western concepts. In describing how pottery making fits the agricultural and religious calendar of activities in Cyprus, Ionas comments: "This temporal distribution of activities did not take into account solely the rhythm of nature and that of the rural buyer, but as well that of the peasant-craftsman who had also to farm his own fields. In that context, it is clear that the term "seasonal craft" did not mean anything for a rural craftsman; it would be as strange to refer to "seasonal harvest" (Ionas 2000:211).

dung, steppe shrubs and agricultural refuse could have been used as fuel. It is less likely that scarce materials like high-quality wood or strong reed would have been used as fuel.[64]

All raw materials needed to produce pottery were readily available at Sabi Abyad, within a distance of some 5 km. Ethnographic studies show that the distance between a production site and the source of the clay is not likely to be very large (generally shorter than 7 km), except when a special clay is needed for some particular reason (cf. Rice 1987: 116). The Balikh River and its tributary wadis in the immediate surroundings of the site are therefore the most likely source for raw materials. Other river valleys (Euphrates, Khabur) are at least 80 km away from the site, and also show a similar geology not providing clays with very different properties.

V.4 The potters at Tell Sabi Abyad and the social environment of pottery production

Access to resources

Nothing is known about any social, religious or cultural limitations to the access to clay and other resources (cf. Rice 1981: 46, 47), although it can be expected that the potter would not just dig for clay at random or in someone's field. He probably had specific opinions as to the place where the clay could best be taken from and the particular properties of that clay. As there are no textual sources from the Middle Assyrian administration dealing with the delivery of raw materials to the potter, his materials would seem to have been freely available. In other periods texts mention the withdrawal by potters of reeds from the "sheep house", probably as fuel for the kilns (Steinkeller 1996: 241-242). Whether the potters in Sabi Abyad also received fuel from officials, farmers or shepherds, or whether they were free to take whatever they could find, is not known. Most probably, the administration (if involved) only dealt with the delivery of the finished products, and left the procurement of raw materials and other necessities (work force or tools, for example) to the potter himself to take care of.

The identity and sex of the potters

Only one of the cuneiform texts found at Sabi Abyad mentions a potter (T93-3, a letter, see Appendix F). In the text Mudammeq-Aššur asks Mannu-ki Adad (who at the time was chief steward at Sabi Abyad) why he didn't send a potter to the brewer in Dunnu-Aššur. Mannu-ki Adad has to send a message to the brewer of Sahlala,[65] so that he will send beer and vessels to Mudammeq-Aššur for the reception of a group of Suteans (see Appendix F).[66]

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[64] Two samples from the fill of the fire chamber in kilns found at Sabi Abyad contained some charcoal and burnt grains and have been sent to laboratories for analyses to determine the type of fuel. No results have been obtained yet. For detailed information, see the description of the kilns (Appendix C).

[65] Dunnu-Aššur and Sahlala are the Assyrian names of *dunnu* settlements in the Balikh Valley. Dunnu-Aššur can probably be identified with Tell Abyad on the Turkish border. Sahlala is almost certainly Tell Sahlan north of Sabi Abyad.

[66] The occurrence of brewers and potters working together to provide for the basic needs of a reception meal can be compared to the co-operation of brewers and potters in Ancient Egypt. On two wall paintings from Saqqara and Thebes pottery production is taking place in association with baking and brewing scenes, indicating that activities involved in supplying basic foods and food containers were located close to each other (Arnold and Bourriau 1993: 75). In wooden models found in Egyptian tombs potters often appear together with carpenters, metal-workers and stone-vessel makers, working together in courtyards or outside (idem: pp. 69-75, fig. 84). In Mesopotamia, too, potters sometimes seem to be associated with food producers, and especially with brewers (Sallaberger 1996: 28,

In this single and very brief mentioning of a potter in the Sabi Abyad texts the personal determinative preceding the word "potter" designates this person as a man. We have seen above (V.2) that in ethnographic cases the craft is usually carried out by men whenever potting becomes economically interesting.[67] The Sabi Abyad potter is not mentioned by name, so his identity or ethnicity is unknown.

There are few other Middle Assyrian texts from elsewhere mentioning potters. A potter is mentioned in a text from Billa. Two men, one called Sîn-bēla-uṣur and one with an only partly legible name, are mentioned in the personnel lists from Aššur, and are part of a group of *šiluḫlu* people. A text from Tell Chuera mentions a potter who receives a ration of 2 *qû* of barley, normally a ration for two days of work (all in Jakob 2003: 475). These potters are all men. From the earliest cuneiform evidence relating to potters, dating to the Ur III period, evidence for women potters seems to be absent as all potters since mentioned in texts are men (Sallaberger 1996: 27; Waetzoldt 1970-71: 10; see also Renger 1996). It therefore seems likely that at least those persons responsible to the administration for the production of pottery (and therefore likely to be mentioned in administrative documents) were men. This does not exclude the involvement of women and children in the daily work in the workshop.

The number of potters

This single mention of a potter in one text is too meagre to draw conclusions from on the number of people that were involved in pottery production at Sabi Abyad. It is also possible that the administration only dealt with the "master" potter, while he himself employed assistants or was assisted by family members. We shall return below (see paragraph V.6) to the question of labour division in the production process, suggesting that more than one person was involved in the different stages of production. The workshops of level 6 (see below) also show evidence for the use of two potters' wheels, suggesting that more than one potter was working in the workshops. Ethnographic research suggests that in cases of specialized pottery production "it takes a whole family to produce vessels, not simply the individual who shapes the vessels" (Underhill 2003: 206).

It has been suggested that there were at most about 60 people living inside the *dunnu* precinct as administrative and domestic staff, including families. The staff was headed by the chief steward who was assisted by "ten-men". The staff included specialists in at least 17 professions including brewers, bakers, singers and hairdressers (Wiggermann 2000: 190). The presence of one or two potters and their families would therefore be in reasonable proportion with the number of other professions compared to the available space inside the *dunnu*.

It is of course possible that more than one workshop contributed to the locally *used and discarded* pottery repertoire that forms the excavated corpus of material. The architectural evidence and the finds so far point to the existence of workshops inside the *dunnu* (see below), but others might have been located outside the *dunnu* or at other nearby sites. If there were different workshops in the area around the site, *and* if their products (or the products from workshops further away) reached the excavated settlement at Sabi Abyad in a sufficient number, this might be visible in a high degree of variability within the corpus, whether in raw materials, techniques or in shapes (Pfälzner 1995: 28, Rice 1987: 203). See below for the discussion of this question (paragraph V.6).

31, Steinkeller 1996: 236 and note 26), but in personnel and ration lists they generally occur amongst other craftsmen (Renger 1996).

[67] Both Kramer 1985: 117 and Johnston 1977: 179 state that in ethnographic cases where fast-turning kick wheels or stick wheels are used, the potters are always men. The use of a fast wheel at Sabi Abyad is discussed in more detail below.

The social and economic position of the potters

Middle Assyrian texts give the impression that craft production was organized in various ways. Either craftsmen (like the brewer and baker) worked in the service of the temple or the palace or craftsmen would receive raw materials to produce a certain fixed amount of objects, while they probably could spend the rest of their time for private work. Among the latter craftsmen are leather workers, chariot makers, textile workers, etc., but no potters (Jakob 2003: 25-28). Middle Assyrian texts do not mention the distribution of raw material to potters. The texts from Sabi Abyad do not inform us explicitly about the position of potters in the *dunnu*. They are not mentioned in the lists of workers and rations found until now, and the texts are silent about the legal status of professionals in general. However, it might be suggested that the position of the potter would be similar to that of the other craftsmen at the *dunnu*. In that case, the potter(s) could be dependants receiving rations and/or working sustenance fields in exchange for their *ilku* service (cf. potters receiving rations at nearby Tell Chuera, Jakob 2003: 475). It is possible that some of the craftsmen belonged to the *šiluḫlu* (Wiggermann 2000: 174, 190), as is suggested by the two *šiluḫlu* potters from Aššur mentioned above (Jakob 2003: 475).

Ethnographic as well as textual evidence shows that in Mesopotamia the craft of potter was usually a family business, at least before large factories or manufactories were present. The craft was passed on from father to son (Renger 1996: 228, Sallaberger 1996: 26-27, Steinkeller 1996: 249), and assistants would often be family members. In third millenium BC Mesopotamia, even baby boys born into potters' families are called "potter" in ration lists (Steinkeller 1996: 240). This does not necessarily mean that the actual potting was done at home or in a workshop that was spatially part of a household (cf. Annis 1988).

The whole intramural space of the *dunnu* and part of the extramural areas have been excavated by now. Among the well-preserved finds several groups of cuneiform tablets have been found, belonging to the administration of different officials and employees at the *dunnu*. There are texts from the baker, the brewer and the administrative staff, but not from or about the potter. Throughout Mesopotamian history, potters seem to be underrepresented in texts when compared to other craftsmen (Steinkeller 1996: 233-34, Sallaberger 1996: 38).[68] Although we may not reason from the unknown, the absence at Sabi Abyad of any (indication of) administration about or belonging to the potter does suggest that he did not keep such an administration. This might be due to the fact that the potter had to provide his own raw materials, which were easily available and mostly free of charge. He therefore did not have to account for the receipt of raw materials and the return of finished products like, for example, the baker or the metalworkers (Sallaberger 1996: 23, 38). The *dunnu* administration would only be interested in obtaining the end product, most probably in return for food rations or a piece of land to cultivate.

The situation is perhaps comparable to that of potters in the Ur III-period public households. There the potters were obliged to deliver a certain amount of vessels, and in return they received rations and plots of land. The potters seem to have worked rather independently but affiliated with a state institution. They would provide for their own raw materials and organize their own work. The institution would only acquire the needed pots, and at the end of the year calculate how many man-days the potter had spent working for the institution. There does not seem to have been a direct control over the organization of pottery production (Steinkeller 1996, Sallaberger 1996).

When the rations the potter received from the *dunnu* administration were sufficient to sustain his family and perhaps some assistants, this would mean that potting was his only source of income. However, in comparison with other craftsmen at the site, it is likely that he and his family also worked a small piece of land, which means that there was at least one secondary source of income, while potting would still be the main source (Wiggermann

[68] For the administration of the work of potters in ancient Egypt, see e.g. Frood 2003.

2000). It is not known whether the potter could produce only for the *dunnu* or was able to sell or exchange his produce privately as well.

V.5 The location of pottery production and the potters' workshops

Ethno-archaeological studies aimed at finding material correlations for production organizations have shown that the location and layout of the workshop as well as the (regional or local) distribution of the products are among the most important indications for production organization (Annis 1988: 47, Underhill 2003). The distribution of the products will be dealt with below (paragraph V.8). Here we shall look into the evidence for the location of pottery production at the site of Sabi Abyad and the use of space by the potters.

Cuneiform text T93-3 (see above and Appendix F) suggests that a potter was resident or at least present at Sabi Abyad in the days of *abarakku* Mannu-ki-Adad (level 6). This is not explicitly mentioned, but from the other texts it becomes clear that the intendant Mannu-ki-Adad had authority solely over the site of Sabi Abyad. A potter that fell under his authority was therefore most probably located at Sabi Abyad.

The local production of pottery at Sabi Abyad can also be deduced from more direct evidence: the finds of unfired pottery, raw clay, wasters, tools and pottery kilns and their relation to the architectural context. Consequently, it is clear that pottery was produced locally, but where at the site? Before we look into this question in more detail, ethnographic and archaeological descriptions of pottery workshops can provide a general idea on how to recognize production areas and what remains we may expect or should be looking for.

Pottery workshops in ethnography and archaeology: what can we expect?

A quick survey of selected literature[69] dealing with contemporary traditional pottery workshops in the Mediterranean world reveals that there is no uniform layout of the workshop architecture and use of space inside a workshop. Even in highly organized workshops with spaces especially designated for each activity, the potters use space for different purposes when needed. However, there are some aspects of layout and use of space common to pottery workshops in general. Also, M.B. Annis (1988) has shown that there are significant relationships between different modes of production and the use of space, while A.P. Underhill (2003) proved the existence of a relation between the use of space and the intensity, output and scale of production.

Space is needed for the variety of different activities in a workshop, depending on production levels and techniques used: space for the storage of raw clay, temper materials and fuel; for the preparation and ageing of clay and the storage of the prepared clay; for the shaping of vessels, for the drying of half-fabricates and drying of completed vessels (preferably away from traffic and playing children), a firing location (kiln), a general storage area for tools and equipment and for the storage of fired vessels until they are distributed (cf. Anderson 1989). Of course, single rooms and areas can be used for different functions simultaneously, and even in modern workshops the use of a room is not always immediately clear from its layout or features. Depending on the organization of production, workshop activities will be carried out in specially designated areas, or they will be carried out within the general spaces of the household that are used for a variety of other functions as well (Annis 1988). It has been suggested that intensification of production is accompanied by

[69] Taniguchi 2003, Al-Bahloul and Kassouha 2002, Van As and Wijnen 2001, Ionas 2000, Annis 1996, 1988, D. Arnold 1991, London 1989a, b, Bresenham 1985, Golvin et al. 1982, Peacock 1982, 1981, Hankey 1968. See also the summary presented in Senior 1998: 147-160. For a study of potters in China, see Underhill 2003.

efforts to place more steps of the production process in one space devoted specially to pottery production (Underhill 2003: 206). There is no typical, universally recognizable layout for pottery workshops, but we can expect one or several indoor areas and a courtyard area next to it, as well as a kiln in the immediate neighborhood (but not necessarily attached to the workshop itself).

Raw materials and garbage are seldom left in the production areas. Working areas are regularly cleaned, raw materials are used until finished. Broken or misfired vessels and sherds are not left but used for a variety of purposes, including usage as building material, as part of the kiln construction, as flowerpots or as a pavement. Fired vessels are distributed to their future users (London 1989b: 75-76, Scham 1998/99, Sullivan 1989). Consequently, we will not necessarily find heaps of these materials in our excavations.

Workshops excavated at other archaeological sites may also help to interpret the Sabi Abyad findings. In the pottery workshops of the Late Bronze Age / Iron Age site of Sarepta the spaces where clay was prepared and stored were well recognizable by the layers of clean potters' clay on floors and walls and in the room fill. Ash and sand, also found in the room fill, was interpreted as a parting material used to prevent clay from sticking to the surface while working it. In general, the rooms were rectangular and contained features whose function was not always clear, like shallow circular pits, ceramic basins, rectangular bins made of clay or mud-bricks, lined post-holes, mortars and "single-wheel" emplacements. The basins where clay was stored or prepared were mostly up to 2 m long. Other indications that the excavated buildings were indeed pottery workshops consisted of amounts of raw and levigated clay, piles of ash and sand, fragments of unfired vessels, kiln slag, tools, and waster fragments (Anderson 1987). In the workmen's village of Amarna, Egypt, a long room and courtyard with associated pits could only be interpreted as a pottery workshop area due to the finds of a wheel bearing and unfired vessel fragments (Rose 1989). The Middle Bronze Age remains in Operation J (10-11 and 13-14) at Tell Mishrifeh have been interpreted as a pottery production location, and contained trodden mud surfaces, pottery kilns of a circular (subterranean?) type, pottery slag, kiln wasters and potters' tools, but no associated architecture (Morandi Bonacossi 2002, 2003, in press). The remains of an Iron Age pottery workshop at Khirbet Qasrij in Northern Iraq included rather unspecified rectangular rooms and courtyard spaces (Simpson 1991). The Late Bronze Age pottery workshop in Lachish, however complete, does not give us a lot of clues as to what kind of architecture and spatial layout we could expect to find, as it was located in a system of caves (Magrill and Middleton 1997). The pottery workshop found in Mari consisted of two rectangular rooms, one with a plastered platform against a wall and both with a hearth in the middle. One of the rooms opened upon a courtyard with a pottery kiln and a pit. The pit was interpreted as a wheel pit, with the potter sitting at the edge and the flywheel located at the bottom of the pit (Weygand 1997), but other than the shape of the pit there are no other arguments for identification as a wheel pit. A basalt wheel bearing was found nearby, but not in the pit. In Kassite Tell Zubeidi the rectangular rooms could only be identified as pottery workshops because of the find of several large updraft kilns (Dämmer 1985: 28-31). In Abu Salabikh a building was identified as a "potter's house" because of the find of clay layers, clinker or slag deposits and ash, together with the find of a clay disc identified as a potter's wheel (Postgate 1990: 104).

The correct identification of tool function and use is often problematic in the case of objects used in ceramic production. Potters' tools are often of a very unspecific and *ad hoc* nature and hardly ever show any usage traces or characteristics specific for pottery production tools. Identification then inevitably remains on a very general level. Also we must take into account that many tools made of thread, rope, textile, wood, leather or other organic materials are not preserved in the archaeological record (P. Arnold 1991: 88 and others, see footnote 69). At Sarepta tools found in the workshops are mainly reworked ceramic sherds, used as ribs in the shaping process (Anderson 1987: fig. 19). Other tools may include polishing stones (but note that the pottery from Sabi Abyad was hardly ever polished or burnished), ropes, knifes or blades, bone or metal pins, tubes or other sharp objects for decoration, perforation, and so on, pieces of cloth and water vessels.

The locations of pottery production at Tell Sabi Abyad

The discussion of the location of pottery production and the workshops will proceed for each level as follows: the location of production areas at the site; the location of kilns at the site and in the workshops; the description of the architecture, areas and architectural features in the workshops; and a discussion of tools and other finds possibly used in pottery production. A detailed discussion of the unfired pottery fragments will follow in paragraph V.6 of this chapter, while the kilns are presented in detail in Appendix C.[70] In this volume only the finds related to pottery production will be highlighted. No evidence for pottery production was found in levels 7 and 3.

The main reasons for interpreting the discussed areas as pottery production locations are the finds of unfired pottery fragments, occurrences of damaged or repaired pottery vessels, several two-chamber updraft kilns and, in level 6, the find of two half basalt potters' wheels. Nowhere at the site, whether in houses or in open areas near kilns, have we found the almost proverbial "piles of wasters" usually thought to be connected to a pottery production location, although single wasters or waster fragments and small fragments of "ceramic slag" have occasionally been found in various spots at the site. At the surface of the site there was no indication whatsoever for the location of kilns or the existence of a production site. This may have some implications for research into production locations using surface survey data.

The level 6 pottery workshops

The earliest evidence for Late Bronze Age local pottery production at Sabi Abyad comes from level 6. As discussed in chapter III, this is the first occupation level built by the Middle Assyrian provincial administration. So, from the start, pottery was produced locally at the site for the community living at the *dunnu*. Moreover, the level 6 workshops are the largest installations for pottery production found at the site so far. Apparently the production of large amounts of pottery was one of the priorities of the first settlers.

The location of pottery production at the site in level 6

Evidence for pottery production was found in squares N10-N13 to O10-O13, the eastern area of the *dunnu* along the moat (cf. fig. III.3 and fig. V.2). Elsewhere at the site in level 6 no indications of pottery production have been found. The workshops in level 6 were located within the *dunnu* settlement (within the confines of the moat), but outside the wall of the fortress.

[70] The information on the stratigraphy, architecture and features as well as the small finds presented here is based mainly on the internal stratigraphy reports prepared by the Sabi Abyad team (updated to September 2005, Sabi Abyad files), and partly on my analysis of the daily reports of the excavation and the small finds administration. In this and other chapters original square-locus-lot information is added in footnotes for the benefit of those working with the original field notes in the future. Since the analysis of the stratigraphy and the architecture as well as the small finds is still in progress, the results presented here are not final and may have to be adjusted once final reports and spatial analyses become available. For this reason also, sketch plans of the architecture are used instead of detailed plans. In the same manner, I will assume that the findspot of an object is related to the use of a space at least in a general manner, in the absence of detailed reports on deposition and formation processes and contextual analyses.

Level 6 workshop architecture
The level 6 architecture in this area formed a densely built quarter along the moat that surrounded the settlement. Buildings were simple, made with rather thin walls. The quarter consisted of a series of rectangular longdrawn rooms with doors towards the west. To the west of this line of rooms architecture included more rooms, open spaces and small streets or courtyards, including the kilns (fig. V.2). West of this complex was the thick wall that surrounded the inner living and working spaces of the Middle Assyian fortress. The kilns were located between the workshops and the fortress. Their location to the east of the fortress kept the fumes and smoke from the firing away from the settlement during the summer months when westerly winds predominate. The many and varied finds suggest that the area between fortress and moat was used for a variety of functions, including craft production as well as domestic activities, as is indicated by a multitude of features and small finds not directly related to pottery production (Akkermans in prep.).

Kilns
Two large updraft pottery kilns were constructed on the first level 6 surfaces: kiln Q in N11 and kiln L in N12 (see Appendix C for a detailed description). The two kilns were probably constructed at more or less the same time directly on or in the Neolithic tell surface, but this is not completely certain. At a later stage a third kiln (H) was probably constructed to the south in square N13 (most probably early in level 5). It is possible that with the construction of each new kiln the earlier kiln was no longer used, but this cannot be stated with certainty at the moment.

The first kilns built at the site were also among the largest. The outer structure of kiln Q (figs. C.1-7) was at least 2.95 x 2.10 m, the pottery floor is estimated at approximately 4 m^2, while the fire chamber had an estimated volume of around 5 m^3. From the descriptions of kiln Q it is clear that it was replastered at least four times: four two-centimetre thick layers of plaster have been applied to the inside of the fire chamber, and fired in alternating green and bluish green colours (figs. C.6, 7). The area immediately surrounding the kiln (between the kiln and wall G) was not excavated further and probably did not reach depositions related to the use of the kiln, but the open area south and west of the kiln was. Here, in N11, the deposition was brown-grey in colour, with lime spots. Sometimes the colour was grey-light-brown or greyish black, there were some ash pockets and charchoal parts and traces of burned reeds (remains of kiln fuel?). Several times “slag” and pieces of baked bricks or “oven wall” were found, possibly from renovating the kiln. Unfired ceramics were found in these deposits,[71] as well as in the upper kiln fill (deposited after the kiln had gone out of use). Other finds are some grinding tools, pottery vessels, lots of sherds and two damaged small stone axes (possibly reused prehistoric artefacts), but none of them point specifically to pottery production. A baked clay wedge (fig. V.7: O03-105) was found in the open area south of kiln Q, and two similar objects were found elsewhere in the level 6 workshop area and one in a level 5 kiln. These wedges may have been used in the kiln to stabilize the kiln load (as for example in Beit Shehab, Lebanon: Hankey 1968: 30; cf. also Zoroğlu 2000: fig. 3). After kiln Q had gone out of use, the upper structure was taken apart and levelled. Now the area was used for several smaller bins and ovens, protected by a curved courtyard wall (wall G, fig. V.6).

Kiln L was most probably constructed only after the northern door to the small courtyard in square N12 had been blocked (fig. V.5, and figs. C.8-10). It could then be argued that kiln L was not built directly at the start of the occupation in level 6 and the building of the courtyard wall, but a little later. It is as yet unclear whether kiln Q was still in use at this time. The courtyard had a *tannur* oven built in the southern corner, next to a door with a doorsocket. The courtyard was part of the workshop complex to the east. Kiln L was therefore built in a more confined and protected space within the workshop areas, whereas kiln Q seems

[71] Loci 37, 40, 41, 42, approximately between elevations 324.90 m and 324.48 m.

to have been built standing alone in the open area between the workshops and the main settlement. Although about 1.5 times smaller than Q, kiln L was another very large kiln (see table C.1), but the remains are less well preserved. The fill in the courtyard around the kiln on floor F consisted of ashy grey deposits with charcoal parts, some mud-brick debris, and some carbonized reeds (remains of kiln fuel?).[72] In these deposits a lot of objects were found, some of which are possibly related to pottery production. Apart from many ceramic vessels, fragments and sherds, there were four grinding implements, four smooth flat stones perhaps used as palettes of some kind, a longitudinal stone tool, and two bone or horn tools. Other finds include two baked-clay model wheels, a faience bead, a stone axe and a fragmented bronze bracelet. The surface of the outer area and street west of the courtyard seems to be quite a bit higher in elevation than the surface of the courtyard itself. Deposits here[73] were ashy soft grey and brown soil. Unfired ceramics were found in the fill of the kiln, and in the fill just south of the courtyard walls. They include a variety of vessel rims (including rim types 315, 212, 113 and 111), many body sherds and a goblet neck with incision, and more than one kilogramme of kneaded lumps of unbaked clay. After kiln L had gone out of use, the structure was used as a tomb for a (Middle Assyrian) burial. Finally kiln H was built in square N13, dug from a surface that is probably no longer preserved, most probably from level 5.

In conclusion we may say that the kiln evidence perhaps points to two main phases of production in level 6, one connected to the use of kiln Q and one to the use of kiln L, but they may have been used simultaneously or alternatingly over a longer period of time as well, without any clear-cut phase divisions. The find of unbaked pottery in the upper fill of kiln Q suggests that the workshop was still producing after this kiln had been abandoned. Kiln H seems to be later. All three kilns are among the largest found at Sabi Abyad so far, while kiln Q is the largest of all. Contrary to level 5, where smaller kilns were used next to large ones, no small kilns have been found in the level 6 production area. It therefore seems that throughout level 6 there was a steady need for large firing facilities. Around the kilns the deposits were sometimes ashy, but no large heaps of kiln refuse, ash, or wasters have been found either near the kilns or elsewhere in the production area. This could point to the deposit of garbage elsewhere at the site (perhaps in the moat?) and a regular cleaning of work-spaces. Perhaps the ashes in the fire chamber were not removed at all (or not completely). It could also indicate a generally low rate of firing losses and waste production.

Workshop architecture and associated finds

The rooms and spaces east of the kilns contain more evidence for pottery production, the most interesting finds concentrating in room 1 in square O12, room 2 in squares N12, O12, N11 and O11, and room 3 in O11 (cf. fig. V.2). Here the level 6 workshops were located.[74]

<u>Room 1</u>

Room 1 was situated directly along the moat (fig. V.4). Wall E was the original eastern wall, but soon after wall S was built, making the room a bit smaller, now measuring 5.4 x 3.25 m (17.55 m^2). Against the southern wall a mud-brick bench (AD, at the top of fig. V.4) was placed, and at a certain point during the accumulation of fill and objects in the room a square plaster bin (Q) was built against the southern wall.[75] Most finds connected to the pottery workshop were found in the medium-hard light-brown fill and on the floor, between the

[72] Loci 24, 25, 26, approximately between elevations 325.02 and 324.60.

[73] Loci 17, 18, approximately between elevations 325.25 and 325.02 (floor F).

[74] From the field day-notes and stratigraphy it becomes clear that the architecture in level 6 was of an "organic" nature: small alterations and additions took place constantly, hampering the division of material into sublevels at the time of writing.

[75] The stratigraphy of this room suggests that there may have been two, or perhaps three, phases in the level 6 use of the room.

elevations of 324.33 and 324.64. Finds indicating that the room was part of a pottery workshop included unbaked pottery fragments, fragments of wasters and a complete but partly vitrified jar, and several tools including two basalt wheel bearings.

Four shallow plastered hollows were dug out into the floor (Y, Z, AA, AB). They were between 0.27 and 0.35 m in diameter and 0.10-0.15 m deep. Three of them were plastered with white lime plaster. They were filled with soft ashy brownish soil, containing small sherds and pieces of unbaked clay. They may have been used in pottery production, for example to hold the bases of large jars or large storage pots while the potter was building the upper wall. It is also possible that (some of) the shallow pits served as bases for the lower part of the pottery wheel (see below). In front of the brick bench AD and in front of J there were concentrations of small white pebbles. Bench AD is only two mud-brick courses high.

An unfired base of a large storage pot was left against the southern wall in the corner of the room (J, visible in the top of fig. V.4).[76] A large pottery jar of which the rim had broken off (fig. IV.32.a, P03-384) was placed against wall S. It contained many small coloured stones. Another, similar, jar without a rim (obj. 212) was placed against bench AD. Next to AD a pot (obj. 172) was standing in the little niche. In the middle of the room a large, heavily overfired and collapsed jar (P03-285, fig. V.53, V.4) was lying on the floor. More than a hundred smaller and larger bowls lay scattered on the floor and in the fill, most of them upside down. It seems as if they were part of the potter's production stored in this room, mostly in the south-eastern corner of the room and away from a route leading from the door to the back of the room in the north (fig. V.4).

The fragments of unfired pottery found in room 1 were concentrated in the eastern part of the room, against wall S. They were mainly fragments (disc shapes) left over from the production of bowls and goblets (see below, paragraph V.6), pieces of kneaded clay and wall fragments of a large, hand-built basin. Apart from unfired ceramic fragments, a small unfired-clay model wheel (O03-222) was found as well. Apparently, the potters did not only make vessels, but other objects as well.

Apart from the large waster jar P03-285, no overfired ceramics were collected from room 1. However, in the day-notes it was observed several times that large fragments of grey/green overfired ceramics have been found, especially near the unfired pot J.

In room 1 two basalt upper halves of a potter's wheel have been found. The lower parts were not found. Perhaps these lower parts were taken elsewhere to be reused, as door-pivot stones for example. One of the wheel bearings (fig. V.8, S03-608) was found north of the doorway to room 2 in the roomfill, at an elevation of 324.58. It is 15.7 cm in diameter and 8 cm thick and made of a dark-grey fine basalt. The side with the pivot is very smoothly polished by the rotational movement. The other side is flat and rough, with rests of bitumen[77] sticking to it. It has an irregular depression slightly out of the centre. The bitumen was most probably used to fix a larger wheel head to the wheel bearing. The second wheel bearing (S03-764) was found in the niche next to bench AD, near the doorway to room 2, at an elevation of 324.43 near floorlevel. It is 15 cm in diameter and 8.4 cm thick, and made of grey basalt. The side with the pivot is very smoothly polished by the rotational movement, the pivot itself, however, is less polished. This side also shows some damages. The other side is irregularly convex and smooth.

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[76] J was first thought to be an oven or bin, then later it was suggested that it could be a pit lined with a thick layer of clay. Both in the field and during the stratigraphy work, uncertainties about the nature of J persisted. On the field photographs, however, it seems clearly to be the (unbaked) base of a large storage pot. Another large fragment of an unbaked storage pot may be represented by locus 35 lots 83, 84, 94. In the field it was thought to be a pit, but there was a lot of uncertainty. It was noted that the "pit" had a border of hard clayey material, as if it was lined, and it got smaller lower down. However, the descriptions in the day-notes are too unspecific to conclude that this "pit" may have been a fragment of unbaked pottery like J.

[77] A sample (O12 sample no. 3) was taken of the bitumen, but has not yet been sent for analysis.

Other tools found in room 1 are much more difficult to recognize as possible potters' tools. There were twelve ground-stone tools (grinders, grinding slabs, pestles and hammers) of the kind found in large numbers everywhere at the site. There were two flat smooth stones tentatively identified as palettes, of a kind common at the site as well. Three stone objects were identified as "tools" or "polishers", but have an unclear function. One (possibly prehistoric, reused) stone axe with a sharp cutting edge was found, and two clay jar stoppers. There was also an animal horn, unworked, but perhaps used as a tool. Two small rectangular baked bricks were found (fig. V.9, perhaps used in the kiln to stabilize the kiln load or to separate vessels during drying, cf. Swan 1984: 40; Zoroğlu 2000: fig. 3), as well as a longitudinal piece of ironoxide / ochre. Finally, a piece of a faience bead and a bronze ring were among the finds in room 1.

Excursion: basalt "potters' wheel" bearings, reconstruction of the potters' wheel and implications for vessel shaping techniques

Stone potters' wheel bearings have been found at a number of sites in Syria and the Near East, dating from the Early Bronze Age up to the Byzantine and Islamic periods (Trokay 1989, Amiran and Shenhav 1984, see the distribution map in Bombardieri 2004: fig. 3). They seem to occur mostly in second millenium BC levels (Trokay 1989: 169), a time when most of the pottery repertoire was thrown on a fast rotating potters' wheel. A complete set of these objects consists of a lower half with a depression and an upper half with a protruding pivot, that fits snugly into the depression of the lower half. Constant and intensive rotational movement results in shiny polished surfaces where the two stones are in contact. Normally, they are made of basalt or granite, but occasionally limestone is used (Bombardieri 2004: 96). Although the interpretation of these objects as small hand mills is occasionally considered (e.g. Trokay 1989, Pruß 1994), their findspot in pottery workshops at several sites such as Lachish (Magrill and Middleton 1997), Mari (Weygand 1997), El Amarna (Rose 1989, 1993, Powell 1995) and now also Tell Sabi Abyad have convinced most scholars to identify them as potters' tools (Trokay 1989, Bombardieri 2004). Mostly, they are called "tournette" or slow wheel, thought to be used only for slowly turning a handmade vessel while building the walls, and not for throwing pottery.

Most pottery from the Early Bronze Age onwards, however, was thrown on what is termed the "fast wheel" or "true potters' wheel", with the exception of some hand-made or partially hand-made shapes like large storage vessels or unique special purpose shapes. As will be clear further down in this chapter (paragraph V.6), the pottery from Sabi Abyad is no exception: the majority was thrown on the fast wheel. To throw vessels on a wheel, a rotary motion of 50-150 rpm is required to provide for the necessary centrifugal force used in lifting the walls (Rye 1981: 74, Edwards and Jacobs 1986: 50). Since the two basalt wheel bearings are the only evidence for potters' wheels at Sabi Abyad so far,[78] the question emerges whether, and how, they could have been used in the production of the Sabi Abyad ceramics. The type of potters' wheel used has implications for the shaping techniques that are available to the potter, depending on the velocity, centrifugal force, continuity of rotation and operability (alone or with an assistant) of the wheel (Rice 1987: 133-134).

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[78] Half of a clay disc identified by the excavators in the field as a potter's wheel was found in square N7. This disc (P01-126) originally would have measured 32 cm in diameter, and is 2.5 cm thick. It is made of baked clay. The sides are flat, while the rim is a bit thicker than the disc itself. In the middle, a hole with a diameter of 6.5 cm is made through the whole disc. On both sides, remains of gypsum plaster are still sticking to the surface. One side is smooth, while the other side is rougher and shows traces of burning. The context of this object does not provide any further indications of its use as yet. Although it is possible that it was in some way part of a potter's wheel construction, it is at the moment unclear exactly how. For now it will not be considered a potter's wheel.

To test the properties of this type of basalt wheel bearings, two experiments have been carried out in the 1980s and one in the 1990s. In the first two cases an archaeologist and a professional potter worked together on the experiments, one in Leiden at the Department of Pottery Technology of Leiden University (Edwards and Jacobs 1986), the other in Israel (Amiran and Shenhav 1984). The most recent experiments were carried out by a professional potter at an excavation site (Powell 1995 at El Amarna). All experiments showed that these wheel bearings cannot be used alone, but that a larger wheel head must be fixed to the upper half of them to provide enough momentum. In Leiden this was done by putting a cake of clay between the wheel head and the upper wheel bearing. In Leiden a wheel head of 30 cm and one of 40 cm in diameter was used, the one used by Amiran and Shenhav was 60 cm in diameter. In both cases the wheel was rotated by an assistant using his hands to move the wheel head while the potter was working. At Amarna a wheel head of 53 cm in diameter made of fired or unfired clay was fixed immediately to the upper pivot stone, while the wheel was turned by the potter herself. In Leiden an average speed of 15-20 rpm was reached by the assistant turning the wheel. A small cup could be thrown from the cone, although with difficulty, and the forming and smoothing of separate parts of vessels (like necks) was possible. It was noted that vessels formed this way showed heavy finger rilling on the interior, and a “tell-tale spiral torsion twist” in the wall of the vessel. Amiran and Shenhav, with their larger wheel, managed to attain a speed of 60 rpm. This speed proved good enough for throwing small vessels, but shaping and opening the large lump of clay on the wheel proved difficult. It may seem that the large quantities of professionally wheel-thrown pottery found at Sabi Abyad could hardly have been made on such a wheel. However, the experiments at Amarna showed that, after some experimenting with different wheel bearings, different lubricants and different types, sizes and weights of wheel heads, a comfortable operating wheel was obtained. This wheel was turned by the potter herself and reached a speed between 60 and 120 rpm that lasted for some time. The addition of a heavy lump of clay on the wheel head (throwing from the cone) helped in maintaining the speed (Powell 1995: 330-332).

Basalt wheel bearings of the type found at Sabi Abyad allow the construction of a “simple wheel” with one bearing (fig. V.11 top), as opposed to the kick wheel or double wheel that has two bearings: a wheel head on top of a longer axle with a bearing at the top, and a pivoted flywheel at the base used for kicking the wheel into motion (fig. V.11 middle left). Basalt wheel bearings, apart from providing a pivot, also provide horizontal stability because of the width of the stone (generally around 15 cm in diameter). Since this also creates a lot of friction between the stone surfaces, the stability of the stones was probably important to the potter: otherwise he could have used a thinner pivot without a horizontal surface.

A kick wheel can be constructed in a bench with the potter sitting or standing at the wheel, or in a pit with the potter sitting at the edge of the pit (cf. fig. V.11 bottom; Weygand 1997 for a possible example of this in Mari). At Sabi Abyad neither benches nor pits, nor any other obvious places for the construction of a kick wheel have been found in the workshops so far (although a bench could have been completely constructed of wood, and therefore not preserved). When basalt wheel bearings are found at sites where wheel-thrown pottery was clearly made, attempts are usually made to interpret these bearings as part of a double kick wheel operated by foot, since it is thought that wheel-thrown pottery can only be made on a kick wheel (e.g. Magrill and Middleton 1997: fig. 6b; Rose 1989: 85-86). A proper kick wheel (spindle wheel), however, does not need a wide and frictional bearing as provided by the basalt examples: since the axle of a double wheel is fixed both at the pivot in the ground and just under the wheel head to the edge of the pit or bench, it is stable enough by itself and will not topple over. The small pivot or spindle turning at the base would only leave a small pivot hole in the floor or base stone. A kick wheel would only benefit from the width of the basalt bearings when the axle was not fixed at the top, and therefore the wheel would be “free-standing”. This reconstruction (fig. V.11 middle right) seems to be rather far-fetched, and much more complicated than either a double kick wheel with a small pivot (spindle wheel) or a low single wheel.[79] Moreover, Löbert (1984: 209) suggests that the foot-driven wheel did not appear until Hellenistic times in the third century BC, and that the spindle wheel was invented in Islamic times, while Hope remarks that there are no depictions of kick wheels in Egypt until the Persian period (1981: 130).

However, a low-pivoted wheel with one bearing is not necessarily just a "tournette" or slow wheel. A "true" potters' wheel, combining rotary motion and pivoting with enough centrifugal force, may also have the shape of a "stick wheel" (fig. V.12). Rice (1987: 134-135) describes the stick wheel as follows: "[it] has a large wheel head and a short axle. There is no flywheel; the head itself has sufficient weight to maintain the momentum. [….The wheel] is rotated by inserting a stick in a hole at the edge on the top, and rotating it thirty or forty times. This is enough to cause the apparatus to spin on its own for as much as five minutes without stopping. The stick-turning may be done by the potter or by an assistant while the potter sits at the wheel […..]". The wheel may of course also be turned by hand at times, or possibly even by foot.[80] The suitability of a stick wheel for throwing pottery using centrifugal force is clearly demonstrated in the work of V. Roux describing potters using stick wheels in Northern India (Roux 1990; see also Powell 1995). The use of the basalt wheel bearings would provide extra horizontal stability to the pivot. At the Late Bronze / Iron Age site of Sarepta in Lebanon, wheel emplacements for single wheels have been found in the pottery workshops. These suggest that the wheel was about 80 cm in diameter (Anderson 1987: 48-49 and fig. 10). Stick wheels described in Afghanistan measure about 95 cm in diameter (Johnston 1977: 196). In India stick wheels measure between 76 and 101 cm in diameter and are between 7.6 and 10 cm thick. They are made of unbaked and heavily tempered clay (or, recently, cement), with a stone socket in the centre (Roux 1990: 99). The tests with the stone wheel bearings in a simple or "stick" wheel at Amarna (Powell 1995) have proved that these bearings are very well suited for this purpose.

The pottery wheel used at Sabi Abyad can therefore be reconstructed as a "simple" (stick) wheel with one bearing (fig. V.11 top, fig. V.12). It would have consisted of two basalt pivoted halves. To the upper half, a large wheel head possibly made of (un)baked clay[81] was

[79] The representation of a person working with an apparently free-standing kick wheel with a thick conical axle in a Roman statue from the museum of Suweida (Dentzer and Dentzer-Feydy 1991: Pl. 20 no. 68, cat. 3,12) may be a matter of iconography rather than of proper technical representation of a mechanical device. However, Childe (1954: 201) claims that basalt wheel bearings were used in foot-driven kick wheels in early twentieth century Palestine. The lower bearing was set into the floor of a pit. A large wooden disc was apparently fixed to the upper bearing. A wooden axle was attached to the disc, supporting the wheel head on the top. The axle is steadied at the top by a looped iron rod. There are no illustrations and no references to further descriptions, and it is unclear whether Childe himself actually saw a kick-wheel constructed like this. I did not find any other ethnographic examples of the use of basalt wheel bearings for the construction of a kick wheel by contemporary potters.

[80] The simple slow-turning wheel heads still used today in Cyprus are turned by foot by the potter herself (Ionas 2000, Johnston 1977: fig. 8-13). Also a recently discovered seal impression dating from the third millenium BC from Tell Mozan, Syria, depicts two potters at work in their workshop, seated on a bench and using one of their feet to turn the low and narrow wheel (Heike Dohmann-Pfälzner, pers. comm.). They may be coiling pots on a slow-turning wheel.

[81] Potters' wheel heads of baked clay have been found in large numbers on Crete, dating from the Minoan period. There, the wheels are 30-40 cm in diameter with a maximum of 75 cm, and between 5 and 10 kg in weight. Many have thickened rims to increase momentum, and one or two holes in the rim (Evely 1988: 100). Perhaps the holes were used to attach a rope or a stick for the assistant to spin the wheel. The rims of the Cretan wheels often show ridges and notches, perhaps to increase the grip of the assistant on the wheel rim. In Mesopotamia, clay wheels have mainly been found in early contexts, as for example the clay wheels identified as potters' wheels found in Ur and Uruk (Childe 1954: 199; Evely 1988: 112, Heinrich 1935: 25 and Taf. 15a) and Abu Salabikh (Postgate 1990: 103-104 and plate XVIIc, including references to other discs from other Early Dynastic sites), and they may have

fixed with bitumen as an adhesive. The basalt bearings provide horizontal stability to the wheel head. The bearings were probably lubricated with fat or oil, as they were in the experiments described above. The wheel was probably simply placed on the floor of the workspace or possibly fixed in a shallow pit as at Sarepta and El Amarna (cf. the pits Y, Z, and possibly AA and AB found in room 1 in square O12, in fig. V.2), with the potter and his assistants sitting or squatting next to it.[82] Of course we cannot completely exclude the possibility that a completely wooden kick wheel (spindle wheel) including its wooden workbench has not been preserved, and that the basalt wheel bearings were used only as a slow wheel. However, with a professionally constructed simple (stick) wheel and potters who are able to use it well, there seems to be no need to suppose a spindle wheel that is not otherwise attested (nor at any other contemporary or earlier site). The find of two half wheel bearings at Sabi Abyad suggests that more than one wheel was in use in the workshops.

The suggestion that a stick wheel was used for producing the Sabi Abyad pottery has some implications for the shaping techniques (see below for further elaboration on shaping techniques employed at Sabi Abyad). First, whether the potter or his assisant turns the wheel with a stick, a continuous rotation is possible only for some minutes at a time. This is enough to form small shapes from the cone, but the shaping of larger vessels has to be interrupted several times. Turning the wheel can only be completely continuous when the potter or an assistant is turning the wheel by hand, but then the speed is lower. Perhaps, a slower speed was enough for lifting the walls once the clay had been opened to a wider shape, or for finishing a vessel (smoothing, forming the rim, scraping, turning, decoration). Rotation can be fast with a stick wheel, but it might be too slow to form the larger vessels from one piece of clay in one go. The sometimes very deep throwing ridges on the inside of jar bases from Sabi Abyad may be an indication that the wheel slowed down a lot while opening the large ball of clay on the wheel. Shaping in stages, in which parts of the vessel dry a little before they are finished on the wheel a second time, may be a solution to the problem. Scraping and turning, the forming of bases, the shaping of rims, decoration, etcetera may all have been done at a lower speed, with the wheel being turned by hand. The stick wheel is also suitable for use as a slow wheel when forming large hand-built shapes (large storage jars, for example). In that case the stability of the wheel would have been important. The presence of a wheel assistant next to the potter is very likely, but not imperative.

Room 2

Room 2 in squares N11, O11, O12 and N12 was located to the west of rooms 1 and 3 (fig. V.2). It was accessible from room 1 and from the open area to the west through doors. Towards the southeast, near oven M, it seems to have had a wider open passage towards the small courtyard south of room 1. Room 3 had no direct access to room 2, unless a door to the north is hidden in the N11-O11 section baulk. Room 2 measured 10.2 x 3.25 m (33.15 m^2). In the north of the room the floor was reached at an elevation of 324.09-15 (in N11 and O11). In the south the floor was apparently found at an elevation of 324.30-45. Either the floor of room

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been used as a wheel head on a simple wheel just like the Cretan examples. The wheel head from Old Babylonian Uruk is 90 cm in diameter and 8 cm thick, and was found in a double grave. It has a flat side with incised concentric circles and a patch of bitumen in the middle, and the other side has a circular pivot hole. The wheel from Abu Salabikh is 70 cm in diameter and 4.2 cm thick. The base side shows impressions at regular distances but in an irregular pattern.

[82] A question that deserves further research deals with the body positions in which people worked and lived. I think it is most likely that most people in the Late Bronze Age were used to sitting on carpets, cushions and mats and working in sitting or squatting positions on the floor, rather than working while sitting on chairs. In Middle Assyrian iconography, sitting on chairs seems to be a priority of high-ranked officials and royalty. Cf. also the comments of Roux (1990: 24) on the squatting working position practised since childhood by people in Northern India. A kick wheel with a sitting bench would then be alien to the normal working position.

2 sloped down strongly, or a dividing wall is hidden in the section baulk, creating two separate rooms. For this reason the room halves will be discussed separately, as room 2a (south) and 2b (north). The two rooms 2a and 2b could either be connected by an internal doorway and both belong to the building of which also room 1 is a part, or they could be separate rooms, one oriented towards room 3 and the other serving room 1. In the latter case, a doorway has to be postulated in the northern wall AH under the section baulk. The fill of the northern half of the room (2b) consisted mainly of mud-brick debris and ashy deposits probably connected to oven X.[83] In N11 the notes mentioned that the western wall J carried traces of burning, as if something had been burning against it. In the south (room 2a) the roomfill around oven M was soft and ashy. In the rest of the room the fill consisted mainly of light brown mud-brick debris and some pieces of baked mud-brick, similar to the northern part.[84] Carbonized reeds were found near floorlevel (parts of the roof or fuel for a kiln?).

In the northern part (2b) the large oven X was placed in the corner of the room. The floor of X was reached at 324.09. It was built of mud bricks and had a thick layer of burnt plaster at the inside. The field notes of square N11 mention the presence of a door angle-stone near the western wall. In the south in room 2a a large circular *tannur* (M) with a mud-brick supporting wall was built near the opening towards the courtyard south of room 1. Next to it an oval clay bin (L) was built on the floor. The 4 cm thick walls of the bin were plastered with white lime plaster on the inside. Against the southern wall of room 2a a huge mortar was placed. Next to it was a door angle-stone, but again there was apparently no door in this location. A small square mud-brick construction was standing in the southern half of the room, perhaps as a support for a workbench or roof? At a later stage of use in the room, a one-mud-brick-wide wall or construction (W) was built, preserved up to 7 courses; perhaps a support similar to the support in the western part of the room.

Against the northern section of square O12 feature AC was found: perhaps a pit or, more likely, a piece of a large unfired vessel left on the floor.[85] Next to the western wall of the room, a huge storage pot was still standing in its original location (fig. V.5, to the left side). In room 2a, 9 more or less complete pottery bowls were found in the fill and on the floor. In room 2b, 9 more or less fragmented bowls and a small jar were found.

Apart from the possibly unfired pot of feature AC, many unfired pottery fragments and waste from pottery production were found only in room 2b.[86] Most fragments were found on the floor in the south-eastern corner and in the fill of oven X. Other fragments were found in the room fill. They included a goblet rim (type 421), a ring base fragment, many body sherds from bowls, goblets and a strainer (type 511), and many fragments left over from the production of bowls and goblets. Wasters, overfired ceramics or slag fragments were not reported from room 2a, nor were they from room 2b.

In room 2a four grinding tools were found (grinding slabs and grinders). Other stone objects include a stone disc, a fractured stone palette, a longitudinal stone object and two stone objects with unclear function. These objects could have been used as tools. Two rounded, abraded pottery sherds were most probably used by the potter as a scraper (fig. V.10, O03-120). Other finds in room 2a, probably unrelated to pottery production, were a clay cylinder seal depicting a hunter and prey, a fragment of a cuneiform tablet (both found in the room fill), a spherical clay token, and a fragment of a ceramic plaque depicting a reclining

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[83] Square N11 locus 29, lot 81 and up; square O11 loci 30, 52 and 55; between elevations 324.91 and 324.10.

[84] Square N12 loci 27 and 28, lot 60 and up; square O12 loci 37, 48, 49, lot 113 and up; between elevations 324.81 and 324.35.

[85] Again the field notes and stratigraphy information are unspecific. AC (locus 56) was described as a pit with a very hard reddish-brown plaster layer at the side. In the first field drawing it has an oval squarish shape. The fill was hard and clayey with a lot of clay pieces, lime spots, and it was covered by some large sherds. In the northern section it was visible as well, curving downwards against wall K and widening gradually.

[86] The only unbaked clay fragment found in room 2a was found at an elevation below the floor and possibly belongs to Neolithic contexts.

feline's paws. In room 2b, apart from the large amount of unfired vessel fragments, a grinder, a hammer stone and a stone palette were found. A semispherical clay token, three bone game pieces and a bronze folded pin were found as well.

Room 3

The find of unfired vessel fragments in room 3 and other spaces in squares O11 and O10 suggests that the activities of the potters were not confined to room 1 and 2 and the surrounding courtyards.

Room 3 was located in square O11 directly along the moat, like room 1 (fig. V.2). Here, as in room 1, the original east wall (CG-CI) was located right next to the moat. In a later phase of the use of room 3 wall BE-AK-AQ was built, making room 3 smaller. A door in the west wall led to the open area where kiln Q was built. Room 3 measured 5.7 x 3.2 m (18.24 m^2). The fill of room 3 in level 6 may be divided into different phases. Important to us here is the lower roomfill, consisting of mud-brick debris on the floor.[87] Below the mud-brick debris, fragments of carbonized reeds and roof material were found. The mud-brick debris was higher along the walls than in the middle of the room, and was covered by ashy layers of a period when room 3 was no longer in use.[88]

Against the south wall a half mud-brick wide dividing wall was built (AS). Bin AR, built of loam and mud-brick, was situated to the north of it. CM was a low mud-brick block built against the western wall, maybe a workbench or a support for shelves. On top of CM a baked brick was found with an unbaked clay disc on it. CM also seems to divide room 3 into two halves. In the northwestern corner of the room feature BI was dug into the floor. It is a cylindrical hole in the ground. The walls were lined with sherds, and a large basalt grinder formed the floor. These features are found more often at Sabi Abyad in various areas, and their function is still not completely clear. They might be mortars, or a kind of post-holes.[89]

As to complete pottery shapes, two bowls were registered from this room. In the fill, large fragments of big jars were noted, but not collected as objects. Unfired vessel fragments (including a rim fragment) and a lump of unfired clay were found near the door in the northern part of the room and south of CM in the southern part of the room. Also in the south of the room, among the unfired fragments, was a large flat piece of bitumen. Bitumen was often used in pottery production at Sabi Abyad, mainly for repairing cracks or for keeping vessels watertight. No wasters or slag fragments were reported from room 3. Other finds in room 3 were three fragments of basalt grinding tools, a complete stone polisher and a complete hammer stone. Furthermore, a river shell, some pieces of eggshell and a pierced disc made from an old sherd (possibly prehistoric) were found.

Room 5

The area west of rooms 3 and 4 in O11 was most likely oriented towards the open area in square N11 around kiln Q. At an elevation of approximately 324.30, floors BV and BW were found. Floor BV is reported to have had a layer of white plaster on top, which is not common for an outer area surface. Perhaps it was a roofed room space.[90] The deposition in this area[91]

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[87] Loci 26, 27, 50, 57, 79, 83, between lots 116 and 201 and lot 209, between elevations 324.50 and 324.27.

[88] Loci 26, 27 between lots 108 and 63. This is mixed material consisting of both the mud-brick debris of the first phase and the ashy layers of the second phase, between elevations 324.90 and 324.50. Above 324.90, locus 21 consists only of the ashy layers. The ashy layers probably belong to the phase when kiln Q was no longer used.

[89] These plastered pits never show traces of rotation on the base stone, so they cannot have been a base for the pivot of a kick wheel. They are too narrow to form the emplacement pit of a single wheel.

[90] Perhaps a north-west running wall closing the space to the west is still hidden in the section baulk or under the depositions covering kiln Q? The corresponding area in N11 was never dug to this level, since excavation was stopped there at the level of the bins and ovens of the second use phase (K, L, M) and the upper elevation of kiln Q at 324.74. However, in the field notes a brown band (mud brick?) was recognized running north-south, east of Q.

consisted mainly of mud-brick debris, with some ashy deposits and carbonized reeds (roof material or kiln fuel for kiln Q?) included.

A circular *tannur* oven AZ was built in the northern part of the room. Apart from pottery sherds, only one complete bowl was found. Several fragments of unfired vessels were found on the floor and in the room fill. They include a rim fragment of a type 322 jar and many body fragments of jars (including fragments with incisions on the shoulder). In the room fill and on the floor in the north of the room fragments of pottery slag were reported. Two grinding slabs and two hammer stones were found. Other stone tools included one palette and two polishing stones (one with traces of ochre), and two tools with unclear function. A corroded piece of bronze was found, but its function is unclear.

Room 6

Room 6 in square O10 is included in the discussion here because fragments of unfired vessels have been found there (but see below). The room was located to the north of room 5. Since the floor level in room 6 (W) was reached at an elevation of 324.57, some 25 cms higher than the floor in room 5, there might be a wall dividing room 6 from room 5 hidden in the section baulk, and/or the floor and fill in room 6 might represent a phase later than the floor in room 5. The Neolithic tell surface was not reached in this room. Room 6 now measured 4.5 x 3 m but was probably longer. The deposition consisted of brown fill including a lot of mud-brick debris and lime spots.[92]

A rectangular bin X was built of half mud-bricks in the north of the room. Next to it against wall Q a pot was set between two bricks (AN). In front of the pot there was a pit lined with sherds (Y), about 20 cms deep. The function of this kind of pit or post-hole is not yet clear. Against the western wall a bin (AD) was placed, next to a small closed oven (AB). A drainage system was constructed in the western wall, with the water running through a partly covered gutter towards the moat in the east, thereby cutting the eastern wall of the room.

Apart from sherds, one complete bowl was found. A large cracked pot (P04-91) was standing in feature AN. Several fragments of unfired vessels (including carinated bowls type 111, body sherds of bowls, a ring base, thicker body sherds) and unbaked clay were found, among a group of around 35 cuneiform-tablet and envelope fragments. Since these tablets were not found directly on the floor, they are thought to have fallen from elsewhere, and not to belong to the original floor context of room 6. That would mean that the unfired vessel fragments, as indications for pottery production, originally did not belong to the room either. Other finds in the room were some grinding-stone fragments, a stone polisher and a flat limestone platform, a stone axe (possibly a reused prehistoric axe), some small fragments of bronze and a faience bead.

Definite conclusions about the context of the unfired vessel fragments and tablets, as well as about the function of room 6 and its relation to the pottery workshops to the south, can only be established after the final reports on the excavation have become available.[93]

The open spaces, small courtyards and rooms south of the workshops in squares N13 and O13 may have been used by the potters as well, but no evidence pointing in that direction was found.

Perhaps these are the upper traces of a wall closing room 5 to the west. There generally seems to be quite some difference in elevation between floors in different rooms, with those in the west being higher than those in the east.

[91] Loci 32, 33, 41, 42, 56, between lots 67 and 173, between elevations 324.78 and 324.27.

[92] Loci 20, 21, 41, 34, between elevations 324.78 and 324.57.

[93] The area west and north of room 6 was excavated in 2005, but the results could not be included in this study anymore. However, they did not yield any indications for the use of room 6 by a potter.

Conclusion: the level 6 workshops
In conclusion, the total area apparently in use by the potters in level 6, according to the finds of unfired vessel fragments, kilns and other production related objects, was approximately 17 x 19 m (323 m^2) large, comprising the whole eastern area between the moat and the fortress and including open areas. In anticipation of the final stratigraphy and architecture reports we may suggest that the level 6 workshops show at least two main phases of use. In general, however, the use of space seems to be continuous with minor alterations and additions of features happening throughout the life of the buildings. From the beginning of level 6 the potters seem to have used rooms 1, 2a, 2b, 3 and 5. Kiln Q and perhaps also kiln L were built and used. In a later phase of level 6, it might be suggested that rooms 3 and 5 were no longer used by the potters. Perhaps this is related to the abandonment of kiln Q. Activities seem to continue uninterruptedly in rooms 1 and 2a (and 2b?) and in the courtyard where kiln L is located. Perhaps the smaller kiln L was built in this time, possibly indicating a reduction in production levels related to the reduction in workshop surface. However, until the final stratigraphy reports are published no conclusions can be drawn with certainty.

Room 1 seems to be the core of the workshop, at least in the later phase. Unfired vessels and waste from shaping vessels were found here, as well as the two wheel bearings. Perhaps the shaping of vessels took place in room 1 (cf. fig. V.3). The room may also have been used as a drying space for semi-finished and finished vessels, a room to stock fired vessels that had not yet been distributed, and as a general storage. In addition drying of vessels may further have taken place in the workshop area as a whole, including floors and shelves in the other rooms, the open area in front of the workshops, the area around kiln Q and the small courtyard where kiln L is located.[94] In summer drying is preferably done in a shaded area or indoors. If unfired clay vessel fragments can be used as an indication of drying locations, room 2b in particular may have been used for drying. The unfired fragments here indicate that especially unfired bowls and goblets were dried or stored in room 2b, while the fragments in room 5 are all from larger jars. Whether this might be connected to a differential use of kiln L and Q respectively (or a specialization of two neighbouring workshops), or whether these finds are related to different production events, must remain unclear. A piece of bitumen, often used to repair slightly damaged vessels after firing, was found in room 3. The large mortar in room 2a might have been used to crush dried clay or other additions to the paste (salt?, chaff, etc.). No basins or pits for levigation or areas for mixing or storing wet clay have been found in the immediate surroundings of the workshops. Perhaps clay was prepared elsewhere and brought in only in the needed quantities (the amount necessary for a day's work for example; cf. Ionas 2000: 154). Clay could have been mixed with temper materials and kneaded outside or inside one of the rooms, but no traces were found. No particular space could be identified for the storage and processing of temper materials (dung, straw) and fuel either. Perhaps fuel was simply piled up in the kiln area at the time of firing.

Firing took place in one or both of the two kilns in front of the workshops. Kiln Q was the largest, and located in an open area. Kiln L was smaller but still quite large, and located in a more confined courtyard area of the workshops.

Pottery production in level 6 is located in a specific, functional area of the site. Space was most probably used in a flexible and organic way, without strict functional divisions between rooms. Although other (domestic) activities seem to have been carried out in these rooms and spaces,[95] as is indicated by the finds of bread ovens, grinding tools, etc., the rooms and courtyards seem to have been mainly used for pottery production. It is likely that the potters and their family were also living in these same spaces,[96] although it may also be suggested that they were living inside the main fortress located a bit further to the west. In

[94] The fragments of unfired ceramics may be the only remains left of the drying process.

[95] Activities carried out simultaneously with the pottery production, but possibly also activities (including other types of craft production?) carried out in the low season for pottery production (winter; cf. Simpson 1991: 126).

[96] Perhaps the presence of bread ovens (*tannurs*) may point in this direction?

that case the pottery workshops were located in their backyards. The find of a clay cylinder seal and a cuneiform tablet fragment, as well as the find of unfired vessel fragments among cuneiform tablet fragments in room 6 in square O10, suggests that the potters were in some way closely connected to the *dunnu* administration (although the tablets did not deal with their craft).[97]

The level 5 pottery workshop and other production locations

Pottery continued to be produced locally at Sabi Abyad in level 5, as is shown by the many finds related to pottery production coming from this level. As was shown in chapter III (and fig. III.4), the start of the level 5 settlement is characterized by major renovations and changes in the existing architecture, the building of new structures and the reuse of old structures, often with a changed function. The moat that had been dug at the start of the level 6 occupation had gradually filled up with garbage and debris. If its location was still visible, it was at least not functioning as a moat anymore. The area between the former moat and the main fortress seems to be deserted in level 5. Now the area was only occasionally used to dig a pit or build a small bread oven. The main activities of the settlement had all retreated within the main fortress walls.

The location of pottery production at the site in level 5

During the occupation of Sabi Abyad in level 5 times pottery production locations can be identified in several different areas of the site (fig. III.4). As far as the current state of the stratigraphy and architecture reports allow at the moment of writing, we can establish that the kilns and the other finds associated with pottery production were built or deposited at at least two, possibly at least three, different moments within the level 5 period.

At the beginning of the level 5 occupation the production of pottery was located in a building in the south-east of the main fortress, covering squares M11, L12, M12 and part of M13. The open area in square M10 and the open area outside the main fortress may have been used for pottery production, too, as some small finds indicate (unfired vessel fragments and unfired pottery production waste), and a larger kiln was probably built in square N13 at this time. This workshop was located due west of the level 6 workshops discussed above and may represent a continuation of the activities of the level 6 workshop, but now relocated inside the main fortress. The level 6 building in squares M11-M12-L12 was renovated at the end of level 6, but retained its general plan. If the level 6 potters were not already living in the house located in squares M11-M12, the move of the workshop into this building in level 5 also indicates a major change in the use of this building. Stratigraphical evidence suggests that the potters were carrying out their activities in an area where considerable debris had been deposited already, suggesting that the space was not in use at the time the potter moved in (see below). In the following discussion, we shall call this workshop "level 5 East" (figs. V.13, 14).

Another production location can be identified at the western side of the main fortress, in square H8 (cf. fig. III.4). Here the potters also seem to have made rather opportunistic use of the available space to build two smaller updraft kilns. The kilns built in H8 seem to date from a later phase in the level 5 occupation, when the architecture in this area was no longer used for its original functions. Many fragments of unfired vessels were found in the same area, but should most probably be dated earlier than the kilns. In square H9 several indications for firing activities were found, but at the moment these are difficult to interpret. In the following discussion we shall call this production location "level 5 West" (fig. V.20).

[97] The use of cuneiform signs and seal rollings on pottery vessels (see below) might also point to literacy among potters. However, we know little about the literacy of craftsmen in this period (F.A.M. Wiggermann, personal communication 9-10-2005).

In squares K8 and L8, finally, two updraft kilns (figs. C.21-25) were built within the existing walls of level 5 buildings, each dated to a different moment in level 5, and again completely changing the function of the former rooms these walls enclose. Hardly any other finds indicate that pottery was actually produced in these areas (apart from the firing stage), and it is as yet difficult to connect these kilns to a workshop location. In the following discussion we shall call this location “level 5 North”.

The level 5 East workshop

During the excavations the finds in squares M11 and M12 were first recognized as belonging to a pottery production location because of the unusually large amounts of damaged and repaired vessels, most of them of similar shapes and sizes, and amounts of unfired vessel fragments and production waste (see below, paragraph V.6). Only later, when other better preserved updraft kilns were excavated elsewhere at the site, were the badly preserved remains of kiln T/U and kiln AC/AI recognized as small updraft pottery kilns.

The level 5 East workshop was located in the area between the tower and the eastern fortress wall (fig. V.13). In the second phase of level 6 this building was levelled and rebuilt in more or less the same location. Then it does not seem to have been a workshop but rather a house, and part of the building was still used as a house at the time of the level 5 workshop (and identified through texts as the house of scribe Belu-erish). Access to the building was provided through the small courtyard or patio in the middle of the area. There was also an exit towards the open area in the east, leading out of the fortress. In the north of the building a corridor led to a staircase leading to the roof or second floor. As in level 6, the level 5 East workshop was part of a larger chain of workshops and utilitarian buildings now located in the south and east of the fortress.

Kilns

It is likely that kiln H in square N13 was built in level 5. Kiln H was located outside the fortress walls, and was built in an open area south-east of the fortress and west of the former moat (fig. V.14). Possibly the ruins of the level 6 buildings were partly still visible. Kiln H was built in general alignment with the level 6 architecture, but the kiln does not make use of a corner between walls, as is often done elsewhere at the site. If kiln H was indeed built in level 5, its location near the former level 6 pottery workshops suggests that there existed some continuity in the use of space here. If kiln H belonged to the level 5 East workshop, it could be reached through the door in room 4. Kiln H was a large kiln, comparable in size and construction to kiln L in level 6. The outer structure of the kiln measures 2.54 m by more than 2.65 m, while the fire chamber measures 1.10 m by more than 1.85 m. The fire chamber is not preserved to its complete height, and possibly slightly more than half is preserved (see fig. C.11 and Appendix C for a detailed description). The deposits around kiln H in square N13 were light-brown soils containing mud-brick debris, but these most probably belonged to layers into which H was dug. The level from which H was dug is no longer preserved in square N13. No unfired ceramics or wasters were found in square N13. In the kiln fill four bowls, a goblet and a spindle whorl were found.

In the squares N11, O11, N12 and O12 east of the main fortress wall, where the pottery workshops were located before in level 6, several fragments of ceramic slag and pieces of overfired pottery have been found in level 5 deposits. This area seems to have been used just for the construction of bread ovens and for digging pits. At least two large, more or less rectangular pits with a clay lining have been found in this area (in N12 and O12-O11, see fig. V.14). Perhaps these pits were used for the storage or preparation of the potters’ clay. In O12 some fragments of unfired vessels were found in a pit fill, but they were probably dug up from the level 6 context when pit R was dug. Several fragments of unfired clay vessels and pottery production waste were found in square M10, in the open area north of the workshop.

Two smaller updraft kilns were built inside the workshop building, in an area that was most probably an unroofed interior courtyard or patio (courtyard 2, fig. V.13). Both kiln T/U and kiln AC/AI were most probably dug from floor AN at an elevation of 326.15 to 326.04, a rather uneven surface in this courtyard on which the remains of pottery making were found. It is not clear whether the two kilns were built or used simultaneously or not. Floor AN does not seem to be the original floor of the courtyard but rather the top surface of a layer of debris in this area, perhaps after the original courtyard had gone out of use.

Kiln T/U was a small kiln built in the northeastern corner of the yard after a doorway had been closed during the renovations of the building at the end of level 6. Only the fire chamber is partly preserved. A mud-brick wall made of half bricks surrounded the top part of the fire chamber and measured 1.53 x 0.89 m. The plaster that was on the inside of one of the arches supporting the pottery floor is still preserved as well(fig. C.12). This kiln was substantially smaller than the large kilns that had been used until now. The fire chamber of T/U was only dug into the floor about 35 cm, while its total height under the preserved arch was around 60 cm.[98] The resulting volume of the fire chamber was therefore about 7 times smaller than that of the largest kiln Q (level 6), while the surface of the pottery chamber was perhaps approximately four to five times smaller than kiln Q (see Appendix C). The fill in the kiln consisted of brown and black ashy soil, with some big stones, large sherds, burnt sherds and a burnt bowl.

Kiln AC/AI was built in the middle of the courtyard and was a middle-sized kiln (cf. fig. V.13). Since initially only the northernmost and southernmost sections were found sticking out of the section baulk, heavily disturbed by later pits, there were many unclarities and difficulties during the fieldwork. Kiln AC/AI was most probably also dug from floor AN, from an elevation of approximately 326.12 to 326.05. Like kiln T/U, it was originally surrounded by a mud-brick structure. In the north this structure was no longer preserved because the kiln was damaged by a later burial pit. In the south bin W possibly belonged to the kiln and formed part of the pottery floor and upper structure, but it was not recognized as such.[99] The floor of the fire chamber was reached at an elevation of 325.07 m. In the middle of the kiln one of the mud-brick arches supporting the pottery floor was still preserved. The fire chamber was approximately 1.28 m deep, while it measured 1.50 x 0.90 m. The estimated volume of the fire chamber is therefore almost 1.8 times smaller than kiln Q. Depositions inside kiln AC/AI consisted of soft brown/grey soil with ash pockets and a lot of unfired vessel fragments. Three goblets and a clay sealing with a seal impression were also found, as well as some sherds and a fragment of bone. The presence of unfired vessel fragments in the kiln fill (see below) suggests that the fire chamber of kiln AC/AI was no longer used but had started to fill up with garbage when pottery making was still going on in the area. Perhaps we can take this as an indication that kiln T/U was used later or longer than kiln AC/AI.

Workshop architecture and associated finds

The level 5 East workshop (fig. V.13) consisted of a central courtyard or patio (courtyard 2) located along the main fortress eastern wall. To the north a rectangular room (1) was situated, accessible only from the small courtyard (3) to the west. From here a door led to a narrow corridor-like space or staircase. To the south a smaller room (4) gave access to the open area to the east. To the west a door led into a square building consisting of a main room or courtyard, several smaller rooms and a corridor with a drainage leading to a cesspit. The cuneiform texts found on the floor of this room identify the house as the place where scribe Belu-Erish lived or worked.[100] Stratigraphical evidence seems to suggest that the use of room

[98] In the field documentation of 1996 it is noted that the kiln was not completely excavated down to floorlevel.

[99] In the field documentation bin W is described as follows: "Bin W has baked bricks in the fill. Against the eastern side there are several ash layers. The fill of W is soft brown soil, dark grey-brown ashy material with charcoal, and patches of burnt loam. Perhaps it was used as an oven".

[100] Personal communication by F.A.M. Wiggermann, 9-10-2005.

1 and courtyard 2 as a pottery workshop dates from a later moment than the original level 5 floors of these areas. The surface of the whole complex measured 21 x 14 m (294 m^2), about the same size as the level 6 workshops. But if the open area east of the workshop is included, the potters would have been using an area of about 580 m^2. The finds related to pottery production came mainly from courtyard 2 and room 1.

<u>Courtyard 2</u>
This area measured about 11.4 x 4 m, or about 46 m^2 and was accessible from the central courtyard (3) and from the house. Floor AN was an unplastered, slightly irregular outdoor surface sloping towards the south between elevations 326.10 and 325.95. The presence of the updraft kilns in courtyard 2 suggests that this area was not, or only partly, roofed. A small *tannur* AN was built next to kiln AC/AI, perhaps shielded by low mud-brick walls (feature X). A pit (AF) was situated in the centre of the southern half of the yard. Its edge was lined with big sherds and pieces of grinding slabs. The diameter of the pit was approximately 0.35 m and it was about 25 cm deep. A little more to the south, pit V (0.37 x 0.42 m, about 15 cm deep) was dug into the floor as well. V was a pit lined with stones and plastered with an 8 cm thick mud plaster. On the bottom of the pit was a grinding slab. The function of these pits is as yet unclear, but similar lined pits have been found elsewhere at the site as well. Perhaps they were post-holes used to support a light roof over this part of the yard, or perhaps they were mortars of some sort. In the north of the yard, near kiln T, the base of a large jar was set in the floor. Some sherds from the wall of the jar were spread around its edge in a circle measuring approximately 60 cm in diameter (fig. V.17). Next to this jar base, a shallow pit AE approximately 50 cm in diameter was dug into the floor. Possibly this pit was used as an emplacement for a potters wheel (cf. possible wheel emplacements in level 6, above, and the wheel emplacements at Sarepta described in Anderson 1987). The depositions[101] in courtyard 2 consisted of soft grey-brown soil with some ashy layers and charcoal fragments in the southern half. In the northern half the soil was brown and grey with lots of sherds and some bones. Especially in the middle of the room but also in the north and west amongst the many pottery objects found here, the soil was brown with lime spots and often very dense, clayish in texture. In the middle a larger spot of very dense clayish material was found, which contained hardly any sherds. Most probably this indicates that amounts of prepared clay were processed or discarded here. Possibly the preparation of the clay body and/or the shaping of the vessels was carried out in this part of the courtyard.

The southern half of the courtyard was relatively empty of finds.[102] Two bowls, a small jar and a goblet were found in the corner next to the door into room 5, at the same spot where also a large amount of unfired vessel fragments were found. Two jar stoppers were found in the area enclosed by feature X. The northern part of the courtyard, however, was full of finds (figs. V.16 and V.18). In this area one cylindrical pot, 85 small and middle-sized bowls and 33 goblets have been found, lying in concentrations on the floor and in the fill in the northern and western part (see fig. IV.36 - 40, 42, 43, 90, 91, vessels from the lots mentioned in footnote 101). In the middle of the room a passage to and from the doorway to courtyard 3 and around kiln AC/AI was kept more or less clear of objects, indicating that the doorway and surface were still in use when these objects were discarded here and that we are not just dealing with a garbage heap. A very large number of these bowls and goblets were misshapen, deformed, cracked, repaired or filled with gypsum, suggesting they are the refuse of a pottery workshop (figs. V.16, 18, 55). This deposit included kiln wasters, of which some

[101] In square M12, locus 4 lots 4, 12, 26, locus 7 lot 7, locus 10 lot 17, locus 13 lot 27, locus 16 lot 29, locus 33 lots 50, 55, 67, between elevations 326.68 and 325.70 (surface in the south). In square M11, locus 7 lots 69, 88, 90, locus 9 lot 126, locus 33 lots 96 until 173, locus 38 lots 13, 138, 157, locus 45 lot 172, between elevations 326.60 and 326.05 (surface in the north).

[102] Possibly the level 5 deposits including contexts belonging to the potter's activities in the northern half of the courtyard have eroded away in this area. Cf. Room 4.

were repaired after firing. The repairs were mostly unsuccessful (fig. V.56). Most probably the vessels deposited here were fired in kiln T/U or in kiln AC/AI.

In the southern half of the courtyard unfired vessel fragments and waste from the shaping process were found in the corner next to the door into room 5 and just north of the lined pit AF. These were mainly goblet and bowl fragments and waste from pottery shaping (figs. V.43, 44, 46). In the northern half of the room large concentrations of unfired vessel fragments were found just north of kiln AC/AI, between kiln AC/AI and the western wall of the room among the bowls and goblets on the floor, and in the fill of the kiln itself (fig. V.16). A few fragments were found south of kiln T/U. The fragments at this side of the room were mainly from goblets, type 131 bowls and larger shapes (figs. V.43, 44, 47). The find of unfired fragments indicates that the drying or shaping of pottery may have taken place in this area, or that unfired broken vessels and waste of the shaping process were discarded together with the kiln wasters here. Just north of kiln AC/AI and in bin X there were some small fragments of completely overfired pottery.

Some of the other finds in the northern half of the courtyard may have been tools used in pottery production. A rounded Halaf sherd with abraded edges was found amongst the bowls and goblets near kiln T/U. It was perhaps used for scraping/turning the vessel wall during the shaping process. Two stone objects were identified as possible polishing or rubbing stones. Next to wall R was an irregular boulder with a pierced hole, of a type of which many more examples were found in room 1 (see below). A piece of animal horn found along wall H was perhaps used as a tool as well. Amongst the bowls and goblets along the northern wall H, a terracotta miniature wheel was found. Perhaps the potter occasionally made these kinds of special shapes as well. Furthermore, four basalt grinding tools of different shapes were found, as well as a fragment of a thick, baked clay tray or platter with large, sharp stone inclusions in the top surface.[103]

<u>*Room 1*</u>

Room 1 measured about 7.7 x 3.1 m (approximately 24 m^2) and was accessible from the central courtyard (3) (fig. V.15). This room could be closed with a door, as indicated by a door angle-stone located on the inside of the western door-jamb. In the northeastern corner of the room a door led into a narrow corridor to the east, perhaps a staircase. Originally a door in the southern wall connected this room directly with the courtyard to the south (2) as well, but the door was later blocked in the renovations of the building and the building of kiln T/U. Floor AM, a simple earthen floor, was found at elevation 326.27-16. Just east of the door, a shallow pit was dug (AR, about 15 cm deep and 65 cm in diameter). Large sherds were used to line the southern edge of the pit, while the inside was lined with soft limestone cobbles and was plastered. Its position next to the door and its width make it unlikely that this pit served as a post-hole. Similar pits have been found in the Late Bronze Age potters' workshops at Sarepta, and are there interpreted as wheel pits for the construction of a potters' wheel (Anderson 1987: 48). Perhaps a similar interpretation could be valid at Sabi Abyad.[104] In the eastern part of the room another shallow pit was dug (BJ), around 0.70 m in diameter and some 15 cm deep. To the east of pit AR a small oven or kiln was built (X/Y/Z/BI). This structure was unfortunately heavily disturbed by a later burial pit, so it is unclear whether this very fragmentarily preserved oven is a very small example of an updraft structure or not. It may also be comparable to single-chamber oven X in square O11 in level 6 (see fig. V.2). In the west a rectangular mud-brick wall surrounded the oven, but the whole eastern part was cut away by the later burial. The inside was rounded and made of red burnt brick and plaster. The mud-brick wall was only flimsily preserved, while the burnt curved inside wall of the oven went down some 20 cm more. In the west two large stones seem to partly cover the oven. The

[103] So-called polishing stones, grinding tools, an animal horn and a terracotta wheel were also found in room 1 of the level 6 pottery workshop.

[104] Cf. the plastered pits Y, Z, AA and AB in the level 6 workshop, fig. V.2.

oven seems to have been rebuilt several times, as indicated by the remnants of two other oven walls in the same spot. On both sides of the oven a thick layer of burnt soil and carbonized material was visible. Oven X/Y/Z/BI is too fragmentarily preserved and too badly understood to interpret it as a pottery kiln at this moment. Along the southern wall of the room some baked bricks were lying on the floor, next to pit AR and behind the oven, forming a kind of platform or working surface. A niche was set into the centre of the western wall of room 1. The blocked door in the south wall served as a niche as well. Next to the niche in the western wall a large base of a jar was set into the floor.

The fill[105] in room 1 consisted of dark-brown mud-brick debris and grey or black ashy soil, perhaps related to the use of oven X/Y/Z/BI. The field documentation mentioned that the soil was often very dense and clayey, and contained baked clay fragments and pieces of gypsum, next to large amounts of sherds. In several spots in the room along the western, northern and eastern wall large concentrations of big sherds, stones and grinding tools were found. The soil under the stones was noted to be very clayey as well, and contained pieces of baked clay and gypsum. The relatively clayey character of the fill might indicate that clay was prepared, stored or used in this room.

Among the many sherds found in the fill and on the floor of room 1 there were eight more or less complete vessels. Against wall J near the niche a base of a jar was set into the floor. The jar had been broken before, but the fractured edge was carefully smoothed so that the jar could be used as a pot (fig. IV.96.a). The jar base was painted, which is rare at Sabi Abyad. Two pot stands and five bowls make out the rest of the pottery objects. Two of the bowls were perhaps used as an oil lamp.

In contrast to the clayey nature of the room fill, there were almost no finds of unfired vessels in this room. One fragment was collected just south of oven X/Y/Z/BI. Two fragments of overfired and molten pottery were collected. Baked and burnt clay pieces were found in the concentrations of sherds and stones along the eastern wall. Against wall J burnt clay and burnt bricks were found.

Other tools and objects in room 1 included a wide range of ground-stone tools and fragments of ground-stone tools, like hammers (n= 6), grinders (n=8), grinding slabs (n=2), a mortar and a pestle, two “whetstones” and a “polisher”, and an axe or hammer. Another pierced cobble, with a perforation smoothed by use, was found. A similar object was found in courtyard 2, and five more stones with various piercings were found higher up in the later fill of room 1 and three in the corridor to the east. The function of these pierced cobbles is as yet unclear. A stone pendant and two clay jar stoppers were found, as well as a scraping tool made of a reworked ring base of a sand-tempered bowl (fig. V.19). Metal finds included a bronze nail fragment and a fragment of an iron knife or blade. The ring base and the metal finds could have been used in the shaping process, for example to turn or trim clay from the wall of the vessel (see below). Finds from a bit higher up in the fill of the room,[106] perhaps dating to a later phase of level 5, also included (apart from more pottery and groundstone tools) a tool made of a curved goat horn, a bronze pin and a stone cylinder seal, as well as a goblet with a cylinder-seal impression.

<u>*Room 4*</u>

Room 4 measured 3.2 x 5 m (16 m^2) and was accessible from courtyard 2. A door also led to the east, providing access from here to the open area in the east and a way to reach kiln H. The opening from courtyard 2 could be closed with a door as is indicated by a door angle-stone on the inside of the door-jamb. The fill and the floor preserved in room 4 most probably belong to level 6, and therefore cannot be used as indication for the use of this room in level 5. Level 5 is not preserved in this part of the building, but it may be suggested that the general layout of the room was similar to level 6, as is the case in the rest of the building.

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[105] M11 Locus 13 lots 137 until 171, locus 513 lot 511, between elevations 326.37 and 326.16.

[106] M11 Locus 13 lots 113 until 127.

Courtyard 3
Courtyard 3 was the open space west of the building and it gave access to the different spaces of the complex. A level 5 floor level was not found in this area. Possibly pits V and W were dug in the yard in level 5, or in a slightly later level 5 phase. Both pits were about 1 m in diameter and between 20 and 35 cm deep. One was filled with greyish ashy soil and lots of bones, the other contained dark-brown soil with lots of sherds. From courtyard 3 a narrow street ran to the north and to the west around the building towards the other workshops of level 5. The deposits in the courtyard[107] consisted of greyish and brown soil with lots of sherds, bones, flint fragments and pieces of gypsum plaster. Next to the northern wall was a concentration of large cobbles amongst very dense compact and clayey soil. Next to the door into room 1 a small wedge-shaped piece of unbaked clay was found (O96-209). Other than a pottery bowl and a goblet, no objects were found in the courtyard.

The house
The main house attached to the workshop area could be entered via two doors, one coming from courtyard 3 and one coming from the internal courtyard 2 (fig. V.13). Both doors had mud-bricks on the threshold, but no door angle-stones. Room 5[108] seems to be a small vestibule before entering the actual house. In room 5 a shallow depression (P) filled with sherds was set in the corner of the walls, protected by a low and narrow mud-brick wall. Perhaps there used to be a large ceramic (water) vessel here. Bin M, built against the eastern wall of room 5, was a partly collapsed structure perhaps used for storage. Five pottery bowls and a hammer stone were found in the vestibule. From room 5 the main room or internal courtyard of the house (6) could be reached. The opening to room 6 could be closed with a door, as indicated by the door angle-stone found on the inside of the door-jamb. In the northwestern corner of room 6 a plastered pit (AH) with a grinding slab at the bottom was built. As with the other plastered pits found at the site, its function is not completely clear but it may have been a post-hole or a mortar. Around AH a lot of burnt seeds were found. In the middle of the room a shallow pit (O) was found, containing pebbles and sherds. The deposits in room or courtyard 6[109] consisted of mud-brick debris, lots of sherds and grinding-stone fragments. On the solid orange-brown earthern floor at elevation 326.05-15 large amounts of ground-stone tools and more than 30 complete pottery vessels were found (ranging from small bowls to large jars), and a lot of burnt grain and charcoal. One of the pottery objects was a completely warped and overfired pot stand (P93-311), obviously a kiln waster. Perhaps room 6 in the house was used as a storage room by the potter. In the south-western corner and in the door opening towards room 7 ten fragmented and complete cuneiform tablets were found, identifying the house as the location of scribe Belu-Erish, and mainly including letters concerning the delivery of different kinds of food stuffs.[110] Also there were many fragments of bronze objects among the vessels on the floor. From this room a door opening led to room 7.[111] Here, too, many sherds and five complete pottery objects were found, as well as a stone grinder. From room 6 to the north a narrow corridor led towards room 8, and then around it to the back of the house. On the floor in room 8,[112] lying a bit higher than the other floors in the house at approximately 326.30, seven ceramic objects (bowls, jars) were found, as well as four ground-stone tools. In addition a fossilized stone, a bronze ring and a stone bead were found. Near the southern wall of the room a complete cuneiform tablet was found on the floor. In room 8 another floor was found belonging to a later phase of use (but most probably

[107] M11 Locus 34 lots 103 until 177, locus 28 lots 147, 152.
[108] M12 locus 5 lots 5 until 13, locus 8 lots 14 until 23, L12 locus 48.
[109] M12 locus 9, L12 loci 18, 23, 24, 29, 38 and 47 (door to room 7).
[110] Personal communication by F.A.M. Wiggermann, 9-10-2005.
[111] L12 loci 19 and 39.
[112] L12 locus 26.

still level 5). On this mud-brick floor, at an elevation of 326.80, several fragments of an unfired bowl and left-overs from pottery production have been found.[113] Also in this phase, two plastered pits with grinding slabs at the bottom (S and V) were found in this room, comparable to feature AH in room 6 and other similar features elsewhere at the site. The narrow corridor leading to the back of the house was fairly empty of finds in the eastern part.[114] On the sloping earth floor (326.31-21) two complete and two fragments of cuneiform tablets have been found. In the western part[115] at the back of the house the floor of the corridor was made of baked bricks (elevation 326.37). Here a drainage pipe leads into space 10. Most probably this part of the corridor was the bathroom or toilet of the house. On the baked-brick floor a pot stand, a goblet, several bowls, a grinding slab and a complete bronze arrowhead were found. Space 10 was most probably used as an outlet for the drainage in the bathroom and perhaps as a garbage pit as well. The southern half of the little room seems to have been separated from the northern part by a thin wall. The inside of the walls of the whole area, as well as the separation wall, were heavily burnt. The depositions in room 10,[116] possibly separable into two phases, consist of very soft black and grey ashy burnt soil. In the southern half there were many fragments of burnt mud-brick, burnt pottery, and many other objects. Apparently the garbage in the drainage outlet was regularly burnt, not surprising in view of the door opening towards the main room of the house.[117] Many objects were found in room 10, including a complete cuneiform tablet very close to the door into room 6, a bronze needle fragment, three possible clay sealings, two jar stoppers, several ground-stone tools and many pottery bowls.

Conclusion: the level 5 East workshops

According to the finds related to pottery production and the architectural structure of the building, we may conclude that the total area in use by the potters was 294 m^2 or 580 m^2 including the open area to the east (fig. V.14). While awaiting the final stratigraphy reports, it seems that the workshops show one, or more likely two phases of use, but it is not clear how long the workshop was in use. One large kiln was in use in level 5 East, but located outside the workshops in the open area to the east. Two smaller kilns were built within the workshop, possibly at different times. Probably these smaller kilns were built and used for smaller kiln loads (when production levels or demands were lower) or for special types of pottery (like smaller bowls or goblets). So, there seems to be a larger variety in production (either in output levels or in the kinds of vessels produced, see also below paragraph V.7) than in level 6, when only large kilns were used. The outer area east of the workshop was possibly also used to store or prepare clay in pits. Room 1 and courtyard 2 seem to form the core of the workshop. At several places in the workshop, most notably in the north of courtyard 2 and in room 1, dense and clayey deposits suggest that clay may have been prepared, stored or used in these spaces. Both in courtyard 2 and in room 1 a shallow pit (AE and AR) has been found that might be interpreted as a wheel emplacement. However, no other indications were found for

[113] As long as the detailed stratigraphy reports are not available, we can only assume that the pottery workshop in M11 was continuously used during the accumulation of floors in this room, and that the unfired fragments belong to the contexts in M11.

[114] L12 loci 36, 37.

[115] L12 loci 40, 50.

[116] L12 loci 17, 31, 34 (northern part, between elevations 326.94 and 325.80), locus 27 (southern part, between elevations 326.70 and 325.79). At 326.22 in locus 31 and at 326.17 in locus 27 there seems to have been a floor or separation of deposits. The upper part above these elevations (locus 31-68 and locus 17; locus 27-48, 75, 76) might be connected with the mud-brick floor in the "bathroom", at elevation 326.48. In locus 34 the burnt fill seems to continue; the bottom of it was not reached.

[117] The possibility that the little room 10 actually represents the dug-in part of an oven or kiln (perhaps even an updraft kiln?) from a later phase, making good use of the already existing walls of this small space, is interesting but cannot be tested or proved at the moment.

the existence or type of potters' wheel used. If AE and AR were wheel emplacements, the shaping of pottery took place in these areas as well. The drying of finished shapes could have taken place in the courtyards (2 and 3), or in room 1. Firing the vessels took place in kiln H in the outer area, accessible through room 4, and in the two smaller kilns in courtyard 2. It is not certain where the fuel was stored, perhaps on the roof of the house. After firing many cracked vessels were repaired, but then finally discarded next to the kilns.

Pottery production in level 5 East took place in an area of the site that bordered on the workshop areas to the south of the tower. However, the architecture and the integration of the activities in the spaces of the house in the western part seem to suggest that the use of space was less specific than in level 6. It seems that the workshop activities have moved closer to the living spaces, making use of whatever empty space was available, and perhaps sometimes workshop activities (like storage) entered the living areas. This seems to be a marked difference with the layout of the level 6 workshops. The location of the workshop, now inside the fortress walls and close to the location of the scribe, as well as the find of a sealing with cylinder-seal impression in the kiln fill, suggest that the potters were still firmly connected to the Assyrian administration.

The level 5 West location

In the west of the settlement in square H8, and probably a bit later than the pottery manufacturing activities in the East, a room just inside the fortress walls was used for pottery production (fig. III.4 and fig. V.20). Two small updraft kilns were dug into the fill of the room, in the corner of the walls. Other finds pointing to pottery production, although stratigraphically probably not contemporaneous with the kilns as will be shown below, include amounts of unfired vessel fragments and pottery wasters. The finds in H8 have the character of a waste dump rather than a proper pottery workshop with finds *in situ*, and I therefore call this area a production location instead of a workshop. The potters seem to have used an empty, unused room to build their kilns. Most likely the workshop proper was located elsewhere. In square H9 the heavily fired western wall may indicate that this area was used for open firing, perhaps of large storage jars.

Kilns

Two small updraft kilns were built in room 14 of the small building located in square H8 just east of the fortress outer wall. At the end of level 5 (level 5B) this room had a floor (J) made of grey ashy soil at an elevation of 326.37-25, while the southern half of the room was covered with baked bricks (floor G). Several very large storage jars were set into floor J, indicating that the room was used as a storage space (fig. V.21). At some point several doors to room 14 were closed and the storage space filled up with enormous amounts of large broken pots, sherds and other waste (fig. V.21, the lower brown part of the eastern and southern section baulks). The two kilns were dug into this layer of waste and debris.[118] Both kilns, as well as the waste dump in room 14, were later levelled with the construction of floor F (level 4D) at an elevation of 326.95-83 (fig. V.21, the grey ashy layers in the eastern and southern section baulks).[119] The kilns and the pottery production activities could therefore belong to the final stages of level 5 or to the earliest times of level 4 (between 5B and 4D). It is unclear whether the two kilns were built or used simultaneously or at different moments.

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[118] This is not only clear from the stratigraphy and section drawings but also from the general construction of this type of kilns, with the fire chamber below ground level and a fire chamber architecture that could not have been a free-standing structure but was always dug in. Also, the absence of any waste related to pottery production in the fill above floor J and under floor F, while the kiln is filled with this kind of waste, suggests that the original surface from where the kilns were used was levelled away.

[119] This also means that any deposits in room 14 associated with the use of the kilns have most probably been levelled away.

Kiln H/AE was dug into the room fill in the northeastern corner of room 14, using the northern and eastern wall for support (see Appendix C and figs. C.13-17). Only the lower part of the fire chamber was preserved, the upper structure was cut away during the construction of floor F. The preserved part of the fire chamber measured 1.44 x 0.68 m, and is 1.10 m deep. Consequently, the size of the kiln is comparable to kiln AC/AI in M11/M12 and to kiln CJ/V in K8 (see below and table C.1). In the pit of the fire chamber whole bricks were upended against the northern wall B of the room and against the western side of the pit, while at the southern side of the pit half bricks were laid in normal masonry. This was probably done to create a stronger fire-chamber wall since the southern pit side was not supported by a wall. At the eastern side the surface of wall AB was used, without a brick covering. All bricks and the surface of wall AB were heavily fired and molten to grey/green, due to the high temperatures reached in the fire chamber. The fill in the oven[120] consisted of soft brown-red, grey and black fill with ash, burnt loam, mud-brick fragments and clay lumps. The bottom of the fire chamber was made of dark-brown soil at an elevation of 325.85. On top of the fire-chamber floor mainly soft ashy fill was found. Higher up in the fill a lot of sherds and many fragments of unbaked vessels were found (mainly belonging to goblets, small bowls and jars, see below paragraph V.6), as well as three kiln wasters (a jar (fig. IV.74.k) and two bowls). Other fired bowls, a jar stopper, a grinder fragment, and two fragments of sealings were also found in the kiln fill.

Kiln I was dug in the northwestern corner of room 14, again making use of the walls for support (see Appendix C and figs. C.18-20). Again only the lower part of the fire chamber is preserved, but the eastern wall seems to curve inwards already. Perhaps the kiln floor was not very much higher. The preserved part of the fire chamber measures 1.12 x 0.65 and is 0.90 m deep, and so kiln I is comparable to kiln H/AE in size. The construction of kiln I was less solid than that of H/AE. The southern, narrow side of the fire-chamber pit as well as the eastern side of the pit were covered with complete mud-bricks set on their sides. At the northern and western sides the faces of the walls B and C were used as fire-chamber walls without any further strengthening. It is unclear what the arch supporting the pottery floor rested upon at the western side. Perhaps the western wall C was cut at a higher level for construction of the pottery floor arches. The bricks inside the fire chamber as well as the western and northern walls of the room were heavily burnt by the fire in the kiln. The walls showed traces of burning up to an elevation of approximately 327.46, indicating that the fire chamber may have been about 1.58 m deep (estimated volume 1.15 m^3). The bottom of the fire chamber, at an elevation of 325.88, consisted of brown soil. The fill of the kiln[121] consisted of two deposits: the lower part was filled with blue-grey ash associated with the use of the kiln. The upper part contained blue-grey, grey-brown fill with ash, loam, burnt loam and mud-brick fragments. The ruins of the fire chamber were later used for a burial, similar to the use of kiln L in square N12 (level 6). The burial partly cut the fire-chamber wall. One fragment of unfired pottery was found in the kiln fill, and several body sherds of unfired pottery were found in the fill of burial 1.

In the open area south of room 14, in square H9, there were indications of firing activities as well, possibly related to pottery production. The eastern side of the bricks of the outer wall of the fortress, called F in this square, were reportedly fired and the whole northern part of the wall was covered in burnt plaster, sintered clay and slags. Clearly, a fierce fire creating very high temperatures had been burning against the wall. The level 5B deposits in the area seem to be dump layers on top of a floor (at elevation 326.26), containing loads of highly eroded and broken pottery sherds, a lot of burnt material, ashes, burnt straw, grain and wood charcoal. In the southeast against wall I feature Y was reported to have been made of a row of

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[120] H8 locus 16 and 42.

[121] H8 locus 17.

baked and burnt bricks and burnt mud-bricks (measuring 2.18 x 0.65 m with lower elevation at 326.63). The available data at the moment are not clear enough, but perhaps Y represents the lower remains of a fire chamber? Similarly, in level 4C, a rectangular band of burnt mud-brick filled with grey soil was reported against the western wall F (feature V/AB, measuring 2.15 x 0.85 m and lower elevation at around 326.86). Possibly the firing and sintering of wall F is connected with the use of V/AB. If indeed Y and V/AB are the remains of kiln fire chambers, they were both probably dug from a level much higher than the level 5B burnt dump fill of the open area. The high firing and sintering of the surface of wall F could also have been caused by an open fire against the wall. Perhaps the firing of large storage jars in a bonfire took place here, in the absence of an updraft kiln large enough to hold them, although there are no further indications for this. A fragment of unfired pottery was found in square H9 along the eastern wall of the open area, in level 4B. In level 5B large amounts of slag and molten clay were found on the floor of the area near the burnt wall under a thick layer of burnt straw and charcoal, and in the thick dump layer also containing burnt material.

Other finds associated with pottery production

In the level 5 West location so far no particular area or associated architecture could be clearly identified as a workshop location. Again the finds of unfired vessel fragments and kiln wasters could point to a production location, but the evidence is much less clear than in level 5 East or in level 6.

Earlier (in level 5C) an office or archive space of the *abarakku* of the *dunnu*, Tammitte, was located in the small rooms to the north. Here many cuneiform tablets were found. Later this room filled up with roof debris and dump layers. Large amounts of unfired vessel fragments were found in the fill of a former bathroom north of room 14 (fig. V.20). The deposits that contain unfired pottery can be divided into two phases. Originally, the room seems to have housed some kind of toilet installation. Baked bricks were placed on their sides against the walls. In the south of the corridor on top of baked brick floor W (elevation 325.80) a layer of debris of some 10 cm thick was deposited with hardly any finds. On top of this soil layer a concentration of cuneiform tablets and envelope fragments, clay sealings and some fragments of unfired pottery vessels (including a ring base) were lying amongst sherds of a large vessel.[122] Other finds included more or less complete pottery bowls, a bone awl, a bronze arrowhead, and a basalt hammer stone. These finds are dated to level 5C. Later, at elevation 326.24, an uneven surface called floor Q was present in the room. On top of this floor and concentrated against the northern wall, in the niche in western wall C, and in the southern part of the room,[123] there was a concentration of large amounts of pottery sherds and many unfired vessel fragments, amongst some ground-stone tools, more or less complete pottery objects, and three jar stoppers. This deposit is dated to level 5B. The unfired fragments comprise hundreds of pieces and show a large variety in rim types and vessel shapes (see below, paragraph V.6). A single unbaked clay fragment related to pottery production was found in the small room (17) in the northeast of the square at an elevation of around 326.54, belonging to level 5B or 4C. And so, if the stratigraphical placement of kilns H/AE and I in room 14 after level 5B (between 5B and 4D) is correct (see above), the finds in corridor 16 cannot be related to the use of the kilns.[124] In that case the area was used more than once by the potters.

Other isolated finds of unfired vessel fragments in surrounding areas come from square G7 (most probably from the fill of the moat that was dug around the settlement in level

[122] Square H8 locus 30.

[123] Square H8 loci 26, 34 and 27 respectively.

[124] Another possibility is that the floors in the "bathroom" and adjacent rooms were kept clean and were in use during level 5B, the time when room 14 filled up with waste. Only in that case could the use of the kilns in room 14 be contemporary with the deposit of unfired vessel fragments in room 16, but then the stratigraphical placement of the deposits in corridor 16 is not correct.

6), from the open area in square H9 (see above, level 4B), and from the floor context in the large courtyard to the east in square I9 (elevation 327.03, level 5B/5C).

Kiln wasters are reported in square H8 from room 15 in level 5C, room 17 in level 5B/5C, from floor J in room 14 (level 5B) and from room 16 in level 4C/5B. Another kiln waster was found in square I8, but very high up in the fill dating from level 1C/3A.

Many slag fragments possibly related to pottery firing were found in square H9 (see above, level 5B), square I8 (level 4B/4C and mixed context), square J9 (courtyard, level 5B/5C), square J8 (courtyard, levels 4B, 3, 1) and squares G8 and G9 (no stratigraphical information available yet). However, these finds come from different levels and do not seem to be strongly associated with other finds related to pottery production. Moreover, “slag” can be related to other fire-related productions as well.

Conclusion: pottery production in the level 5 West location

The deposits of unfired vessel fragments in corridor 16 suggest that pottery production waste was put here on at least two occasions (level 5C and 5B), both most probably unrelated to the building of the kilns in room 14 (after level 5B). Therefore the area was used by a potter at at least three moments in time. The finds in the open area of square H9 are possibly related to pottery production as well. It seems that there was not a specifically designed building in use as a pottery workshop in this area. Rather, the potters made use of empty unused buildings and spaces for their activities. Possibly they used room 14 itself, the outside area west of the fortress wall, the large courtyard to the east or the smaller open area to the south of room 14 (square H9) for shaping and drying their vessels. Or the actual workshop was perhaps located further away from the kilns and room 14 was just thought to be a suitable place for building the kilns. We even cannot completely exclude the possibility that the kilns in level 5 West were actually used by the potters working in the level 5 East workshop. Compared to level 5 East and especially level 6, the activities in level 5 West seem to have been more of an *ad hoc* nature. As in level 5 East, the evidence from this location suggests that the use of space was very flexible, and that any space not used for other functions at the time could be put at the disposal of the potter if needed.

The location of kilns in the west of the settlement, as opposed to the formerly preferred eastern location, might be related to the time of production. Westerly winds predominate in the summer season, creating a lot of nuisance for the settlement if pottery kilns are located in the west. In the winter, however, the predominant direction of the winds is easterly. Perhaps, the kilns in the level 5 West production location were used only in the autumn or winter season?

The level 5 North location

A third location of pottery production identified by the presence of two updraft kilns is found in the north of the fortress settlement (fig. III.4 and fig. V.22). Two kilns were located in squares K8 and L8.

Kilns

The earliest kiln in the northern area is kiln AR located in square L8. It is a rather large updraft kiln built in the corner of the western and northern walls of room 2 in what later would be the so-called “office” building. Although the stratigraphy here is not yet available in detail, it seems clear that level 5B floor AI in room 2 (at an elevation of 326.28-34) covered or even levelled kiln AR. Only the fire chamber has been preserved. The top elevation of the preserved kiln construction is 326.10, and because the air flues of the pottery floor are already visible, the pottery floor and the level from which the kiln was constructed would not have been much higher than that. Perhaps kiln AR was dug at a time when the level 5C room was no longer used for its original functions, or perhaps a pottery workshop was located here originally in level 5C.[125] Kiln AR ranks amongst the largest kilns found at Sabi Abyad (see table C.1 in Appendix C), with a fire-chamber volume similar to kiln H in N13 (level 5), kiln L in N13 (level 6) and kiln K in J7 (level 4). The kiln was replastered or repaired at least three times. The fill of the fire chamber consisted of pure black and white soft ashes on the earthen floor, then a layer of soft ashy soil[126] covered with debris including stones and large chunks of burnt and unburnt mud-bricks originally belonging to the upper structure. Green/blue sintered plaster pieces, some pottery slag and some fragments of heavily burnt bone were included in this fill as well. In the lower kiln fill near the floor a bowl, a bronze ring and a wedge-shaped object (fig. V.7, O03-198) of baked clay were found, of a type similar to objects found in the level 6 pottery workshops. Perhaps this object was used to stabilize the kiln load during firing. A clay sealing with a cylinder-seal impression[127] was found in the kiln fill near the floor.

After the *dunnu* gate in square K8 went out of use as a gate, but before the recesses in the wall and the gate were closed and bricked up, kiln CJ/V was built against the eastern wall (see figs. C.21-25 and Appendix C for a detailed description). This is the only updraft kiln found at Tell Sabi Abyad of which not only the pottery floor but also part of the pottery chamber construction have been preserved. The kiln was built from a surface at an elevation of 326.80, using the western wall of the room as a support. At this elevation no real floor was recognized in the room,[128] and it seems that the kiln was built in an otherwise unused space. The fire chamber was dug into the fill covering floor CM (level 5B, elevation 326.19), and cut floor CM. The lower elevation of the fire chamber was 326.16. The sides of the pit were covered with upended mud bricks, two bricks on top of each other. On the surface at 326.80, a rectangular bin was built using half mud bricks on all sides of the fire-chamber pit. The bin seems to extend towards the south more than the fire-chamber pit, and perhaps formed a fuel hole or entrance to the fire chamber.[129] Also at this level two mud bricks were placed obliquely leaning against each other over the fire-chamber pit, forming an arch to support the pottery chamber floor. The pottery chamber floor, with at least six preserved flue holes, had an elevation of 327.11 and was well plastered. The floor is not preserved over the whole length of the structure. The walls of the bin continued and now formed the side walls of the pottery chamber. The pottery-chamber walls have been preserved up to the elevation of 327.62, two courses above the pottery-chamber floor. A firing hole to the fire chamber was present on the northern side just next to the buttress of the former gate. Because kiln CJ/V cut level 5B floor CM and the fill on top of it, it should be dated later than level 5B. In level 4 the door opening of the gate was blocked, making the use of the firing hole impossible. A level 4B surface at 327.60 covered the remains of the kiln. Consequently, kiln CJ/V was built and used between level 5B and 4B. The fill of the pottery chamber[130] consisted of brown soil with plaster fragments and charcoal, and included a pottery bowl and a stone sphere. The fill of the fire chamber[131] was loose brown and grey, sandy and ashy soil, while a thin layer of soft, pure fine black-to-grey ash with charred grains[132] was lying on top of the fire-chamber floor. Small finds from the fire-chamber fill included a small piece of faience, a clay jar stopper, and a

[125] However, at the moment there are no other indications for the presence of a workshop in this location.

[126] Sample SN03-182 was taken from the ashy kiln fill, containing charcoal and burnt plant material. The sample was sent to the botanical laboratories in Groningen but results of the analysis have not yet been received.

[127] See Duistermaat and Wiggermann in prep.

[128] A surface was noted in the southern section drawing, at elevation 326.72. This surface was also noted in the northern section drawing of square K9, at elevation 326.60-70.

[129] Cf. kiln AC/AI in square M11/M12. If bin W in square M12 originally belonged to this kiln as part of the superstructure, it also extended more to the south than the fire chamber itself.

[130] Square K8 loci 29, 47.

[131] Square K8 loci 161, 164.

[132] Sample SN99-5 contains ash with seeds from this layer just above the fire chamber floor. The sample was not yet sent for analysis.

grinder fragment. The deposits around the kiln possibly associated with the use of the kiln[133] consisted of grey ashy soil and mud-brick debris with grey spots.

Other finds associated with pottery production
Finds of unfired vessels or kiln wasters that might be associated with the use of kiln AR in square L8 and kiln CJ/V in square K8 are few. No unfired vessel fragments are reported from square L8. One unfired bodysherd of a jar was found in square K8 (O99-2, level 5B) and two fragments in square M7, possibly in the fill of the Assyrian moat. Kiln wasters have been found in square K8 (two objects, both level 5B), square M9 (two objects, both level 5B) and square L9 (level 5B). Several pieces of "slag" have been reported from different levels in surrounding squares, but without a clear association with the kilns. As with the level 5 West location, no specific architectural space seems to have been designated for pottery production. The potters seem to have used the space whenever they needed to build a kiln in this general area, making use of spaces not used otherwise at that moment.

Conclusions: The location of pottery production in level 5
We have seen that the location of pottery production in level 5 presents us with a picture of flexibility and of opportunistic use of space at the site. At the start of level 5 a large updraft kiln was in use in square L8 in the north of the settlement, in a room built against the outer fortress walls. This room would later become a kind of office. Apparently no pottery workshops were located in the immediate vicinity of the kiln. A bit later in level 5 a pottery workshop including two smaller updraft kilns (T/U and AC/AI) was located on the eastern side of the settlement, making use of the courtyard and a room belonging to a house. This house belonged to a scribe, and perhaps he still lived or worked there. Although this location (level 5 East) was identified as a proper pottery workshop, it seems that the allocation of space to the potters proceeded in a less fixed way than in level 6. The potters mainly used areas that had been left empty for some time. The workshop in level 5 East probably also used the large kiln H in square N13. At more or less the same time large amounts of unfired vessel fragments were dumped in corridor 16 in square H8, a space formerly belonging to a kind of archive or office. Later still, two smaller updraft kilns (H/AE and I) were built in the waste dump of room 14 in square H8, while possibly the open area in square H9 was used for firing activities as well. Around the same time or again a bit later, possibly already in level 4, a smaller updraft kiln CJ/V was built in the recess behind the former city gate in square K8. It is unclear whether the workshop in level 5 East was still in use at this time, or whether pottery was shaped in a location closer to the western and northern kilns.

During level 5, a period of about 15 years as indicated by the dates in the cuneiform texts (see Chapter IV), two larger and five smaller pottery kilns were used. Compared to the use of the two large kilns in level 6, estimated at a duration of ca. 30 years, this could suggest an increase in production output when the ovens were used with the same intensity. The settlement itself, however, seems to have contracted within the fortress walls.

It is as yet unclear why, in level 5, pottery production seems to be shifting to different locations in the settlement. Perhaps there is a relation between the season and prevailing winds and the location of the kilns needed at that moment. Perhaps depositional circumstances only preserved the remains of one workshop for us to excavate, while other workshops were located but not preserved, found, or identified close to the western and northern kilns. It might also be suggested that the potters did not have or need a permanent workshop during (part of) the level 5 occupation of the settlement, but that they used available spaces for producing pottery and building kilns as soon as vessels were needed, and that they were perhaps not producing continuously. Whether they participated in other work when they

[133] Square K8 locus 162 lot 371, square K9 locus 61 lots 146, 148.

were not producing, or whether they were absent from the site to produce pottery elsewhere,[134] must remain unanswered.

Evidence for pottery production in level 4

As was shown in chapter III, the occupation of the settlement in level 4 changed drastically. The settlement contracted to the northwestern part of the site, while the rest of the *dunnu* was partly a landscape of ruins and derelict buildings occasionally used for *tannur*s and other small-scale activities. Although it is most probable that there was no longer an *abarakku* during this time, it seems that the settlement was still part of the Assyrian administration, albeit on a different scale and perhaps with a different function. Despite this radical change of function and scale, local pottery production now also continued, although evidence is restricted to the earliest phases of level 4.[135]

The small kiln CJ/V in square K8 is as yet tentatively dated to a period between level 5B and level 4B. Although for the moment the kiln is discussed together with the level 5 evidence, it may have belonged to the early level 4 occupation. See above for a full description of this kiln and other related finds.

In the area north of the former (level 5) *dunnu* gate, which was blocked in level 4, a large updraft kiln K was built in square J7 (fig. III.5 and fig. V.23; see figs. C.26-31 and Appendix C for details). This kiln was published earlier in Akkermans and Duistermaat 2001. The kiln is free-standing and very well preserved, including the complete pottery floor with flue holes. The kiln is preserved up to an elevation of 327.24-35. The fire chamber was dug from a surface S at elevation 327.10. The long sides of the fire chamber were covered with walls made of half mud-bricks in normal masonry. The short sides were covered with whole mud-bricks on their sides. Three real V-shaped arches, made of whole mud-bricks slightly leaning inwards one after the other, cover the fire chamber and support the pottery floor. The pottery floor has nine circular flue holes, made with mud-bricks fixed between the arches. The whole inside of the fire chamber and flue holes was plastered, and everything was fiercely burnt and baked to a greenish colour. The kiln has two fuel holes on the northern and southern side. The fire chamber measures 2.16 x 0.64 m and is 1.70 m deep, putting this kiln in the size-range of kiln AR in L8, about 1.3 times smaller than the volume of kiln Q in N11 (see table C.1 in Appendix C). The deposits inside the kiln[136] consisted of soft fine dark-brown soil with some sherds and bone in the flue holes. The fill of the fire chamber was soft brown and ashy grey soil, sherds and charcoal. Below that was a layer of very powdery soft grey, grey-yellow and pink ashy soils, with big parts of burnt mud-bricks. On the bottom of the fire chamber, fill was dark-brown to black ashy soil. Some large jar bases and other large sherds, bone, stones and burnt mud-brick were found in the south of the fire chamber, under one of the fuel holes. Lots of objects were found in the oven fill, including jar stoppers, stone grinding tools, a bronze pin fragment, two figurines of baked clay, and more or less complete pottery shapes. The deposits surrounding the kiln[137] form a thick pack of sloping ashy soil layers, looking like

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[134] Cf cuneiform text T93-3 discussed above and in Appendix F.

[135] The excavations in 2005 yielded the badly preserved remains of an updraft pottery kiln in square M6, dug from a high but undatable level (P.M.M.G. Akkermans, personal communication 2-11-2005), and possibly connected to the evidence for pottery production in level 4. This kiln could not be included in the current study anymore.

[136] Square J7 locus 38 lots 74, 112, 142, and loci 76, 78, 81. Sample SN98-531, sintered plaster, was taken from the inside of the pottery chamber, but has not yet been analysed.

[137] Square J7 locus 31 lot 62, locus 33 lots 65-66, locus 34 lots 67, 75, locus 36 lots 69, 70, locus 41 lot 79, locus 45 lots 83, 87, locus 58 lot 111, locus 60 lot 114, locus 62 lots 120, 124, locus 63 lots 121, 122, 127, 130, locus 64 lot 125, locus 65 lot 12, locus 66 lot 128, 129, locus 69 lot 132, locus 74 lots 140, 146, to the west, south and east of kiln K, between elevations 327.37 and 326.85 (surface S is sloping). Sample SN98-10 was taken from slags near the kiln in an ashy layer, but was not sent in for analysis.

a waste deposit of ashes and garbage and containing many sherds, pieces of slags, bones, stones, and burnt mud-brick pieces. The small finds contain a remarkable amount of bronze fragments (n=10), two grinding tools and two pottery vessels.

No fragments of unfired vessels were found in square J7. However, many fragments were found in the adjoining square J6 to the north approximately at an elevation of 326.40, in an area south of a wall running east-west north of the kiln (see fig.) Although the stratigraphy of this square was not available at the time of writing, the daily field notes indicate that these fragments could be from the same level as kiln K. Among the fragments was also a fragment of a cuneiform tablet.

No kiln wasters have been registered from square J7 or surrounding squares. Fragments of "slag" have been found in the fill of square J7, and in squares H6, H7, I6, K6, K7.

It is therefore clear that at the beginning of the level 4 occupation, despite the major changes in the organization of the Middle Assyrian provinces and the *dunnu*, the staff at Sabi Abyad kept producing pottery on a reasonable scale, even making use of a large kiln. The potters' activities seem to have shifted to the north of the settlement, just like the rest of the occupation. No workshop was found or identified, but it was probably located not far from the kilns, possibly in squares J6 and K6.

V.6 Technical aspects of pottery production at Tell Sabi Abyad

Identifying the local output of pottery production

The variability, standardization and size of the output of production, as well as the locally used techniques for shaping and firing are important factors in determining the kind of production organization. These aspects should ideally be studied *within* the corpus of locally produced pottery: otherwise, the aspects of products originating from different sources and perhaps different production organizations are mixed and the conclusions will be less clear. It is therefore important to know what range of vessels was actually produced locally and which vessels came from other sources.

Shapes that can easily and securely be identified as local produce are those shapes that are present among the unfired pottery and the kiln wasters. Other shapes likely to have been produced at the site are the huge storage vessels, which are very heavy and are not likely to have been moved over large distances.[138] It is clear that a large variety of shapes was produced locally at Sabi Abyad. From fragments of unfired vessels and from kiln wasters it appears that at least the following vessel types were definitely produced locally (fig. V.25; cf. also figs. V.43, 44, 45 for unfired fragments and page 190 for figure numbers of kiln wasters):

Bowls: 111, 113, 131, 132, 135, 141, 142, 143, 145
Pots: 212, 221
Jars: 311, 315, 322, 323
Pot stands: 611
Goblets: 411, 421
Strainers: 511
Bases: 711, 712, 721, 731, 741

[138] For an example of potters travelling in a region to produce large storage vessels on the location of use, see London 1989b and Voyatzoglou 1974.

To this list we can add the large handmade storage pots type 213, 215 and 226, and the large bowls type 1410, because they were probably too large to be transported anywhere far and are most likely to have been produced locally. We may also possibly add jars type 321 and bowl types 112, since they occur in large numbers at the site and are amongst the "top ten" of shapes (see table V.21 and below), and because they are minor shape variations only. The wares recognized among the unfired vessels and wasters were B, C, H and I (although the inclusions are often difficult to compare with normally fired sherds). All taken together, local shapes made from supposedly local wares[139] (ware groups X and Y) comprise 84.3% of the total database of described diagnostic sherds. For the majority of shapes found at the site we may therefore assume that they were locally produced, although this is of course not absolutely certain for every single sherd. Not all locally produced shapes are necessarily also represented amongst unfired fragments or kiln wasters. So the list of local shapes is probably even longer, including for example those shapes that are made in similar traditions as the ones in the list above (see below, table V.5). The technological analysis of shaping and firing techniques is discussed below. Although technological similarities do not prove local production, conclusions can be drawn on whether the pots were produced in the same technological tradition.

For the other shapes and wares present among the corpus of Sabi Abyad, the only certain way to establish whether they, too, have been produced at the site or not, is archaeometric research. A first step is to study thin sections of a sufficient sample of sherds from both groups with a polarizing microscope. In this way the minerals included in the clay and their number, shape, size and distribution can be identified. This is important to compare different clay mixtures. Something may be said about firing circumstances and temperature as well. Thin-section analysis therefore gives information on whether vessels are produced using the same materials and in the same technological "tradition", or not. Chemical analysis of the clay of a selected sample of sherds from both groups and of local raw materials can indicate whether the sherds in each group are actually made of the same chemical components. This may show whether groups of vessels are produced in the same geographical area or made from the same clay source, or not. On the basis of the archaeometric results, five groups of raw materials could be formed, three of which are probably not local to Sabi Abyad or the Balikh region. The detailed data is presented in Appendix D; here, table V.2 presents these groups including information on shape and wares described in the field. Based on the thin-section analyses, I suggest to consider all type 911 "pilgrim" flasks as foreign to the site, as well as red-slipped pottery, glazed pottery, and most (but not all!) cooking-ware vessels. Interestingly, these types were already recognizable from their different shaping or decoration techniques. Type 315 jars could partly have come from elsewhere in the region as well, as could the burnished deep bowls with spout and handle type 151.

For some unique shapes it was suggested that they could have been imported to the site. For some of them comparisons with shapes from other (non-Middle Assyrian) sites were found (Chapter IV). Shapes that were certainly or possibly imported to the site are shown in fig. V.26.

Based on these considerations, and knowing that the recognition of "imported" vessels on the basis of macroscopic identification of the fabric has proved to be largely impossible, the following shape types will be considered as belonging to the local production at Tell Sabi Abyad (types between brackets are only included based on the similarity of shaping techniques used, cf. Table. V.5. Cf. also fig. V.25):

Bowls: 111, 112, 113, 117, (121), 122, (125), 131, 132, (134), 135, 141, 142, 143, 145, 1410

[139] As with the shapes, the local origin of a ware group can only be proved by thin-section and chemical analysis. See Appendix D for results of these analyses.

Pots:	(211, but excluding cooking pots), 212 (but excluding cooking pots), 213, 215, 221, (222), (225), 226
Jars:	311, (312), 313, 314, 321, 322, 323
Pot stands:	611
Goblets:	411, 421
Strainers:	511
Bases:	711, 712, 721, 731, 741

group	Description	Field wares	Shape types	Possible origin	Sample nos.
A1a	Calcareous clay with organic incl.	Ware I	132, 117, 315 (mostly level 7!)	Balikh Valley, Sabi Abyad?	02, 05, 32, 42
A1b	Calcareous clay, no org. incl.	Ware C, B	122, goblet	Balikh Valley, Sabi Abyad?	<u>44</u>, 45 (Nuzi)
A1c	Calcareous clay, fine-sand incl.	Ware A	911 pilgrim flask	Balikh Valley??	12
A2a	Calcareous clay with org. incl	Ware H, I, J	111, 112, 113, 221, 212, 311, 313, 315, 322, 611 waster	Sabi Abyad	01, 03, 04, 11, 13, 14, 16, 17, 18, 21, 22, 26, 29, 31, <u>47</u>
A2b	Calcareous clay, no org. incl.	Ware A, B	314, 421, 711, 712, 721	Sabi Abyad	09, 10, 15, 24, 25, Nuzi: <u>40</u>, <u>43</u>
A2c	Calcareous clay, fine-sand and org. incl.	Ware I	151 bowl with spout	Sabi Abyad??	08
D1a	Cooking ware, calcareous clay with coarse calcite incl.	Ware E	212 cooking pot	Balikh Valley	<u>35</u>
D1b	Cooking ware, calcareous clay with coarse calcite incl. and org. incl.	Ware D	212 cooking pot	Balikh Valley	<u>46</u>
D2	Cooking ware, calcareous clay and crushed-shell incl.	Ware F	2211 cooking pot	Balikh Valley	<u>34</u>
B1	Calcareous clay with basalt and fine quartz/chert	Ware I	Base from a glazed bowl	Jezira	23
B2	Like A1a but with basalt	Ware I	123, 111	Jezira	39, 41
B3a	Calcareous clay with basalt and fine-sand and org. incl.	Ware I	Body of red-slipped jar	Jezira??	<u>38</u>
B3b	Calcareous clay with basalt and fine sand.	Ware B	111	Jezira	<u>48</u>
C1a	Cooking ware, calcareous clay with fine basalt and coarse calcite	Ware E	211 cooking pot	Jezira	<u>33</u>
C1b	Cooking ware, calcareous clay with coarse basalt and coarse calcite	Ware E	212 cooking pot	Jezira	<u>36</u>
C2a	Calcareous clay with coarse basalt and chert	Ware C	911 pilgrim flask	Jezira	07
C2b	Cooking ware, calcareous clay with coarse sand and coarse calcite	Ware D	212 cooking pot	Jezira	J730
C3	Calcareous clay with medium-coarse sand and basalt	Ware B	315 jar	Jezira, Euphrates?	<u>37</u>
E1	Non-calcareous clay with basalt and coarse sand	Ware B	911 pilgrim flask	Upper Euphrates?	06
E2	Cooking ware, non-calcareous clay with steatite	Ware D	211 cooking pot	Ugarit area	J728

Table V.2: Archaeometric groups and comparison with field ware groups and shape types, suggesting the possible origin of the clay and including sample numbers used in Appendix D. Samples from level 7 are underlined.

Clay and inclusions, preparation of the clay body

As was clear from the discussion of the natural environment (paragraph V.4), pottery clay is abundant close to the site. After the clay had been carried to the site, it had to be cleaned of larger particles and plant roots. The end product (the pottery) at Sabi Abyad seems to be made of rather clean clay, with few impurities (cf. Appendix D). Very rarely a small piece of shell, a small pebble or a larger calcite particle was left in the clay. It is not likely that it was necessary to crush or grind the clay with pestles and grinding stones, as is sometimes the case in other geographical areas (cf. Rice 1987: 120-123). After cleaning, the clay would then be mixed with water and soaked until it reached the right plasticity and temper material could be added.

All inclusions that were distinguished for the Bronze Age pottery from Sabi Abyad (see chapter II) were present locally, at the site or in its immediate surroundings. Fine-sand and fine-calcite inclusions were most probably already present in the clay, and were not added (cf. Appendix D; Franken and Van As 1994: 508). Chaff was probably best available just after the harvest in early summer, as it is now in the Balikh valley (personal observation), but could also be stored for later use. Dung would have been available year-round, and could also have been used as fuel for the kilns. Calcite was available on the terraces on either side of the river valley, sand most probably in the riverbed itself. Coarse calcite was crushed or ground to reach the right particle size. After cleaning the raw clay, it was mixed with water. Tanks or pits for this purpose have not been recognized at Sabi Abyad so far, although perhaps large vessels or the squarish pits east of the level 5 workshop may have been used for mixing or soaking (see fig. V.14). For 8.7% of all vessels no additional temper material was added. But most pottery (90.6%) was made of clays with organic inclusions. Pots with added mineral inclusions or with both mineral and organic added inclusions were rarer, and most of them were not locally made (cf. Appendix D). Perhaps salt was added (see above). Organic temper was possibly added while the clay was in a thick liquid condition, after which it was left to allow the organic particles time to absorb water and become more plastic (Appendix D). After adding the temper material, the clay would be kneaded thoroughly, perhaps by trampling on it with bare feet, to make it ready for shaping. Rarely (n=5) the presence of air bubbles in the vessel wall indicates that kneading was not sufficiently thorough (fig. V.35). The majority of the pottery therefore required the preparation of the clay in several stages: digging the clay, cleaning, adding inclusions, resting, kneading. In rural workshops in modern-day Cyprus the amount of clay prepared is just sufficient for one day of work. Prepared clay is stored only in urban workshops (Ionas 2000: 154).

Raw clay	*Added mineral inclusions*	*Added organic inclusions*	*Ware group*	*n*	*%*
No visible incl.	No	No X	N	4	0.0%
Fine calcite	99.3%	9.0%	A	251	1.6%
Fine sand			B	924	5.8%
Calcite and sand			C	240	1.5%
100%		Yes Y	G	14	0.1%
		90.3%	H	1418	8.9%
			I	12259	76.6%
			J	745	4.7%
	Coarse sand	No	D	54	0.3%
	Coarse calcite	0.5%	E	33	0.2%
	Shell		F	3	0.0%
	0.6%	Yes	K	11	0.1%
		0.1%	L	2	0.0%
			M	4	0.0%

Table V.3: The preparation of the clay body and frequencies of the different wares. Ware groups X and Y were found among the unfired vessel fragments and kiln wasters at the site (only diagnostics described by the author).

Shaping techniques

In 1996 pottery specialist A. van As and professional potter L. Jacobs from the Department of Pottery Technology at the Faculty of Archaeology, Leiden University, visited the site of Sabi Abyad with the objective of performing a first and small scale assessment of the ceramics found at the site. For the Middle Assyrian pottery a selection of the most common shapes was made. This included goblets (type 411), pot stands (type 611), small, medium and large bowls (like types 111, 131), deep bowls and pots (like types 141, 222), small jars (like type 311), and large jars (like types 321, 322, 323). Study of imported vessels included one "cooking-ware" vessel (type 211, P93-308), and one "pilgrim flask" (type 911). L. Jacobs commented on general shaping techniques, clays and inclusions, as well as on more particular techniques used for the different shapes. The following description of shaping techniques is based on his comments as well as on the notes made by myself during the description of the pottery in the field. The shaping techniques were grouped in the following technological groups:

A Thrown from the cone
B Thrown from one lump of clay
C Thrown in two parts
D Thrown closed (only imported "pilgrim flasks")
E Handmade (including some imported cooking-ware vessels)

Most of the pottery was made on the fast potters' wheel (98.9%). Even in wheel-thrown pottery, however, parts of the shaping process took place with the help of a slow-turning support or on a stationary vessel.[140] Examples of the latter are the addition of spouts, handles

[140] In the only other extensive publication of Middle Assyrian pottery, P. Pfälzner (1995: 244-245) spends no more than a few lines on the shaping techniques of the pottery from Tell Sheikh Hamad. In consultation with a potter from Bamberg (Germany), he concludes that a large part of the pottery there may have been pre-shaped by hand in coils, and then finished on the potters' wheel. For the large jars shaping in two stages is suggested, whereby the lower part is shaped in coils and the upper part on the fast potters' wheel. It is unclear whether the Bamberg potter saw the pottery in the field or worked with drawings and photographs only. The described techniques are not attested at Sabi Abyad, and also seem to be at odds with Pfälzner's idea that the pottery of Sheikh Hamad was "mass-produced" in a quick and careless way in a "manufactory" (see also below).

and decorations, or turning a leather-hard vessel. Only very large vessels and special shapes were made by hand (for the largest part), sometimes with the help of a slow-turning turntable. Therefore the distinction between wheel-made and handmade is sometimes not very sharply delineated.

Wheel-throwing techniques

Wheel-made vessels mostly show thin horizontal, parallel lines on the outside and more or less clear throwing ridges on the inside (cf. Courty and Roux 1995). The spiral traces on the inside and string-cutting traces on the outside of several objects (fig. V.27) show that the potters' wheel at Sabi Abyad turned in a counter-clockwise (CCW) direction.[141] Wheel direction was generally not noted when describing the pottery. Table V.4 describes the direction of spiral traces on a random sample of 9 vessels available to me in 2005. Spiral traces of the wheel direction during the shaping of the vessels are often visible on the inside of the vessel. Not all vessels still show the original direction of the wheel. Spiral traces on the outside of the vessel indicate the direction of the wheel when cutting the vessel off the cone or when finishing the vessel, but it must be noted that the vessel may have been placed up-side-down on the wheel at this stage, thus creating spiral traces in the opposite direction (see below, cf. Senior 1998: 381-384, 392). See fig. V.28 for a guide to the reading of spiral traces on pottery. Often turning or scraping has obliterated the spiral traces on the outside (fig. V.29).

Masterfile no.	*Type of vessel*	*Inside or outside*	*wheel direction*
P03-226	Carinated bowl 111	inside	CCW
P03-202	Goblet	inside	CCW
P03-212	Goblet 421	inside	CCW
P03-235	Goblet 421	inside	CCW
P03-208	Bowl	outside	CCW
P03-196	Carinated bowl 111	outside	CCW
P03-204	Carinated bowl 111	outside	CCW
P03-191	Carinated bowl 111	outside	CCW
P03-219	Carinated bowl 112	outside	CCW

Table V.4: Potter's wheel rotational direction as reconstructed from spiral traces on vessels.

Several techniques were used to make vessels on the wheel. Rim shapes can vary widely within and between wheel-made shape groups, and are often not the most informative part of the vessel when looking at shaping techniques.

Small bowls were thrown from the cone in one stage (fig.V.30 step 1-3, technology group A). They show spiral traces at their bases, made by cutting the bowl from the cone with a thread while the bowl was still rotating fast. Flat bases were mostly not finished further. Sometimes a ring base was added in a separate stage (fig. V.30 step 4): the bowl was placed on the rim so that the base could be scraped (turned) and the spiral cutting traces were smoothed away, after which the ring was attached. Throwing from the cone is a very fast technique that allows for the production of large quantities of vessels in a short time, especially when the vessels are shaped in one stage and are not finished off any further. The speed with which vessels are produced on the other hand influences the quality of the vessels and the care that is taken in finishing them. This is reflected in the high number of base cracks and oval or slanting shapes in these vessels, as described below. Moreover, Franken and Van As (1994: 508) found that the limited plasticity of Euphrates clays influences the shape of the pottery thrown from the cone: strongly curving walls are difficult to make without causing

[141] The same counter-clockwise direction was obtained with the experimental simple wheels at El Amarna: the potter pulled the wheel towards her with her left hand (Powell 1995).

cracks. Indeed, Sabi Abyad shapes that were thrown from the cone are mostly open shapes with flaring walls.

Goblets have been thrown from the cone as well (technology group A, fig. V.31), in two stages. The shaping technique, whereby the base of the vessel is finished after a drying period, was reconstructed with the help of unfired goblet fragments and is described in detail below.

Larger bowls, small and middle-sized jars and small and middle-sized pots were each thrown from one lump of clay (fig. V.32, technology group B). After throwing and a short drying period, the vessel would be put upside down on the rim (fig. V.32 steps 5-6), to scrape the lower body and base, to add a ring base (fig. V.36) or to finish the flat, pedestal or knob base. The fact that ring bases were added in a second stage, and were not thrown from the same clay body, is clear from numerous fractured bases in which the separate attachment of the ring is clearly visible. Large pots were possibly started with one lump of clay on the wheel. After a short drying period coils would be added to the "rim" to build up the vessel wall, after which the shape was finished further on the fast wheel. Franken and Van As (1994) suggested that the Euphrates clays are too short to allow for larger vessels to be completely thrown from one piece of clay.

Large jars were made in several steps: first two "cylindrical" parts were thrown (a base part and an upper part) which were later joined together to form the body (fig. V.33, technology group C, also described in Van As and Wijnen 2001). The rim was formed in a separate stage from the clay at the top of the upper part. The joint between the two halves was carefully closed and smoothed, and is rarely visible on the fired vessel (but see fig. V.34). The base of large jars often shows very deep throwing spirals on the inside, suggesting that the opening of a large amount of clay on the wheel was difficult (the wheel speed was barely fast enough). The vessel was sometimes stabilized with a rope during the shaping of the rim and the drying stage (cf. fig. V.34). The lower half and base of the vessel were often scraped in a separate stage some time after the shaping stage (perhaps together with the joining of the top part), perhaps on a slow-turning wheel. The scraping improved the vessel shape and made the lower vessel wall thinner and more even in thickness. Often an extra layer of clay with lots of organic inclusions was added on the inside of the base, to cover the deep throwing ridges and to prevent drying cracks (fig. V.35; cf. Van As en Jacobs 1992: 539). It is believed that this method of shaping in different pieces was not used for vessels with a diameter larger than approximately 30 cm, because then the prefabricated cylinders became unmanageable and the clay would tear (Franken and Van As 1994: 511, Jacobs and Van As in prep.). This corresponds more or less with the maximum shoulder diameter of the Sabi Abyad large jars.

Shaping in several stages, as described for the latter two groups, may leave a characteristic trace at the base. A lot of these vessels show an inside midpoint that is eccentric compared to the outside circumference. The wall thickness at the base is uneven. This could be due to initial careless centring of the clay at the first stage of throwing. This was probably the case when no traces of scraping are visible and when the differences in the wall thickness occur throughout the whole vessel up to the rim. It rarely occured, however. An uneven wall thickness at the base was more often caused in one of the subsequent shaping stages. In the first stage the vessel was thrown on the wheel. In a following stage, it was replaced on the wheel (but not centred in exactly the same spot as the first time), and clay was removed from the lower part of the wall by scraping. Because the vessel was not exactly in the same position as in the first stage, more clay was removed from one side than from the other, creating an uneven wall thickness and an eccentric midpoint on the inside (Rye 1981: 74, 87).

Many larger bowls, pots and jars, but sometimes smaller bowls as well, show "stretching" traces in the vessel wall. This is due to the leanness of the clay (see above and Appendix D) and is characteristic of wheel-thrown pottery (Van As and Jacobs 1992: 535-536).

Apart from shaping, the wheel was also used to make simple horizontal or wavy painted or incised decorations.

<u>Handmade shapes</u>
Handmade shapes (technology group E) include handles, spouts, large storage vessels and shapes that cannot be made on the wheel (e.g. rectangular shapes).

Very large storage vessels are too heavy to make on a fast-turning wheel (handmade storage vessels include types 212, 213, 215, 221, 222). Instead, they were partly or completely made by hand, by joining rectangular slabs or coils. These vessels were made in several different stages. First the base was made, either on the wheel or by hand, or with the support of a mould or a shallow pit (cf. for example Bresenham 1985: fig. 4). Often the lower part of the vessel was supported by ropes wound around the wet vessel, to prevent the wall from collapsing under the weight of the wet clay. This leaves characteristic rope impressions on the surface (cf. fig. V.38 and figs. IV.58.e, IV.67.d, IV.69.h). The edge or the 'rim' of this base part was then pinched between thumb and finger, after which it was allowed to dry. When strong enough to carry the weight of the upper wall, slabs or coils were attached to the pinched rim and firmly joined, forming the upper vessel part. The pinched parts on the joints act as a 'zipper': when the new part is added to the already dry lower part, the shrinkage of the clay fixes the joint (fig. V.38). After the attachment of new slabs or coils, the vessel could be rotated on a slow-turning wheel to finish the shape. The rim was joined in the same manner in a later stage (fig. V.40, 41). Often the upper part of the vessel and the rim show traces that are similar to wheel-thrown pottery. It is possible that the rim was added on a slow-turning wheel. The line along which the rim part was attached, some 15 cm below the rim, is often masked with an appliqué band of clay, imitating a thick cable. Vessels made in this way often fracture along the line where coils or slabs were joined. In the cross-section of the sherds a void is often visible between the joined parts. Sometimes finger impressions from pinching are still visible where joints have broken (fig. V.39). Some very large shallow bowls (type 1411) seem to have been made by hand, too, with the same slab or coil building method.

Rectangular boxes, low circular or rectangular trays and platters, a lid, large pot stands and some miniatures were completely shaped by hand. Spouts, handles and appliqués were shaped on the wheel or by hand, and were attached by hand after shaping the vessel. Sometimes these parts have more organic inclusions than the vessel body. This prevents their breaking off the vessel during the drying and firing stages, because of different drying and shrinking rates of vessel and added parts, which often differ in thickness. Handles generally have an oval or circular section. Ribbed handles rarely occur. The holes in the bases of small bowls, large storage vessels and strainer walls were also made by hand. Mostly these holes were made by piercing from the outside of the vessel, when the clay was still plastic. The edges of these holes are frayed and irregular, especially on the inside of the vessel. Sometimes holes have been drilled after the vessel was fired. Most of the decorations, especially elaborate appliqués, were made by hand on a stationary vessel.

<u>Techniques not applied at Tell Sabi Abyad</u>
The imported lentil-shaped, so-called "pilgrim bottles" were made out of one lump of clay, thrown closed in several steps (fig. V.42, technology group D). First, one side was thrown on the wheel, as if making a shallow bowl. Then this shape was closed again by turning the walls upwards and inwards until they closed, so that a lentil-shaped "balloon" existed, and no air could escape. In this way the vessel was firm enough for further treatment. The outside traces of throwing and cutting from the wheel head were removed. After a drying stage a hole was made where the diameter of the "lentil" is largest, and a spout was attached. A handle was attached to the spout and the shoulder of the vessel, and then the surface was smoothed or burnished. The sherds of these flasks are characterized by a carefully treated, mostly burnished outer surface, while the inner surface is not smoothed at all and shows fine throwing ridges (cf. also fig. D.52 showing the burnished outer surface and fig. D.53 showing

the rough untreated inner surface in thin section). At the largest diameter the absence of a seam indicates that the vessel was made from one piece of clay and not from two bowl-shaped parts joined together. A spiral navel is present at the centre of the flat sides of the bottle, on the inside, where the shape was closed. The edges of the spout have been left rough at the inside, because the spout is too narrow for the fingers to reach this point (cf. also Magrill and Middleton 2004: 2532-2539 for a description and illustrations of this technique). These shaping techniques as well as the wares used for making these vessels put the "pilgrim bottle" in a different technological tradition or group than the rest of the wheel-made pottery at Sabi Abyad. The archaeometric analyses in Appendix D confirm the foreign origin of these shapes.

Some very large imported cooking-ware vessels (cf. fig. IV.62.a) were partly or completely made by hand. The base of the vessel was probably made in a mould, after which coils were used to build the wall. These vessels were very carefully finished by scraping and burnishing, leaving a relatively thin, very even and smooth wall without sharp carinations. Other cooking-ware vessels were not studied by Jacobs, but could have been handmade or wheel-made. The part mould, part coil-building techniques, together with the careful burnishing, place the cooking pots outside the main Sabi Abyad shaping traditions. This is confirmed by the archaeometric analysis (Appendix D), which showed that many cooking pots came to the site from other areas.

A. Thrown from the cone	Small and medium-sized bowls and goblets, rim types 111a-c, 112a-b, 122a-c, 132a, 411, 421, 511, some miniatures.
B. Thrown from one lump of clay	Larger bowls, small and medium-sized jars and pots, cooking vessels (?), pot stands, rim types 113, 121, 122d, 123, 125, 131, 132b, 134, 141, 142, 143, 211a, 212a, 221a, 222a, 225, 311, 312, 315, 611.
C. Thrown in two parts	Collared rim large jars, rim types 321, 322, 323.
D. Pilgrim bottles thrown closed (import)	Rim type 911 and bases and handles belonging to these bottles.
E. Handmade (cooking pots partly imported)	Big storage pots, cooking vessels (?), special shapes, types 1411, very large 145 (rim diameter > ca. 410 mm), 211b, cooking vessel P93-308, 212b, 213, 215, 221b, 222b, 226, loose handles and spouts, trays, special shapes, varia.
Technique unclear	Unspecified body sherds, other rim shapes and vessel types not studied technologically (114, 115, 116, 117, 124, 127, 128, 129, 1210, 1211, 1213, 133, 135, 144, smaller 145 (rim diameter < 410 mm), 146, 147, 148, 149, 1410, 1412, 1413, 151, 214, 227, 228, 229, 2210, 2211, 2212, 2213, 231, 232, 313, 314, 316, 318, 324, 331, 332), loose bases not assigned to a shape category.

Table V.5: List of the vessel types made in each technological group.[142]

Surface treatment

After the initial shaping of the vessel, the surface could be treated further to improve the qualities and appearance of the vessel. This was very rarely done within the Sabi Abyad corpus. In 183 fragments (0.9%) the surface was burnished on the outside, inside or on both sides. Burnishing was done with a blunt hard tool on the leather-hard surface of the vessel. Polishing stones or bone tools could have been used for this task. The application of a slip is

[142] The classification in a technological group was not done in the field but during the processing of the data. In the field only the presence or absence of "wheel marks" was coded. Vessels were classified in a group based on vessel shape, rim type and rim diameter or vessel height (in the case of complete vessels), as shown in the table. Further classification was based on remarks in the database or on drawings. In the group of handmade large storage vessels, many rims have been coded in the field as being "wheel-made" due to the presence of rotating finishing marks on the rim fragment. These vessels, however, have been finished on a slowly turning wheel while the vessel itself was made by hand. The distinction made above between "small" and "larger" vessels is based as much as possible on analyses of vessel dimensions (bimodality or size groups, see appendix B). If size groups were not apparent within a rim type, the classifications were more or less arbitrarily based on rim diameter in comparison with other shapes in the same group.

even rarer. For only 40 fragments (0.2%) a real slip was recognized. The slip could have various colours: whitish and buff, grey-buff, but mostly slips were shades of orange, reddish-brown, dark red or dark brown. The analysis of sample no. 38 (Appendix D) showed that the raw materials for a dark-red slip are not available around Sabi Abyad. Red-slipped pottery was therefore probably not locally made.

Decoration

The pottery at Sabi Abyad was rarely decorated, as only 4.8% of all described fragments showed decoration. Different techniques were used for decoration. All are reasonably simple. Decoration was mostly carried out by incising lines with a blunt or slightly sharper object (Table V.6). Many vessels were decorated with applied decoration, in which a separate piece of clay was shaped and attached to the surface of the vessel, or with a combination of incision and application. Painted decoration occurred less often (this overview excludes the painted and incised marks that were identified as “potters’ marks”; see below for a detailed discussion of them). Painted and incised decoration was often carried out on a slowly rotating vessel. Impressed and applied decoration was mostly done on a stationary or occasionally rotated vessel.

Decoration	*%*
Painted	10.9
Incised	48.5
Painted + Incised	0.3
Applied	21.5
Incised + Applied	12.9
Impressed	5.2
Glazed	0.5
Total	100.0

Table V.6: Decoration techniques used at Sabi Abyad.

The patterns used on the vessels illustrate that decoration was in most cases carried out in a careless and irregular way. Little time was spent on patterns and motifs (Table V.7). The greater majority of decoration consisted of one (or sometimes more than one) horizontal line. These lines occur on the shoulder of the vessels or below the rim. Wavy lines were made by moving the tool up and down while the vessel rotated slowly. Often no attention was paid to whether the beginning and the end of the line would meet up neatly or not. A combination of horizontal and wavy lines was often carried out, either with incision only or with applied and incised decoration together. The greater majority of incised-and-applied decoration consists of a horizontal band of applied clay, often impressed with fingerprints to make it look like a thick rope, with a wavy incised line above and/or below this band. The indication “circles” in table V.7 is used to indicate a special pattern. A regular pattern of circles was impressed with a tubular instrument. Often triangles were cut out of the rim of the vessel. The circles and triangles were then filled with a white paste, probably gypsum (cf. fig. IV.45.i). Motifs classified under “other” include a wide range of different patterns and shapes. With painted decoration, they include irregular lines and blobs and unrecognizable patterns, as well as very detailed and fine “Nuzi” style decoration. Incised “other” patterns include more complex combinations of wavy lines, straight lines and impressions, often with double lines. Applied “other” decorations vary from vertical “handle”-like applications on the rim of pots, to applied human and animal figures (cf. figs. IV.61.g, IV.64.a, b).

	Painted	Incised	Painted + Incised	Applied	Incised + Applied	Impressed
Horizontal	34	172	1	107	2	
Wavy	1	66		11	4	
Horizontal + wavy		38			69	
Other	30	12		10	2	1
Circles			1			30

Table V.7: Patterns of decoration.

A special kind of decoration is represented by the cut-out technique: holes cut out of the wall of pot stands. The holes are oval, triangular or rectangular in shape (cf. fig. IV.92.k, l, IV.111.k-n). The edges of the holes have been smoothed. Six stands show this kind of decoration, one combined with applied decoration. Possibly the cut-out shapes do not only have a decorative effect but a functional aspect as well, by allowing some ventilation under the base of the vessel that is set in the pot stand.

Details of surface treatment and decoration were discussed in the chapter on typology and chronology (Chapter IV), where the characteristics of the ceramics have been presented per level.

Unfired pottery fragments

Unfired pottery is one of the clearest pieces of evidence for the local production of pottery. Fired pots may have been transported from the place of production to sites at a considerable distance, especially when they were transported as containers for other goods. Unfired pottery, like kiln wasters, was certainly not transported anywhere, but discarded at the site of production. Unfired waste of pottery production may also provide new insights into the techniques of production. The shapes of the unfired fragments give some indication of the range of shapes produced by the local workshop(s). Unfired fragments have mainly been found in deposits from level 6 and level 5, while some fragments come from level 4. They are often related to the pottery workshops and kiln locations (see above, paragraph V.5).

<u>Fragments of vessels (figs. V.43, 44, 45)</u>
In total at least 61 rim fragments of vessels were found, of which five could be fitted to base fragments therefore forming a complete profile. At least 55 pieces were base fragments of vessels. Furthermore, several hundreds of body fragments were found, sometimes recognizable as coming from bowls, jars or goblets.

Level 6
In total 19 rims, 2 bases, and many body fragments have been found in level 6. A small number of fragments comes from the Assyrian moat in square G7, in the northwestern part of the site, and may be dated to level 6.[143] The fragments from square G7 include one type 323 jar rim (fig. V.44.g) and some body sherds of a jar, several small fragments of type 111 carinated bowls, a body sherd possibly from a pot and several other body sherds. All rims and body sherds have organic inclusions (ware I).

The majority of unfired vessel fragments (rims, bases and body fragments) from level 6 come from the workshops in the east of the site. They were found mainly in room 2b, the fill of kiln L in square N12, and amongst the fragments of cuneiform tablets in square O10. A few isolated fragments come from rooms 3, 4 and 5, the open area south of the courtyard in square N12, and the open area around kiln Q in square N11 and square N10. From room 1,

[143] G7 lot 90, 95 and 167.

the main workshop area (see above), there are several thick fragments of a hand-formed squarish bin (fig. V.44.i, j, k). Perhaps feature J in this room can be interpreted as a large unfired pot (similar to type 221) set into the corner of the room (see above with the discussion of room 1). Unfired-clay waste that is left over during the shaping process (see below) was found mainly in room 1 and room 2b, as well as in the open area north of kiln Q in square N10, while many pieces and lumps of clean kneaded clay without further shape were found in room 1, the fill of kiln L (more than 1 kg!), the fill of kiln Q (one piece) and the outer area in squares N11 and N10. It can therefore be suggested that the shaping of vessels apparently took place in rooms 1 and 2 (a and/or b), while the finished but still unfired vessels were dried or stored in rooms 1, 2b, and in the outer area around kiln Q, as well as perhaps in rooms 5 and 3 (cf. fig. V.3). Interestingly, the unfired fragments from room 2b mainly comprise fragments of goblets and bowls, while those from room 5 are all from jars.

Recognizable unfired vessel fragments from level 6 include a wide variety of shapes. Apart from eight fragments of type 111 carinated bowl rims (figs. V.43.g, h, i), single fragments were found of a type 113 bowl (fig. V.43.l), a type 132 bowl (fig. V.43.m), a type 142 deep bowl (fig. V.44.c), a burnished type 212 closed pot with incised lines on the shoulder (fig. V.44.d), a 315 jar (fi. V.44.e), a 322 and a 323 jar and a type 421 goblet (fig. V.44.n). Base fragments included two ring bases (fig. V.45.c, type 741). Among the body fragments there were thin pieces belonging to goblets, one strainer fragment (type 511), many fragments of carinated and other bowls both large and small, 9 fragments of a jar with an incised line on the shoulder, other jar body sherds, and one fragment of a neck of a small fine-ware jar or goblet with a horizontal incision (cf. fig. V.44.s). The fragments of goblets were all made of a fine clay without any organic inclusions (ware B), while the other sherds were all made of the common fabric used for most ceramics at the site, ware I with organic inclusions and small particles of calcite and sand.

Level 5 East

In total at least 16 different rim fragments, more than 12 different bases, and many body fragments of unfired clay were found in the level 5 East workshop. Isolated finds came from room 1 (one fragment), courtyard 3 near the door to room 1 (a small wedge-shaped piece), and a later level 5 floor in room 8 (a carinated bowl body fragment, three discs left over from pottery shaping and a clay cylinder (see below). In the open area to the east, the former location of the level 6 workshops, a 322 jar rim (fig. V.44.f), several body fragments from jars, and several fragments of production waste were dumped. In the open area to the north, in square M10, a group of unfired fragments was found as well, including a fragment of a large storage pot (perhaps type 221), a rim fragment of a bowl (type 111, analysed in Appendix D (SN96-130), a ring base, a thick body sherd, one disc and several lumps of pottery production waste.

The large majority of unfired vessel fragments and waste from pottery production came from different locations in courtyard 2. Here, next to the door into the house, a concentration of unfired vessel fragments was found, including four goblet rims (3 type 421 and 1 type 411 fragments, fig. V.44.l, m, o, p), one goblet base (fig. V.45.a), many goblet body-sherds, three small carinated bowl rims (fig. V.43.a, b, e) and several body fragments, a ring base (fig. V.45.i) and three unclear bases, and some thicker body-sherds perhaps belonging to bowls or jars. In the same concentration more than 25 fragments of disc-shaped waste from shaping bowls and goblets (fig. V.46.g, h) as well as three unbaked clay lumps were found as well (see below). In the north of the courtyard, between the concentration of damaged and repaired fired goblets and bowls, there were five rim fragments of straight-sided bowls (fig. V.43.n-q, t and fig. V.47), a large carinated-bowl rim fragment (fig. V.43.j), two flat bases, and a wall fragment of a thick-walled bowl or trough with cut-out holes in the wall (fig. V.44.t). Furthermore, in the fill of kiln AC/AI, many fragments[144] of unfired vessels were

[144] I did not have the opportunity to see this collection myself.

found, including four goblet bases, body-sherds, rim sherds, lumps of clay and disc-shaped left-overs from pottery shaping. The vessel fragments in this collection were all clearly deformed when the clay was still wet. The fragments of goblets were all made of a fine clay without any organic inclusions, sometimes with some fine-sand inclusions (wares B and C), while the other sherds were all made of the common fabric used for most ceramics at the site, ware I with organic inclusions and small particles of calcite and sand.

There seems to be a difference between the unfired vessel fragments found next to the door to the house (including mainly goblet and small bowl fragments) and the fragments found in the north of the courtyard (mainly belonging to larger bowls and thicker walled vessels). Perhaps they are waste from two different production occasions. Unlike the unfired fragments, the fired vessels in the north of the courtyard were mostly small bowls and goblets (see above with the discussion of production locations).

Level 5 West

In total at least 30 different rim fragments, parts of at least 37 bases, and a large amount of body fragments of unfired clay were found in the western location. Isolated finds come from the large courtyard in square I9 (a goblet-base fragment type 711), the courtyard in square H9 (a disc-shaped leftover from production), the northern small room 17 (a cylinder related to production waste), and from the lower fill of the corridor between the cuneiform tablets (a ring base type 741).

Most unfired vessel fragments were found in the fill of updraft kiln H/AE and in the upper fill of the corridor. In the fill of kiln H a strainer rim fragment (fig. V.44.r), six small carinated-bowl rim fragments (fig. V.43.c, d, f), a goblet (fig. V.44.q) and several goblet body sherds, five flat bases (fig. V.45.d), two unclear bases and a bowl that was not cut off from the cone (fig. V.46.a, see below), several body fragments of large jars, about 700 gr of body sherds belonging to a larger vessel, and five disc-shaped leftovers from pottery shaping (fig. V.46.d-f, see below) were found.

In the upper fill of the corridor a large variety of rim fragments and other pieces was found, including a goblet rim fragment (type 421), two rims of jars (type 322 and 315), a rim of a type 221 pot, two rims of deep bowls (fig. V.44.a, type 145 and 143), six rims of type 141 bowls (fig. V.44.b), a type 135 bowl rim, seven rims of straight-sided type 131 bowls (fig. V.43.r), and two rims of carinated bowls (type 111, diameter 170 mm). Furthermore, five goblet bases (type 712), a pedestal base (type 721), ten flat bases (type 731), four ring bases (fig. V.45.j, k, type 741), and six bases of which the shaping had not been finished (with the "disc" still attached, see below and fig. V.46.i-k). Body fragments include pieces of goblets (n=2), a strainer (n=1), a base fragment with a hole from a large pot (n=1), body fragments of a deep bowl (n=16), of jars (n=42) and a large pot with a cable appliqué band (n=3), as well as about 200 body fragments of unidentified vessels. A lot of waste from shaping was also found in the upper fill of the corridor, including 52 discs left over from shaping, three cone/cylinder shapes, and about 500 gr of lumps of kneaded potters' clay. Like the other unfired vessel fragments, the fragments of goblets were all made of a fine clay without any organic inclusions, sometimes with some fine-sand inclusions (wares B and C), while the other sherds were all made of the common fabric ware I with organic inclusions and small particles of calcite and sand.

Level 5 North

Very few unfired vessel fragments were found in the northern level 5 location around kilns CJ/V and AR. A body sherd was found in square K8, three pieces of kneaded potters' clay in square K9, and two discs left over from pottery production were found in square M7, perhaps in the Assyrian moat. Diagnostic fragments were not found in this area.

Level 4
In level 4, around kiln K in square J7, unfired fragments have only been found in square J6 in an open area north of kiln K. These fragments include seven flat bases (type 731), and 22 pieces of waste left over from pottery shaping.

The unfired vessel fragments are often damaged, folded, squeezed or otherwise deformed, and sometimes fragments stick together. Many fragments have lumps of clay stuck to their surface, as if they have been pressed together with other waste fragments. This obviously happened when the clay was still plastic. Apparently the shaping of some vessels failed, while others were damaged while standing to dry. The large diversity of the vessel types found together in dumps of unfired vessel fragments might indicate that different vessels were shaped or dried together in the same production event, or that the same workshop or potters produced a large variety of vessel shapes.

Waste from shaping vessels
An interesting group of unfired pottery fragments does not consist of vessel fragments, but of fragments that may be identified as waste from the shaping of vessels.

More than two kilogrammes and many separate pieces or lumps of kneaded pottery clay have been found in all locations where unfired vessel fragments were found. Apparently these pieces of clay were never used again for shaping vessels.

More than 150 disc-shaped pieces of unfired clay (figs. V.46.c-h, V.48) provide an interesting clue for understanding shaping techniques. These discs are between 2.8 and 4 cm in diameter. In most cases both sides show spiral string or knife cuts. One side appears to have been incised before the piece was cut, with the string cut just on the incision (cf. fig. V.48, the top two discs on the right). Some unfired bases of an unusual shape, not present among the collection of fired pottery, can be compared with these discs (fig. V.46.i-k). They are bases of goblets, but instead of a nipple or knob base the base part is disc-shaped, with a deep horizontal incision. The shaping technique may be reconstructed as follows (cf. fig. V.31). The goblet was shaped on the wheel, thrown from the cone. An incision was made at the base side to indicate the proper final thickness of the base. Then, the vessel was cut from the cone a bit below the incision, so that a 'disc' was left attached. The vessel was then put aside to wait for the next shaping stage (the finishing of the base). Perhaps the disc was left attached to prevent the base from drying too quickly before it could be finished, or to provide the goblet with a stable support so that it could dry without having to put it on its still wet and fragile thin rim. When dry enough, the vessel was then put rim-down on the wheel, perhaps on a support (as indicated by traces of sticking on the inside wall of many straight-sided goblets; perhaps the support was a clay cone like fig. V.51?). The disc was cut off with a string or knife, while the incision indicated the spot where to cut, so that the base would not become too thin. Then the base was scraped and shaped into a nipple or knob shape with a sharp knife and wet hands (fig. V.31).[145] The discs consist both of ware B and C (used for goblets) and ware I (of which small bowls are usually made). Some evidence for similar procedures in shaping bowls (perhaps in case a ring base was intended) is provided by a carinated bowl with an unfinished base (fig. V.43.c). A second carinated bowl still attached to a long cylindrical piece of pottery clay (fig. V.46.a, V.49) may suggest a similar technique. The cylinder is clearly wheel-thrown but not smoothed, and a finger impression shows it was pressed a little when it was lifted. The bottom shows string cuts. This cylinder most probably represents the last bit of clay left on the wheel. A few other fragments of similar bowls with unfinished bases and loose cylinders have been found among the unfired pottery fragments (fig. V.50). These cylinders, however, never show incisions like the discs. A further support

[145] For pottery from second millennium Iraq, Franken and Van As, too, remark that it appears to be very difficult to create bases with a correct thickness in goblets. But the Old Babylonian and Kassite potters found another technical solution to the problem (Franken and Van As 1994: 508).

for the above reconstruction can be found in the spiral direction of the string and knife cut traces on the discs. We have seen above that the rotational direction of the potters' wheel was counter-clockwise (ccw). Most discs in which spiral direction could be established show spiral traces of string cutting in the same direction on both sides. This is only possible when one side of the disc was cut off while the piece was upside down on the wheel. In some pieces the knife cut left a spiral trace in opposite, clockwise direction. This indicates that the knife cut was made when the piece was still standing upright on the wheel.

Similar base "slices" have been found in the pottery workshop at Tell el-'Amarna, Egypt. They, too, are interpreted as leftovers from the last stage of shaping the base, by cutting off the excess clay from the base with a string (Rose 1993: 128, fig. 136).

A question that may be asked with regard to these unfired fragments, is why they were not reused to make other pots? Since the clay was unfired, it would have been easy to remoisten it and make it plastic again, or to knead and store the still wet clay. This would save the time and effort of acquiring new clay and cleaning it. It is possible that the resources of pottery clay were so abundant and easy to process that recycling of unfired clay was not seen as profitable. However, another reason for throwing away unfired and even unshaped clay without reusing it in a next shaping session could be that there was no such next session and therefore no reason to recycle the clay. If true, this would mean that pottery production did not take place continually, but that there were intervals during which no pottery was produced. These intervals would have been longer periods, so that the storage of wet clay was no option. Maybe this was the case in winter, or when the potter was busy at other sites or in agricultural work.

Firing procedures

After the vessels had dried thoroughly, they were packed in the kiln for firing. It is not known what kind of fuel was used, as the ashes left in the kilns did not yield any macroscopically visible parts and their composition was not analysed. Considering the environment of Sabi Abyad, dung cakes, agricultural refuse and steppe shrubs are good candidates for fuel.

The effects of firing circumstances, such as the duration, temperature and atmosphere of firing, are visible in the end product. They influence the colour of the core and surfaces on the inside and outside of the vessel, and the hardness and porosity of the fabric. Consequently, colour, hardness and porosity may theoretically be used to estimate the firing circumstances. This will, however, yield only a very general indication of firing circumstances, as the exact circumstances can only be established in detail by archaeometric research. Re-firing experiments and thin-section analysis may be used for this purpose (cf. Appendix D and Chapter II).

For the purposes of this chapter the exact firing temperature of the pottery is of little interest. It is more important to draw conclusions about the control of the potter over the firing process, and the desired quality of the products (Rice 1987: 435). Therefore I believe that a general, rough estimation of firing temperatures, duration and atmosphere is sufficient. The methods used to describe colour, temperature and atmosphere were described in Chapter II. The data recorded in the field will be used here, although with due caution and with the comments regarding the difficulties and inaccuracies of estimating firing temperatures (discussed in Chapter II) at the back of our minds.

Firing atmosphere

The colour of pottery is influenced by the composition of the clay, mainly by the presence of iron, calcite and organic matter. Iron gives the pottery reddish colours when fired in an oxidizing atmosphere. When the clay is fired above approximately 1000 ºC, calcite reacts with iron and produces a yellowish to olive green colour. Organic matter in the clay leaves a grey to black colour (Rice 1987: 333-336). All locally made pottery was made of clays with the same basic mineral composition and would therefore fire to similar colours in similar circumstances and with similar added inclusions.

A second factor that is of great importance for the colour of the vessel are the firing circumstances (Rice 1987: 335). Three different firing circumstances have been distinguished for the Sabi Abyad pottery. They have been identified on the basis of the degree of burning out of organic matter (carbon) from the sherd. *Oxidizing* circumstances prevailed when enough oxygen (fresh air) was present in the kiln. This allowed the full combustion of any organic matter in the clay. An oxidizing atmosphere yields clear colours throughout the sherd's fracture. When organic matter was not completely burnt out (leaving a dark grey or black core), this points to an *incompletely oxidizing* atmosphere. Oxygen was not sufficiently available during the firing (or parts thereof), and/or the vessels were fired for too short a period or at too low temperatures to allow complete oxidation (see below). *Reducing* firing circumstances yield dark-grey and black sherds and fractures. In this case oxygen was scarce and organic matter did not burn out completely[146] (see chapter II, and Rice 1987: 343-345). As is clear from table V.10, pottery with organic inclusions more often has a dark core than pottery from clays with only mineral inclusions, as would be expected because the dark core is due to organic inclusions in the clay. The fact that vessels with only mineral inclusions sometimes show dark cores, too, indicates that the carbon was probably present in the atmosphere of the kiln due to the fuel and to a mixed kiln load consisting of both wares with organic and mineral inclusions. This very general indication[147] of firing atmosphere does not tell us anything about the variations in atmosphere that may have occurred during firing, adding of fuel and cooling. Occasionally sherds were found that have a "multiple" sandwich fracture, with alternating layers of brighter and darker colours. These may point to a variable kiln atmosphere. The pottery from Sabi Abyad shows little variation in firing circumstances, most vessels having been fired in oxidizing or incompletely oxidizing kiln atmospheres. The words "incompletely oxidizing" may suggest to the reader that the potter did not or not completely control the firing process. However, incompletely oxidized vessels have attained the same surface colour as the completely oxidized vessels and are of the same quality. To the potter and his customers, incompletely oxidized vessels consequently did not differ from completely oxidized ones. It is clear that the potters at Sabi Abyad had sufficient control over the firing procedures to make suitable vessels.

Surface colours / *Atmosphere* *Core*	Brown, dark red	Grey, black	Light red, orange, buff	Buff, cream, greenish
Oxidizing	Same, other		Same, other	Same, other
Incompletely oxidizing	Dark		Dark	Dark
Reducing		Same/dark Other: reducing in last stage of firing		

Table V.8: The relation between firing atmosphere and surface and core colours. Core colours: same= same as the surface colour. Dark= grey or black. Other= other than the surface colour but not grey or black (red, orange, buff, etc.).

[146] Thin-section analysis of one sherd described as fired in reducing circumstances showed that it seems actually to have been fired under incompletely oxidizing circumstances and at a low temperature (Appendix D, sample 16). Possibly not all sherds described as such were really fired in reducing atmospheres.

[147] That the estimate of firing circumstances must stay general is also illustrated by the fact that core colours may vary with the thickness of the sherd: often the carbon has burnt out completely in the thinner upper wall of the vessel, while a dark core remains in the thick base. So it may depend on the remaining vessel part which atmosphere is coded for. Surface colours, too, may vary considerably in a single vessel.

Ware	Oxidizing	Inc. oxidizing	Reducing	Total
N	41 97.6%		1 2.4%	42 100.0%
A	297 96.1%	4 1.3%	8 2.6%	309 100.0%
B	645 97.9%	6 0.9%	8 1.2%	659 100.0%
C	116 84.1%	9 6.5%	13 9.4%	138 100.0%
D	27 84.4%	1 3.1%	4 12.5%	32 100.0%
E	1 12.5%	7 87.5%		8 100.0%
F	1 100.0%			1 100.0%
G	173 95.6%	6 3.3%	2 1.1%	181 100.0%
H	1856 91.8%	141 7.0%	25 1.2%	2022 100.0%
I	7494 85.9%	1126 12.9%	105 1.2%	8725 100.0%
J	387 83.2%	51 11.0%	27 5.8%	465 100.0%
K	5 50.0%	2 20.0%	3 30.0%	10 100.0%
L	1 50.0%	1 50.0%		2 100.0%
M	4 100.0%			4 100.0%
Total	11048 87.7%	1354 10.7%	196 1.6%	12598 100.0%

Table V.9: Numbers and percentages of sherds fired in different kiln atmospheres split according to ware.

Ware	Atmosphere	Oxidizing	Inc. oxidizing	Reducing	Total
Group X (mineral inclusions)	No. % of group X % of atmosphere	1100 95.7% 10.0%	19 1.7% 1.4%	30 2.6% 15.9%	1149 100.0% 9.2%
Group Y (organic inclusions)	No. % of group Y % of atmosphere	9915 87.0% 90.0%	1324 11.6% 98.6%	159 1.4% 84.1%	11398 100.0% 90.8%
Total	No. Total row % Total column %	11015 87.8% 100.0%	1343 10.7% 100.0%	189 1.5% 100.0%	12547 100.0% 100.0%

Table V.10: Comparison of ware groups and kiln atmosphere.
A Chi-Square test indicates that sherds with a “sandwich” are significantly more often made of wares with organic inclusions.

The atmosphere that prevailed during firing must also be seen in relation to the kilns used. At Sabi Abyad only updraft kilns seem to have been used. When an updraft kiln has an open top that is only temporarily covered during firing, it is impossible to fire in a reducing atmosphere (Rhodes 1968: 123, Golvin et al. 1982: 74). To create a reducing atmosphere (yielding black colours), the kiln has to be completely closed so that no oxygen can enter the kiln atmosphere. In an updraft kiln with a closed top and a door at the side, a reducing firing is possible but difficult. All openings including flues, stoke hole, door, and so on have to be completely closed (Swan 1984: 34, 35; Rye 1981: 100). A black surface colour may have been desired for esthetical reasons. Not only the design, but also the remains of the kilns may provide clues about the firing circumstances. It has been suggested that the quantity and texture of the ashes left after firing reflect the atmosphere in the kiln during firing. Swan (1984: 41) notes: “In an oxidizing firing the fuel becomes completely burnt out, leaving little ash. In a reducing firing however, wood stoked into the flue and furnace chamber to burn up excess oxygen at the pre-cooling stage, immediately before the flue-mouth is sealed, carbonizes and remains as a layer of abundant charcoal fragments and black ash”. The kilns at Sabi Abyad all have a thin layer of very fine yellowish to light grey and black ashes at the bottom of the fire chamber. Virtually no fragments of charcoal were found, except for the kiln in K8 where small charcoal pieces were found (cf. Appendix C). So both the design of the kilns and their contents suggest that pottery was not fired in reducing circumstances at the site.

Temperature and duration of firing

The properties of a fired vessel depend for a large part on the firing temperature and the duration of the fire. These two variables are closely interrelated, and without archaeometric research it is almost impossible to separate the two. A high-temperature fire for a short while may have exactly the same result as a lower-temperature firing for a longer period. There is some evidence from ethno-archaeology to suggest that pre-industrial potters did not “soak” the fire (keeping the fire at maximum temperature for a longer period) but that after reaching the maximum temperature the kiln was almost immediately allowed to cool down (Rice 1987: 435; Golvin et al. 1982; Nicholson and Patterson 1989: 79). In the absence of archaeometric research on this specific topic for the Sabi Abyad material, the temperature of firing and the duration will not be discussed separately, and will inevitably remain very imprecise. Firing temperature is roughly estimated on the basis of sherd colours, along the lines described in chapter II.

	Number	*%*
“High” temperatures (ca. 950-1000 °C)	1925	15.3
“Medium” temperatures (ca. 800-950 °C)	10324	81.9
“Low” temperatures (ca. 700-800 °C)	354	2.8
Total	12603	100.0

Table V.11: Frequencies of roughly estimated firing temperatures.

It is clear that a large majority of the pottery was fired in the range of “medium” temperatures, while one out of seven vessels was fired at high temperatures. This means that the potters controlled the firing temperatures well, and aimed at well-fired vessels and perhaps at light colours. At the same time they tried to avoid creating wasters by firing at too high temperatures, to judge by the extremely small number of over-fired wasters found at the site (see below).

The firing temperatures also have to be considered in relation to the used kilns. It was no technical problem to reach temperatures up to 1000 °C (Akkermans and Duistermaat 2001; Rhodes 1968: 16). In an updraft kiln the heat is relatively unevenly distributed through the kiln load, because of the upward draft. This results in local overheating (Rye 1981: 100). Firing experiments in an updraft kiln in Egypt have shown that the temperature near the kiln floor was higher than at the top of the load. Consequently, the number of greenish coloured vessels and wasters due to over-firing was significantly higher in the lower part of the kiln load than near the top (Nicholson and Patterson 1989). Once a potter knows the characteristics of his kiln, he can try to reduce firing losses caused by over-firing by placing vessels that can stand higher temperatures in the “hot” spots and delicate, thin-walled vessels higher up in the kiln load where temperatures are lower (Swan 1984: 38). If this is true, it may be possible to draw some conclusions on the loading of the kilns, by comparing the estimated firing temperatures or colours with vessel shapes.

In table V.12, vessel shape and firing temperatures are compared. When we look at the percentages for each vessel shape, it seems that pot stands are more often fired at high temperatures than expected. Next are pots, which also seem to have been fired at higher than average temperatures. Could it be that pot stands, and perhaps pots, were fired lower in the kiln load and other shapes higher up? Indeed, the pattern of firing temperatures in pot stands is statistically significant: pot stands are generally fired at higher temperatures. There are 26 wasters resulting from over-firing (see below). Eight of them are pot stands (30.7%), and nine are bowls (mostly type 111). If vessel shapes were equally distributed within the group of wasters (each vessel shape having the same chance to become a waster), the expected numbers of pot stands and bowls within the group of wasters would be 0.75 (2.9%) and 10.45 (40.2%), respectively. So pot stands are strongly overrepresented among wasters, again suggesting that they were packed in the lower part of the kiln load during firing.

	High temperatures	*Medium temperatures*	*Low temperatures*	*Total*
Bowls	670	4280	119	5069
	13.2%	84.4%	2.3%	100.0%
Pots	164	511	35	710
	23.1%	72.0%	4.9%	100.0%
Jars	341	1762	53	2156
	15.8%	81.7%	2.5%	100.0%
Goblets	69	396	12	477
	14.5%	83.0%	2.5%	100.0%
Pot stands	133	248	2	383
	34.7%	64.8%	0.5%	100.0%

Table V.12: Vessel shape related to firing temperature.

Wasters and other production damages

Firing losses

Firing is the most risky stage of pottery production. Chances are big that part of the production will be lost due to under-firing, over-firing or cracking. For updraft kilns Rice (1987: 173 table 6.1) estimates a rate of 12-20% of firing losses per kiln load on the basis of ethnographic studies. Other reports of modern firings in updraft kilns give rates of 5% wasters (Nicholson and Patterson 1989: 80) or only 2% (London 1989b: 76). The presence of wasters is often taken as an indication for the existence of a pottery production site (Rice 1987: 179-180), but ethnographic studies show that the occurrence of large amounts of wasters near production localities is rare because sherds are immediately used for various other purposes (e.g. London 1989b).

Wasters are generally defined as vessels that have become so damaged during firing that they are unusable or unsaleable. This is a slightly problematic definition if working with archaeological material, because whether a vessel is unusable or not is a matter of judgment by the potter and the user. A vessel may have cracked during firing so that it was unsuitable for holding liquids, but it may still have been suitable for dry goods. In many cases minor damages were repaired (see below), so that the vessel was still usable. Another problem is that it is often impossible to infer from fragments (sherds) whether the original vessel was usable or not. In this study a waster is defined as a piece of pottery that has become totally and obviously unusable, because of the following reasons:

- Over-firing to such an extent that the clay became vitrified and extremely brittle, and the shape warped. This includes molten and fused pieces, but not the greenish and sometimes brittle vessels that were fired at high temperatures but retained their shape and are otherwise apparently undamaged.
- Cracking caused by firing, to such an extent that the vessel could clearly not have held any contents. Traces of repair must be absent.

Wasters from updraft kilns such as the ones used at Sabi Abyad are most likely to be over-fired (Rye 1981: 100) or cracked. Under-fired vessels, with a soft and brittle fabric resembling unfired clay, were not found at Sabi Abyad. At Sabi Abyad only 33 vessels and fragments were defined as wasters, out of a total of 19,562 coded diagnostics (or 0.2%). This seems to be a rather small number, but many of the vessels that were damaged in the production process were not complete wasters. The rate of firing losses must have been higher than these 33 wasters suggest (since cracked vessels are unrecognizable among sherds, and complete wasters were possibly disposed of in dumps that have not all been excavated), but the rate of recycling and repairing of damaged vessels seems to have been high as well (see below). In any case, there is no evidence for very high firing losses, suggesting at least that the potters controlled the firing process well. Perhaps it is reasonable to assume a rate of 5% of firing losses at the most. Vessels and fragments described as wasters can be found in figs. IV.30.h, IV.33.y, IV.40.c, m, s, IV.41.h, IV.42.i, IV.43.d, h, IV.74.k, IV.90.ac, ah, and fig. IV.91.ac.

Most wasters (n=26) were severely over-fired, so that the clay turned bright green or green-grey. The fabric was vitrified and brittle (as in fig. V.52, see also fig. D.29), while the shape of the vessel was seriously deformed due to warping. The best example of this is perhaps the large jar with a completely warped rim found in room 1 of the level 6 pottery workshop (fig. V.53). Many over-fired wasters are pot stands (n=8, see above and fig. V.54), but carinated type 111 bowls (n=7), a type 131 straight-sided bowl and a type 141 bowl, a goblet type 421, three bases (721, 731 and 741) and some body sherds were found, as well as a number of unrecognizable molten pieces. Most are made of ware I or H (with organic inclusions and calcium, and sometimes a little sand), while the over-fired goblet was made of ware A (a fine clay with some calcium inclusions).

Only five vessels or fragments with severe cracks were identified as wasters. This is mainly due to the fact that cracked vessels are unrecognizable if not complete. Also, the potters made great efforts to use or repair even severely cracked vessels. One complete type 311 jar (from kiln H/AE, fig. IV.74.k) had a wide crack running spirally all along the circumference of the lower body, as well as some base cracks that extended into the wall. The jar did not show any signs of repair and would actually have been unusable. The other vessels that were severely damaged by cracks include a carinated type 111 bowl and three goblets (types 412 and 411) (from the level 5 East workshop, figs. IV.43.h, IV.90.ac, ah, IV.91.ac). The cracked vessels were made of ware I or of ware B (fine calcium and sand, for the goblets).

At Sabi Abyad kiln wasters occurred in very small quantities all over the settlement, with two concentrations. The first was in square H8, where seven wasters were found (in kiln H, in room 14 near the kiln, and in the corridor and two rooms north of room 14), most of them in a fill that also included unfired pottery waste. The other concentration was in square M11, in the level 5 East workshop. Here, too, amounts of unfired pottery were associated with the wasters. Moreover, the wasters here were mainly cracked vessels, while many damaged vessels had been repaired (fig. V.55, 56, and see below). Kiln wasters were also found in the squares surrounding the workshop in M11, in square K8 and L8 (in the vicinity of kilns CJ/V and AR), and in the squares where the workshop in level 6 is located (N11, N12, O12, O13, each one piece only). Although most wasters were actually found near the kilns, no large heaps of wasters were found in their immediate surroundings or anywhere else. Perhaps the rate of kiln losses was not very high, but there are other ways for damaged vessels not to end up next to the kiln. Damaged vessels may have been repaired or reused for other purposes on a large scale. Sherds may have been used as tools in pottery or other craft production, or as pavement and filling material. Wasters and other production waste may have been dumped in particular places rather than simply around the kiln, especially considering the location of the kilns close to or inside inhabited areas.

<u>Minor damages from firing, drying and shaping</u>

Damages that occurred during the pre-firing stages of production (shaping and drying) could never have been so severe as to make the vessel unusable: in that case the vessel would not have been fired at all. The unfired pottery fragments discussed above perhaps belong to this group. Minor cracks from drying may have been almost invisible or deemed not serious, although they could later become worse during firing. But as long as a vessel seemed to be usable, the potters did not seem to care much about some minor damages that occurred during shaping or drying and proceeded to fire them.

Cracks

Spiral, S-shaped or star-shaped cracks have been found in 686 bases (3.4% of all sherds, 9.2% of the total amount of described bases). These cracks occurred during the drying or firing of the vessels. Tiny drying cracks may have increased during firing, when the clay shrank further. Table V.13 shows the distribution of base types with cracks. The percentage of these base types in the total database is given as well. It appears that flat bases are overrepresented in the group of bases with cracks. The presence of most base cracks in flat bases is related to the shaping technique. When vessels are thrown from the cone and the base is not finished further, the clay forming the base cannot be pressed to push out the air in the pores. A large risk then exists of the base cracking during drying (L. Jacobs, pers. comm.). Most base cracks started on the inside of the vessel, and often the crack extended through the vessel wall. Base cracks occurred far less often only on the outside. Perhaps this can be taken as an indication that the vessels were put to dry on their bases, so that the outside dried slower (and therefore cracked less) than the inside.

In jars base cracks sometimes occurred during drying because the vessel wall was much thicker at the base than at the lower body. Often the potter tried to prevent or repair this type of base crack by covering the inside of the base with a second layer of clay after the vessel had dried. This second layer contained a lot more organic inclusions than the original vessel clay. The fact that such measures were taken indicates that some care was taken to prevent firing losses (Van As and Jacobs 1992: 539). Moreover, the extra clay layer made the inside of the base smoother, by covering the often very deep throwing spirals. This may have been important to prevent people from hurting their fingers when reaching for the contents in the jar. In total 265 bases (3.6% of total amount of bases) were covered by such an extra clay layer on the inside. The majority of them were ring bases (96.2%), and most of them belonged to jars. In only 13 of them base cracks were noted.

Minor base cracks generally did not make a vessel unusable. Many vessels seem to have been used even with base cracks, perhaps for solid contents only. Only 16% (n=110) of cracked bases were repaired before or after firing (see below, and cf. Appendix G).

Base type	No.	% of bases with base cracks	% of bases of this type in the database
711	11	2.3	6.4
712	29	5.9	6.0
721	11	2.3	4.6
731	315	64.5	36.7
741	119	24.4	44.9
751	3	0.6	1.3
Total	488	100.0	100.0

Table V.13: Number and percentage of bases with base cracks, according to base type. A Chi-Square test showed that flat bases show base cracks significantly more often than other bases.

A small number of sherds (1.1% of all described sherds) shows cracks other than base cracks. Vertical cracks in the rim or cracks more or less horizontal and parallel to the throwing ridges may occur during drying and firing. During the drying stage small cracks may have been caused by the large weight of the clay in large vessels (L. Jacobs, pers. comm.). During the firing stage cracks in the rim or wall can occur when the vessel is cooled or heated too rapidly or unevenly (Rye 1981: 114). Moreover, any existing tiny cracks will become larger during firing.

Spalling
When thick-walled vessels are not dried completely before firing, the wall can be damaged when the vessel is heated too quickly. Moisture in the centre of the wall expands, and causes a large lens-shaped piece to break away, sometimes even creating a hole (Rye 1981: 114). Spalling occurred rarely in the Sabi Abyad corpus (n=3), and then only in extremely thick-walled vessels.

Lime spalling
The phenomenon of lime spalling is described in Chapter II. The damage caused by lime spalling is recognizable by a conical shaped hole with a white grain in the middle. Lime spalling was noted for 461 sherds (only 2.3% of the total). Lime spalling is of course related to the amount of calcite present in the clay. As the Balikh clays are marly clays, it is to be expected that large amounts of calcite are generally present and that spalling would occur in many vessels made from this clay, depending on the firing circumstances. Occasionally larger calcite particles (up to 8 mm) occurred, but generally the calcite particles that caused the spalling were rather small but visible (under 3 mm). Lime spalling *only* occured in wares where visible calcite inclusions were described (wares A, B, G, H, I). In most cases spalling does not seem to have caused very serious damage to a vessel. However, when there were many damages due to lime spalling, the vessel wall was seriously weakened or even crumbled completely. In a few vessels it caused the crumbling of the inside wall surface, and once a 17 mm wide hole appeared through the whole vessel wall. Wares with coarse calcite inclusions (E, L) do not show any lime spalling, a fact which possibly supports the idea that cooking-ware was fired at low temperatures (below ca. 800 °C) that do not cause lime spalling (see chapter II and Appendix D). But also in other wares lime spalling might be related to the firing circumstances, especially the temperature.[148] In Chapter II we saw that lime spalling occurs especially when the clay is fired between about 750/850 ºC and 900/1000 ºC, in oxidizing atmospheres (Rice 1987: 98, Rye 1981: 114). With the help of table II.2, describing the relation between sherd colour and firing temperature, the estimated firing temperatures for sherds with lime spalling are summarized in table V.14. It is clear that most sherds fall in the group of “medium-fired” fabrics, as is generally true for the whole corpus. A Chi-Square test indicated that the firing temperature does not significantly influence the presence of lime spalling.

	% of sherds with lime spalling	% of all sherds
High temperatures	12.3	15.3
Medium temperatures	86.8	81.9
Low temperatures	0.9	2.8
Total	100.0	100.0

Table V.14: Firing temperatures in sherds with lime spalling and firing temperatures in the whole assemblage.

The comparatively rare occurrence of lime spalling then might be due to the addition of salt to the clay, which prevents lime spalling. Salt at the same time makes the colours of the fired product lighter at lower temperatures than without salt, perhaps resulting in slightly too high temperature estimates based on colour alone (Rice 1987: 119, see also Chapter II and Appendix D).

Crumbling
When a vessel is fired at a high temperature and the fabric has turned greenish in colour and crumbly in texture, the surface both on the inside and outside of the vessel may crumble

[148] A Chi-Square test indicated that in the Sabi Abyad corpus there is absolutely no relation between firing atmosphere and the occurrence of lime spalling.

away. In this case, the crumbling was clearly caused by over-firing. However, some vessels fired at lower temperatures also showed a crumbling inner or outer surface. The reasons for this crumbling are not completely clear and might be connected to several different processes. First, the surface hardness may have been influenced by the migration of salts to the surface of the wall during the drying stage, resulting in a softer surface (Rice 1987: 355; see also Appendix D). Secondly, the inside surface might have crumbled because of a chemical reaction of the vessel wall with the contents (e.g. acid fluids?), or by other use-related causes (e.g. repeated and heavy stirring with a hard object). These use-related possibilities will be further discussed in Chapter VI and Appendix G. Or the crumbling might be related to post-depositional processes. The deposition environment (soil pH) may influence the chemical composition of the fired vessel, causing leaching. This might for example remove the calcium in the surface of the vessel (Rice 1987: 421). This process may have been active in the case of one or two vessels that had preserved their shape before deposition, but completely crumbled upon excavation. One would, however, expect the environment to be of equal influence on all ceramics buried at that spot, and not on a single vessel only. Crumbling may also be due to the very high content of small calcite aggregates in the natural clay, as is illustrated in some of the sherds in Appendix D. The lime-spalling effect in many tiny particles of calcite may have destroyed the internal strength of the vessel wall completely.

<u>Deformation</u>
Sometimes vessels were damaged or deformed when the clay was still wet. When the vessel was pressed or bumped against something, this could result in dents in the wall or in an oval circumference. Rims and bases were sometimes struck by other objects, leaving notches or scratches in the wet clay.

A particular kind of deformation is visible most clearly in the small to medium-sized bowls. As we have seen, they were thrown from the cone. When they were cut from the cone with a thread, a lot of them were cut askew. The base is then not aligned with the rim, resulting in a bowl with a slanting rim when standing. This type of deformation is often quoted as an example of the hasty and careless shaping of these bowls (e.g., Pfälzner 1995: 244).

Repair and use of damaged vessels

Some vessels (n=232) with minor or more serious damages were repaired, so that they could still be used. Several different ways of repairing vessels were in use:

- filling the crack or damaged part with a gypsum/lime paste (e.g. figs. IV.26.a, IV.39.ap, IV.42.p, IV.49.c, IV.58.f, IV.76.a, IV.81.d, e, IV.82.b, c, IV.88.d, IV.96.g, IV.106.g).
- filling the crack or damaged part with a bitumen paste (e.g. figs. IV.58.f, IV.84.e and fig. VI.9 right)
- drilling holes along a fracture to tie it with rope (fig. V.57).
- closing cracks when the clay is still plastic (before drying and firing the vessel, cf. fig. IV.76.k)

A few vessels were repaired in several places (e.g. base and rim) or with two different methods. In the following table a distinction is made between cracks and other damages. Cracks mostly occurred during the production of the vessels, mainly during drying and firing. The group of other damages includes spalling damages (see below), but also damages that may have occurred during the use of the vessel.

	Gypsum/lime	Bitumen	Repair holes	Clay repair	Reworked fractures
Base cracks	96	2		1	
Base damage	1			1	2
Base and wall/rim cracks	10				
Wall/rim cracks	68	22	1	1	
Wall/rim damage	7	1		7	13
Total	182	25	1	10	15

Table V.15: Methods and location of repairs on damaged vessels.

From table V.15 it is clear that most repairs were done by filling up the crack or the damaged spot with a gypsum/lime paste. This paste was carefully smoothed into the crack so that the surface of the vessel would be smooth and the crack would not show too much. During deposition, however, the gypsum expanded in volume, yielding irregular blobs of white paste on the surface of the vessels in and along the fractures. Occasionally, this process has widened the crack by pushing the fracture apart. Refitting the vessel for drawing and description was then only possible by removing the complete gypsum layer. When bitumen was used for repair, it was mainly used for rim and wall cracks.

Reparations of damages before the clay had dried were only rarely carried out. This was done by pressing the clay around a crack with a blunt object, to close the crack; another method was to press the damaged part together and to smooth the spot with the fingers. Sometimes an extra piece of clay was added to a damaged spot before the vessel dried. This method did not work very well: often the vessel cracked again during firing exactly in the repaired spot, thereby further weakening the vessel.

When part of a vessel had broken, the fractures were sometimes smoothed, so that the undamaged part of the vessel could still be used (n=15). Vessels used in this way include large jars of which the rim had broken off, while the base part was subsequently used as a pot (cf. figs. IV.35.l, IV.95.g, IV.96.a); vessels of which only the broken rim was smoothened, preserving the same general vessel shape (goblets, bowls, strainer, small jars, figs. IV.73.j, V.58); and a complete type 321 jar rim that was reused as a pot stand. Another use of damaged and otherwise unusable vessels (n=4) can be illustrated by a small jar base that was used as a bitumen container after the upper body broke off (fig. VI.5). Some over-fired very brittle and severely cracked and warped bowls were used as gypsum paste containers in the level 5 pottery workshop (fig. VI.5).

Summary: techniques and the organization of production

When summarizing the different aspects of production techniques discussed here, we see the following picture of pottery production at Sabi Abyad emerge.

There is little variety in the used clay and clay bodies. Most pottery is made of clays with organic inclusions. Wares without added inclusions and wares with coarse mineral inclusions were prepared for specific purposes: finer thin-walled vessels, large vessels, cooking vessels, etc. The clay seems to have been prepared sufficiently well: particles are evenly distributed through the matrix and air bubbles hardly occur. For particular purposes, such as handles, applied decorations, and to prevent base cracks, a paste was prepared with extra organic inclusions to avoid shrinking cracks. The potters seem to have known the properties of the clay and the effect of inclusions well.

Most pottery was wheel-thrown, but handmade techniques were used for special purposes. Several different shaping techniques were distinguished:

A throwing from the cone in one stage
throwing from the cone with subsequent finishing stages
B throwing from one piece of clay, in several stages
C throwing in cylindrical parts and combining the pieces later
D throwing closed (not part of the Sabi Abyad tradition)
E handmade from one piece of clay
handmade with slabs
handmade with coils
handmade decorations, holes, applied parts like spouts and handles

Throwing from the cone is a technique that is especially suitable to produce large quantities of pottery in a short time (Franken and Van As 1994: 508). Especially when vessels are not finished or decorated further, as is indeed the case at Sabi Abyad, this technique is extremely efficient. When vessels were shaped in several stages, the most efficient way to do this would be to work in series: first make a large amount of half-finished vessels and then finish all of them. When throwing from the cone this working in series is necessary: first the hump of clay has to be used up before anything else can be done on the wheel. But even with pieces thrown from one piece of clay it would be better to work in series. While shaping the next half-fabricates, the vessels can dry a little so that they are stronger and won't be damaged so easily when put back on the wheel to be finished. Throwing in cylindrical parts seems to be the most complex shaping technique. Pots shaped in this technique are produced in series, as each base part has to dry a while before connecting it to the top part. L. Jacobs (pers. comm.) estimated that one experienced potter could produce around 30 large jars (types 321, 322, 323) in a day's work with this technique. Among the handmade vessels, the large storage vessels seem to have been the most labour-intensive. When building the vessel in slabs or coils, the vessel had to dry before one could add the next part. It would therefore be efficient to make more vessels at the same time, or to fill the time of drying with making other shapes on the wheel. Modern itinerant storage jar makers on Crete using similar techniques can make 400 storage jars in 40 days with a team of six potters and assistants (Voyatzoglou 1974). Their colleagues on Cyprus worked at 30 jars simultaneously. In both cases the whole process of shaping took about forty days, allowing for drying time (Voyatzoglou 1974: 19; London 1989b: 70). Other hand-shaped vessels were most probably only made on occasion, in spare time or when needed for a specific purpose. They were definitely not produced serially.

Most pottery was therefore shaped using techniques that aim at a large output and quick, efficient production. The fact that the potters neglected to finish their products in more detail seems to confirm this picture. Hardly any attention was paid to further surface treatment or to decoration, suggesting that the time investment per vessel was limited. When decoration was applied it was mostly on the larger shapes on which most time was spent in shaping. Decoration was almost exclusively of a very simple, schematic nature and was often carried out in a quick, careless manner. The beauty of the vessels seems to have been a minor concern to the Sabi Abyad potters: a functional collection of pots was their main aim.

As expected, the potters did not use very sophisticated tools or equipment. However, both the type of kilns and the professional way they are built, as well as the use of the fast potters' wheel, show that the potters were professionals in their craft.

All shaping techniques used at Sabi Abyad could have been executed by one and the same potter. None of them are particularly complicated, although skill is needed. According to L. Jacobs (pers. comm.), all the pottery in the selection he studied was made within a single larger "tradition". But he thought it very well possible that several different potters worked to produce this range of shapes, each with his particular specialization and techniques. In any case, all techniques that involve serial production would benefit enormously from the presence of one or more assistants who carried and prepared raw clay, carried away the finished vessels to a drying place, handed over tools, etc. A small modern potters' workshop in Damascus employs two professional potters while a young boy assists them with these various tasks and another adult spends his time decorating pots (pers. observation by the author, 1999). It may therefore be suggested that the Sabi Abyad potter did not work completely on his own but was assisted by others, most likely members of his family. There is, however, no evidence for "worker specialization" (each worker specializing in shaping part of the vessel in an "assembly line" fashion, as is characteristic of manufactories).

Firing the vessels took place mostly in oxidizing circumstances, a fact that is most probably largely connected to the structure of the kilns. The potters seem to have aimed for well-fired pottery and perhaps they preferred vessels with a light colour. Although vessel colours vary from dark-red to buff and bright green, and colours may even vary strongly within one vessel, the amounts of both over-fired and under-fired sherds are very low. The variable temperatures during firing in updraft kilns must have caused these colour variations. On the other hand, if the firing temperature estimates in chapter II are in the right range, temperatures varied generally between around 800 and 950 °C, a variation of 150 °C only. So it would seem that the potters controlled the temperature and atmosphere of their kilns well.

When vessels showed minor damages like base cracks or lime spalling, this does not seem to have prevented their use. Sometimes serious cracks were repaired with gypsum or bitumen. Also, it was not very important whether vessels were exactly circular or whether their bases were exactly horizontal. Especially bowls, hastily cut from the cone, are often slanting or slightly oval. Again, the most important issue seems to have been whether a vessel was usable, not its appearance or beauty. The reuse of broken or damaged vessels also points in this direction.

Signs and "potters' marks"

All non-decorative marks and signs that occur isolated on a vessel and are intentionally applied (Lindblom 2001: 13) are described as a "potters' mark" or as a sign. From the start, we have to make a distinction between those marks applied when the clay was still wet or before firing (potters' marks), and those applied after the firing of the vessel (signs). The first group was certainly applied in the workshop, while the signs applied after firing may have been applied anywhere and at any point in time after the vessel left the workshop. The first group is therefore most likely related to the production of pottery, while the second group of signs may have had more varied uses. For the sake of convenience, both groups will be discussed in this paragraph. Not much is known about the use or meaning of these signs, and the use and meaning may differ from sign to sign. The only way to recover some of this meaning is to look for relations between sign, vessel and context.[149] Few extensive studies of potters' marks and signs have been carried out in Near Eastern archaeology (cf. Koliński 1993-94, but see Seidl 1972 for Hittite marks, see also Lindblom 2001 for the Mediterranean). At Sabi Abyad, a total of 128 marks and signs was recognized on vessels and vessel fragments. So only a very small percentage of all ceramics was actually marked (only 0.6% of all described sherds). Fifty-nine marks were impressed (n=17) or incised (n=42) on the vessel surface before the clay had dried, i.e. before firing. Sixty-nine signs were painted on the vessel surface after firing. All signs are presented in a catalogue in Appendix E, listing the figure number in the catalogue, the excavation sherd number, the place on the vessel, the type, state of preservation and dimensions of the vessel, the estimated capacity in litres in the case of complete vessels, and the level number. All signs are complete unless stated otherwise.

[149] Lindblom (2001:7) rightly remarks that we have to look at the marks as "indices of a specific situation", studying the relations between marks, vessels, chronology, distribution, etc. (and ask ourselves "what activities do the marks reflect") rather than trying to assess the original meaning of the marks. The original meaning is a priori difficult to establish for an outsider, and may moreover have differed depending on whether the viewer was the potter, a consumer, or someone at a different site far away.

Fragmentary signs may be part of known signs or belong to other, new signs. Comparisons are only cited for contemporary ceramics.

Potters' marks applied before firing

Since potters' marks were applied before the vessel was completely dry and before firing, it is generally thought that the meaning of these signs is related to the potter or to pottery production, an idea that is reflected in the name. Other suggested functions of pre-firing marks include religious symbols, identification of ethnic groups, capacity of the vessels, quantity or quality of the contents, a numerical system, the quality of the pots themselves, the price, the distribution or destination of the pots, ownership, or a relation with a script (Lindblom 2001: 18 table 2, Koliński 1993/94, Potts 1981, Dollfus and Encrevé 1982, Quivron 1980). Because the function of the vessels produced at Sabi Abyad is mostly of a general nature (in all likelihood no vessels were produced for just one specific function or product, see also chapter VI), the potter could not have known much about the specific use of the vessel after it left his workshop. It is therefore unlikely that potters' marks have anything to do with different aspects of the use of the vessel including the kind, quality, quantity or ownership of the contents. Although it is theoretically possible that the potter would indicate a capacity measure on his products, this is not likely. Precise measurement of capacity is only possible after firing,[150] and anyone with some familiarity with the current shapes and sizes would be able to give a general indication of capacity without a sign or mark. The idea that potters' marks represent a basic form of writing can be excluded in the case of Sabi Abyad, since ceramics were sometimes inscribed with cuneiform script, and therefore the potter did not need another writing system. When any function of potters' marks outside the production process is suggested, a connection should be demonstrated between the use of the marks and the type, material, size, shape, findspot, context, and so on of the marked vessels. This has never been possible in archaeological cases (Lindblom 2001: 19), and at Sabi Abyad there does not seem to exist a clear relation between a mark and the vessel size or quality either (see below). Ethnoarchaeological investigations all conclude that pre-firing marks on pottery are related to the production process. Invariably marks are used to distinguish the production of "single economic units" (a family, a workshop) from the production of others (Lindblom 2001: 19-21; Donnan 1971). This is necessary when potters fire the production of more than one potter in one kiln load to save on fuel; when the products of different potters are drying or are stored in the same space; when a potter from a different economic unit (i.e. producing for himself) works in a workshop belonging to someone else and is paid for his output; or when potters are remunerated (by middlemen or authorities) on the basis of their production. It seems that none of the ethnographically attested marks were intended for the user of the ceramics (*ibid*.). Lindblom (2001:132-133) also examines the possibility that marks are used to regulate economic obligations between a ruling elite and dependent potters. In archaeological cases usually only a small amount of the total corpus is marked. This may indicate either that the potter did not mark all vessels but only a small number of them, for example the last vessel of a batch (cf. Koliński 1993-94:15), or that it was only occasionally necessary to mark the production of different potters.

With these thoughts in mind, we shall now take a closer look at the marks from Sabi Abyad. A total of 59 potters' marks was found within the corpus described in this thesis. They were impressed (17) or incised (42) on the vessel surface before the clay had dried.

There are five groups of impressed marks, one of which comprises sherds inscribed with cuneiform signs. Since cuneiform signs are most probably used in case a message was to be conveyed to the user of the vessel, this group is slightly outside the present discussion of

[150] A jar from Tell al-Rimah that carries a capacity measure was indeed inscribed *after* firing (Postgate 1978). A large Middle Assyrian storage jar from Tell Chuera also has a capacity measure inscribed after firing (I. Boesze, personal communication). See also Chapter VI for a more detailed discussion of capacity measures.

potters' marks. As far as the meaning of the inscription is clear, the cuneiform signs seem to have been used to indicate the intended function of the vessel or a personal name (see Appendix F for more information on the cuneiform inscriptions, see also chapter VI).[151] Another somewhat exceptional group is composed of two instances of a seal impression on a ceramic vessel. Once a cylinder seal was used on a goblet, and once a stamp seal was used several times on a carinated bowl (fig. E.4). Whether these impressions are part of the same system as the other marks is difficult to establish. Seal impressions are often found on ceramics from the Near East (Aruz 2005); however, mainly on large storage and transport jars and not on small vessels as at Sabi Abyad.

We are then left with three types of impressed marks: impressed crescents (fig. E.1), impressed crescents upside-down (fig. E.2), and an impressed figure (fig. E.3). Of course, the crescents could all belong to one group depending on whether the orientation of the mark was of any importance or not. The impressed figure comes from level 7 and apparently has close parallels at Mitanni / Middle Assyrian Nemrik, Tell Mohammed Arab and Aššur.[152] The crescents, on the other hand, all come from level 5 (n=8) and level 4 (n=2). For our discussion on pottery production, these are therefore the most important. There are 10 cases of the use of this mark, all of them on the shoulder or rim of large jars (type 321, 322, one type 312 jar). Impressed crescents were also used on vessels from Tell Sheikh Hamad (MA III, Pfälzner 1995: Taf. 151a) and Tell Brak HH1 (Oates et al. 1997: fig. 182 no. 30).

The 42 incised marks were all applied with a blunt object in wet or mostly leather-hard clay. They are more varied in shape than the impressed marks. Shapes vary from five-pointed stars, tridents and crosses to more irregular crossing lines, crescents and vertical lines, presented in Appendix E in eleven shape groups (figs. E.5-14). These incised marks are generally a bit larger than the impressed crescents. Often the incisions have a somewhat careless appearance, as if the exact shape was not of very important as long as the vessel was marked. A special type of incised marks is represented by notches incised at the top of the rim or at the edge or ring of the base (fig. E.14). They occur alone or in groups of three or five notches. Incised marks from level 7 are exclusively notches, at the edge of the base of three small bowls. Incised marks from the later levels include three notches on the rim of a large type 322 jar, from level 3. All other incised marks come from levels 6-4, with most occurrences in level 5. The majority (n=20) of incised marks appears on large jars and are always applied at the rim or at the shoulder or upper body and never near or at the base. However, unlike the impressed crescents that were used exclusively on large jars, incised marks appear on other vessel types as well. These include a cross and a "plough" shape on medium-sized type 318 jars, a cross on the body of a pilgrim flask (type 911, probably not made locally), below the rim of a type 131 bowl, near the base of a type 111 bowl, and at the underside of a bowl base; crossing lines under the rim of a type 222 pot; a trident at the lower body of a bowl; four crescents incised on the rim of a pot stand; notches incised on the bases of small bowls and unknown[153] incised signs at the rim of a pot stand and the rim of a type 131 bowl. Whereas incised marks on jars appear always at the rim or on the upper body of the vessel, incised marks on bowls (n=11) and other shapes (n=9, including undetermined body

[151] Cuneiform inscriptions have been found on Middle Assyrian pottery from Aššur as well. The names and titles of the king were written on vessels made especially for the *tākultu* ceremony, and the inscription stated that the vessels belonged to the temple of Aššur (Weidner 1926: XX (Adad-narari) 33, 34, XXI (Shalmaneser I) 24, 25; cf. Grayson 1987: 76.28 and 27, 77.25, 26, 27, see also Frankena 1953: 51f.). Other inscriptions on pottery mention the names of kings or functionaries, and some indicate that they were meant for storing cuneiform tablets (Frahm 2002: 85; Pedersén 1985: 43, cf. Postgate 1980: 69). Another vessel was inscribed: "1 x-vessel [ ]-ṣi (?) of the potter of the servant of the palace, the servant of the king" (Jakob-Rost 1991). From Tell Chuera (Orthmann 1990: Abb. 43 Fig. 3) comes a fragment possibly inscribed with a personal name, and similarly an early NA pot from Tell al-Hawa is inscribed with a personal name (George 1990: 42 no. 2).

[152] Personal communication of A. Reiche.

[153] Unknown because no drawings are available.

sherds) could be applied either on the rim or body of the vessel or at the base. The marks on pot stands indicate that they certainly were not an indication of the expected contents of the vessel. With the exception of the cross on a pilgrim-flask fragment, all marks appear on vessel types that were produced locally. In the group of incised marks there is not only more variety in the shape of the marks than in the group of impressed crescents, but also these marks are used on more different vessels and in different places on these vessels. Table V.16 shows the capacity in litres of the complete vessels with impressed or incised marks. Although the sample is small, it seems clear that the capacity of the vessel was not the intended message of the mark. Although a detailed contextual analysis cannot be performed at this moment, a quick look at the squares from which the sherds and vessels with potters' marks come, shows that there might be a pattern in the findspots. In level 5, most potters' marks seem to come from squares in the northwestern and northern part of the *dunnu* inside the walls (mainly in squares H8, K8, L8, M9), and not so much from the "palace", "tower", or areas in the east and south. Whether this means that the potters' marks are indeed related to the control over production by the *dunnu* authorities, whose offices were mostly located in those areas in level 5, or whether other factors are of influence, must remain open.

In conclusion we can say that the use of impressed and incised marks seems to be in accordance with the idea that potters' marks were used during the production process, most probably to keep apart batches of vessels in the kiln or during production stages. The fact that similar marks were used on different vessels may indicate that one potter or workshop produced a variety of shapes (as was already clear from the evidence in the workshops themselves, see above). Why impressed crescents were only used on large jars is unclear. The rare occurences of marks on the pottery from Sabi Abyad may suggest that it was not rarely necessary to separate different batches of pottery, and that it definitely was not a daily practice in the workshops to mark vessels. The marks are therefore unlikely to indicate a particular potter (as a kind of "signature", as with the use of workshop stamps in Roman times). It is possible that marks on vessels were used to account for the number of days the potter worked or the number of vessels he produced, so that he could account for his work to receive rations, although there are easier ways of accounting for this in a society very much used to the compilation of lists. It is also possible that potters' marks at Sabi Abyad were used mainly to distinguish the production of different potters (or economic entities) in case the same facilities (kilns, drying spaces) were used, and that this did not occur very often.[154]

[154] It is also possible that the marked vessels were not produced at Sabi Abyad at all, but came from other sites where a different production organization predominated (e.g. more workshops at one site, so that there was an increased need to distinguish produce from workshop to workshop). However, this would not explain the occurrence of marks on bowls and pot stands at Sabi Abyad, since vessels transported from other sites would most probably be jars (transported as packing material). A sample for thin-section analysis was taken for one marked sherd, type 122 bowl P93-110, from level 7. The thin-section analysis showed that the vessel was probably made in the Balikh Valley if not at Sabi Abyad itself (sample no. 44, Appendix D).

Excavation number	*Vessel type*	*Capacity in litres*	*Sign*	*level*
P93-127	Base of small bowl type 122	0.1	Incised notches	7
P93-110	Base of small bowl type 122	0.2	Incised notches	7
P93-91	Middle bowl type 111	1.2	Incised Greek cross	4
P97-320	Deep pot type 222	10.2	Incised crossing lines	5
P98-57	Middle jar type 318	12.8	Incised Greek cross	-
P97-314	Middle jar type 318	13.9	Incised “plough”	5
P93-454	Large jar type 322	23.4	Incised crescent	5
P96-527	Large jar type 322	25.0	Impressed crescent 2	5
P93-448	Large jar type 323	36.8	Incised St. Andrew’s cross	5

Table V.16: The capacity of vessels with impressed or incised marks.

<u>Signs applied after firing</u>

Sixty-nine signs were painted on the surface of the vessel after firing (figs. E.15-29). They could have been applied in the potter’s workshop, but they may also have been painted at other places and points in time during the use of the pot, perhaps even years after manufacturing. Consequently, there is no inherent link between the sign and pottery production, and interpretation of the signs may be even more difficult. They do seem to indicate something, but their “meaning” may vary from playful “doodles” to precise indications of owner, content, capacity, destination, etcetera. At the same time, it is clear that if a very particular message was to be conveyed, the cuneiform script could have been used to write the message, as we have seen above. Again only the careful analysis of possible relations between sign, vessel and context will perhaps yield a pattern that we can try to interpret.

The composition of the paint was not analysed, but in all cases the paint is very dark brown to black or blackish grey. It is thin, not clay or slip-like, and somewhat transparent. It is very well possible that bitumen was used. The painted signs are generally larger than the impressed or incised signs. Drippings of paint sometimes indicate that the vessel had been standing on the rim (drippings “upward”) or on the base (drippings “downward”) during painting. It is recalled here that many of the large jars without neck (types 321, 322, 323) are not stable when standing on the base without a support. Perhaps, after the paint had been applied “right side up”, the vessels were put to dry on their rims. This means those vessels were empty when the sign was applied.

In total 15 different groups of signs have been distinguished, of which some contain fragmentary signs that possibly belong to another group (see Appendix E). The signs consist of single geometric shapes like triangles, crescents, circles and squares. Circles and squares also occur filled with a cross. The most popular signs are the crossed square (fig. E.21), the crescent (fig. E.18), the crossed circle (fig. E.20) and the triangle (point up or down, figs. E.15, 16, 24). Together these signs account for 31 cases, while another 28 cases show fragmentary or unclear signs that may belong to one of these groups. The other 6 signs occur only once or twice, together in 10 cases. Painted signs, like impressed and incised signs, occur mostly on large jars (rim types 321, 322, 323, n=44). Signs were applied far less frequently on middle-sized jars (n=1, type 312) and small jars (n=2, types 311, 312), or on other shapes like large storage vessels (n=1, type 213) or pots (n=1, type 226). Painted signs were never used on open shapes like small or larger bowls, or on goblets, pot stands or other shapes that are not meant for storage. Moreover, the signs on the storage vessel, large pot and middle-size jar are either fragmentarily preserved or belong to the less popular sign groups, while only the small jars were marked with a crescent that occurs more often on other shapes as well. So we see that the most popular sign groups were used almost exclusively on large jars (rim types 321, 322, 323). A large majority of the signs appear on the shoulder or upper body of the vessel, as shown in table V.17, while they never occur on the rim, near the base or on the base of the vessel. It appears that the signs were meant to be seen, even if the jar was closed with a piece of cloth or a jar stopper over the rim[155] (cf. Müller-Karpe 1988: 148).

	Large jar	*Middle jar*	*Small jar*	*Storage vessel*	*Pot*	*Body sherds*	*Total (%)*
Shoulder	24	1	1		1		27 (39.1)
Upper body	12		1	1			14 (20.3)
Lower body	1					1	2 (2.3)
Body sherd	8					18	26 (37.7)
Total	45	1	2	1	1	19	69 (100.0)

Table V.17: Position of the painted signs on different kinds of vessels.

A calculation of the capacity for each completely preserved vessel, shown in table V.18, shows that there is no apparent relation between the capacity of the vessel and the sign, although the sample is very small. As to the context of the vessels with painted signs, it seems that the painted signs in level 5, too, occur mostly in the northern part of the *dunnu* (two-thirds of the sherds have been found in the northern squares comprising the "offices"). But again we cannot draw any further conclusions on a possible relation with the *dunnu* adminstration.

Summarizing, we can say that a variety of geometric signs (with four popular types) was used mainly on large jars, and that they were well visible. It seems that the signs are related to the function of the vessels (all are suitable for storage), and it is possible that these signs were used to indicate the contents inside the jar, the destination or owner of the jar, the day of filling, etc. However, only a very small percentage of jars was marked with a sign, so the use of a sign seems to have been exceptional.

Excavation number	*Vessel type*	*Capacity in litres*	*Sign*	*level*
P96-255	Small jar type 311	1.3	Painted crescent	4
P96-569	Middle jar type 312	13.8	Painted rectangle	5
P97-181	Large jar type 322	21.7	Painted Y-shape	5
P93-334	Large jar type 323	27.4	Painted triangle point down	4
P96-555	Large jar type 323	27.5	Painted crescent	5
P97-200	Large jar type 323	38.4	Painted comb	5
P93-426	Storage pot type 213	106.0	Painted rectangle, open base	5

Table V.18: The capacity of vessels with painted signs.

Some of the signs are reminiscent of symbols used on seals and other figurative art. These include the crescent, the (Greek) cross and the circle (or disc?) with a cross (cf. Matthews 1990). These symbols most probably represent gods and goddesses, like the moon god Sîn (crescent), the sun god Šamaš (cross; disc with a star). A star is also used frequently as a symbol in art, but is mostly composed as an eight-pointed or six-pointed star and not as a five-pointed one like the mark on the pottery (Black and Green 1992). Our impressed figure (fig. E.3), topped by a crescent, might also be connected to the moon god Sîn. However, from superficial similarities we cannot lightly conclude that these and other signs used on the pottery have a meaning comparable to the symbols used in glyptics and art, and were used for example to indicate vessels destined for the temple. Not all signs can be compared to symbols used in art, while the signs that are alike are so simple that it could easily be a coincidental similarity. More importantly, the context of the symbols in seal designs is very different and incomparable to the use of signs on pottery, so that their meaning may not be compared just on the basis of their similar shapes.

[155] It also may mean that the signs were applied when the vessel was standing upright, but that this was not always the case can be inferred from the drippings of the paint as discussed above.

V.7 The products of the Tell Sabi Abyad workshops

The kind and quality of the vessels

In chapter IV we have seen what the pottery looks like in each level and what kind of shapes and sizes were produced. The kind of vessel produced at Sabi Abyad was mainly utilitarian. Any more luxurious shapes or decorations are exceptional. A general idea existed about what kind of shapes one needs in a household. When looking at the frequencies of vessel types in the corpus, it seems that there is a group of vessels that was frequently made, while others were made in smaller numbers. The efficient production techniques, the use of slightly damaged vessels and the repair and reuse of damaged vessels indicate that usability was the main issue, not the appearance. Nevertheless, the potters sometimes found reason or time to decorate vessels, with simple incisions or with appliqué decorations. Perhaps these vessels were made for specific occasions.

In chapter VI we will look at the function or use of different types of vessels in more detail. However, we can conclude that the potters produced the majority of vessels for general storage and serving purposes (bowls, pots, jars). Furthermore, they produced vessels with more specific functions, like strainers, pot stands, bowls with spouts, a bowl with a strainer in the base, large storage pots, drinking goblets. The production included vessels of different sizes, ranging from very small bowls to very big storage pots. It is clear that the workshops at Sabi Abyad did not specialize in a specific type or shape of pottery but had a varied output, and that they used different shaping techniques for different vessels. Apart from ceramic vessels, the pottery workshops most probably also produced other objects. This study will not discuss these products, but we can name drain pipes, baked tiles and other architectural and engineering elements, figurines, toys (chariot wheels), moulds and tools for metal production, cylinder seals, beads, spindles, and so on.

The quality of the vessels was actually quite good. Although they were quickly, sometimes almost hastily, produced and not much time was spent on the finishing, decorating, etcetera, they are generally well made and well fired by skilled potters who mastered the shaping techniques they used. The quality of the pottery was sufficient for its purpose. The shaping techniques, using "throwing from the cone" and the serial production of vessels in two or more stages of production, point to a focus on efficiency and on lowering the labour investment per vessel. This may be related to two partly interrelated aspects of production. On the one hand, it can be linked to independent production for a market or for "commoners" (e.g. Costin and Hagstrum 1995: 621, Rice 1991: 266). On the other hand, it may be related to increased levels of production, in which a small number of potters had to produce larger amounts of vessels and therefore strove for more efficient production methods (e.g. Stark 1995: 233, 235). It seems that the Middle Assyrian potters at Sabi Abyad were oriented more towards efficiency and quick production than the potters who produced the ceramics from level 7, who spent more time on, for example, surface treatment and decoration, as we have seen in Chapter IV.

Scale of production, output and demand

The term *scale* encompasses two related aspects of production organization: the size of the production facility or the number of individuals working in one production unit, and the principles of labour recruitment (e.g. are co-workers part of the family, or manufactory personnel recruited from different families? Costin 1991: 15). Apart from the size of the production unit, Pool (1992: 278) considers the input (in energy, capital, or material resources) and output (amount of vessels) of production also as an aspect of the scale of production. However, Costin (1991) warns for equating output levels and scale: a large number of vessels may have been produced by many small-scale production units. Several archaeologically recognizable dimensions are related to, and influence, the aspect of scale (Costin 1991: 29-30):

- the size of production facilities (single production units).
- the context or location of production: in the family home, in specially designed buildings, etc.
- the organization of the workspace.

It is clear that these dimensions are related to the direct evidence for pottery production more than to the products themselves. We will now have a look at the Sabi Abyad evidence for scale of production based on the evidence and suggestions collected in this chapter.

In level 6 we have seen that the pottery workshops are clearly located in a separate area of the *dunnu*, but within the moat surrounding the *dunnu*. The workshops cover an area of approximately 323 m^2. In the workshops two wheel bearings for a potter's wheel have been found, suggesting that at least two potters were working here. The discussion of shaping techniques has made clear that the presence of several assistants for clay preparation, wheel turning, and helping with the serial production of shapes in two or more stages, is very likely. Perhaps in level 6 there were between 5 and 10 people (men, women and children) involved in pottery production. Two very large kilns were in use, indicating that output levels were relatively high. Later in level 6 there is some evidence for a reduction in scale: fewer rooms now seem to be used and perhaps one of the kilns went out of use. Firing of the products took place close to the workshop location. It is probable that the potters and their family lived in the workshop area as well, as is indicated by the find of domestic installations and tools like *tannurs* and mortars. The workshops are clearly located within the *dunnu* and at a specific site inside the settlement, but at the same time they seem to overlap with domestic space. Inside the workshop there is not a very clearly visible distinction between the use of different areas, and space seems to have been used in a rather flexible way.

In level 5 the flexibility of the potters in their use of space seems to increase. At the beginning of level 5 a large kiln was in use in the northern part of the site, inside the fortress walls, but no associated workshop was found. The remains of a workshop were found in the east of the site. Here an area of around 294 m^2 (or 580 m^2 if we include the open area to the east) was used by the potters, a size comparable to the level 6 workshops. They used a large kiln in the south-east, and two smaller kilns inside the workshop. The workshop now does not seem to be a specially designed area anymore, and the potter's work is encroaching even more on the domestic spaces of the fortress, perhaps indicating a decrease of intensity in production. It seems that the potters used a suitable and otherwise unused space within the houses and working spaces of the fortress. Other areas that were unused at specific times, such as spaces in the west and north of the site, were used for building smaller kilns. Perhaps, as was suggested above, this is related to the direction of the wind in different seasons. This could be an indication that production was continued in the winter season as well. In level 5 several smaller kilns were used for the first time. Perhaps the potter wanted to be able to fire his products more often at the same output level, or perhaps his output levels were lower at certain moments so that he did not need the large kiln (kilns are only fired efficiently if fully loaded). Or perhaps he used the smaller kilns for different products than the larger kilns. Also only one large kiln seems to have been in use at any one time.

The evidence for production in level 4 is much more difficult to interpret. However, at least one large kiln was in use at these times, indicating that although the settlement changed its character profoundly, the production of pottery was still kept up at a certain level. A workshop was not found. As to the context of production, it seems that the Middle Assyrian *dunnu* administration had changed, but Assyrians were still living at the site. We may summarize the information on scale as follows:

Level 6: 1 or 2 workshops (total 323 m^2), around 5-10 people, 2 large kilns, 2 wheels in use over a span of ca. 30 years. At the end of the period the scale probably decreased slightly. Separate area for workshops but overlapping with domestic functions, associated with the *dunnu* administration, flexible use of space.

Level 5: 1 workshop (total 294-580 m^2) and several more flexible locations, 2 large kilns used one at a time, several small kilns in use over a span of ca. 15 years. Workshops now more mixed with domestic or unused space, associated with the *dunnu* administration, very flexible use of space.

Level 4: at least one large kiln, no information about workshops.

The output of production, or the number of vessels produced, is another important aspect of the organization of production. However, it is not easily measured in archaeological cases. Depositional and post-depositional processes, differential breakage of vessels, inability to always distinguish locally produced vessels from "imports", differences in archaeological context and preservation, differences in archaeological processing (e.g. how much time was spent on refitting) of the pottery, all influence our ability to estimate output levels. Moreover, the amounts of sherds and vessels recovered from an archaeological context perhaps reflect the scale of consumption rather than the scale of production (Pool 1992: 280-281). In the same way we cannot be sure that the complete production of a workshop stayed at the site and can therefore be recovered, and was not partly transported to other sites. Lastly, not all pottery from the site was excavated or recorded (although the excavated sherds were all counted). I therefore feel that, especially in the absence of detailed stratigraphical control, calculations of "output" based for example on numbers and radius of rim sherds in relation to the total counts of sherds are not valid. A relative indication of output may, however, be found in the size of the kilns. Elsewhere (Akkermans and Duistermaat 2001) it was suggested that a larger kiln could hold a mixed load of at least 500-1000 vessels of different shapes and sizes (between around 4000 middle-sized bowls not stacked inside each other, or around 70 large jars; the numbers would increase if bowls were stacked). The larger kilns in squares N11 and L8 show evidence of several occasions of replastering (see Appendix C), something that was necessary after a number of firings.[156] Without being able to calculate the exact number of firings and size of the kiln load per firing, we can still see that the large kilns (of which at least one was in use at any one time) could have yielded many thousands of vessels per year. The used shaping techniques, as we have seen above, are aimed at an efficient and quick production of large amounts of pottery, something also reflected in the lack of labour-intensive treatments like burnishing or decoration. It therefore seems clear that the workshops at Sabi Abyad were producing a sizeable amount of vessels.

It is without doubt that these vessels were produced for the *dunnu* staff living at the site, estimated at maximum 60 people (see above and Wiggermann 2000: 191). While a future spatial analysis of the site will perhaps yield information on the number of vessels a household generally used, one may ask whether only these 60 people would have consumed the thousands of vessels produced by the potters. Both the facilities the potters used (especially the kilns) and the techniques they employed were aimed at high production levels. It therefore seems reasonable to suggest that the produce of the Sabi Abyad potters was distributed to other, surrounding sites as well. The dependents of the *dunnu*, calculated by

[156] Ethnoarchaeological information about the renovation of kilns is scarce. The very large kilns in Fustat, Egypt, are replastered after every firing, while the smaller Fustat kilns that are comparable to the Sabi Abyad large kilns are replastered after "repeated use". Firing takes place every two weeks, and approximately 5000 flower pots are fired per kiln load (Golvin et al. 1982: 60-61, 73). Potters in Qamishly, using a rather small kiln, replace the pottery floor with the flue holes every two years, after about 70 firings. Firing takes place every week in summer, around 36 times per year, and the kiln load contains a mixed load of around 100 vessels (Taniguchi 2003: 148). Swan (1984: 33), expects that a well-built updraft kiln can survive "scores rather than dozens of firings."

Wiggermann at around 900 people living in the area under authority of Sabi Abyad, are the first group that comes to mind (see also below). Whether distribution to those people took place by the potter selling his wares on a market, or whether the *dunnu* administration was in charge of distributing the vessels, is not clear.

Variability and standardization of the pottery

Standardization of vessel attributes has become an important aspect of the description of the organization of production, especially in cases where direct evidence for production is absent. Many studies of ceramic production assume that there exists a more or less direct relation between the organization of production and the standardization or diversity of the produce. Most studies focus on the economic factors behind the process of standardization, such as increase of production, efficiency, cost-reduction and economic competition, or “political” factors like the emergence of craft specialization (taken as an indicator for the emergence of complex societies) (e.g. Coursey 1997; Stark 1995; Costin and Hagstrum 1995; Costin 1991; Rice 1989, 1991). Some more recent studies also try to take into account the social and technological factors influencing standardization (e.g. Berg 2004, Underhill 2003). The study of standardization in pottery is not new. As Rice (1989: 113; 1991: 258) noted, the link between standardization and specialized production was already made by Anna Shepard in the late 1950s. The link between standardized shapes and ancient systems of measurement was already investigated in the 1960s (Rottländer 1966, 1967). Most studies date from the late 1980s and 1990s and after, and more and more data is becoming available for comparison both from archaeology and from ethnoarchaeology. However, there are many and important problems with this type of study.

First of all, it is not so clear what the nature is of the relation between diversity or standardization of ceramics and the organization of production. Several ethnographic studies, in which researchers have the possibility to study the output of a known production organization, have been carried out in an attempt to establish these links (e.g. Roux 2003a; Underhill 2003; Longacre 1999; Kvamme et al. 1996; Stark 1995; Arnold and Nieves 1992; Rice 1989), but so far without unequivocal results. Craft specialists in contemporary traditional societies sometimes do and sometimes do not produce more standardized pots than household potters, and it seems crucial to understand which other factors may have contributed to the observed standardization (Stark 1995: 231, 232).

Moreover, the definition of the terms involved is not clear: what exactly is standardization, and how can we quantify it? Similar problems exist with terms like “skill” or “efficiency”. Mostly, statistical techniques and metrical data are used to measure standardization, but problems exist in the comparability of assemblages and contexts as well as in the statistical testing of similarities. Non-numerical analyses remain of an intuitive nature and cannot easily be compared with results from other studies. The development of techniques to measure standardization and diversity in a statistically valid way, and so that assemblages can be compared, has only just started in archaeology (cf. Eerkens and Bettinger 2001; Kintigh 1989, 1984).

Besides, standardization is not an absolute measure. We can only speak about more standardized assemblages (in shapes, sizes, decoration, etc.) in comparison with other, less standardized assemblages. Standardization and diversity are relative notions, so that the best results are obtained when comparing two data groups (but groups that are somehow related, in geographical area or time, for example; see Costin 1991: 35; Arnold and Nieves 1992: 94). The relative standardization of an assemblage is not a qualitative measurement in itself, but only meaningful when compared to one or more other, comparable assemblages.

Most studies focus on standardization as an indication of (the emergence of) specialized craft production, assuming that “increased production intensity is reflected in increased product uniformity” (Kvamme et al. 1996: 116, see also Costin 1991, Rice 1991, Kramer 1985). In the case of Sabi Abyad it is clear that the potters were specialists in their craft. The existence of craft specialization at the site does not need any further proof. The direct evidence for pottery production and the technologies used are a much stronger indication of specialized craft production than is the standardization of output. Therefore, we are interested in standardization not so much to prove the *presence* of craft specialization, but to learn more about the other factors influencing standardization. We have to ask the question whether the relative standardization of the Sabi Abyad assemblage is just a natural consequence of the fact that the potters were indeed specialists, or whether other factors were involved as well. There are, however, many such factors, as we will see below, and (especially in archaeological cases) it is difficult to establish which factors were responsible for the standardization encountered. So, even if we can measure standardization, it is not always clear what exactly we are measuring (the results of which process or factor).

Notwithstanding these difficulties, most Near Eastern archaeologists would intuitively agree that Middle Assyrian pottery is of a "very standardized" nature, that it comprises a limited set of "standard" shapes that look similar all over the Middle Assyrian empire, and that these aspects are related to the production technology and production organization. The typical Middle Assyrian shapes are easy to recognize and often used as type-fossils in surveys. A discussion of Middle Assyrian pottery production must therefore discuss the nature and extent of standardization and variability, and discuss the possible relations with production organization or other factors.

The information I have collected in this chapter about the organization of pottery production at Tell Sabi Abyad will be used as a background to interpret any conclusions on standardization (Costin 1991: 32). In this paragraph we will look closer into the different aspects of diversity and standardization in the ceramic assemblage at Sabi Abyad. The conclusions reached in this paragraph are used to colour in the picture of the organization of pottery production at Sabi Abyad further and are also meant as a group of data on standardization from an archaeological production context for comparison with other sites.

Factors influencing variability and standardization

If we can measure or describe the relative amount of diversity or standardization of different aspects in our assemblage, what can we say about the underlying causes for this pattern? What are we actually measuring? Standardization is not simply an indication of a certain type of production organization. Many different and interrelated factors (some more than others related to production organization) affect the relative degree of standardization of a product (Underhill 2003; Kvamme et al. 1996: 125; Stark 1995; Eerkens and Bettinger 2001; Blackman et al. 1993; Benco 1988; Rice 1987: 201-204), and several of them may have acted at the same time:

- The need for easily stackable shapes for firing, transport or storage.
- The availability and choice of different raw materials.
- The function of the vessels, e.g. the need for vessels holding specific volumes, the need for "unique" vessels, etc.
- Consumer demands, ideas about "normal" shapes and sizes, and consumer acceptance of variability. The presence of traditions and customs related to shapes and sizes or vessel properties.
- Calculations or accounts of costs of production, raw materials, numbers of delivered vessels, etc.
- Orders from authorities to produce standardized forms or shapes, control over resources, etc. (administrative control of production or output).
- The destination of the produce (or "market"), composition of the consumer groups. Vessels produced for one's own household, for a commercial market, for the state or for tourists may differ in the amount of standardization striven for.

- The size of consumer groups. When fewer potters have to produce vessels for more people, they will strive for a lower labour input per vessel and more efficient production methods. These again lead to increasing standardization.
- The use of measuring systems or measuring tools in production. If a measuring system is used during production, the products will be more standardized than when sizes are estimated only visually.
- Human errors. Even if aiming at an exact copy, a potter will always create pots with a small margin of variation (unless he/she uses a mould, machinery or a measuring tool). The minimum amount of variation within a class that can be obtained by humans is 1.7% (also called “Weber fraction”, Eerkens and Bettinger 2001).
- Motor skill and experience of the potter, or expertise. The more skilful the potter and the more experience he/she has, the more he/she will be *able* to produce identical products. Routine and repetition will increase the uniformity of the output. The random variation in the actual production of one producer seems to depend strongly on whether or not a standard shape or size is aimed at, whether this does not matter or it has been decided to vary, whether or not the potter is working continuously or only part of the year or occasionally, etc.
- The ratio of the amount of producers to the total size of the assemblage. Each producer has his/her own range of variation. Vessels produced by one potter can vary even within a group of similar vessels produced in one day. When more producers have contributed to the total assemblage, the variation in the assemblage will be larger (“ratio effect”).
- The span of time the assemblage covers. This effect is similar to the ratio effect: the longer the period over which the assemblage has been built up, the larger the variation will be (“cumulative blurring”).
- The technology used (handmade, wheel-made, mould-made, etc.). Intuitively, archaeologists seem to think that handmade pottery is more variable than wheel-made pottery. However, ethnographic studies yield varying results and often conclude the opposite (wheelmade pottery being more variable), and the method of forming does not always influence the morphological standardization of the vessels as much as other factors do (Benco 1988: 68).

In the case of Sabi Abyad some of these factors are better known than others, as is clear from the data presented in this chapter. I will summarize these data and ideas here, discussing each of the above-mentioned factors influencing standardization for the Middle Assyrian levels.

The raw materials were probably rather uniform in the area of Sabi Abyad. Any minor differences in ware composition are therefore probably due to small differences in paste preparation. As to the function of the vessels, we may conclude that in general all vessels were of a utilitarian nature and that there was very little demand for “special” or “unique” shapes, and decorated vessels (see also Chapter VI). The Sabi Abyad potters produced the bulk ceramics used for daily life. There was hardly any need for vessels holding a specific volume (see Chapter VI). Some vessels were produced for specific purposes (e.g. pot stands, strainers), while others (bowls, pots, jars) served a variety of purposes. It is very well possible that there existed a “mental image” or specific names for most shapes produced in Middle Assyrian times (see Chapter VI for Assyrian pottery names). That would facilitate for example the ordering or listing of a number of specific vessels without confusion. In that case, too large a variation from this image may have made vessels unacceptable to the consumer. However, it is impossible to know exactly how much variation an Assyrian would have accepted in his/her vessels. There is no information on the question whether the potters had to present accounts to the administration on used resources, number of produced vessels, and so on, but it does not seem likely. Above it was concluded that resources were possibly available without cost. Accounting considerations do not seem to be at the basis of any standardization observed at Sabi Abyad. Reduction of labour or time spent in production may have been a factor, though. The authorities in Sabi Abyad do not seem to have exercised strict control over the resources or the work of the potter, since they do not seem to have administrated his raw materials or labour. Perhaps they placed orders for amounts or certain kinds of vessels. The main consumer group for the Sabi Abyad potters seems to have consisted of the inhabitants and possibly the dependents of the *dunnu*, and perhaps even other *dunnus* in the area. This group consisted (in level 5) of around 900 people, including farmers, craftsmen and administrative staff, of which approximately 60 people were living inside the *dunnu*. For now it is assumed that this size stayed more or less constant over time during levels 6 and 5, and perhaps in level 4. There does not seem to have been a separate production aimed at the "elite", although there are a few special shapes with unique types of decoration. The consumer group of *dunnu* staff most probably does not constitute a "commercial" market, if the potter produced pots in exchange for rations or a plot of land as argued above. Whether other *dunnu* dependents had to pay for their pots or received them as part of their own remuneration from the administration, and whether Sabi Abyad potters could also produce for an outside market is not known, but anyway those vessels would not constitute a big percentage of the assemblage found at the *dunnu* since they would have left the site. The potters working at Sabi Abyad are considered to be specialized craft producers, most probably making pottery full time and perhaps occasionally performing other tasks as well. They would have possessed the necessary skill and routine needed to produce vessels in the techniques used and in the quantities needed. The exact number of potters that contributed to the assemblage in each level at Sabi Abyad is not known. However, based on the production facilities and the set-up of the *dunnu* as a whole, it can be argued that the number of potters working at Sabi Abyad in level 6, 5 and 4 was in the range of 2 to 10 rather than in the range of dozens of potters. It seems that relatively few potters produced large amounts of vessels for a large group of consumers. We cannot exactly establish what percentage of pots came to Sabi Abyad from other sites and was made by (how many) other potters. The span of time the assemblage in each level covers may be estimated at 30 years (level 6), 15 years (level 5) and a very rough estimation of 50 years (level 4). The technological tradition at Sabi Abyad includes several different technologies using the potter's wheel and hand-building. Each vessel type used in this analysis of standardization was produced with one technique only, therefore enabling us to check for this factor.

So the relative standardization or variability of the ceramics at Sabi Abyad seems to be related mainly to the following (partly interrelated) factors:

- The intended function of the vessels and the possible need for specific size classes.
- The context of production and the nature of the consumer group.
- Possible existing ideas or consumer demands about shapes and sizes, or the demand for specific vessel types by the authorities or consumers.
- The limited amount of producers producing large amounts of vessels, and possible efforts to reduce labour or time needed in production.
- Specialized and skilful full-time potters producing wheel-made vessels using several efficient techniques.
- The time span covered by the assemblage in each level.

The relative standardization of the ceramics in each level should ideally be compared to the other levels at Sabi Abyad or to contemporary or similar assemblages from other sites. Few publications, however, offer enough material for such comparisons.

Standardization of ceramic vessels can be detected in the standardization or variability of used raw materials or of the clay preparation processes, in the used techniques for shaping and firing, in the shape, size and detailed measurements of vessels and in decoration of the vessels (Roux 2003a: 768; Blackman et al. 1993: 61; Stein and Blackman 1993). We will now have a look at each of these aspects for the assemblage from Sabi Abyad.

Used raw materials and their preparation

The best way to establish standardization in the used raw materials and preparation is to compare detailed (chemical) analyses for a large enough number of sherds from each group in each level (cf. Blackman et al. 1993). However, as explained in chapter II and this chapter, description of the clay and inclusions proceeded only on a macroscopic level in the field, using 14 ware categories. Petrographical analyses were only carried out on a limited number of samples (Appendix D). Any conclusion on the standardization of raw materials is therefore severely limited by the lack of detail in the data. The conclusions in this paragraph would benefit from a more detailed study of the wares, with a large-scale programme of thin-section analyses and chemical characterization of the clays.

As was shown in table IV.42, the large majority of ceramics at Sabi Abyad was made of wares with added organic inclusions. A small part was made of fine wares without any added inclusions. Coarse mineral inclusions were rare in levels 6 to 3 and more popular in level 7. Also, the percentages were most similar between level 6 and 5, while they were slightly more variable in level 4 and 3. In levels 6 to 4 the amount of sherds with remarkably few or many mineral inclusions is relatively lower than in level 7. The thin-section analyses (Appendix D, see also Chapter II) have shown that any further distinctions between different wares have no basis in petrography, and can therefore not be used for any analysis of standardization in raw materials. Standardization of raw materials and inclusions can also take place within a shape group. As we have seen in Chapter IV, goblets were made of fine wares with no added inclusions. Other shapes, including small bowls and large jars, were made of similar pastes with similar amounts of organic inclusions, suggesting that the Middle Assyrian potters in levels 6 to 3 only prepared a different paste for goblets. Cooking pots were also made of a different paste, but Appendix D showed that many of them do not come from Sabi Abyad and were therefore not part of the local production tradition.

Shaping, decoration and firing technology

Earlier in this chapter we have seen that the potters at Sabi Abyad employed a number of specific and efficient techniques to produce their pottery, each technique suited to the size and shape of the vessels produced. The number of different shaping techniques used is therefore directly related to the kind and size of the vessels produced. We have never detected the occurrence of different shaping techniques for producing the same type of vessel.

Because throwing from the cone is a technique aimed at a quick production of large numbers of small vessels resulting in relatively more standardized shapes, the relative increase or decrease of this technique in an assemblage might give us some indication of the standardization of shaping techniques. In the graph in fig. V.59 we see the share of each technology group in each level. With caution we may conclude that in the Middle Assyrian levels a higher percentage of pottery was thrown from the cone, whereas the relative share of vessels thrown from one lump of clay is lower than in level 7, suggesting that production in levels 6 to 3 was aimed at more standardized shapes. However, we have to keep in mind that the shaping technique is related to the vessel shape: a higher percentage of vessels thrown from the cone also reflects a higher number of small bowls in the assemblage.

Other aspects of shaping techniques related to standardization are for example surface treatment and decoration. The burnishing or decoration of pottery gives the vessel a less uniform appearance and takes more time in production. At Sabi Abyad burnishing was mostly done in level 7, while the other levels each contained a burnished vessel only very rarely. In level 7 9% of all pottery was decorated, while in levels 6 to 3 only 3.6 to 5.4% was decorated. The pottery in levels 6 to 3 looks more standardized.

The control over the firing circumstances is an indication for the skill and professionalism of the potters. They were able to control the firing temperatures and possibly aimed at producing lighter colours, and kiln losses were low. If we look at differences in the firing temperatures between levels in table V.19 we see that, in general, this picture is true for all levels. In level 7 there are slightly more vessels fired at relatively low temperatures. Levels 6 to 3 show a tendency for medium to high temperatures and a relatively small amount of vessels fired at low temperatures. Control over firing temperatures therefore seems to be stricter in levels 6 to 3.

Level	high	medium	low	Total
7	23	289	32	344
	6.7%	84.0%	9.3%	100.0%
6	257	1985	46	2288
	11.2%	86.8%	2.0%	100.0%
5	1260	6112	226	7598
	16.6%	80.4%	3.0%	100.0%
4	360	1595	61	2016
	17.9%	79.1%	3.0%	100.0%
3	48	632	21	701
	6.8%	90.2%	3.0%	100.0%
Total	1948	10613	386	12947
	15.0%	82.0%	3.0%	100.0%

Table V.19: Comparing firing temperatures between levels.

Diversity in vessel shapes and rim types

When looking at the shape typology (Appendix B), it seems that there is a very large variety of types present at Sabi Abyad. However, a closer look shows that many of these types are only represented once or a few times. The bulk of the pottery from Sabi Abyad consists of a limited number of shapes and types. We have seen in chapter IV how the different types change over time, with some types being more popular in level 7 and some being more characteristic of the Middle Assyrian levels 6 to 3. But what can we say about the diversity of rim types in each level?[157] If we take a look at the number of different rim types per level, it seems that the diversity is largest in level 5, with 65 different types. However, it is also clear that the assemblage sizes are very different, ranging from 214 rims in level 7 to 5367 rims in level 5. Consequently, it is difficult to judge the diversity of types in each level. We will explore two other less intuitive ways of measuring diversity. First, the diversity index Shannon's H and the evenness (E_H) are calculated for each level (see chapter II for an explanation how). These indices take the assemblage size into account, so that H and E_H are comparable between levels. We see that the diversity indices of rim types are fairly close together. Level 7 has the largest diversity, while level 6 has the least diversity. In other words: level 7 has relatively more rim types than level 6. When we look at evenness, it shows that the rim types in level 7 are also more evenly distributed, while the rim types in levels 6 and 5 are less evenly distributed. This means that in levels 6 and 5 a smaller number of rim types forms the majority of cases, while in level 7 each type is represented more equally.

Level	Number of rims	Number of rim types	Diversity index H	Evenness E_H
7	214	36	1.27	0.82
6	1639	52	1.07	0.63
5	5367	65	1.13	0.63
4	1380	53	1.16	0.68
3	560	38	1.12	0.71

Table V.20: The diversity index Shannon's H and equitability index E_H for the rim types within each level.

157 The following calculations do not take into account any functional differences between the assemblages from each level.

We can also have a look at the “top ten” of rim types per level, listing the percentage of sherds of each rim type (see table V.21). It is clear that the “top ten” differs from level to level, with some types and shapes being more popular in one level than in the other. This is due both to chronological and perhaps also to functional differences between levels (see chapter IV). For our questions about diversity we are now interested most in the cumulative percentages. These show, for example, that in levels 6 and 5 more than 50% of all cases is represented by three rim types only: types 111, 322 and 311. In level 6 type 111 alone is already responsible for more than 40% of all cases. When we put the cumulative percentages in a graph (fig. V.60), it becomes clearer. The steeper the line, the more even the distribution of shapes is and the lower the line starts, the fewer shapes are dominant. There is a marked difference between level 7 on the one hand and levels 6 to 3 on the other.

level	7			6			5			4			3		
rank	Type	%	cum%	Type	%	cum%	Type	%	cum%	Type	%	cum%	Type	%	cum%
1	111	14.9	14.9	111	41.8	41.8	111	33.3	33.3	111	33.2	33.2	111	33.9	33.9
2	122	11.1	26.0	131	7.5	49.3	322	12.6	45.9	322	8.2	41.3	131	8.3	42.2
3	212	9.1	35.1	322	6.9	56.2	311	7.2	53.1	131	7.9	49.3	322	6.5	48.7
4	123	7.7	42.8	311	4.4	60.6	131	6.5	59.5	311	5.8	55.1	611	6.5	55.1
5	125	6.3	49.0	411	3.9	64.5	611	4.3	63.8	221	5.2	60.3	321	5.2	60.3
6	322	6.3	55.3	421	3.2	67.7	421	2.9	66.7	321	4.7	65.0	113	3.6	63.9
7	131	5.3	60.6	221	3.1	70.7	411	2.9	69.5	611	4.6	69.6	221	3.6	67.5
8	132	4.3	64.9	611	2.8	73.6	221	2.6	72.2	222	2.7	72.3	311	3.4	70.9
9	315	3.4	68.3	132	2.3	75.8	141	2.4	74.6	132	2.2	74.2	143	3.1	74.0
10	411	3.4	71.6	222	2.1	78.0	222	2.2	76.8	112	2.0	76.5	141	2.5	76.5

Table V.21: Table showing the rim types and percentages for the first ten most popular rim types per level.

At Tell Sheikh Hamad P. Pfälzner identified the “leichte Knickwandnäpfe” and “leichte Knickwandschalen” (our type 111) and the “eingezogene Flaschen” (our type 322) as being Middle Assyrian “standard” shapes, because these shapes together represented 57.5% of the total number of shapes and because they look very standardized (1995: 245). If we look at Sabi Abyad (table V.21), we can see that in levels 6 to 3 in each level only three types make up 50% of the rims (111, 131 and 322 in levels 6, 4 and 3; 111, 322 and 311 in level 5). Consequently these four types (111, 131, 311 and 322) are characteristic of the Middle Assyrian assemblages.[158] Whether these types were standardized will be discussed below.

These data show that, although in the Middle Assyrian levels there are more rim types present than in level 7, the majority of the corpus is composed of a few rim types only. The diversity of rim types in levels 6 to 3 is lower than in level 7. Furthermore in level 7 each rim type is more equally represented than in the Middle Assyrian levels 6 to 3, where a limited number of shapes predominates. Although differences are small, it can be concluded that in levels 6 to 3 production was oriented more towards a limited “set” of shapes than in level 7. The rim types with which we are concerned here are related primarily to vessel shape, wall shape and general shape and direction of the rim (see chapter II). The classification system of rim types used at Sabi Abyad is not geared towards distinguishing detailed variations in rim shape (cf. for example the detailed classification of “Lippenvarianten” in Pfälzner 1995: 62-70). These minor variations in rim shape are most likely a consequence of variation between potters or between different production events in the same workshop, while trying to reproduce a certain rim type. This means that the diversity measures of rim types at Sabi Abyad do not allow us to conclude much about individual potters or production events. Rather, they suggest that there existed a strong consumer demand for certain specific vessel/rim types in levels 6 to 3, while this demand was less strong in level 7. Obviously this

[158] For the other popular Middle Assyrian types, see table V.20. In levels 6-3 all “top ten” types except three also appear among the unfired vessel fragments and were therefore certainly produced locally.Types 321 and 112, although not found among the unfired fragments, do appear in the “top ten” for these levels and are possibly also locally made. Types 321 and 112 represent minor variations on types 322 and 111, respectively.

demand was related to the presence of the Middle Assyrian *dunnu* administration. Rare types perhaps reached the site from other, less regulated workshops, were coincidental variations, or were produced by the potters as special shapes or for other "markets". Simultaneously these data may suggest that in level 7 pottery from more different workshops reached the site in larger numbers, perhaps because there was no resident potter at the site.[159]

Vessel sizes and size groups

The diversity of types per assemblage does not say anything about the relative standardization of those types themselves. Did the Sabi Abyad potters shape bowls and jars that were only roughly similar to each other, or did they try to exactly reproduce a shape, size or even volume in their vessels? We will now look at the existence of size groups and the relative standardization of vessel types.

When looking at the standardization of a single shape, we have to make sure that there are no size groups hidden in our population (Roux 2003a, Stark 1995). If one type group consists of small bowls and large bowls lumped together, the variability in this group will be big. But looking at the small bowls only, the variability may be small. Size groups have to be made on the basis of the ceramic material. Size groups may already be apparent in the field, so that different vessel type numbers are used for description. Size groups can also be deducted afterwards, by comparing as many measurements as possible. In the case of the Sabi Abyad assemblage, total vessel height and rim diameter as well as the relation between these two measurements, have proved to be most informative.[160] For every shape and rim type in the shape typology (Appendix B) simple visual comparisons of the distribution of rim diameters, vessel height and their mutual relation were performed, making use of different graphs, scatter plots and histograms. In some cases, two similar types were compared to each other. When size groups became apparent, the type was subdivided into different size groups. These size groups were then used as a basis for further calculations on standardization and variability. So there are size groups for carinated bowls (types 111, 112), rounded bowls (type 122), perhaps for pots (type 211, 212, 221, 222) and for jars (small, middle and large jars; types 311, types 321, 322, 323), but not for all types.

[159] This is also reflected in the results of the thin-section analyses for sherds from level 7; see Appendix D.

[160] It is useless to make size groups on a random basis, dividing a shape type into three groups of equal size (as was done in Pfälzner 1995: 25). Size groups are only interesting if they have at least a basis in the material itself, if not in the mind of the potter or consumer.

Rim type	Small	Medium	Large	X-large	No groups
122a	88				
111a	91				
122b		130			
511a		135			
112a		137			
111b		143			
511b			190		
112b			206		
132a			206		
122c			209		
111c			216		
122d				307	
132b				308	
125					245
134					248
113					252
123					273
131					300
Mean	89	136	205	307.5	263

Table V.22: Bowls and strainers, mean rim diameters (mm) organized into size groups.

When looking at table V.22, it becomes clear that amongst the shallow bowls and the strainers there are clear groups around similar mean rim diameters. The size groups seem to vary around core measurements of 89, 136, 205 and 307 mm rim diameter. It is striking to see that each larger size group is exactly 1.5 times larger than the smaller group immediately below.

In the case of deep bowls and pots, size grouping is less clear. Not only was it more difficult and often impossible to distinguish size groups within the rim type groups and did rim types often display a large variety of rim diameters (see Appendix B). The size groups that did appear also showed more variety. Table V.23 summarizes mean rim diameters for deep bowls and pots. The measurements apparent in the bowls do not seem to return here, and the ratio of 1.5 is only apparent in the size difference between middle and extra-large pots. Generally, deep bowls and pots seem to be more variable in rim diameter and it seems that the potter was not aiming for specific groups in rim diameters.[161]

[161] This effect may also be caused by divergences between the shape typology and the “emic” classes of pots used by the potter.

Rim type	Small	Middle	Large	X-large	XX-large
225a	140				
211a		213			
212b		216			
144		227			
222a		228			
141			270		
142			282		
225b			287		
221a			288		
1410			290		
143				327	
231				329	
222b				331	
211b				340	
215				340	
213				347	
212b				357	
226					381
145					405
221b					741
Mean	140	221	283	339	509

Table V.23: Deep bowls and pots, mean rim diameters organized into size groups.

As discussed in the shape typology (Appendix B), size groups in jars were most apparent when comparing vessel heights. Jars can be divided into three groups: small jars (with a vessel height < 250 mm, mean height 173 mm), middle-sized jars (with vessel height between 250 and 500 mm, mean height 376 mm), and large jars (with vessel height > 500 mm, mean height 609 mm). The large jars form the most coherent group, containing rim types 321, 322 and 323, and showing little variety in height (CV for height = 6.1%). The small jars, although consisting mainly of rim type 311, show much more variety in vessel height (CV for height = 22.6%). Below we will look at the standardization of rim diameters for several jar types separately.[162]

Size groups can be made by the potter for different reasons and with different causes. For example, it is possible that the potter was aiming at a set volume. Since it is impossible to measure the volume of a wet, unbaked piece of pottery exactly, the potter has to rely on his experience with known shapes and sizes, and perhaps on his experience with the ratio between vessel height and rim diameter or maximum vessel width in the case of closed shapes. This ratio was studied for all types for which enough complete examples were present, but no apparent relationship appeared. It is unlikely that the volumes of the pottery types were aimed at capacity measures (see below and Chapter VI). Another possible cause for size grouping to appear is related to the potter's use of certain implicit or explicit measuring systems. In the absence of absolute measuring scales, a potter could, for example, use the measurements of his hands (finger width, hand width, hand span from little finger to thumb, etc.; cf. Arnold and Nieves 1992: 99, 100; Underhill 2003: 208). The use of body measurements leads to less variety in an assemblage, but not to as much standardization as when fixed measurement scales were used. If measuring systems were used, we would expect to see a relatively higher degree of standardization than if potters varied loosely around an idea of "small", "middle" and "large". Size groups can also be related to the use of the vessels. For example, the stacking of similarly sized vessels in the kiln or in the storage room

[162] Not enough data is available for a useful comparison of vessel height per rim type.

at home is easier than the stacking of lots of different-sized vessels.[163] Since deep bowls, pots and jars are not stacked in similar ways, the size grouping was possibly less important here.

The relative standardization of measurements of several shape types was investigated using the rim diameter measurements made in the field. Rim diameters may not have been the main focus of the potter in creating more or less standardized shapes.[164] However, since not all vessels are completely preserved, it is one of the few measurements that is easy to obtain from diagnostic fragments (easier than for example maximum vessel circumference or vessel height), and therefore often used in archaeological studies of standardization (e.g. Stark 1995; Blackman et al. 1993: 71; Arnold and Nieves 1992). As an indicator of the relative standardization of rim diameters, the Coefficient of Variation (CV) has been used (see chapter II for an explanation how). This CV is by now accepted as a useful measuring tool of variation in archaeological assemblages, enabling comparisons between different assemblages irrespective of the value of the mean (Roux 2003a; Underhill 2003; Eerkens and Bettinger 2001).

The raw data (mean rim diameter and CV) for a number of different vessel types from Sabi Abyad are listed in table V.24, showing measurements per level and measurements for the unfired vessel fragments. Since unfired vessel fragments are definitely all from (a few?) production events at Sabi Abyad, they may function as a comparison group to establish how much "cumulative blurring" or "ratio effect" has affected standardization in the assemblages. There were too few rim fragments in this collection to enable comparisons with unfired fragments for each level separately. Also, between square brackets for rim type 111a, the CV values have been added for sherds that come from the pottery workshops in level 6 and 5, respectively. Although we do not know for sure that these sherds stem from one or a few production events only, it is likely that they do stem from the production of these particular workshops. This is especially the case for the bowls from square M11 in level 5, most of which were found among the heaps of damaged bowls and goblets discarded in the workshop (see above).

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[163] The conclusion in Pfälzner (1995: 245-246 and 253, abb. 144 and 160a-c) that Middle Assyrian bowls are better stackable than Mitanni ones is misleading, because for his analysis of "stackability" drawings of the same vessel are duplicated and "stacked". In reality, however, the bowls never show such an exact similarity as in these figures and stackability is much less, also due to the often careless and slanted shape of the Middle Assyrian bowls (see fig. VI.15 and also Appendix G for these bowls). Moreover, Pfälzner's conclusion (1997: 338) that from stackability it follows that bowls were used in massive numbers and thus may have been used as ration bowls is disputable.

[164] Although potters in China did focus on standardization of the rim diameter within a batch, more than on other vessel measurements. Their consumers saw a clear sign of the potter's skill in the uniformity of the batch, and preferred to buy from skilled potters (Underhill 2003: 208).

	7		6		5		4		3		unbaked	
	mrd	CV(%)	mrd	CV(%)	mrd	CV(%)	mrd	CV(%)	mrd	CV(%)	mrd	CV(%)
111a	91	11.0	90	12.0 [11.9]	91	11.0 [10.2]	90	9.2	89	7.8	90	-
111b	138	10.6	141	12.2	141	10.5	144	10.8	147	10.5	148	15.4
111c	246	18.3	218	13.3	217	11.5	210	10.7	209	10.3	212	16.8
131	261	11.9	308	18.3	303	18.6	305	19.7	278	21.5	273	7.9
311a	-	-	85	8.9	87	9.1	88	7.3	83	13.9	-	-
311b	120	-	127	13.1	125	9.1	124	5.6	119	(1.7)	-	-
322	161	10.4	144	13.9	146	10.8	139	12.8	150	12.9	145	14.6
411	87	9.4	88	13.7	89	13.0	90	8.5	90	15.7	60	-
421	78	(3.7)	80	12.8	79	14.4	81	13.6	80	10.8	81	9.9
611	-	-	198	12.8	199	14.6	193	14.2	206	14.8	-	-

Table V.24: Mean rim diameter (mrd) and CV values (in %) for selected rim types per level and for unbaked pottery fragments. Between brackets: these values are not valid because of a very small sample size. Between square brackets: values for sherds from the pottery workshops only.

If we look at these data, the CV values vary between 5.6 and 35.9%. If we look at each shape type separately, a clearer picture emerges. The smallest carinated bowls (type 111a) and the middle and larger carinated bowls (types 111b, 111c)[165] have CV values that are rather close together, varying between 7.8 and 13.3% with 18.3% as an outlier in level 7. In contrast, the straight-sided bowls type 131, for which we could not find any size groups before (Appendix B), show a large variety of sizes with CV values ranging from 11.9 to 21.5%. The CV values in the group of large jars, here represented by type 322[166], also show a very close distribution with values ranging from 10.4 to 13.9%. Small jars show CV values that are lower, indicating a smaller variety of rim diameters than with the large jars. CV values range from 5.6 to13.9% for type 311 jars. For goblets, CV values range from 8.5 to 15.7% for type 411 goblets and from 10.8 to 14.4% for type 421 goblets. For pot stands type 611, the range is equally narrow, with values between 12.8 and 14.8%. We see that carinated bowls, jars, goblets and pot stands show a relatively high degree of standardization (below ca. 15%, mostly around 10%) as compared to straight-sided bowls (over 20%). But what do these values mean? We can either compare the CV values per type within the ceramic sequence of Sabi Abyad, or compare them to assemblages from other sites.

In the graphs in figs. V.61-63 a comparison of CV values of the different levels at Sabi Abyad is shown per rim type. In graph fig. V.61 it is clear that the CV values of the different carinated bowls (type 111) in levels 6 to 3 are very close to each other: they show a similar degree of standardization. Straight-sided bowls (type 131) however, are less standardized and show higher CV values throughout the sequence. This is remarkable, since we have seen that type 131 bowls feature prominently in the “top ten” of shapes and could be considered a typical Middle Assyrian shape. However, they are apparently not subject to the same ideas about size groups or standardization as the type 111 bowls. The CV values of the carinated bowls seem to become a little lower through levels 6 to 3, perhaps indicating more attention for a standardized size, or indicating that fewer workshops or potters have contributed to the assemblage, or perhaps indicating the shortening time spans of the different assemblages.[167] However, it is unclear whether this small decrease in CV values is statistically significant. Graph fig. V.62, summarizing the CV values for jars, shows a different picture. Here we see that the large jars type 322 are fairly even in relative standardization, with CV

[165] These three types are “standard” Middle Assyrian bowls in Pfälzner 1995.

[166] This type is the “standard” Middle Assyrian jar in Pfälzner 1995.

[167] The occupation of level 5 lasted only about 15 years as opposed to the 30 years or thereabouts of level 6; the longer the time span an assemblage represents, the more variation is to be expected. The duration of levels 4 and 3 is less wellknown.

values that are only a bit higher than those of the carinated bowls. From level 7 to 3 large jars seem to have rather fixed rim diameters, with a slightly larger variation in level 6. Small jars types 311 seem to vary more between levels, and although the variation in rim diameters first decreases sharply towards level 4, in level 3 an increase can be seen again. Graph fig. V.63 shows the relative standardization of goblets and pot stands. Throughout levels 6 to 4 the values are relatively even and slightly decreasing, again with values varying between around 10 and 15%. Levels 7 and 3 both show a more complex picture.

Comparison with data from fired vessels in the workshop contexts shows that the CV values hardly decreased in these contexts. So small bowls type 111a from the level 6 workshop in square O12 show a CV value of 11.9% as opposed to a CV value of 12.0% for the whole level 6 assemblage. Similarly, these bowls from the level 5 east workshop in square M11 have a CV value of 10.2% as opposed to a value of 11.0% in the whole of level 5. This indicates that the variation within the output of a workshop (independent o whether or not these vessels come from one production event) is comparable to the variation of the whole assemblage in a level as a whole. This strengthens the idea that a vast majority of the ceramics found in levels 6 to 4 at Sabi Abyad was produced by a limited number of local workshops.

Comparison with data from the unfired vessel fragments is less straightforward. Calculation of the CV value for type 111a bowls was impossible since all four fragments have the same rim diameter. For type 111b and 111c bowls, however, the CV values (15.4 and 16.8%) are higher than those of the fired ceramics, even if the unfired fragments of type 111b are from square H8 only and may represent a single production event. Possibly the deformation of still plastic unfired bowls has corrupted the measurements. On the other hand, unfired type 131 fragments (mainly from square M11) show a much lower (7.9%) CV value than the fired assemblage, possibly because only bowls of a certain size were produced in the production event from which the waste came. Although unfired vessel fragments seemed to form an ideal baseline for variation in local production, the interpretation of the data appeared to be rather difficult. The small sample sizes complicated the matter as well.

Summarizing, we can see that levels 6 to 4 show a rather homogeneous picture as compared to levels 7 and perhaps 3. Of course, the Middle Assyrian *dunnu* administration would probably put similar demands on pottery production and output in these levels. It is probably also related to the fact that the majority of the pottery found in these levels was produced locally by the *dunnu's* own workshops, whereas in level 7 (and 3?) pottery was most probably obtained from other sites and therefore from different workshops, as was suggested by the results of the thin-section analyses (Appendix D). Besides, some shapes in levels 6 to 3 show more relative standardization than other shapes, indicating that similarity in size was more important for some shapes than for others. This may be related to (consumer) ideas about size classes (small, medium, large bowls) or to intended vessel function, since these size classes do not seem to be apparent for all bowl types. Also, the lower standardization in type 131 bowls might be related to the differences in production technique (thrown from one lump of clay as opposed to throwing from the cone). For jars, we can question the reliability of rim diameters as a measure of standardization or size. In the case of large jars, the rim may have been produced just so that the opening was large enough to put in a hand, while small enough to close the opening with a jar stopper or piece of cloth, but without fixed ideas about a standard rim diameter. Vessel height and maximum circumference may have been better indicators of size. In this respect, the low CV value for vessel height (6.1%) for large jars is recalled. In the case of small and medium jars, size grouping and standardization seems to be lowest.

But how standardized is a vessel type with a CV value of 11%? Does this value indicate that standardization of size or replication of exact sizes or shapes was the intent of the potter? Or is it the “natural” variation occuring within the production output of an experienced potter not aiming for a specific measurement? J. Eerkens and R. Bettinger (2001) have tried to design a scale that can be used for standardization of artefacts of all times and cultures, by relating the scale to the limits and properties of human psychology and psychophysics. They concluded that, when skilled people attempt to reproduce an exact copy of an artefact without moulds or measurement scales, and they are allowed to discard those attempts that were perceived as being not exact enough, there is a minimum variation of 1.7% (CV) irrespective of the artefact's size. This is because of limitations in the interpretation and comparison of visual information in the human brain. On the other hand, completely random production would in theory (mathematically) show a CV of 57.7%. In the real world, however, artisans never produce objects with a variation this large, and the actual variation of "random" sizes would be much smaller. These values can be used as baselines.

Data from ethnoarchaeological studies show that CV values are generally lower than CV values obtained from archaeological assemblages (tables V.25 and 26). This may be due mainly to the "cumulative blurring" effect, pooling data from different potters or from a long time period together, thus increasing the variation in the data set (Blackman et al. 1993). Ethnoarchaeological data often use measurements from one production event or from one potter only, and from complete vessels only, a situation hardly encountered in archaeology where we have to deal with an unknown amount of production events and potters, and where we have to rely on diameter chart measurements. Besides, archaeologists have to devise a classification themselves, while ethnoarchaeologists can ask the potter which vessels belong to one group.

When it is known that potters aim for a standardized shape or exact replicas of shapes and sizes, the CV value in ethno-archaeological cases is generally low, up to around 5% (table V.25, e.g. Spanish and San Nicolas data, Chinese data). Pots that are not explicitly standardized but are meant to form a size class, show CV values between ca. 5 and 10%. Of course, these data come from varying production contexts, and vessel sizes and standardization will have been influenced by as many different factors. However, some general idea may be obtained, without taking these numbers as absolute limits. Moreover, these data are in general alignment with the findings of Eerkens and Bettinger discussed above.

Ceramic group	CV (%)
Andhra Pradesh (India) cooking vessels produced by low-rate producing specialists made in one production event by 6 potters, not aimed at strictly standardized vessels, demand for volume depending on family size.	6.24
Uttam Nagar (India) small water jars produced by high-rate producing specialists in urban pottery workshops, made in one production event by 6 potters. Small jars form a size class, but it is unclear whether standardized size is aimed at.	4.85
Spanish pitchers produced by a full-time urban high-rate producing specialist aiming at standardized products, made over the course of two days by one potter.	2.5
Kalinga (Philippines, Dangtalan) pots made in household production and for household use, from ca. 7 years, all pots from one volume class .	7.47
Kalinga (Philippines, Dalupa) pots made by part-time specialists made for distribution, from one year, all pots from one volume class.	4.99
Paradijon (Philippines) pots made by full-time specialists for shops, from two years, all pots from one volume class..	4.53
Ticul (Mexico) bowls produced for the internal market by one specialist producer household over 6 months, vessels are not measured during production.	10.8
Ticul (Mexico) pots produced for external markets through middlemen by one specialist producer household over 6 months, vessels are measured with hand spans and fingers but rims are ruffled making diameters more variable.	12.3
San Nicolas (Philippines) water jars from one production event by four potters, aiming at standardized sizes and volumes due to customer demand, but relying on skill and not using measuring tools.	4.6 (2.4-7.5)
Guizhou (China), rim diameters of *wan* bowls produced by 6 specialized household potters in two areas for commercial distribution, over a period of three years. Potters aiming at standardized rim diameters because of consumer demand and because of easier stacking in the kiln, using their hands for a quick measurement.	3.3

Table V.25: Comparing some CV scores for rim diameter measurements on vessels from different ethno-archaeological contexts. Most measurements stem from single (or a few) production events or from single (or a few) potters (based on Roux 2003a: tables 4, 6 and 7; Kvamme et al. 1996: table 4; Arnold and Nieves 1992, based on table 4.2; Longacre 1999: table 4.5; Underhill 2003: table VI).

Data from archaeological studies are informative as well. At the site of Ayia Irini in the Aegean, potters explicitly seemed to aim at exact copies of Minoan conical cups. The CV value is correspondingly low at around 3% (table V.26). At Tell Leilan the unique find of a stack of kiln wasters offered the opportunity to study the output of one production event for one type of vessel. The CV of the rim diameters in the stack is around 9%, leading Blackman et al. to conclude that this indicates specialized mass production of standardized shapes (1993: 72-73). However, similar bowls from the whole assemblage show a much higher CV of around 16% due to the cumulative effect of ca. 200 years of production. Roux (2003a: 780), on the contrary, thinks that the CV value of 9% for the Leilan waster stack indicates a rather low degree of standardization compared to ethnoarchaeological data. In fourth millenium BC Abu Salabikh, data on perhaps the best known “mass-produced, highly standardized” shapes (bevelled-rim bowls, BRB) yields a comparatively high CV of almost 15%, although it is the lowest CV value within the Abu Salabikh corpus. Although the BRBs seem to be more standardized than the rest of the corpus, Coursey (1997: 110-118, 174) concludes that it is unlikely that standard volume sizes were aimed for, and she concludes that the apparent relative standardization is “probably more a factor of coherence to an accepted size and shape defined by the local […] tradition than [related] to mass-production [….]”.

Comparison of the relative standardization of the Sabi Abyad vessels with other archaeological and ethno-archaeological assemblages does not, and cannot, lead to definite conclusions concerning standardization. There are simply too many factors influencing standardization involved in each case. However, we could tentatively suggest that although size classes and generally accepted ideas about vessel shape and size seem to be present in several Middle Assyrian shapes, the potters did not seem to aim for completely standardized vessel measurements and/or did not make use of an external measuring system.

Ceramic group	CV (%)
Late Cycladic II (Late Bronze Age) conical cups from Ayia Irini, intentionally copying Minoan shapes.	2.97
Al Basra islamic pottery produced in independent urban workshops.	3-10
Roman cooking vessels from Libya made in large, state-run workshops.	6-7
Tell Leilan 3rd millenium fine-ware bowls rim diameter in waster stack, single workshop output.	9.19
Tell Leilan 3rd millenium fine-ware bowls rim diameter, output of multiple independent workshops (over 200 years).	15.68
Middle Uruk bevelled-rim bowls (rims) from Abu Salabikh.	14.56
Inka pottery produced by part-time corvée labourers in Inka state service.	29.46

Table V.26: Comparing some CV scores for measurements on vessels from different archaeological contexts (based on Berg 2004: table 1; Benco 1988; Stein and Blackman 1993: table 3; Coursey 1997: table 4.6; Costin and Hagstrum 1995: table 4).

Capacity

The capacities of vessels were calculated for a large number of completely preserved shapes. The calculations took place on the basis of the drawings, as described in Chapter II. The capacity of each calculated vessel is mentioned in the descriptions with fig. IV.1-120. In Chapter VI and Appendix G the capacities of different shape and size groups are discussed. There it becomes clear that the variation in capacity is much larger than the variation in rim diameter or vessel height. This suggests that there was no standardization of capacity for any of these shape groups (except, perhaps, for the so-called “grain measures” type 225). See Chapter VI for a more detailed discussion of capacity and of Assyrian capacity measures.

Variability and standardization: conclusions

Summarizing, we can draw the following conclusions on variability and standardization within the corpus of Sabi Abyad and from a comparison between the different levels. In levels 6 to 3 the diversity of used raw materials seems to be slightly lower than in level 7, but the database is not suited for further analysis. The potters were in good control of their paste preparation, but prepared different wares only for some functionally and technologically different vessel groups. The homogeneity of used wares in the Middle Assyrian pottery is therefore also related to the small amount of functionally very different pottery vessels, like cooking pots and “luxury wares”, and to the general “daily, utilitarian” nature of the majority of the vessels (see also chapter VI). With due caution we might conclude that in the Middle Assyrian levels more vessels are made by “throwing from the cone” than in level 7, suggesting that efficient and quick production was favoured in these times. Moreover, the pottery from levels 6 to 3 shows less decoration and less elaboration of the vessels during production, giving the pottery a plainer and more homogeneous look. In levels 6 to 3 there seems to have been a stricter control over firing temperatures, which may again be related to the lower number of (very skilled) producers in relation to the size of the assemblage. When looking at vessel shapes, it appeared that the assemblages in levels 6 to 3 consisted of a lower diversity in rim types, and also that a smaller amount of rim types dominated the assemblage when compared to level 7. This may be related to the Middle Assyrian consumer demand (for only a particular “set” of vessels consisting of a few characteristic shapes) as well as, again, to a more limited number of workshops contributing to the assemblage in these levels. For some bowls and for small and large jars, ideas about size groups seem to have existed, but for other bowl types, pots and other jar types, size groups were apparently not really an issue. Shapes that were made in size groups show a higher standardization in measurements than other shapes. Size groups seem to be focussed on a set of measurements of 89, 136, 205 and 307 mm for bowls, but it is unlikely that a measuring system was used during production or that explicit standardization of size was aimed at. Rather, the size groups seem to be related to more general ideas about "small", "middle" and "large" bowls. The "cumulative-blurring" effect of the time duration of an assemblage seems to have had some effect on the standardization at Sabi Abyad.

So the data about standardization and variability seem to corroborate the picture that was already emerging. Compared to level 7, levels 6 to 3 show an assemblage of which the variability was most probably mainly related to aspects of the consumer demand and character of the consumer group on the one hand, and the small number of producers as opposed to consumers on the other hand. However, although the pottery generally *looks* "standardized" or shows little variety, potters probably did not aim at producing exactly standardized sizes or shapes.

V.8 The distribution of the products

Questions on the distribution of the products deal with the consumption and demand side of the production organization. Although it is an important aspect of studies of production organization (cf. Pool 1992: 275), I will only be able to give some general comments on the topic in this study. On the one hand, this is because solid conclusions about the consumption of pottery at the site of Sabi Abyad can only be drawn after a detailed stratigraphical and spatial analysis of the site has been carried out, taking all the contextual and depositional aspects into account. On the other hand, little is known about the distribution of pottery made in Sabi Abyad to other sites in and outside the region. This paragraph will try to summarize what can be suggested about consumption on the basis of the information collected in this thesis, and to propose further lines of study.

First of all, it must be remarked that almost all the ceramics presented in this study come from consumer contexts, not from production contexts. Some of the ceramic vessels found in the workshops in level 6 and level 5 East (especially the kiln waster goblets and bowls in square M11), kiln wasters, unfired pottery and perhaps sherds found in and around kilns are part of the production context. However, other vessels in the workshops,[168] and most if not all ceramics elsewhere at the site, are part of the consumption context. In this chapter, I have therefore tried to reach conclusions on production organization by studying material that was mostly derived from a consumption context (cf. Pool 1992: 280-282).

We will look at the distribution of the vessels produced in the Sabi Abyad workshops to "circles" of increasing size, starting with the *dunnu* itself. It goes without saying that pottery was produced in the first place for the people living at the *dunnu*. It is expected that the potters would have produced vessels with special functions for example for the baker or the brewer, next to the normal domestic vessels everyone needed. Some occasional special shapes would be produced as well. In chapter VI, we will look in more detail at the function and use of the vessels. At the moment there is little information available about the use of different vessels in different areas or buildings at the site. A detailed spatial analyses could shed light on whether the administrative staff used or needed different vessels than the craftspeople living and working at the site, and on how many vessels each household used. In this study it was not possible to discern between two or more different "traditions" of ceramics, for example a luxury kind and a common kind. It seems that staff and workers at the *dunnu* all used the same kind of vessels, perhaps apart from those they needed for their craft (e.g. brewing, cooking). Although the demand of this group of consumers would have largely determined the kind and quality of the vessels the potters produced, we have seen above that it is unlikely that the administration exercised a lot of control over exact shapes,

[168] Unless spatial analyses would identify these as the storage or stock of the workshop.

used techniques or resources. But although the products of the workshops, the used techniques and materials and the variability of the products mostly resemble “independent” production organizations (cf. Costin 1991), it is reasonable to assume that the potters were completely dependent on the administration at least for their rations.

As was argued above it is very likely that the output of the workshops was larger than the demand of the *dunnu* inhabitants only. Most probably, pottery was produced for the hundreds of dependents of the *dunnu* as well. In his informative article discussing agriculture in the Balikh and at Sabi Abyad in Middle Assyrian times, F. Wiggermann used textual evidence to estimate a catchment area of the *dunnu*. In this area, measuring about 36 km^2 around the site (within a radius of approximately 3.5 km from the site), the *dunnu* had its fields and dependents were living in small villages and farms. The sites of Khirbet esh-Shenef and Tell Hammam et-Turkman fall within this catchment area and could have been (small) subcentres, while the existence of four more subcentres is suggested but not proven by survey material (Wiggermann 2000; in the whole Balikh Valley only six sites and six small possible sites dating to the Middle Assyrian period have been identified in surveys; see Lyon 2000: 100). We know very little about the extent to which the local, non-Assyrian (Šubarean) villages around Sabi Abyad also had their own pottery workshops producing vessels in their own, different tradition (Wiggermann 2000: 192; Lyon 2000: 94). This would archaeologically be very difficult to recognize from survey material. First, since potting is a very conservative trade, a local tradition of people resident in the area before the Assyrians came would possibly build on past practices regarding shape, decoration, and so on. Thus their pottery would perhaps be similar to the ceramics of the time when the region was under Mitanni rule, and in a survey it would be dated to the Mitanni period. Secondly, whereas the Middle Assyrian products are easily recognizable in survey material, it could be possible that a local produce different from the Assyrian one is not so easily recognized and therefore not dated to the same period. A detailed re-evaluation of ceramic material both from the Balikh survey (carried out by P.M.M.G. Akkermans in 1983 and by T.J. Wilkinson in 1993, 1994 and 1995, see also Curvers 1991) and from the excavations at Khirbet esh-Shenef (Bartl 1990) and Tell Hammam et-Turkman (Van Loon 1988, Smit 1988) would shed more light on the Middle Assyrian pottery corpus at the sites in Sabi Abyad’s catchment area. One of the most interesting questions would be if there is a distinction between the assemblages found at these sites and the assemblage at the *dunnu*; in other words, whether there is evidence for an “official” tradition of pottery and a “common” one (cf. Pfälzner 1995, 1997), or an “Assyrian” and a “local” tradition.[169] If dependents of the *dunnu* indeed obtained most of their pottery from the workshops at Sabi Abyad, one would expect the pottery at the smaller subcentres to be similar to that found at the *dunnu*. Such a re-evaluation was partly undertaken in the work of J.D. Lyon (2000) but needs more detailed study. It is as yet unclear whether distribution to the dependents followed “market” principles, or whether pottery vessels were part of the remuneration of the administration.

It is hardly likely that Sabi Abyad was the only Middle Assyrian site in the province of Hanigalbat where pottery was produced. More likely, most *dunnus* and certainly every town had its own resident potters, like Sabi Abyad. In any case, especially near the rivers and wadis, the resources for pottery production were available everywhere. There were several other *dunnus* and numerous other Middle Assyrian sites in the Balikh Valley, identified both from surveys and from texts (see Chapter I). The surveys carried out in the Balikh Valley (see Chapter I) did not yield any direct evidence for pottery production in Middle Assyrian times at any of the other identified sites. However, such evidence is very rarely found in surveys in general and the evidence at Sabi Abyad has shown that the absence of wasters, kiln fragments

[169] Since the sites in the catchment area of Sabi Abyad are so close to each other, the areas from which raw materials would have been taken overlap, and archaeometric analyses of the clay composition can therefore not be used to differentiate the products from the settlements around Sabi Abyad from those made at the site (Rands 1988: 167).

or the like in survey material is not surprising. A Middle Assyrian text (TCh 95.G.185:5) from Tell Chuera, to the east of Sabi Abyad, mentions a ration of two days for a potter, suggesting that pottery was produced locally at the site, but it is possible that this potter was working at Chuera on a special order and did not reside there (Jakob 2003: 475). Cuneiform text T93-3 (see above and Appendix F) shows that the potter of Sabi Abyad could be sent to other places when the need arose. This is reminiscent of the "redistributive" use of specialized craftsmen by the state as described by Zaccagnini (1983: 247-249) for the Mari archives, and continuing until the end of the first millennium BC (*idem*, 259). However, the texts from Sabi Abyad and other sites show that Dunnu-Aššur and Sabi Abyad stood under the authority of different families. Both are private agricultural estates, with their own responsibilities and their own employees. Still, on occasion the Sabi Abyad potter seems to have provided Dunnu-Aššur with the ceramics needed, therefore taking care of the production for another Assyrian state settlement in the region. Apparently Mudammeq-Aššur was not able or not willing to acquire pottery from other sources such as a local (non-Assyrian?) potter or market, but rather asked for the potter under Sabi Abyad's authority. Whether Dunnu-Aššur itself never had a resident potter (as suggested by Jakob 2003: 475) or whether this situation was exceptional is not clear. The analyses of the Middle Assyrian pottery from Sheikh Hamad in the Khabur and Tell Umm Aqrebe in the eastern steppe on the route to Aššur showed that the pottery at these sites was produced locally and therefore that each had its own pottery production (Pfälzner 1995: 248). Chemical and thin-section analyses of Middle Assyrian ceramics from Tell Chuera, ancient Kharbe, located between the Khabur and Balikh valleys, will demonstrate whether this is true for Chuera as well (Boesze in prep., personal communication). However, chemical and thin-section analyses will not show whether the potter himself travelled to other sites and then produced pottery at that site with local resources. If Middle Assyrian potters who fell under the authority of an official administration did actually travel to other sites to produce pottery locally, this may partly explain the typological homogeneity of Middle Assyrian pottery in the area from Sabi Abyad in the west to Kar-Tukulti-Ninurta in the east (described in Pfälzner 1995: 227). Not only would pottery at many sites be produced by a limited number of potters only, therefore increasing formal similarities between sites, potters would also be in closer contact with each other, exchanging information and experiences with techniques and local materials.

It is unlikely that the pottery produced at Sabi Abyad reached sites further away in any significant numbers. Transport of vessels over long distances usually occurs only if they are used as packaging material in the transport or trade of other commodities, or if the pottery produced had special qualities. Specific characteristics of only locally occuring resources (as in the case of, for example, Neolithic Dark Faced Burnished Ware, certain types of cooking pots, Chinese porcelain, etc.) may create a demand for vessels produced in other regions, as well as particular shaping or finishing techniques not mastered elsewhere. However, in the case of Sabi Abyad, we see that the resources used by the potters are very similar all over northern Mesopotamia, and that they did not produce technically or functionally exceptional wares or shapes.

V.9 Conclusions: the organization of pottery production at Tell Sabi Abyad

In this chapter, I have tried to study all aspects of production organization and combine all available data on the pottery and its production, in order to draw a picture of the organization of pottery production at Tell Sabi Abyad. Of course, as is often the case in archaeology, definite conclusions on any of these aspects are difficult to draw, and in many instances our reconstruction of pottery production organization is built on suggestions and possibilities at best. However, by combining all aspects and trying to take into account all different variables as much as possible, we can at least choose the most likely story, the one that fits the material and the larger picture of society in Middle Assyrian times best. As always, this story will be subject to changes, adaptions and further detailing when more work is done on the other finds from Sabi Abyad, from other contemporary sites, on Middle Assyrian texts, and on pottery production in archaeology and ethnoarchaeology.

A short summary of the conclusions in this chapter yields the following picture. The organization of pottery production at Middle Assyrian Sabi Abyad seems to have been of a professional but unassuming and practical nature. The picture that emerges from the data presented in this chapter is one of one or two professional, skilful and efficient potters and several assistants (women, boys, members of his family?) producing the daily utilitarian pottery at the *dunnu* for the *dunnu* staff and their dependents, and occasionally at other *dunnus* as well. They had a good knowledge of their resources, how they needed to prepare them and what the problems in shaping and firing would be, but they balanced the time and effort needed to overcome these problems against the small advantages of a perfect product. Since the resources at other *dunnus* were similar to the ones at Sabi Abyad, it was easy for them to travel elsewhere and produce pots locally. They used efficient shaping techniques and professional tools and kilns, and were most probably involved full time in pottery production. It is likely that the local administration paid them for their work in rations or perhaps also with a sustenance field. Although they were in this way part of the Middle Assyrian state organization, they do not seem to have had a very large role in it, and probably did not have a very high status. The administration was apparently not deeply involved in how the potter acquired his resources or his assistants, and they apparently did not exercise much control over the work of the potter. The products the potters made are rather uniform and comprise a rather limited set of shapes. For some shapes they made pots in different size groups, but the exact size or capacity was not important. The production of a limited range of shapes may have facilitated the coordination between the administration and the potter: everyone knew what to expect if for example a quantity of “drinking cups” was ordered. It is not known whether the potter received rations based on the number of pots he produced or based on the amount of days he was working. Although the potter was therefore part of the Middle Assyrian administrative system, he does not seem to have been an “attached” specialist. Rather, the picture that emerges is that of a relatively independent potter working in an individual workshop organization, but commissioned by and under the protection and authority of the Middle Assyrian *dunnu* administration. This would compare most closely to an “estate” or “state” individual workshop organization, or to individuals performing their corvée (*ilku*) obligations. Although the potters in Middle Assyrian times seem to continue their work technically largely in the old traditions pre-eminent in Mitanni days, the difference with earlier production seems to lie mainly in the decrease of variability in the products and the decrease of time spent on decoration and special shapes. This is most probably related to the changed consumer demands and production organization under the Middle Assyrian management of the provinces. Perhaps fewer potters now had to produce more vessels, while there was less need to produce special or especially nice vessels since there was no competition on a free market.

CHAPTER VI: FUNCTION AND USE OF THE MIDDLE ASSYRIAN CERAMICS

"Let a written order go out from you to your brewer in Saḫlalu,
that he must give beer and tarīḫu-vessels
(for) when the Suteans come to have dinner with me."
Mudammeq-Aššur writing to Mannu-kī-Adad at Sabi Abyad.

VI.1 Introduction

Vessels are made for a certain purpose or, in the words of D.P. Braun (1983), pots are tools. This rather mundane but important realization immediately clarifies the importance of discussing vessel function and use in relation to the context of production and production organization. Vessel function and use is an integral and indispensable part of a study of pottery production, because it is one of the most important things the potter had in mind from the start of his work. However, after the vessels had been made and distributed, they could acquire a wide range of different uses and reuses over the course of time, not always closely related to their intended function and ultimately resulting in discard and deposition. In this chapter I will look into the different sources that can yield information, however fragmentary, on the function and use of the Middle Assyrian vessels.

One caveat has to be made at the beginning of this chapter: pottery vessels form only a part of all containers and vessels that were in use in the Middle Assyrian settlement. There are some indications that bronze vessels were used at the site (cf. M97-50, fig. VI.1), but most bronze and other metal vessels would have been taken away when the inhabitants left the site.[170] Other containers made of organic materials, like wooden boxes, chests and bowls, baskets of different shapes and sizes, and textile and leather bags, were in use at the site but are barely preserved in the archaeological record.[171] So we are dealing only with a partial set of containers used for the different activities at the site. Through the pottery we are studying only a small segment of the material and cultural context. This is important not only for our understanding of pottery as containers, but also for our understanding of pottery as a cultural phenomenon vis-à-vis other cultural expressions (such as architecture, other crafts, style and art; Ionas 2000: 113).

Many archaeological and ethno-archaeological studies have dealt with the problem of inferring the function and use of ceramics (cf. Ellison 1984, Rice 1987: 207-243 including a bibliography; more recently e.g. Smith 1988, Henrickson 1990, Rice 1990, Vilders 1991/92, Skibo 1992, Schaub 1996, Lesure 1998). Often the study of function and use of pottery vessels forms a preparatory part of a broader functional or spatial analysis of a whole settlement (Henrickson 1982, Voigt 1983, Verhoeven 1999, Jamieson 2000, Pfälzner 2001, to name just a few). In this respect the present study can be seen as an indispensable step towards a future spatial analysis of the *dunnu* at Sabi Abyad. The study of function and use generally proceeds from three related perspectives: 1) archaeological context and remains of contents, 2) performance characteristics, and 3) contemporary information from texts or iconography (Smith 1988: 912, Henrickson 1990: 83-88, Rice 1990, Schaub 1996, Lesure 1998: 20).

First, the archaeological context can provide clues to the way a vessel was last used. In some cases the relation between archaeological context and use is unequivocal, as when ceramics are part of a burial context. In other cases a real danger for circular reasoning exists: the identification of the use of space often proceeds exactly on the basis of the artefacts found there, including ceramics. Because a spatial analysis of Sabi Abyad is not part of this study, the possible role of the archaeological context in establishing or inferring the use of ceramics is even more limited. The archaeological context will therefore only be mentioned in very clear or remarkable cases, as far as it was noted in the pottery documentation. This section will also discuss any remains of contents like charred seeds, crusts or other residues, which provide a second source of direct evidence for vessel use.

A second perspective is the study of the performance characteristics of vessels, and the study of the use traces left on the vessel surface. Traces of use, studied for the first time in a systematic way by Skibo

[170] In this respect, it is interesting to see that a text about Hurrian deportees and their properties (Freydank 1980) lists metal cooking pots but no pottery vessels among the household goods.
[171] That these containers were in use at the site is proved by the impressions they have left on the reverse side of clay sealings (Duistermaat and Wiggermann in prep.). Another indication is provided by basketry impressions on bitumen, found in level 6.

(1992), include sooting, abrasion, and scratches. Performance characteristics include all aspects of a vessel that have an influence on its performance as a container or tool. They include fabric and inclusions, firing, porosity, thermal-shock resistance, the general shape and presence of appendages like spouts, handles, holes, etc., surface treatments, decorations, and size, as well as the related aspects of capacity, accessibility, stability, and transportability (Rice 1987: 207-243, Tite 1999, Skibo 1992: 36-38). Combining all information, these aspects can provide indications as to the function of the vessel. Usually, the different performance characteristics are summarized in a functional classification, listing vessels for processing, serving/eating, transport or storage (cf. Pfälzner 1995: 23, Rice 1987: 209, 238, see also Ionas 2000: 30-37). A similar classification of the vessels from Sabi Abyad will be presented in this chapter, summarizing all available evidence.

The third approach used in this study is the Assyrian textual and art-historical context of the pottery. Ancient vessel names, the occurrence of vessels in texts of different natures (lists, letters, literary texts) and dealing with different subjects, and indications for the capacity or content of vessels from texts all help to reconstruct the functions and uses of ceramic vessels. Furthermore, the way ceramic vessels are depicted in iconography can be informative. Contemporary textual information about prevalent foodstuffs and diets, recipes and ways of preparing food form a background to this part of the chapter. Unfortunately, the information from iconography and cuneiform texts about pottery vessels and their use is extremely limited in the Middle Assyrian period.

Of course, there are other ways to study function and use as well, but they could not be pursued here. This study does not include the laboratory analysis of residues of foodstuffs or other materials left in or on the vessel walls (e.g. Gouin 1996, Deal and Silk 1988, Rice 1987: 233-234). A laboratory materials science approach, studying aspects of porosity, mechanical stress, and so on has only been carried out for two cooking-pot sherds (cf. Appendix D). Experimental studies of the ways in which vessels can be used (Rice 1987: 211, Schiffer 1990) are not dealt with in this thesis either.

This chapter will deal with the ceramics from the Middle Assyrian levels 6 to 3 only. For reasons of readability, all data pertaining to function and use have been collected in Appendix G, discussing the archaeological context, the performance characteristics and traces of use, for a number of vessel groups separately. These include the most popular Middle Assyrian shapes (the "top ten" in each level, cf. Chapter IV). Because detailed rim variations are thought to be generally of less influence on function and use than the overall vessel shape and vessel properties, various type numbers will be grouped in this discussion. Several unique shapes will be discussed in the text of this chapter. For each shape group, Appendix G lists all the data on functional aspects discussed in this paragraph. The sixteen groups thus formed comprise almost 90% of all rims and complete vessels found at the site, and are:

- Carinated bowls (types 111, 112)
- Carinated bowls with long vessel wall above the carination (type 113)
- Small and large straight-sided bowls (types 131, 132, 143)
- Deep bowls and open pots (types 141, 142, 221, 222)
- Closed cooking pots (types 211, 212, made from cooking wares)
- Closed pots (no cooking pots, type 211a, 212a)
- Small jars (types 311)
- Medium-sized and large jars (types 312, 321, 322, 323)
- Jars with a handle (type 333)
- Goblets (types 411, 421)
- Pot stands (type 611)
- "Pilgrim flasks" (type 911)
- Strainers (type 511)
- Bowls with handles and a spout (type 151)
- Large pots (types 212b, 215, 221b, 145)
- "Grain measures"(type 225)

A distinction will be made between the *function* and the *use* of a vessel. "Function" indicates the broad vessel purpose that the potter had in mind when producing a certain vessel. Function is therefore most closely related to vessel design. Multiple functions may have been part of the design of a single vessel type, whereas different vessel types may have had similar functions. The word “use” indicates in which way vessels were ultimately used. In this case we are dealing mostly with the way the vessel became part of the archaeological record. Use can also leave traces on the vessel during its use-life. Often function and use will be similar, but generally the uses of vessels may be both more varied and more specific than their function (cf. Rice 1987: 233, Rice 1990:1-2, Skibo 1992: 35, Henrickson 1990: 83-84).

VI.2 Ceramics in their archaeological context

Remarkable find contexts

Apart from the numerous small sherds found in all archaeological debris and discard contexts at Sabi Abyad, many complete or reconstructable vessels were found in floor contexts at the site. About 10% (representing almost 2000 vessels) of all database entries were vessels with at least the rim and the base preserved. At first glance all common vessel types were found in all areas at the site. Awaiting a complete functional analysis to see if differences do exist, not many areas can be singled out as “different” based on the pottery finds. Apart from the pottery workshops (discussed in Chapter V) which obviously contained a different set of ceramics than other contexts, some exceptions may be mentioned here.

The first is a room in square K9 in level 5, containing several small ovens (fig. VI.2). In one of these ovens the broken but reconstructable imported cooking pot P93-308 was found. The room stands out because of the rest of the pottery finds as well since many of the special (imported) shapes were found here, including the bowls with a spout and handles (type 151), “pilgrim flasks” (type 911), and dark bowls with white-filled impressed decorations (type 113). It is clear that we are not dealing with a house or living area like the rest of the areas at the site. The space was tentatively identified as a kitchen for the *dunnu* staff (Akkermans and Wiggermann in press).

Another special area that can be mentioned here is a small room south of the “office” area of *abarakku* Tammitte in level 5 (fig. VI.3). This room was completely filled with many very large storage vessels, part of them dug into the floor. The room may well have been a storage room for bulk goods. Later the room was used as a dump for other large and small pottery vessels and garbage.

In several other locations large jars or their reused bases were found to be part of some kind of industrial installation made of mud bricks (fig. VI.4). The jars seemed to have the role of collecting liquid or other material, but the exact use of these installations is as yet unclear.

Several small and middle-sized bowls were found on the rim of large jars, acting as a lid. Other specific find circumstances, where applicable, are mentioned in Appendix G.

Remains of contents

No chemical analyses of organic residues in or on vessel walls were performed. Promising vessels for such a study would include cooking pots (identification of fats), “pilgrim flasks” and storage jars and pots (traces of wine, (perfumed) oil, beer, ghee, tanning materials), pots with a hole in the base and large storage pots (see Zarnkow et al. 2006 who have identified these vessels as used in beer production), and deep bowls with a spout and handles that must have had a specific, although unknown, function. Possible traces of residues were recorded in a small number of cases. These include stains or discolourations in various colours (orange, reddish, brown, greenish) on the inside of vessels (carinated and straight-sided bowls, large jars, a strainer); crusts of a carbonized material inside (carinated bowls); and whitish or yellowish crusts or accretions sticking to the inside (carinated bowls, closed pots, small and large jars, large storage pots). The exact nature of these stains and crusts must remain unclear for the time being.

Other remains of original contents include charred grains, seeds, sesame, garlic and possibly fruits. These were found mainly in carinated bowls, as well as in small and large jars, and in large storage pots. These botanical samples have not completely been analysed yet. However, they indicate that short and long-term storage of grain and other dry foodstuffs probably took place in these vessels. Due to their adhesive qualities, dark-red pigment, gypsum/lime paste and bitumen paste were also found inside vessels (fig. VI.5), mainly in carinated or straight-sided bowls and in the broken base of a small jar. They show that these containers were (secondarily?) used for short-term storage and processing in craft production or repair of artefacts. The few artefacts found in vessels usually do not provide clear indications of the vessel use. In any case, they indicate that smaller vessels like deep bowls and small jars were not only used for the storage or processing of foodstuffs, but also for the storage of tools, raw materials (e.g. for stone cutting or bead production, fig. VI.6) or more precious objects.[172]

Ceramics in burials

Ceramic vessels occurred in burials of adults and children in two ways: as a container of the body or cremation remains and as a burial gift. In either case ceramics would have had a practical as well as a symbolical role in the grave.

The Late Bronze Age burials from Sabi Abyad will be published in the forthcoming volume on the results of the excavation (Akkermans in prep.) and have been the topic of an unpublished Leiden University MA thesis (Otte 2005). This paragraph is solely based on preliminary information from the field documentation. Not all burials contained pottery or made use of pottery vessels as containers. This paragraph will only deal with those graves that did contain pottery.

Pottery jars were used to contain the remains of the deceased. Two kinds of burials made use of pottery jar containers: cremation graves[173] (most probably adults) and burials of children (in one case two young children were buried in one jar).[174] The jars used for cremation graves (cf. fig. VI.7) mostly date from levels 4 and 3, or could not be attributed to a level because the level from where they had been dug in had eroded out. Interestingly, cremations were put in jars with a neck of type 315 or 318 (fig. IV.78.d, IV.108.n, IV.118.h), and not in the more common jars of types 311 or 322. Most cremation jars were closed with a type 111 carinated bowl as a lid, whereas jar P98-57 (fig. IV.78.d) was originally closed with a piece of textile tied over the opening with rope and then sealed with a clay sealing. The sealing was still *in situ* at the moment of excavation. Burial gifts in cremation graves included bones and skulls of sheep or goat and ceramic bowls in the burial pit, as well as beads, necklaces, bronze and gold bracelets, rings, earrings and other jewellery in the cremation jar, some of them also known from burials at other Middle Assyrian sites (cf. Ohnuma and Numoto 2001: pl. 49b). The cremation of a corpse was not customary in Assyria, and the relation with jars of a different type than the common Middle Assyrian type 322 jar may suggest that the persons were non-Assyrians as well.[175] Perhaps the cremations were local non-Assyrian persons whose own cultural traditions were respected at the moment of their deaths.

It seems that babies and toddlers were usually buried in jars. The jars used for these burials are exclusively of type 323 and 322, the large ovoid Middle Assyrian jars (fig. VI.8). Usually the broader ones with a large circumference were chosen as opposed to the more slender shapes, so as to have more space inside. The rims and/or bases of the jar were sometimes missing or had been intentionally removed. The jars were mostly left open (although textile covers would not have been preserved), but sometimes a mud brick was placed at the open end as a kind of closure. Burial gifts in these jar graves included a ceramic bowl and personal jewellery like bronze anklets or bracelets, iron rings, and shell and stone beads. Graves of adults[176] were sometimes covered with large sherds from huge storage vessels. The sherds then function as some kind of protection, and were used in the same manner as mud bricks placed over the body in other burials. However, not all Late Bronze Age adult burials were covered by bricks or sherds. There were no burials of adults where two large pots were placed with the rims against each other as a coffin, a popular custom in other periods in northern Syria (cf. for example Jean-Marie 1999 at Mari).

[172] The storage of cuneiform tablets in jars, as at Giricano Höyük (Radner 2004), has not been attested at Sabi Abyad.
[173] Jars P93-133i and P93-133ii; P96-87 and P96-86; P98-57; P01-130 and P01-135; P01-56; P01-60.
[174] Jars P93-334; P96-529; P96-460; K8 83-178; K8 96-203.
[175] Of the three sherds from type 315 jars studied in thin section (Appendix D sample nos. 42, 47 and 37) one was most probably made from local clays found around Sabi Abyad, one was probably made from Balikh clays and one was definitely not of a local origin.
[176] H9 44-87; BN 97-1 / H8 14-51; BN99-15 / I12 63-155; BN99-16 / H12 loc. 15; BN03-1 and BN03-9 / N12 loc. 32: burial inside pottery kiln L.

Both child inhumations and cremation burials use closed jar shapes to contain the body or ashes; no open shapes like deep bowls or pots were used for this purpose. The cremation jars were moreover carefully closed with lids, and once even sealed. The protective role of the pottery is quite clear in these cases. Although an in-depth discussion of Assyrian burial ritual and ideas about life, death and the nether-world would lead too far for this thesis, it seems plausible that the ceramics used as burial containers had some kind of symbolic aspect apart from their purely practical role of containing the remains of the dead. Mesopotamian textual sources, including literary and religious texts, abound with parallels between the making of pots and birth on the one hand, and between the breaking of pots and death on the other. Besides, the comparison between the human body and the pottery vessel seems to have been part of the Mesopotamian world of ideas (see for example Foster 1991).

As seen above, ceramics did not only serve as a container for a burial but were also part of the burial gifts. Interestingly, ceramic burial gifts are almost exclusively limited to small type 111 carinated bowls. Only once a small jar (type 312) was given as well. Pottery gifts occurred in all types of burials, whether they were cremation graves,[177] or children[178] or adult[179] inhumations. In the case of cremation graves the bowls were placed in the burial pit, together with parts of a sheep or goat (once together with another jar with a bowl as a lid; P93-134i and 134ii), while the personal jewellery was included with the ashes in the jar. In inhumation graves the bowls were nearly always placed near the head of the body, sometimes near the upper arms and seldom at the feet. Not all burials had pottery bowls among the burial gifts; sometimes only a few beads or rings were given, and other people were buried without any grave goods. The type of vessel as well as the place of the vessel near the head of the deceased indicates that these bowls were given into the grave in their function as food containers or drinking vessels. Perhaps actual food or drink was placed in the grave during a funerary meal. Or the deceased could have been given a bowl to use in the afterlife whenever a *kispu* meal would be offered to him or her by the family (cf. Sürenhagen 2002: 326).

Secondary use and discard

Some vessels were recycled even when broken (see Chapter V, also for illustrations). Several large jars were reused as pots in this way. After their top halves had been broken off, the fracture was straightened and smoothed and the base half could be reused as a pot. Once a rim and upper-vessel half of a large jar was reused, possibly as a pot stand.

After a pot had broken and was no longer useable as a container, its sherds could still fulfil different purposes (cf. Skibo 1992: 44). Several sherds were clearly reused as tools. Mostly, they seem to have been used as tools for scraping activities, as for example the loamer from the pottery workshop discussed in Chapter V (O03-120, fig. V.10). It was made of a body sherd. Rim and base sherds were also used as scrapers, as is shown by two carinated bowl rims (P97-208 and K8 102-214:7) and a base (fig. V.19). Sherds were also used for a make-shift pavement in streets, and to fill holes and weak points in walls. These sherds, as well as the ones from clear dump contexts, were often easily recognizable by their dirty, eroded surfaces and small size. In contrast, sherds from floor contexts were much cleaner and larger, and showed cleaner fractures. Not only sherds, but also more or less complete vessels were discarded, sometimes in abandoned rooms or in pottery kilns that were no longer used. Ultimately, whether discarded on purpose or not, none of the excavated vessels was deemed valuable enough to take along when the inhabitants left the site, and all eventually entered the archaeological record.

VI.3 Performance characteristics and traces of use

To be able to fulfil their functions, pottery vessels must be able to contain contents (whether dry or liquid) for a shorter or longer period of time, and they must not break too easily. When pottery vessels suit the

[177] P93-102; P93-134i and P93-134ii; P96-177.
[178] P96-494; P01-123 and P01-120.
[179] P96-98 and P96-47; P96-174 and P96-451; P96-480; P97-204; P01-27; P01-119 and P01-120.

engineering requirements of the particular function and use, they are successful containers (Braun 1983: 108-109). The construction of suitable pots involves many choices of materials, techniques, shapes, and so on, and the end product will be a compromise between the demands of users and the environmental, economic, technological, traditional, cultural or ideological factors faced by the potter (Braun 1983: 109, Rice 1996a: 140). From the perspective of performance characteristics, the reconstruction of vessel function is based on several basic, function-related attributes (Braun 1983, Henrickson and McDonald 1983, Rice 1987: 207-243, 1990, Smith 1988, Henrickson 1990, Skibo 1992: 37, Schaub 1996, Lesure 1998, Tite 1999). At Sabi Abyad most of these data were collected systematically for all sherds and vessels during description in the field. These include measurements (rim diameter, base diameter, thickness, vessel height), fabric and inclusions, surface treatment, decoration, special features (the presence of burning traces, gypsum/lime crusts, bitumen crusts, base cracks or other deformations), vessel shape, and any remarks on damages, abrasions or repairs. Attributes that were calculated afterwards, on the basis of the field data or with the help of digitized drawings, are the maximum vessel diameter (in closed shapes), the ratio between vessel height and rim diameter, the ratio between vessel height and maximum vessel diameter, and the capacity in litres (see Chapter II for an explanation of calculation methods). A combination of these data was used to draw conclusions on three important aspects of vessels in relation to their function: the accessibility of contents, the transportability of the vessel, and the stability of the vessel. Detailed information on these data for the various shape groups can be found in Appendix G; here, a summary discussion will be presented.

Fabric and inclusions

The first choice the potter makes in the production sequence, that of the raw materials, has consequences for several material properties (Schiffer 2003) of the pottery. Aspects influenced by this choice include porosity and permeability, fracture strength, hardness, and ability to resist thermal shock. It is not assumed here that the potter was a materials scientist and completely understood or controlled the effects of different kinds and qualities of temper and raw materials. Neither must we assume that raw materials were always and only chosen because of their functional properties in a direct and causal way. For example, when laboratory tests show that a certain temper influences the porosity of the vessel, that does not immediately mean that the potter chose to add this kind of temper with the aim of creating a more porous vessel. Other reasons, like the workability of the clay related to the shaping technique, may be involved as well. Recently the realization that technological choices are embedded not only in a technical context but also in the environmental, economic, social, political and ideological contexts of society is becoming more and more accepted (e.g. Tite et al. 2001: 317, Sillar 2003). However, the potter and the pottery users would have been aware of the effects of different materials through experience. That these effects and qualities are often recognized by potters and users is also clear from ethnoarchaeological studies (e.g. Ionas 2000, Tite *et al.* 2001: 320-321, Braun 1983: 112, Arnold 2000: 342). Indeed, the existence of a relation between raw materials and functional suitability of a vessel is generally accepted in the archaeological literature, especially for cooking pots and water-storage vessels (Schiffer 1990). Experimental tests have been carried out both for archaeological and ethnographic pottery (e.g. Tite *et al.* 2001, Tite 1999, Schiffer 1990, Rice 1987: 226-232, 347-370).

It is therefore useful to see what the functional consequences could be of the choices of raw material made by the Sabi Abyad potters. In Sabi Abyad four major groups of fabric and inclusions can be discussed in the light of their functional properties: calcareous clay with added organic inclusions, calcareous clay without added inclusions, fabrics with sand inclusions, and the so-called “cooking wares”. As was shown in Chapter V, the locally available resources did not provide the potter with much choice. The whole region is characterized by marly clays. The only way the potter could vary his raw materials with the purpose of influencing the performance characteristics of the vessels was by varying the preparation of the clay body (e.g. by sieving or levigation, the addition of temper or the addition of salt). Or vessels with specific characteristics related to raw materials not locally available could be imported from other regions.

The greater majority of the pottery at Sabi Abyad was made of a local, marly clay with fine organic inclusions. This ware was used for almost all shapes and sizes of pottery. The addition of organic inclusions will make a fabric more porous, an attribute that is often preferred for short-term water storage vessels (Schneider 2006: 313, Schiffer 1990, Rice 1987: 231). The evaporation of the water through the vessel wall will cool the water stored inside. This aspect may have been important for small and large jars, deep bowls and large storage vessels. However, one of the large pots with the cuneiform inscription "water" on the upper shoulder (Appendix F, and figs. F.6 and F.7) is coated on the inside with bitumen, preventing any evaporation through the wall. Besides, organic inclusions make a fabric lighter, a property that is useful when making very large vessels like the large jars and the large storage pots. Finally, the inclusion of fibrous material will make the fabric stronger, since small cracks are stopped at the void created by the inclusion (Tite *et al*. 2001: 313, Tite 1999: 219-220). Since all sizes, from small bowls with thin walls to huge storage pots with very thick walls, are made from the same clay with similar quantities of organic inclusions, one may wonder whether these functional considerations actually formed the basis of the potter's decision to add organic material to the clay. From a technological perspective, as shown in Appendix D and Chapter V, the addition of organic inclusions and especially animal dung provides a much-needed improvement of plasticity and coherence in the very short marly clays. Because there is no relation between fabric and size or shape, I suggest that the increased workability of the clay, and perhaps the increased strength of the fired fabric, were the main reasons for the potter to include organic materials in his clays. The benificial effects of increased porosity in jars and reduced weight in large vessels may have been a pleasant side-effect.

The only case in which the normal local clay was prepared in a different way is the use of a fine clay without organic inclusions for some small bowls and especially for the V-shaped and S-shaped goblets. The clay without organic inclusions would have been more difficult to work on the wheel, since the clay is less plastic and will tear more easily. Indeed, small tension cracks are sometimes visible on the inside vessel wall, due to the shortness of the clay. Because the potter only made small vessels in this ware, these shaping problems may have been minor. Nevertheless, the absence of organic inclusions was chosen deliberately and is perhaps related to the intended function. The organic inclusions in other shapes are generally rather fine. However, compared to the wall thickness of the goblets, they are much too coarse. Inclusion of organic material in these shapes would have created relatively large pores and perhaps even holes in the vessel wall. But even a finer material would have increased porosity. Instead, it seems that the potter's aim was to create a very dense, fine-grained and non-porous fabric, even if this reduced the vessel's toughness (Kilikoglou *et al*. 1998). Apart from creating a non-porous fabric highly suitable for holding liquids, one of the aims may have been to produce a fine fabric that resembled metal, faience or glass luxury goblets. The technical skill required to produce pottery goblets may have added to the feeling of luxury. It may be suggested that the choice for a fine fabric is related to the function of these vessels as drinking vessels in a social context.

Among the few vessels with a remarkable amount of sand inclusions, the so-called "pilgrim flasks" can be singled out. Archaeometric research has shown that most of these bottles were made of raw materials not available around Sabi Abyad or in the Balikh region; for one vessel, an origin much further away must be suggested (see Appendix D). Although these vessels are therefore not a part of the production system at Sabi Abyad (cf. also Chapter V), we may briefly discuss the performance characteristics related to the choice of sand as a temper. As discussed by Kilikoglou *et al*. (1998) for Punic transport amphorae, the addition of around 20% of quartz sand greatly increases the toughness of the vessel, and therefore the resistance of the vessel against mechanical shock (see also Tite 1999: 219). This is especially important since the amphorae, like the pilgrim flasks, had relatively thin walls to reduce the total vessel weight, a prerequisite in transport vessels (Rice 1987: 240). The choice for sand instead of organic inclusions as a temper material may additionally be related to the fact that sand temper results in a less porous fabric than organic tempers, which may have been important when liquids were transported. However, since we don't know how the pilgrim flasks relate to the rest of the production tradition in which they were made, conclusions about the reasons for choosing sand as a temper must remain tentative.

The best studied relation between fabric, inclusions and performance characteristics is that in cooking pots. Because cooking pots had to resist thermal stress and thermal shock during use, and because they had to possess a certain effectiveness in heating the contents of the pot, it is assumed that potters tried to optimize the performance characteristics in various ways. The choice of the raw materials is one of these ways (the choice of wall thickness, vessel shape and surface treatment in cooking pots will be discussed below). Several laboratory experiments and ethnoarchaeological studies have been aimed at establishing the behaviour of different types of clay and inclusions in cooking pots (Rice 1987: 228-230). It has been suggested that shell and crushed calcite inclusions are superior in resisting thermal shock in cooking pots, because these materials have thermal expansion coefficients that are similar to that of clay. Therefore they will not create internal tensions in the vessel wall during heating and cooling. Moreover, their platey shape would be useful in stopping small cracks and preventing vessel breakage (Rice 1987: 229, Vilders 1991/2: 69, Feathers 2003). Pottery with calcite inclusions cannot be fired at temperatures over 700°C (or a bit higher in a reducing atmosphere), because of the decomposition and subsequent re-hydration of calcite, which will damage the vessel (Daszkiewicz *et al*. 2006, Rice 1987: 97-98). Therefore these cooking pots are characterized by a low-fired fabric in dark colours. However, both (pre-)historic and modern cooking pots worldwide are tempered with a variety of coarse inclusions, including organic material, coarse sand, crushed basalt, and crushed talc. Some of these materials have even better thermal-shock resistance properties than calcite (Tite *et al*. 2001, Daszkiewicz *et al*. 2006). Many of them are fired at low temperatures, although there is no risk of breaking caused by calcite. At Sabi Abyad vessels were tentatively identified as cooking pots based on the unusually coarse mineral inclusions, thin vessel walls, rounded vessel shapes and often burnished surfaces (see below). The archaeometric study (Appendix D) shows that cooking vessels at Sabi Abyad were made of a variety of pastes, including different non-mineral inclusions. This reflects a multitude of origins in the Balikh Valley and further away. From a technological point of view the cooking pots do not fit the Sabi Abyad corpus, supporting a non-local origin. Tests of water permeability and thermal-shock resistance on two cooking pot sherds from Sabi Abyad revealed that the pot with talc temper (P03-308) had excellent properties for use over a fire. During the tests it stayed impermeable and undamaged. This pot was imported from the Ugarit region (see Appendix D, sample J728). Another sample (sample J730, Appendix D), made from a calcareous clay with coarse sand and crushed calcite inclusions, and therefore a “classical” example of a cooking pot, performed very badly. The fabric was full of small cracks that became worse after the thermal-shock tests (Daszkiewicz *et al*. 2000, the cracks are visible in fig. D.54). However, it can be remarked that these tests were performed on vessels that were thrown away after use, and that only the residual properties after use and deposition are tested (cf. Braun 1983: 114). Perhaps the vessel had been used so often over a fire that it became porous and was deemed useless as a cooking pot, which was subsequently confirmed in the tests. Other cooking pots from Sabi Abyad have coarse calcite, organic, crushed-shell, crushed-basalt and coarse-sand inclusions, and were made both from calcareous and non-calcareous clays. All of them were fired at low temperatures. Indeed, laboratory tests suggest that the most important characteristic of a fabric suitable for making cooking pots is that it has a high temper concentration (of any kind) and a low firing temperature (Tite *et al*. 2001: 321, LeMière and Picon 1994). Cooking pots with different kinds of inclusions seem to perform equally well, but pots made from non-calcareous clays seem to be better (Daszkiewicz *et al*. 2006: 426; 2000).

Summarizing, we have seen that the fabric and inclusions of a vessel type may be related to its intended function. In the case of Sabi Abyad this seems to be especially true for imported pottery, while the pottery produced at the site was largely made of one ware without any indication of functional differences. Possibly the imported vessels were coveted especially because of their superior performance characteristics, related to the raw materials used as well as to shaping techniques.

Vessel design

Most studies of ceramic function focus on the design and shape of the vessels. Extensive comparative research in ethnographic situations has shown that there are several basic relations between general vessel form and general functional category (Henrickson 1990, Henrickson and McDonald 1983). Although a specific function cannot be inferred from general vessel shape alone, and vessels with similar design may be used for different purposes, the broader functional categories of storage, processing, and transfer (Rice 1987: 208) may be very useful for further spatial and functional analysis of a settlement. The most important aspects of shape in this context are vessel size (rim diameter, maximum vessel diameter and vessel height), openness or restrictedness (accessibility of contents), stability, capacity and transportability (Schaub 1996: 234, Smith 1988: 914, Rice 1987: 224-226). This paragraph will also discuss more specific function-related attributes in ceramic vessels, like base holes, handles and spouts, and surface treatment. Several special shapes and their possible function will be discussed as well.

Shaping methods

The shaping methods used by the potter seem to have only a limited effect on the suitability of the vessel for the intended function. In Chapter V and Appendix G it is shown that vessels thrown from the cone without further treatment of the base may show serious base cracking (especially in carinated bowls and straight-sided bowls). These cracks often prevent the vessels from being used as containers for liquids. Often the potters attempted to repair the cracks. The potters explicitly avoided or carefully repaired cracks in bases or walls of deep bowls, small jars and large jars. Base cracks never occur in cooking pots, closed pots, "grain measures" and "pilgrim flasks". Possibly these vessels were meant to be used for liquids, so that the potters put extra efforts in producing a vessel without flaws.

Relating vessel shape to function

Although the vessel shape is not the only clue archaeologists may use to reconstruct vessel function, it is the one used most. Both intuitively and through ethnographic observations, archaeologists feel that there is a rather strong relation between the two (Jamieson 2000: 275-276 with bibliography, Rice 1987: 211). The relations between general vessel shape and general function have been studied both in archaeology and in anthropology, and seem indeed to be rather stable between cultures and periods (Lesure 1998: 20, Henrickson and McDonald 1983: 631-634, Rice 1987: Table 7.2).[180] They can be listed as follows:

Cooking pots
- Short, squat shape
- Rounded vessel shape without sharp angles
- Large base surface, often rounded base
- Somewhat restricted shape
- Lugs and handles are optional

Serving and eating vessels
- Low, open shapes (bowls), stable
- Often decorated
- Short life-span (resulting in relatively large amounts in the archaeological record)
- Individual and family capacities (often with the ratio 1:3)

Dry storage
- Opening often allows scooping out the contents
- Few lids
- Rims rolled over for fastening a flexible cover
- Temporary storage: shorter and more stable vessel shape
- Long-term storage: taller and thinner vessel shape
- Appendages and handles only on long-term storage vessels, for a better grip

Liquid storage
- Long-term storage: large, immobile when full
- Taller and thinner shapes than dry-storage vessels
- Temporary storage: smaller sizes
- Everted rims to aid in pouring
- Openings restricted to prevent spilling, but often openings do allow dipping or scooping
- Relatively more often burnished or glazed

Liquid transport
- Globular vessel shape
- Small orifice

[180] M. Smith (1988) tried to express the relation between shape and function in a mathematical formula, based on data from ethnographic and archaeological cases. Application of her formulas did not yield any interesting results for the pottery from Sabi Abyad: all vessels and types ended up in her broad class of "utility".

- Handles, especially when meant for short-distance transportation
- When full portable by a single person

In Appendix G each of these aspects is listed with the individual vessel groups. Moreover, Appendix G lists information on the size of the vessel and the ratio between vessel height and maximum vessel diameter. These are often taken as good indications for vessel function. The capacity of the vessels was calculated, and the values are listed in Appendix G. The other aspects of vessel shape are not expressed in a numerical form, but rather as belonging to a category (low, medium, high, etc.).

The *accessibility* of the vessel contents is basically a function of vessel shape: open shapes are easily accessible, while closed shapes both restrict the access to the vessel and prevent the contents from spilling out easily. However, accessibility is more than just a restricted or unrestricted shape. For example, the contents of closed pots are still rather easily accessible because of their large rim diameters. Small jars, in contrast, have rim diameters that are generally small; their orifices do not allow a hand or a scoop to get at the contents. Similarly, although large storage pots have rather large rim diameters, they are very deep and contents may be difficult to scoop out from the bottom. For some vessels, like the large jars or the pilgrim flasks, pouring may be the only way to get the contents out.

Stability relates to how easy a vessel can stand on its own without a support and how easily it is tipped over. This is related to the overall vessel size, the width of the base and the centre of gravity of a vessel. Tall vessels with small bases are less stable than low squat vessels with broad bases. However, the use of a stand may greatly increase vessel stability, and is especially helpful in case both stability and unstability have a function. For example, the large jars need a high centre of gravity for pouring, and are most probably made unstable (tall and with a small base) on purpose. Stands were then provided for the necessary stability when the vessel was not handled (fig. VI.9).[181] The high stability of deep bowls, closed pots and large storage pots suggests that they were meant to be mainly stationary. In contrast, goblets could never stand on their own, and this is perhaps related to the customary position during drinking, holding the vessel in the hand when full. Interestingly, the small jars (type 311) are unstable as well, and over time (especially in levels 4 and 3) the bases become more narrow (cf. Chapter IV). They could hardly stand alone, but small ceramic stands have not been found. Perhaps these jars were drinking jars (their capacity and general shape is well suited for this purpose), possibly for beer. Perhaps they were set in wooden racks, as is depicted in Neo-Assyrian art (fig. VI.40, 41).

Transportability is related both to the shape of the vessel (do the contents easily spill, do handles and ridges facilitate handling?) and to the size and weight of a full vessel. Depending on the capacity and wall thickness, vessels easily become too heavy to carry over a larger distance, even if carried by several persons. The ease with which a vessel can be held is a factor as well. For each shape group, the vessels were thus assigned to one of the general functional categories listed above.

[181] Large jars can also be set leaning against a wall or against other vessels. Especially if more jars are set against each other, this method provides a rather stable position.

Vessel type	*Ratio**	*Size*	*Accessibility*	*Stability*	*Capacity*	*Transportability Long distance*	*Transportability Short distance*
Carinated bowls	0.37	Small	Very easy	Medium – high	Small	Very bad	Good
Goblets	1.16	Small	Easy	Low	Small	Very bad	Good
Straight-sided bowls	0.34	Small - medium	Very easy	Medium – high	Small-medium	Very bad	Good
Deep bowls	0.85	Medium	Easy	High	Medium	Bad	Medium
Cooking pots	-	Medium – large	Medium	Low	Medium – large	Bad	Medium
Closed pots	0.87	Medium	Medium	High	Medium	Bad	Medium
Small jars	1.43-1.6	Small-medium	Difficult	Medium	Small – medium	Medium – good	Good
Large jars	1.88-2.1	Large	Medium – difficult	Low With stand: high	Large	Difficult	Difficult
Large storage pots	1.19	Very large	Medium – difficult	High	Very large	Impossible	Impossible
Pilgrim flasks	-	Medium	Very difficult	Low	Medium	Good	Good

Table VI.1: The functional aspects of vessel shape listed for each vessel type.
* Ratio is the ratio between the vessel height and the maximum vessel diameter.

Surface treatment

Very few vessels at Sabi Abyad show a surface treatment other than simple smoothing. When surfaces are treated, they are mostly burnished. Burnishing is usually done for a variety of reasons, including display (a shiny burnished surface is attractive) and reduction of permeability (a burnished surface does not let liquids through easily). Burnishing for aesthetical reasons may have been applied in the case of the carinated bowls with a long vessel wall above the carination (type 113). These bowls are also frequently decorated (fig. VI.10). Burnishing for improving vessel performance was probably applied in the case of the cooking pots. It was shown (Schiffer 1990) that exterior burnishing increases the heating effectiveness of cooking pots. Indeed, several of the Sabi Abyad cooking pots show burnished surfaces. Many of the so-called “pilgrim flasks” were burnished as well, and this was perhaps done to reduce permeability of the vessel wall, suggesting that these vessels were used for the long-term storage or transportation of liquids. Why the deep bowls with handles and a spout (type 151) were burnished remains unclear. Some very large vessels were coated with bitumen on the inside, perhaps in an attempt to make the vessel watertight.

Special features

Some shapes were made with features that may provide us with a clue to their function. Some small carinated bowls had holes made in their bases before firing. Clearly, these bowls were not meant to hold liquids. Perhaps the holes functioned as a ventilation when the bowls were used as lids. Or the bowls were meant to perform as a kind of small strainer. Very large open pots frequently have base holes as well. These may have functioned similarly, as ventilation holes when storing dry goods in them. Or these vessels may have been used for the soaking of grain in beer production (see below). A special shape is represented by a deep bowl with a base hole and a strainer attached to the inside over the hole.

Handles facilitate the lifting and tilting of vessels and are especially often used in vessels for liquids. They were found on closed pots, deep bowls with spouts (type 151), on some jars and on “pilgrim flasks”. An exceptional shape is a U-shaped drinking mug with a big handle (P97-195, fig. IV.91.ag). Spouts are obviously connected to the pouring of liquids as well. They often occur together with handles. Shapes with handles and spouts are therefore suited for the serving and processing of liquids (fig. VI.13 and VI.14).

Capacity

Capacity measures in the Middle Assyrian period are not without problems. Different absolute sizes as well as different amounts of smaller units per larger unit seem to have been used. In texts from other sites, there are “old”, “new”, “big”, “little”, “palace” and “*bīt ḫiburni*” measures, and their precise meaning is often unclear (Powell 1987/90: 501). At Tell Sabi Abyad the following ratios between capacity measures were used (Wiggermann 2000: 186):

1 *imēru* = 10 *sūtu*
1 *sūtu* = 10 *qû,* whereby the *qû* is taken to be 0.84 litre.

These values have also been used in Appendix G, to give an indication of the capacity in Assyrian measures of a vessel group. A jar from the nearby Middle Assyrian site of Tell Chuera, comparable to our large jars (type 322), was inscribed *after firing* with the sign for 1 *sūtu*. The capacity of this jar was calculated from the drawing to be between 13.8 and 15.2 litres, equalling about 17 *qû* when 1 *qû* = 0.84 litre (I. Boesze, personal communication). Whether the inhabitants of Tell Chuera used a different value for their capacity measures (for example the “big” *sūtu* of approximately 16 litres, as opposed to the “old” *sūtu* of about 8 litres, cf. Powell 1987/90: 501) than the inhabitants of Sabi Abyad, must be revealed by further study;[182] however, this example illustrates the flexibility and variability of the measurement systems in use. Other vessels with inscribed capacity measures come from Nimrud (NA; Oates and Oates 2001: 62, the inscription implies a *qû* of 0.792 litre), Tell al-Rimah (OB; Postgate 1978, with a *qû* between 0.82301 and 0.79073 litre) and Mari (OB; Joannès 1980, a *qû* of 0.799 litre). It is hoped that the capacity measures provided for the complete vessels from Sabi Abyad in Appendix G and in the individual descriptions in figs. IV.1-120 will provide those interested in capacity measures with additional material for their studies. Unfortunately, so far no capacity measures have been found inscribed on the Sabi Abyad vessels, so a direct comparison between vessel capacity and terminology is not yet possible.

As the capacity measurements listed for different shapes in Appendix G show, none of the vessel groups was made in a standardized or fixed capacity, even when size groups exist. The capacity measures generally vary widely around the mean value for the (size-) group. The coefficient of variation (CV; see Chapter II for an explanation of what this value means) is smallest (12%) for the type 911 “pilgrim flasks”, which seem to have been produced at a size of more or less 9 *qû*. Usually CV values for capacity are around 35% or even higher, suggesting that a standardized capacity was not aimed at in any of these cases.[183] Generally, the variation in single size measurements, like rim diameter or vessel height, varies much less than the capacity. This is not surprising: it is much easier for a potter to measure vessel height or rim diameter, and even maximum vessel diameter, than to measure and shape a vessel with an exact capacity.[184] Capacity can only be precisely measured in a dried vessel, but then the shape is already fixed and cannot be adjusted anymore. Therefore, although some shapes (carinated bowls, jars) were clearly produced in different size groups (small, middle, large), the exact capacity was probably not an issue. When the vessels at Sabi Abyad were mainly used in domestic contexts for preparation, storage and consumption of food and drink this is not remarkable. Exact volumes in vessels would only have been needed in case ceramic vessels were used as a measuring tool (for example in the distribution of rations), or in case the contents of the vessels were traded “per container” instead of per volume. In this context it is interesting that the imported “pilgrim flasks”, which were probably obtained for their contents, show a more standardized capacity.

It is clear from cuneiform texts that measuring vessels existed in the Middle Assyrian period, and could have been made of wood, metal or other materials, as well as of pottery (see below: *sūtu* , *mišlu, šapputu*). It is not known what these vessels looked like or whether they were recognizable as specialized measuring vessels. The only specialized vessel type in the Sabi Abyad repertoire that may have served as a

[182] The use of a small *sūtu* of 8 *qû* is attested at Tell Chuera, cf. Freydank (1991b: 219f.) and Kühne (1995: 206 n. 28).
[183] Although Eerkens and Bettinger (2001) in their illustrative article about measuring material variability do not say anything about the value of the CV in three-dimensional cases (as with volume measures), the high CV values suggest that the potters were did not aim at standardized volumes in cases where the CV for capacity is high. Moreover, these high values suggest that there is a linear dependence between the width, length and depth of a vessel, which is most probably related to prevailing ideas about proportions and shape (J.J. Duistermaat, personal communication).
[184] There are several examples of pottery vessels with inscribed capacity measures from other sites (Postgate 1978: Tell el-Rimah; Jakob-Rost 1991: Aššur and Kar Tukulti-Ninurta). However, in most cases these inscriptions were inscribed on the vessel *after firing*, i.e. after the exact capacity could have been measured. I do not know of any examples where a capacity measure was inscribed before firing, i.e. during the shaping stage, although Jakob-Rost (1991) suggests that the inscriptions “1 altes Sutu-Maß” were stamped on some of the vessels (i.e. before the clay was dry; the provided line-drawings prevent the checking of this suggestion). A thorough inspection of those sherds, as well as a reconstruction of their vessel shape, would be worthwile.

measuring vessel is the so-called "grain measure" (type 225). The term "grain measure" was originally coined by M. Mallowan (1936, 1946) to indicate a cylindrical vessel that occurred in two sizes: short and tall (Gates 1988: 65). Probably on the basis of the formal similarity to modern measures for dry goods, Mallowan suggested that these vessels may have been used to measure grain for rations. However, he did not calculate the capacity for these vessels. M.-H. Gates recently concluded that they were probably not used as measures, since standards of measure were not of uniform size in each location (1988: 65 and note 3). Nevertheless, the use of ceramic measuring vessels has been attested in the texts. The capacity of completely preserved "grain measures" from the Middle Assyrian levels at Sabi Abyad could only be calculated (up to the rim) for two vessels, and these did not seem to suggest a uniform capacity (see Appendix G). A uniform volume was not expected in any case, because of the difficulties discussed above of producing a vessel with a set volume. However, most "grain measures" from levels 6 to 3 show horizontal incisions executed in a leather-hard state on the outside of the vessel. If the capacity of the vessel is calculated each time up to the next incision, a remarkable pattern appears. Allowing for inaccuracies in the original vessel drawings and in calculating the capacity from a pottery drawing, we see that each section of the vessel could hold a set fraction of the *qû* (fig. VI.17.12). For example, in vessel P96-413, the three lines are drawn at about 1/3 *qû* each. This vessel was used secondarily as a gypsum container in the level 5 pottery workshop in M11, and perhaps this system was no longer used at the time.[185] The other five measured vessels and vessel fragments, indeed, show fractions of 1/2 *qû* in each part delimited by a horizontal incision. It is possible that the potter first made a cylindrical shape with a volume of more than 2 *qû*. Because he could not shape a vessel with an exact capacity of 2 *qû,* he first let the vessel dry until it had reached a leather-hard stage. Then, with the help of known quantities of dry goods (grain, for example), he could measure the line up to which the vessel contained 1, 1 1/2 and 2 *qû*, and mark these points with incised lines. After firing, the vessel could thus be used as a measuring vessel by filling up to one of the lines, although not with a very high accuracy. Indeed, several cuneiform texts from Sabi Abyad indicate that 1/2 *qû* was the smallest measuring unit in use.[186] The Sabi Abyad sample is too small to conclude irrefutably that these vessels were indeed used as measuring vessels. However, these results do merit the further study of other "grain measures" found at other sites and in other periods. Very small ceramic measuring vessels, perhaps represented by the word *kāsu* (see below), could only be found among the very small carinated bowls. None of the pottery vessels found at Sabi Abyad is likely to have been used as a measuring vessel for the larger volume measures known from the texts, like the *sūtu*. Any completely preserved vessel that could hold a volume of approximately 1 *sūtu* is not recognizable as a measuring vessel when compared to vessels of the same shape, type and size-group, while the capacity of these similar vessels varies widely.

Traces of use

Apart from any remains of contents and the specific archaeological context, indirect information on vessel use can be deducted from the traces left by the activities in which the vessel was involved (Skibo 1992). Traces of use are on the whole rare on the Sabi Abyad ceramics. Alteration of the surface of ceramic vessels was studied only macroscopically at Sabi Abyad. Any remarkable attrition of the surface was noted in the remarks of the database, including the location of the attrition on the vessel and sometimes including suggestions as to the cause of these traces. General terms were used to describe these traces, like "abraded", "eroded", "damaged", or "flaking surface". Traces of burning or sooting in different locations on a vessel form another kind of use-related traces.

Burning traces, or deposits of a light layer of soot on the surface of the vessel, were noted in almost all vessel groups in small percentages. At Sabi Abyad generally between 2 and 4% of all sherds show traces of burning. However, in most cases, these burning traces must be related to processes of deposition, for example when a building was destroyed in a fire or when garbage was burnt. This is especially so when

[185] A division of the *qû* in thirds is not attested in the texts from Sabi Abyad, but is mentioned in the lexical lists cited in CAD *qû* B (F.A.M. Wiggermann, personal communication).
[186] For example T93-11 dealing with oil, and T98:54 concerning grain for sowing. In the ration lists from Aššur 1/2 *qû* is similarly the smallest unit (MARV III 3) (F.A.M. Wiggermann, personal communication). Perhaps, the vessel names *ḫupā'u* (a (broken) vessel of ½ *qû)* and *mišlu* (a half-size container) may be connected to these vessels.

burning traces do not show a preferential location on the vessel, or when the burning traces extend over the fracture of the sherd. Only rarely were burning traces found that can be related to the use of the vessels. The clearest example is the group of cooking pots (types 211, 212). Almost 27% of all cooking pots showed traces of burning, mostly on the outside surface. Since most cooking-pot sherds are rims (loose body fragments were not kept), it is not clear whether sooting was more severe at the base of the pots. The use of these vessels in or over a fire is, however, clear. Another example in which burning traces may provide a clue as to the use of the vessel is in small carinated bowls. About 7% of all carinated bowls have burning traces, and more than half of them belong to the group of very small bowls. There burning traces tend to be located on the inside of the rim, mostly in one or two spots only. It looks as if something was burnt in one spot inside the bowl, and it may be suggested that most of these bowls were used as oil lamps, with a fibre wick sticking out at the rim. That bowls were indeed used as oil lamps is shown by P92-21, an oil lamp with a pinched rim (fig. VI.16). A small carinated bowl was stuck inside with gypsum/lime paste after the lamp had cracked.[187] In large jars, too, about 7% contain traces of burning. Mostly these must be related to depositional processes. However, in several jars as well as in several large storage pots it was noted that burning traces were concentrated especially on the inside surface of the rim, not extending down the vessel. How these traces came about is not certain, but perhaps they are related to the use of flammable textile covers over the rim.

The abrasion of inside vessel surfaces may be related to the repeated use of hard tools in vessels, for example in pounding, crushing and grinding, mixing, or stirring. The surface is damaged, but the remaining surface and vessel or fragment retain their internal cohesion and strength. This kind of damage was noted for carinated bowls (mainly middle and large size), in about 10% of all straight-sided bowls, in several large deep bowls, several cooking pots, one closed pot, in one small jar (clear traces of scraping), a deep large pot, and in deep bowls with a spout and handles. Probably these vessels were used in the processing of food or other materials. Abrasion of outer vessel surfaces, most often at the base and lower vessel wall, is probably related to the movement of the vessel over a rough surface (the floor, a pot stand, a hearth). This type of attrition was noted in type 113 carinated bowls and on the base of the large cooking pot P93-308.

Flaking is different from abrasion in that the surface of the sherd was still crumbly at excavation and description, and new small flat fragments kept coming off the surface. The sherd seems to have lost part of its internal strength. This type of attrition was noted on the inside surface of small jars, rarely on the inside of large jars, as well as on the outside surfaces of carinated bowls, small, middle-sized and large jars, sometimes located only at the base. Once, a middle-sized jar could only be recognized as such during cleaning in the field, and completely disintegrated when lifted. It is not certain what processes caused this complete destruction of the coherence of the fabric. Perhaps it is related to the original contents, but firing temperatures, fabric composition or post-depositional processes may be involved as well.

A phenomenon possibly related to the original contents of the vessel is the soft chalky and pink/whitish inner surface of some large jars and large storage pots. The original inner surface has disappeared, exposing the fabric directly under the surface. Perhaps, acidic contents (beer, fruit juices, vinegar?) of the vessels dissolved the many calcite grains in the surface of the sherd, whereupon the top surface became fragile and crumbled off. The chalky effect may be due to the fact that just below the surface of many sherds, an enrichment of secondary deposited calcite has taken place (see Appendix D). However, this suggestion must remain speculative, and the phenomenon may also have been caused by mechanical means (although this is less likely in large jars).

Some shapes were made with holes in the base (see above, and fig. VI.12). However, in some cases, holes were drilled after firing in vessels that originally did not have a base hole. This happened to a deep bowl (P92-81) in which a large base hole was drilled, and to a large storage pot (P97-284, fig. IV.67.f) in which a small hole was drilled from both surfaces in the lower vessel wall. Most probably, these holes functioned as ventilation or drainage holes to prevent rotting of the contents. Holes were drilled especially often in carinated bowls of all sizes (while holes made before firing occur mostly in small bowls, see above), in the base or lower vessel wall. Drilled holes in bowls are generally bigger than holes made before firing.

[187] However, that not all bowls with these traces could have been used as oil lamps is illustrated by a bowl (fig. IV.36.u) with a hole in the base (made before firing) that shows similar burning patterns.

Conclusions of paragraph VI.3

Appendix G lists all functional aspects related to shape, including special surface treatments, decorations, and the existence of handles, lugs, spouts and holes in the base or vessel wall. Together with the information on the archaeological context and the traces of use, the vessels from Sabi Abyad could tentatively be assigned to twelve functional groups and a group of special shapes. As is clear from the illustration of these groups in fig VI.17, some vessels were probably meant for several purposes. This illustrates the generally practical, multifunctional character of the assemblage at Sabi Abyad.

1. Cooking pots
These vessels are defined by the coarse and low-fired fabric and rounded vessel shapes. Often the vessel wall is burnished to reduce permeability. The hand-shaping methods resulted in relatively thin walls and a very regular shape without any cracks or flaws. Rims are rolled over for better grip, but handles seem to be decorative rather than functional. The capacity of these pots varies (between about 8 and 44 litres). Many cooking pots show traces of sooting on the surface.

2. Serving, eating and drinking vessels
Middle Assyrian tableware consists of open bowls in three different size groups, very small and small jars, drinking cups and bowls, and pitchers with handles. An exceptional shape is represented by P97-193, a huge bowl probably used for communal meals. It was found in the "staff quarters" in the north of the settlement. The large quantities of carinated bowls found in Middle Assyrian settlements indicate that many of these bowls were used at meals, perhaps similarly to modern Middle Eastern "mezzeh": a tradition of serving different kinds of food in small quantities in many small bowls. It also indicates that the bowls were easily broken and replaced. As expected, the mean capacities of the size groups in bowls roughly relate to each other as 1:3:9, reflecting individual and group portions.

3. Vessels used in food processing and craft activities
This group includes both open bowls and deep bowls and pots. The use of these vessels in processing activities is often indicated by the traces of use (abrading, damages) found on the inside of the vessel wall. The addition of spouts (for pouring liquids in a precise way), handles (to make lifting and pouring of liquids easier) and base holes is also related to the use of the vessel in other activities than storage or serving. Among vessels with handles and spouts especially the deep bowls (type 151) are interesting. They seem to have been used for separating a liquid from material floating on top or sunk to the bottom. Base holes can be functional in draining a liquid from a mixture in the vessel (in beer production, or in pressing juices from fruit), as well as in ventilating the dry contents of a storage vessel. Bowl P97-221 is an interesting variation on the vessels with base holes: a strainer is attached upside down over the base hole (see also fig. VI.11). This may suggest that strainers were used over base holes in other vessels as well. A special shape in this functional group is represented by thick, very coarse platters. They have a rough underside as if made on the ground and a thick curved rim suggesting an originally roughly circular shape. Towards the middle the platters often slope downwards. The top surface of these platters is covered in large, very sharp angular white stones (crushed calcite?). These platters must have been used for some kind of rubbing, grinding or grating activity.

4. Storage
Many different vessels could have been used for storage, either long-term or short-term, and storing dry or liquid goods. Shallow bowls are probably only suited for short-term storage, and the find of grains and garlic in such bowls proves that this was indeed done. Deep bowls provide for a more stable storage place and could have been used both for dry goods (short and long-term) as well as for short-term storage of liquids. Small and large jars are suitable for both liquids and dry storage. The finds of botanical materials and artefacts in these vessels indicate that a large variety of products was stored at Sabi Abyad.

5. Long term storage in bulk
Storage in bulk obviously took place in the huge, stationary storage pots that could contain up to 295 litres (3.5 *imēru*). Their thick but porous walls provide good storing and cooling properties, but they also make them too heavy to lift. Some of these vessels were coated on the inside with a bitumen layer, perhaps to reduce permeability of the wall. The inscription of the sign for water (see below and Appendix F) on some of these pots indicates that not only dry goods were stored in bulk.

6. Transport
The transport of dry goods in pottery vessels is not practical, and the use of bags and sacks would be expected instead. However, for the transport of liquids ceramic vessels are very well suited. For short-distance transport, like fetching water from a well, both jars and deep bowls may have been used. There is only a limited number of shapes in the Sabi Abyad assemblage that is suitable for the transport of liquids over longer distances, including foreign shapes like the "pilgrim flasks".

7. Pot and jar stands
These cylindrical shapes obviously have been used to support large jars and pots. Especially the large jars are very unstable and in need of a support. Smaller supports, suitable for small jars and goblets, have not been found. Perhaps they were not used, or made of wood.

8. Strainers
Small bowls with perforated walls were most probably used as strainers. When used in combination with a piece of textile, they would even make very fine sieves. They may have been used on top of a jar rim to strain a liquid decanted in the jar, or top-side down on a base hole of a large bowl, to ease the drainage of the mixture inside. They may also have been used as cheese moulds. A special shape is represented by strainer jar P99-55 (fig. IV.95.k), perhaps also meant for making cheese.

9. Lamps
Only very few purpose-made oil lamps were found at the site. However, the small burning traces on the inside of the rim of small carinated bowls suggest that many of these could have been used as lamps as well.

10. Lids and covers
Small bowls were regularly used as lids for jars. They could only be identified as such because of their findspot on the rim of a jar. However, several purpose-made lids with different shapes were found as well (O96-45, O99-39, fig. IV.95.d, e).

11. Vessels used in burial and ritual
These bowls and jars are listed here because of their archaeological context in burials. Only the conical stand, perhaps an incense burner or the base of an incense burner, was put in this category on the basis of its similarity with incense burners in iconography (see below).

12. Measuring vessels
The only vessel that could be recognized as a possible measuring vessel is the so-called "grain measure". Its suggested (and tentative) function is related to the division of the vessel in fixed fractions of the *qû* capacity measure with the help of incised lines. Otherwise these vessels may also have been used for storage or serving.

13. Special shapes
A very exceptional shape is represented by a square basin with a semi-spherical depression in the centre (P96-438, fig. IV.96.i). It was found in fragments in the upper room fill of the "residence". The base side is covered in bitumen, while the top side is smooth and does not show any traces of use. The function of this enigmatic shape remains unclear for the time-being.

VI.4 Ceramics in their cultural context

How often do archaeologists envy their anthropologist and ethnographer colleagues, simply because of the fact that they have access to an important source of information on material culture: they can observe contemporary people producing and using artefacts, and can ask them all they want to know. In archaeology, however, we should not forget that contemporary sources are available. Unfortunately, these are often studied in different scholarly spheres (philology, art history), and only few archaeologists fully exploit these sources. Nevertheless, especially in a chapter on the function and use of our pottery vessels, we should ask the Assyrians themselves how they viewed their pots. In this paragraph, we will look at evidence from Middle Assyrian cuneiform texts and iconography.

Ceramics in contemporary texts

Information about the use of pottery can be gauged from contemporary texts. In theory, several kinds of information are available: lexical lists in which vessel names are listed; lists of vessels (inventory or delivery texts); receipts listing vessels for their contents; and letters, contracts and literary texts from which we can learn something about the context in which certain vessels were used (cf. Jamieson 2000: 279, Potts 1997: 139-140). Unfortunately, Middle Assyrian texts are mostly silent about ceramic vessels, as opposed to Early Bronze Age texts (cf. Sallaberger 1996, Steinkeller 1996). There are several difficulties related to the study of texts with the aim of understanding the function or use of ancient vessels. First, and this is also attested in ethnographic situations[188], the names used for particular vessel types may vary, between periods, locations, situations of use, or between people from different social groups. Thus different names may relate to similar or identical vessels, or identical names may refer to different vessels. A vessel name in a text may also be a generic name like “container”, “pot”, including different shapes without being more specific.[189] Second not all vessels attested archaeologically are necessarily present in the preserved texts, and not all vessels mentioned in texts are always found in an excavation. Vessels described in texts may be rare vessels used in specific ritual or industrial contexts, so that their recovery depends on the archaeological context. Or vessel names in texts may be archaic, and no longer in daily use (especially in the case of lexical lists). Thirdly, it is not always clear whether a vessel name designates a pottery vessel or a container made from another kind of material (metal, wood), although in many cases the determinative DUG is used for pottery vessel names (Sallaberger 1996: 109). And last but not least, the archaeologist’s concept of a vessel type, shape (group) or class is most likely different from the Assyrian perception of the kind of vessels that could be identified by one name. Where the archaeologist’s typology would be based mainly on shape and size, the Assyrian classification (and identification) may also be based on functional groups, or on the situation in which a vessel is used. However, either the context of the vessel name in the text (for example mentioning the vessel contents) or the name itself (e.g. providing indications of its shape or size) give us some clues as to the ancient function or use of the vessel. This very fragmentary textual evidence can be compared to the actual shapes, sizes and other functional indications of the vessels found in the archaeological context and discussed above.

The textual evidence from Sabi Abyad relating to pottery vessels is presented in Appendix F, including drawings, transcriptions and translations of the texts. Below is a list of all vessel names in alphabetical order, from the texts found at Sabi Abyad and from other Middle Assyrian texts.[190] Together with the vessel names, any other available information is listed concerning the material, capacity, context and content of the vessels as described in the texts. As an exercise, some vessel names for which the function seems a little clearer are tentatively combined in fig. VI.18 with the functional shapes defined earlier (above), in an attempt to identify which vessels the Assyrians had in mind when using these vessel names. This is based on the assumption that most vessel names in texts are related to or refer to the material reality.

[188] Compare for example the names and shapes of vessels from different villages in Ionas 2000: 30-99 and tables 1-5.
[189] The present study, focussing on Middle Assyrian material, yielded 36 names for ceramic vessels. In comparison with the number of different shape groups and the relative uniformity of the corpus, this suggests that several different names may have been used for vessels that look similar to us.
[190] For other texts, the bibliographical reference will be given in a footnote when the text is first mentioned, to avoid unnecessary cluttering of the text and alphabetical list with references.

Although the resulting table (fig.VI.18) looks clean and clearcut, we have to keep in mind the numerous uncertainties just mentioned, and more textual and archaeological evidence is likely to change the picture presented here.

The 35 vessels of ten different kinds mentioned in Sabi Abyad text T98-131 were part of an inventory, probably related to a ritual occasion (see Appendix F). Other inventory lists dealing with pottery vessels and other items have been found at Middle Assyrian Aššur: KAV 118[191], MARV I no. 58[192], MARV I no. 7[193], MARV I no. 29[194], KAJ 277 and 317[195], MARV III no. 9[196], MARV IV no 146[197], KAJ 310[198], Lutz 1927: 104 no. 46. Sometimes they list large amounts of vessels, but mostly numbers are small as in the Sabi Abyad example. The reasons behind making such lists are not always clear or mentioned in the texts. Some lists deal with the vessels only, others mention the vessels as containers of honey, flour, cress or other foodstuffs, or as containers of cuneiform tablets. Sometimes the vessels are property of a particular person (as in KAJ 317); other lists give the impression that the vessels were part of the contents of a store room or brought into storage (MARV III 9: 23-26; KAJ 310). Vessels mentioned in inventory lists are *agannu, ḫanṣubu, ḫapāltu, ḫupā'u, ḫuruppu, kallu, kukkubu, kūtu, laḫannu, makkusu, marsattu, mišlu, nazzītu, nignakku, pursītu, qulli'u, saḫḫarru, sūtu, šapputu, tallu.*

Other texts containing vessel names are texts related to production, for example of beer or perfumed oil, as in KAR 220.[199] Vessels mentioned are *agannu, diqāru, ḫari'u, ḫersu, kāsu, mašḫalu, sūtu, šapputu.* Several texts are related to rituals (describing either the ritual or the deliveries for a ritual: KAR 139[200], KAR 154[201], Ebeling 1948: 19a+[202], VAT 16435[203], MARV III no. 16[204], MARV VI no. 35[205]). Vessels occuring in these texts are *diqāru, ḫaṣbu, kallu, kāsu, kirru, laḫannu, mākaltu, maqqû, nignakku, pursītu, sūtu, ṣurṣupu.* Pottery vessels occur less often in letters or economic texts (cf. Sabi Abyad T93-3, Appendix F, mentioning *tarīḫu* vessels).

The list of vessel names below shows that Assyrian vessel names mostly indicate the function or form of the vessel rather than the material it was made of. So vessels with similar names could have been made of pottery but also of metal, wood or stone. The chances we will recover the latter are slight: metal will have been recycled and wood has not been preserved. Stone vessels, especially the larger ones, occur mostly in contexts of extreme (sometimes literally fantastic) luxury, and cannot be expected in settlements of ordinary people. Some vessel names suggest that they may be used as a generic name for "container". The majority of vessel names is feminine (F.A.M. Wiggermann, personal communication).

Apart from the measuring-vessels (like *sūtu*), vessels in texts do not seem to have specific capacities (a vessel name is not linked to a set capacity). Nevertheless, the capacity of a vessel is sometimes mentioned (for example in KAJ 277: "x *šapputu* vessels measuring 1 *sūtu*", MARV III no. 9: 26: "5 *šapputu* vessels of 42 *qû* for measuring"). Or the amount of the material in the vessel provides an indication of vessel size. In this way, in the texts dealing with the preparation of 2 *sūtu* of perfume (e.g. KAR 220), the decanting of the mixtures in certain vessels suggests that these vessels had capacities larger than 2 *sūtu*. In some cases it is consequently clear that we are dealing with small vessels (e.g. *kallu*, *kāsu*), while others must have been very big (e.g. *ḫari'u*). The indications of capacity in fig.VI.18 are mostly based on this kind of rather circumstantial evidence. In only one case the name of a vessel could be connected with the shape and size of an actual vessel. In Tell Hamidiyah, a Neo-Assyrian large closed storage pot was identified by an inscription

[191] Schroeder 1930/31, also discussed in Appendix F of this book.
[192] Freydank 1976b, cf. also Pedersén 1985: 113, M 12:14, private archive, and Hecker 1980: 278 for some remarks on the translation.
[193] Freydank 1976b, cf. Pedersén 1985: M 8:43 and Weidner 1939/41: 113.
[194] Freydank 1976b, cf. the edition of Harrak 1990, which is followed here.
[195] Freydank and Saporetti 1989: 16, 17f., 58.
[196] Freydank 1994: 23-26.
[197] Freydank 2001.
[198] Postgate 1988: 106ff., no.50: 25ff.
[199] Ebeling 1948: 308ff.; see also Jakob 2003: 480 ff.
[200] Menzel 1981 (vol. 2) no. 1, transcription and translation; Oppenheim 1965, translation and analysis.
[201] Menzel 1981 (vol. 2) no. 2.
[202] Menzel 1981 (vol. 2) no. 3.
[203] Köcher 1952:192-202, cf. Menzel 1981 vol. 1: 41-43, 78f., vol. 2: T 7.
[204] Freydank 1994.
[205] Freydank and Feller 2005.

on the shoulder as a *ḫari'u* vessel (Deller 1990: 334, pl. 20.1), representing the only certain identification so far.

The texts often give clues as to the specific use of the vessel in the particular context the text is dealing with. So, texts will mention "so many jars for oil" or "decant the perfumed oil in so-and-so vessels". The large majority of all vessel names is connected to the storage, consumption, production or libation of liquids. They include water, beer, wine, vinegar, oil and honey as well as perfumed oil. A few vessels, including the *ḫari'u*, the *kallu*, the *kirru*, the *mākaltu*, and the *sūtu*, are used for both dry and liquid foodstuffs. Only the *qulli'u* is exclusively mentioned in connection with dry goods.

Alphabetical list of Middle Assyrian pottery names
Compiled with the assistance of F.A.M. Wiggermann.

The list includes items from a selection of MA texts, specifically those with relevant contexts and those published after the dictionaries. The lemmata are cited in their MA form; NA and NB material has selectively been included. Only vessels that are attested as being made of pottery have been included. The Sabi Abyad texts are discussed in more detail in Appendix F.

agannu (a large bowl)
Sabi Abyad T98-131: 5 (DUG.*a*.); KAV 118: 7 (pl.); Harrak 1990: 10 (pl.); in recipes for perfume see Ebeling 1948/50: Glossary (DUG.*a*.).
Sallaberger 1996: 110 (Krug).

An *agannu* is usually made of metal or stone, seldom of pottery. It is a large bowl or basin, sometimes with a stand. It is used for soaking the aromatics during perfume preparation, for oil or water, and in rituals. In the perfume recipes its capacity seems to lie between *ḫari'u* and *kasu*, perhaps 1/4 *imēru*? (= 25 *qû*). CAD suggests that it had a diameter of 60 cm or more.

diqāru (a deep bowl for serving and heating)
Postgate 1979a: 90.28 (2 *d*.'s of bronze, domestic; with 1 *saplu* and 2 *kappu*s of bronze); Freydank 1980: 108 iii 8 (one of the richer families of Ḫurrian deportees in KTN ownes a *d.* of bronze); Cancik-Kirschbaum 1996: no. 6: 29f. (transport of oil on donkeys in *d*.'s of bronze); recipe for perfume KAR 220 i 2, ii 1, 17 (placed on fire), iii 5', 11' (covered), 14' (placed on fire) 15'f.', iv 3' (covered), 7'[206]; in ritual: KAR 154: 15'.
Sallaberger 1996: 111 (Schüssel, Topf).

A *diqāru* can be made of metal (or stone), or of pottery. It is a deep bowl with a round base, used for serving and heating, such as a cooking pot or cauldron. It is found among household utensils and is used for boiling. It has soot on the surface. It is used for meat broth. In perfume preparation it is used for heating, brewing and mixing the mixture of water, oil and aromata. The volume of the ingredients in the perfume recipes suggests that some *diqārus* had a capacity of at least 2 *sūtu.*

ḫanṣubu (ḫanṣabu/ḫaṣṣabu) (a potter's waste product)
In the MA text (Harrak 1990: 20) it must be something countable, presumably a type of vessel: "(fired) waster" fits the evidence. Harrak 1990: 20 (1 *ḫa-an-ṣú-bu,* rather than *ḫa-an-zu-bu).*
Sallaberger 1996: 111 (variant of *ḫaṣbu*).

In the lexical lists this word is equated with the Babylonian word for "potter's waste", *zê paḫāri*, literally "potter's excrements". The existence of a "millstone for potter's excrements" shows the use of ground sherds, "grog" (CAD Z 151).

[206] Cf. Ebeling 1948/50 Glossary for further attestations.

ḫapāltu (a container)
Listed in the dictionaries under **ḫapālu* . Sabi Abyad T98-131: 7 (sg. DUG.*ḫa-pa-al-tu*); KAV 118: 6 (pl. *ḫa-pa-la-tu*). The fact that this word occurs only in these two texts confirms their common background; see also Appendix F.
Sallaberger 1996: 111 (ein Behälter (aus Ton??)).

ḫari'u (a large container)
Recipe for perfume KAR 220 i 3, 5, 17[207]; in ritual Ebeling 1948/50: 19a+ i 7'.
Sallaberger 1996: 111 (grosser Topf, Kessel).
NA: two earthenware *ḫ*.'s in a household (Deller and Finkel 1984: 32).

A large container (pot, kettle or tub) made of pottery, also of metal, sometimes with a stand. In Tell al-Hamidiya *ḫari'u* can be identified from a NA inscription on a large storage pot with a sketch drawing of a closed pot with a pointed base (Deller 1990: 334, pl. 20.1). In perfume preparation the heated mixture is poured into it and left to stand overnight. It is also used to collect oil. It is used for storing barley, water and wine, and in rituals. It is a large container, at least 2 *sūtu,* or 2 *imēru*?

ḫaṣbu pottery, terracotta, pot sherd; small pot (waster? cf. *ḫanṣabu*)
In ritual: KAR 154: 15' (Menzel (1981 vol. 2 no. 2) translates "*ḫaṣbu*-Gefäss").
Sallaberger 1996: 112 (variant of *ḫanṣabu;* Scherbe, (gebranntes) Tongefäss).
NA: used in cult; contains perfumed water for the hands of the king during his meal (Müller 1937: 59ff.). In NA the *ḫaṣbu* pot can be made of precious metal (AHw *ḫaṣbu* III.3)

ḫersu (AHw) / *ḫirsu* (CAD) (a vessel) (AHw), (a bowl) (CAD)
Recipe for perfume: KAR 220 passim.[208]
Sallaberger 1996: 112 (?).

A pottery or stone bowl. In the perfume recipes the mixture is decanted through a cloth into this vessel, and decanted from *ḫ*-vessel to *ḫ*-vessel. The volume of the ingredients in the perfume recipes suggests that a *ḫersu* had a capacity of at least 2 *sūtu.*

ḫupā'u (*ḫupû*) "(broken) vessel of ½ *qû*", pl. "sherds" (cf. CAD *ḫupû* A, B, and *ḫupa'u*)
KAJ 310: 37 (domestic, to store tablets).
Sallaberger 1996: 112 (Bruckstück).

The meaning is derived from *ḫepû* "to break", and indicates a sherd or broken vessel or a vessel of ½ *qû*. Perhaps it is also used for reused broken vessels (or sherds) of other sizes. Possibly, *ḫupā'u* (and/or *mišlu,* see below) was used for the "grain measures" divided into ½ *qû* fractions described above?

ḫuruppu dish
Sabi Abyad T98-131: 2 (DUG.*ḫ*., see the commentary in Appendix F); MA Laws Tablet A ¶ 42 (KAV 1 vi 17, 20; for a banquet).[209]
Sallaberger 1996: 112, 118 (ein Metallgefäss).
NA: of copper, in household (Postgate 1970: 152:3).

Only in the Sabi Abyad text this (ritual) vessel is made of pottery, a sure sign of poverty; elsewhere, earlier and later, it was always made of metal.

[207] Cf. Ebeling 1948/50 Glossary for further attestations, also wr. DUG.*ḫ*.
[208] Cf. Ebeling 1948/50 Glossary for further attestations.
[209] Schroeder 1920.

ildu base, foundation, potstand

MARV I no. 58: 2 (115 *kal-lu ša il-di*), KAJ 303: 2 (CAD reads *iš-du*, Freydank and Saporetti 1989: 82 read *du-du*), MARV VII no. 102: 22'[210] (*kap-pu ša il-di*, bowl with postand). Contrasts with *kablu*.

kablu leg (CAD *kablu*: of a chair, bed, table, potstand; add: vessel)

MARV I no. 58: 1f. *(kallu ša ka-ab-li);* MARV VII no. 102: 22' (*kap-pu ša [ka-ab-li(?)]);* KAJ 121a:3[211] (GIŠ.BAN$_2$ *ša ka-ab-la-a-te*.MEŠ).

In MARV I no. 58: 1f. *kallu ša ildi* varies with *kallu ša ka-ab-li*, apparently as *kallu* with a "potstand", and *kallu* with a "leg" or "foot"; the second occurence of *ša ka-ab-li* in this text remains unexplained. Probably comparable is MARV VII no. 102: 22', where a Kassite messenger receives as honorary gift a *kap-pu ša il-di* and a *kap-pu ša [ka-ab-li(?)].* In KAJ 121a: 3 there is a *sūtu* measuring vessel *ša ka-ab-la-a-te*.MEŠ "with legs" used for measuring corn in the meadow. The passages MARV I no. 58: 1f. and KAJ 121a show that *kablu* denotes not only the leg of a pot stand (CAD), but also that of a vessel. KAJ 121a shows that a larger vessel (*sūtu*) may have more than one "leg".
In NA *kablu* may denote a "(potstand with a) leg (or: legs)" (CAD *kablu* mng. d).

kallu bowl

Sabi Abyad T98-131: 6 (DUG.*k*.); KAV 118: 2; MARV I no. 58: 1 (*ša kabli*), 2 (*ša ildi*) "with legs"; Harrak 1990: 6 (*ša agarimuri*), 7 (small *k*.'s *ša šaplišḫi*), 9 (18 *kal-li* GI ŠE.MEŠ, "en roseaux de grains"??), 14 (pl., *sērūtu* "covered with a clay slip", for the meal of the king); in ritual: Köcher 1952 (VAT 16435): 192ff.: 16 (with flour to be scattered over a roasting lamb); passim in MARV III no. 16 (offering list), with foodstuffs. In this text (except once) *kallu* (sg. or pl.) is determined by GIŠ.ŠE, probably the same as GI.ŠE.MEŠ determining *kallu* pl. in Harrak 1990: 9. Donbaz 1988: 70 no. 2:5: 10 *kal-lu ša* NINDA.MEŠ KUR$_4$.RA, "for making(??) thick bread".
Sallaberger 1996: 112 (Schale).

In MA *kallu* is one of the most common types of container (Harrak 1990: 70-75). CAD translates "bowl" (meaning indicated by "crown of the skull" and "shell of the turtle"). It could be made of reed (?), pottery, wood or metal, and was part of the normal household equipment. It was used to store or serve foodstuffs, flour, salt, oil, water, etc. It was also used for washing the hands or fingers. Harrak 1990 shows the existence of a small and a large *kallu*.

NA: K.Radner (1997: 253ff.) treats the phrase *kallu saḫḫarru* "Topf (und) Schälchen" in NA testaments; these are the humblest objects in the household, and occur as an expression meaning to say "really everything". The Sumerian equivalents dug.bur.zi.gal and dug.bur.zi.tur show that the terms denote a bigger (gal) and a smaller (tur) vessel of the bur.zi type. DUG.BUR.ZI is the logogram of *pursītu* (in fact a loanword from the Sumerian), which suggests a series of ascending size but comparable form or function: *saḫḫarru – pursītu – kallu.*

kannu "wooden rack for storing containers", "metal pot stand", "(a small container)"

Cf. Donbaz 1990: no. 133, concerning wine "for (on) the potstands", that is: to be served.
Sallaberger 1996: 112 (Gefässständer).
NA: 6 *kannus* of iron weighing 30 kg each (Postgate 1970: 152:15, inventory of a household).

A *kannu* is not a pottery vessel, but a metal or wooden stand used to support (pottery) containers. It is sometimes used under the *nazzītu* beer–vat in rituals. It can be a stand to support pots with a pointed base, or a rack to hold cups. Cf. figs. VI.19, 21, 28 for MA, figs. VI.35, 38, 39, 41, 42, 43 for NA scenes.

[210] Freydank and Feller 2006.
[211] Postgate 1988:187f. no. 75

kāsu cup, bowl, small drinking vessel, subdivision of the *qû*
Inventory MAH 16130: 100:16[212] (1 *ka-su* ŠU.2 "one two-handled cup/bowl"; domestic); recipe for perfume KAR 220 i 16[213] (for measuring, *ina kāse ṣeḫerte*, "with the small *kāsu* measure"); in a ritual: Ebeling 1948/50: 19a+: ii 9', 15'f. (bowl for beer), 18'ff. (*ša ṣarpi* "of silver"); MARV V no. 69: 5', 7'[214] as a subdivision of the *qû* (probably 1/10th, as in NA); probably as a measure also in MARV III no. 58:6[215] (*1 ka-si* I_3 *perṣaduḫḫe*, "one cup of balsam oil").
Sallaberger 1996:113 (Trinkgefäss).

NA: cf. Radner 1999/01: 17-23: a *kāsu* "goblet" inscribed "Stadtherr von Zarātu"; the form is typically NA, and used for drinking wine; ibid. 21f., *Trinkschalen als Ehrengeschenke*: it would be this type of *kāsu* that has a capacity of about one tenth of a *qû* (0.084 litre). In NA the "*qû* of the king" is a standard for the measure of wine; the wine records also use *kāsu* ("cup") as a subdivision of the *qû* (probably 10 *kāsu* = 1 *qû*), see CAD *kāsu* mng. 2, Powell 1987/90: 502, referring to Kinnier-Wilson 1972: 110-120 (CTN 1). This gives a general indication as to the capacity of the "cup": approximately 0.08 litre. Except for the few attestations as a capacity measure, *kāsu* is apparently not normally used in MA or NA (although common everywhere else in the LBA). Large (*dannātu*) *k.*'s are used for drinking during the meal of the king (Müller 1937). Metal *kāsu* are very common in NB dowries (Roth 1989/90: 25; once DUG$^?$.GU$_2$.ZI).

A small pottery or metal drinking cup, for wine, beer, and for measuring (balsam, perfume).

kirru (a large vessel), (a standardized container for beer, not in MA)
Harrak 1990: 9 (4 *kír-ra-a-tu* with *kukkusu*-flour), 10 (*6 kír-ru uš-ḫa-tu/li* ? GI), 15 (2 *kír-ru*); KAJ 303: 6[216] (of bronze; in storage); in inventories: MAH 16130: 100:11 (10 KIR$_2$.MEŠ ...); in ritual: KAR 139: 7 (beer).
Sallaberger 1996: 113 (ein grosses, offenes Gefäss).

A *kirru* is a large (storage) vessel of pottery, metal or stone, possibly with a neck. It is used for flour, ghee, water, milk, beer, fat, oil, lard, perfume, wine, and honey. It is also used for libations.

kukkubu (a small container)
Sabi Abyad T98-131: 4 (DUG.*k.*); KAV 118: 4; MARV I no. 7: 17 (DUG.*k.* pl.); Harrak 1990: 19 (pl.); Postgate 1973: 14:27 (with oil).
Sallaberger 1996:113 (Flasche).

A *kukkubu* is a small container or flask, made of pottery, metal, stone or glass. It serves as an alabastron, libation jar and drinking flask, for perfume, beer and oil. Its capacity lies perhaps around 5 *qû*?

kūtu (a container)
KAJ 317: 9 (3 DUG.*ku-ta-tu*, coll., CAD K 612a reads here *ku-ú-tu*).
Sallaberger 1996: 113 (Eimer/Kessel/grosser Topf).
NA: earthenware *k.* in household (Deller and Finkel 1984: 76ff.:34).

Made of pottery or metal, rarely of wood. Used for the storage and serving of liquids (oil, milk, beer, wine, soup). A metal one weighing about half a kilogramme (i. e. relatively small) used for storing and serving liquids may have had a long spout "like an elephant" (CAD disc. sect.).

[212] Postgate 1979b.
[213] cf. Ebeling 1948/50 Glossary for further references).
[214] Freydank and Feller 2004.
[215] Freydank 1994.
[216] Freydank and Saporetti 1989: 44, 82.

laḫannu (a bottle)

KAV 118: 3; in ritual: Köcher 1952 (VAT 16435): 192ff.:2 (*6 l.* NA_4.ZA.GIN_3 *ku-ri* "aus künstlichem Lazurstein", with wine, votive of king for deities), 17'f. (with wine, with beer for libation), 23, 27, 30 (with wine for libation).
Sallaberger 1996: 113 ((schlanke) Flasche).

A *laḫannu* is a bottle made of pottery, glass, precious metal or stone. It can be closed with a stopper. It is used for beer (sometimes called "tavern keeper's bottle"), water, milk, wine, honey, and objects. 7 bottles can be put on a brazier. It is also used for washing the hands. In rituals it is used for libations and medications. Its capacity is perhaps around 1 *qû*?

mākaltu (a bowl or shallow saucer)

In ritual: KAR 139: 6 (for offering food); KAR 154 passim (for offering bread).
Sallaberger 1996: 114 (Ess-Gefäss).

A *mākaltu* is mainly made of wood, but also of pottery or metal. It is a shallow eating or serving bowl (the word is derived from *akālu*, to eat). It is also used in libations with beer or dates, figs, bread or oil. It occurs in dowry lists and inventories. Its capacity is perhaps around 1 *qû*?

makkusu (makkasu) (a bowl)

Sabi Abyad T98-131: 3 (DUG.*m.*); KAV 118: 8.
Sallaberger 1996:114 (?).

Made of pottery or metal.

malītu (a small bowl)

MARV IV no. 146: 5' (*1 ma-li-tu ša* I_3 *su-ni a-na nap-šu-u[š x x]* "one *malītu*-vessel with filtered? oil for anointing [x x x]), 7'f. (*2 ma-li-a-tu ša 1* $SILA_3$.TA.AM_3 I_3, 2 *m.*-vessels with one *qû* oil each). The reading of the sign *–li-* is uncertain, it looks more like *-šar-* or *–šìr-*, which does not result in a satisfactory solution (*maširru*? *maššaru*?).
Sallaberger 1996: 114 ("Volles", ein Kultgefäss).
All other attestations are NB.

Made of pottery or precious metal.

maqqû libation bowl or goblet

In ritual: KAR 139: 7 (beer).
Sallaberger 1996: 114 (Libations-Gefäss).

marsattu (a large vessel), derived from *rasānu* "to soak, to steep, to brew beer"

Lutz 1927: 104 no. 46:2 (coll. by Caplice cited in CAD s.v. *marsattu*), 4 (DUG.*m.*); Harrak 1990: 19 (DUG.*m.*, pl.); KAJ 310: 25, 29, 32, 37 (domestic, to store tablets).
Sallaberger 1996: 114 ("Durchfeuchter", "Einweicher" (in der Bierproduktion)).

A *marsattu* is a large soaking or mixing vat, used in beer production. It is also used to store cuneiform tablets, and for milk.

mašḫulu strainer

KAR 220 i 17 (perfume recipe); MARV VI no. 75:2f.[217] *m.* of *bu-ra-li* (a type of stone), and GIŠ.*al-la-ni* (a type of wood).
Sallaberger 1996: 114 (*mašḫalu,* Sieb).

[217] Freydank and Feller 2005.

A strainer of pottery (not attested in MA), wood, metal, stone or glass, used for straining beer and during perfume production. Given to (?) bakers and brewers in MARV VI no. 75.

mišlu (a half-size container)
Harrak 1990: 18 (preceded by *sūtu*) (for foodstuff); KAJ 277: 4 (DUG.*m. ša x x [...])*, 5 (*balṭāte* "intact"); KAJ 310: 28 (domestic, to store tablets).

nazzītu (*namzītu*) (fermenting vat)
Sabi Abyad T98-131: 8 (DUG.*n.*).
Sallaberger 1996: 115 (Bier-Gärgefäss).
A *n.* occurs sometimes in NB dowries (which implies domestic, non-specialist brewing), Roth 1989/90: 27.

A *nazzītu* is a large vessel used for the preparation of beer. It has a hole in the base, and is used over a vessel or stand (*kannu*) under it. See also the discussion of beer production below in this chapter.

nignakku censer
KAV 118 rev. (large and small *n.*'s); in ritual KAR 139: 9 (incense scattered on a censer, *ni-id-na-ki* for *nignakku*; a metal censer *šēḫtu* occurs in the same text).
Sallaberger 1996: 116 (Räucherschale, -ständer).

A metal or pottery censer or censer-stand, used for burning aromata in rituals. Small and large *nignakkus* exist.

pursītu (a bowl)
Sabi Abyad T98-131: 9 (DUG.*p.*, pl.); KAV 118: 5 (pl.); MARV I no. 58: 4; MARV III no. 16 ii 13', iv 18 (offering list); MARV V no. 46: 8[218] (DUG.BUR.ZI, to store drugs).
Sallaberger 1996: 116 (ein Kult- oder Trinkgefäss).

A cultic and drinking bowl of pottery, metal, wood or stone, used in rituals.

qulli'u (a bowl)
Harrak 1990: 11 (with flour).
Sallaberger 1996: 116 (?).
NA: bowl or plate used by someone during a meal (Müller 1937).

A bowl of pottery or metal, for food or flour.

saḫḫarru (a small bowl)
Sabi Abyad T98-131: 10 (DUG.*s.*); MARV I no. 58: 3 (the only MA attestations).
Sallaberger 1996: 116 (eine im Kult verwendete Schale?).
NA: see above with the comments on *kallu*.

A small bowl used for oil, honey, dates, groats, fruit (often in rituals); among household equipment.

sūtu (a measuring vessel)
Lutz 1927: 104 no. 46 (1 DUG.BAN$_2$ PN); Harrak 1990: 18 (DUG.BAN$_2$.MEŠ, followed by *mišlu*); KAJ 277: 3 (*ša kudi[mme]* "with cress"); MARV III no. 9: 23f. (x DUG.BAN$_2$.MEŠ, of PN the *alaḫinnu*, of the storeroom); KAJ 310: 39 (to store industrial materials in); in recipes for perfume (Ebeling 1948/50 Glossary); in ritual Ebeling 1948/50: 19a+ i 3', ii 9'ff. (with beer); Jakob-Rost 1991: 62 nos 37-40 (sherds of vessels inscribed 1 BAN$_2$ SUMUN "1 altes sūtu-Mass").
Sallaberger 1996:116 (Seah-Gefäss).

218 Freydank and Feller 2004.

A pottery, metal or wood container or measuring vessel of a standard capacity, and its volume. It is used for oil, barley, flour, chick peas, and cress. It is used by the baker, the perfume maker, in the storeroom, and for rations. It is also used with beer in rituals. There are various different *sūtu* measures in the MA period, among which large and small ones. In Sabi Abyad 1 *sūtu* equals 10 *qû.* There is, however, no identifiable group of pottery vessels at the site that has a standardized capacity of 1 *sūtu* (ca. 8.4 litres).

ṣurṣuppu (CAD: a container provided with teat-shaped protuberances; CDA: a container with knobs)
MARV VI 35:41 (for beer during offerings to gods). Apart from the one MA attestation this word occurs only in Lexical Texts.
Sallaberger 1996: 116 (no translation).

šapputu (a container)
Sabi Abyad T98-131: 1 (DUG.*š*., pl. ?); MARV I no. 7: 14ff. (DUG.*š*., pl. *ša* LAL_3 “with honey”, *ša* ḪI.ḪI “for mixing”, *ša* I_3.NUN.NA “with ghee”); Harrak 1990: 20 (“with honey”); KAJ 277: 1f. (pl.), 6, (DUG.*š*.pl. *ša* GIŠ.BAN_2, “*š*.’s (measuring) one *sūtu”;* CAD reads here *ša* 2 $SILA_3$, but the passage was collated by Freydank and Saporetti 1989: 58*)*, KAV 98: 29[219] (*ša jarzibni*, MA letter; *jarzibnu* is an aromatic); KAJ 317: 10 (1 DUG.ŠAB *ša* GAL-*e*); MARV III no. 9: 25f. (x DUG.ŠAB.MEŠ, of PN, 5 of 42 *qû* (*ana madāde* “for measuring”); MARV IV no. 146: 20’f. “with oil”; in recipes for perfume (KAR 220 passim and cf. Ebeling 1948/50 Glossary for further attenstations; for oil, water, aromata). In ritual (Cancik-Kirschbaum 1996: SH 80/1527 I 341, for the *gina’u* offering).
Sallaberger 1996:117 (eine grosse Flasche (?), Lagergefäss).
NA: twenty *š*.-jars in a household (Deller and Finkel 1984: 76ff.:31)

A pottery jar, bottle or storage vessel. In perfume preparation the prepared perfumed oil is strained through a cloth into this vessel at the end of the preparation. It is also used for making wine and vinegar and for the storage of honey, ghee, oil and beer. It is used in ritual as well as for measuring. It occurs with a stand. Its capacity is perhaps between 2 *qû* and 4 *sūtu* 2 *qû ?*

tabiltu (a pottery vessel)
In recipes for perfume (Ebeling 1948/50 Glossary).
Sallaberger 1996: 117 (zu *abālu* D “trocknen”?).

tallu (oil vessel)
KAJ 310: 30 (domestic, to store tablets).
Sallaberger 1996: 117 (ein Gefäss besonders für Öl).

An oil vessel, possible capacity 8 *qû*?

tarīḫu (a vessel)
KAJ 169: 29 (DUG.*ta-ri-ḫu*)*,* Sabi Abyad T93-3: 16 (beer and DUG.*ta-ri-ḫa-te*); Donbaz 1992: 119f. 17, 20 (2 *sūtu* of beer, 2 DUG.*ta-ri-ḫa-tu*, 1 *sūtu* of good bread for the journey of Ninurta-tukul-Aššur; 2 *sūtu* of beer, 1 DUG.*ta-ri-ḫu*, 1 *sūtu* of bread were delivered, by order of Ninurta-tukul-Aššur, when Buza dressed the divine statues in the town of [..]na); in Tell Chuera (DUG.*ta-ri-ḫa-te* GIBIL cf. Jakob 2003:407).

Is associated with beer, but probably not used for beer production, storage or transport. For serving beer? To be delivered by the brewer together with beer for immediate consumption. Mentioned in connection with brewers.

[219] Schroeder 1920.

Ceramics in a culinary context

It has been suggested (e.g. Lesure 1998: 20, Henrickson 1990: 85) that the majority of the primary functions of ancient ceramics involve the storage, transport, preparation and consumption of foods and liquids in a domestic setting. This raises questions as to what kinds of foods and liquids were consumed in a household or processed in a workshop or kitchen. The reconstruction of ancient diets and recipes is based mainly on textual and botanical or archaeozoological evidence, but architecture (kitchens, ovens, kilns) and artefacts (grinders etcetera) are also important. At Sabi Abyad, all these sources are available. However, since none of this information at Sabi Abyad has been fully published yet, our interpretations must remain of a general nature.

Many and varied foods and drinks were available in Mesopotamia. Texts and archaeological materials give evidence of barley and wheat for porridges, many types of bread, and beer. Sesame is important as well. Fruits include grapes, apples, dates, figs and pomegranates, and could also be used dried, as a juice or as a syrup. Olives and olive oil were used, as well as onions, leeks, garlic, cress, almonds and pistachios. Spices included salt, mustard, cumin and coriander. As to the animal sources, beef, sheep, goat, deer, pig, fowl and fish were consumed, either fresh or salted. Animals were also exploited for their secondary products: eggs, milk, butter and many kinds of cheese (Curtis 2001: 193-194, Ellison 1984b). One of the most expensive drinks was wine, imported from mountainous regions.[220] The *production* of wine in southern Mesopotamia is not attested before the first millenium BC. However, it was produced in Northern Mesopotamia where grapes could be grown more easily, for example at Carchemish, and in the Levant (Zettler and Miller 1996, Powell 1996). A Middle Assyrian text of unknown provenance, but possibly from Tell Sheikh Hamad / *Dur-Katlimmu*, discusses the registration of small agricultural plots with vineyards and fruit trees (Fales 1989).

Textual sources from Sabi Abyad indicate, however, that the daily diet of most of the inhabitants of the *dunnu* was much less varied and luxurious. The staple food of the *dunnu* dependents consisted of bread (or other dishes made from grain), onions and beer, sometimes with the addition of some cress. Beer and bread were centrally distributed to the staff (and to visitors), and were prepared by the baker and brewer (F.A.M. Wiggermann, personal communication). In much smaller quantities, lentils, fennel, chick peas and oil were consumed as well, but fruits were virtually absent (apart from some nuts). Honey/syrup was probably not consumed on a regular basis by everyone. The spices included coriander, cumin, black cumin, possibly mint and some unidentified spices (Wiggermann 2000:197). Sesame is attested in the texts as well as in the botanical material and was used to press oil (Wiggermann 2000: 197, Van Zeist 1994: 546, Bottema and Cappers 2000). The texts do not contain any information on the consumption of meat or milk products (Wiggermann 2000: 198), but it is likely that milk products such as butter or cheese[221] formed a substantial part of the diet, especially in the light of the large amounts of sheep in the care of the settlement. The botanical evidence from the site is only partly published (Van Zeist 1994, Bottema and Cappers 2000), but cereals (barley and wheat) form the bulk of the material. Sesame and garlic are also attested in the botanical material. Ovicaprids (sheep and goat) are dominant in the archaeozoological material (as yet unpublished). Pork and beef were much less used. The faunal remains also indicate that gazelles were hunted. The use of the meat, fat and skin of the wild boar is attested in the texts, while fallow deer is present among the faunal remains (Wiggermann 2000: 179, 198). Furthermore, it seems that ostriches were known at the site, and doves and other birds were eaten (Wiggermann 2000: 200-201). Beer was the most important drink apart from water; wine is not attested in the texts from Sabi Abyad.

Serving and eating customs

Some information about eating customs in Mesopotamia can be deducted from iconography and administrative texts on food issues, collected in the work of E.R. Ellison (1978). Although most texts and scenes on seals and reliefs deal with banquets of kings and other important figures as well as with ritual banquets and food offerings to the gods, some general ideas about the eating habits of common people might

[220] Analysis of residues in vessels has proved that wine was drunk already in prehistoric Iran (McGovern et al. 1996), in Egypt at least since the First Dynasty (Murray et al. 2000) and in Old Assyrian times (Wartke 1997: note 30). A Middle Assyrian text (Freydank 1994 (MARV III) no. 23) discusses the delivery of wine for cultic purposes.
[221] Cf. Gouin 1993, 1994, 1996 for residue analyses of Harappan cheese-making vessels.

be taken from these. It seems that in these higher circles throughout Mesopotamian history it was customary for servants to bring food in small portions or in small bowls to the diner. A small cup could be held in the hand, while larger jars were sometimes set to the side of the scene. Tables were present but served only as sideboards to hold the prepared dishes. Although all diners in these scenes are seated on chairs, it is unlikely that ordinary people all ate while seated on chairs at a table.[222] There are few indications for the use of cutlery,[223] and it seems most likely that the food had been prepared in such a way that it could be easily scooped up with the fingers or a piece of bread. Elamite prisoners shown in reliefs of the Neo-Assyrian period are seated on low cushions and either eating food in individual portions or reaching into one common vessel or into a pile of food in the middle of their group (fig. VI.36, 37; Ellison 1978: 246-253). Even when iconographic evidence for the Middle Assyrian period is very meagre, it may be reasonable to suggest that people at Sabi Abyad used small bowls to hold spices, cheese, or side-dishes like onions, while the main fare of their meal consisted of flat bread baked in the numerous tannurs found all over the site. Larger bowls could have been used to contain dishes prepared for a group of people (stews, porridges, bulgur, etc.) and placed in the middle for all to reach into. Serving dishes for small amounts, individual portions and group portions may therefore be expected. Middle Assyrian vessel names possibly fitting these descriptions are *kallu* (a rounded bowl in two sizes, small and large), *kāsu* (a very small bowl or cup), *mākaltu* (eating bowl), *saḫḫarru* (a small bowl) and *qulli'u* (a bowl) (cf. fig. VI.18). Mats could have been used as an underlay for bread and other dry foodstuffs. The shape of the goblets suggests that the custom of holding a drink in the hand was prevalent in Middle Assyrian times,[224] but water and beer could also have been drunk from small bowls or from the smaller jars. Middle Assyrian vessel names related to drinking are *kāsu* (drinking cup or bowl), *kukubbu* (a small jar or drinking flask), and perhaps *laḫannu* (a bottle) (cf. fig. VI.18). See below for the scarce iconographic evidence on eating and drinking customs.

<u>Cooking methods</u>

In the Mesopotamian kitchen several methods for food preparation were available. These include the baking of flat bread in a tannur oven, the baking of other types of leavened or unleavened bread in closed ovens or hearths, the roasting of grain and meat over a fire, drying, pickling and salting, as well as different methods of boiling in pots (Curtis 2001: 194-195, see also Bottéro 1987, 2004). Only the method of cooking in a liquid required the use of cooking pots. A scene from a Neo-Assyrian relief shows how cooking could have proceeded (fig. VI.39). Two kinds of cooking pots are known from the "Yale Culinary Tablets", dated to the Old Babylonian period. One is the *diqāru,* usually made of pottery but also of metal, and also known from Middle Assyrian texts. J. Bottéro expects that the capacity of a *diqāru* was rather large, in any case exceeding 6 litres. The same vessel name is also used in Mari for pots to contain dough set aside to rise, for cooking oils and preparing perfumes (see below; Bottéro 2004: 50-51). The other pot mentioned in the Mari texts, the *ruqqu*, is a metal cooking vessel and does not concern us here.

Although several of the foodstuffs attested at Sabi Abyad require cooking rather than roasting or baking (including lentils, porridges made from grain, meat if used in soups or stews instead of roasted, and milk products prepared with heat, it is remarkable that pottery vessels recognized as cooking pots only constitute a very small proportion of the total assemblage (less than 0.4%). Several explanations may be offered for this phenomenon. Firstly, it may be suggested that cooking was not a much-used method for food preparation at the site (cf. Frankel and Webb 2001: 125). The staple foods show that cooked foodstuffs did not form a large proportion of the diet. Bread, beer and onions do not have to be cooked, while the meat that was occasionally eaten could have been prepared by roasting. Although tannur ovens and hearths are found in all buildings at the site, cooking vessels are much less common, and perhaps not every household used them. The fact that many cooking pots were imported, and that there does not seem to have been a local cooking-pot production tradition, may suggest that cooking in pottery vessels was not a common practice among the Assyrians living at the *dunnu*. Interestingly, the largest and best preserved cooking pot (P93-308)

[222] Texts listing inventories of Hurrian deportees list some chairs and tables among their possessions; however, never enough to seat the whole family (Freydank 1980).

[223] Bronze knives are occasionally found at Sabi Abyad, but no spoons or forks or similar instruments. Metal or wooden spoons are known from Middle Assyrian texts (e.g. in a list of private property, Postgate 1988: KAJ 310, *itqūru*).

[224] Later Neo-Assyrian iconography shows elaborate banqueting scenes. In these scenes, depicting the elite, people drink (wine?) from shallow bowls and from goblets. These vessels are never set on the tables which are laden with food items. Servants stand aside to fill the cups when necessary (cf. e.g. Stronach 1996).

comes from a room in the north of the settlement that is characterized by many hearths and by other special vessels, suggesting that this room was not a normal domestic kitchen. Perhaps cooked dishes were served from there only to some inhabitants of the site (the *abarakku*, the grand vizier and their staff; F.A.M. Wiggermann, personal communication), or were prepared centrally for common meals on special occasions only.[225]

Secondly, cooking pots made of metal could have been used for preparing the daily dishes. Metal pots would probably not have been left behind at the site, but taken away when the inhabitants left. This is illustrated by textual (Middle Assyrian, Freydank 1980: 112ff including a metal *diqāru*) as well as iconographic sources (Neo-Assyrian, figs. VI.33), in which metal cauldrons are part of the inventory taken away at deportation or at the sacking of a city. Pottery vessels are never mentioned in this context and were probably left behind. It is likewise possible that the imported cooking pots were deemed valuable enough to take along when people moved, while the locally produced pottery was left behind. In that case, only broken or damaged cooking pots would have become part of the archaeological record.

A third explanation may be that other pottery vessels were used as cooking pots as well, but that we did not recognize them as such. However, no other vessel group showed the characteristic combinations of shape, surface treatment, fabric and traces of soot that the group of cooking pots did.

Apart from the cooking of food, pottery vessels could also be used to process foodstuffs in other ways. In the Sabi Abyad texts there is evidence for beer brewing, oil pressing and the baking of bread (Wiggermann 2000: 190).

<u>Beer brewing</u>

Among the craftsmen mentioned in the texts of Sabi Abyad is a brewer (Ass. *sirašû*; Wiggermann 2000). A concentration in the northern part of the *dunnu* of texts dealing with the delivery of beer indicates that the office and part of the brewery were located in this area. The texts mention up to six brewers delivering large quantities of beer to the staff, but the frequency of delivery is unknown. Part of the deliveries came from other settlements (Akkermans and Wiggermann in press; F.A.M. Wiggermann, personal communication). Among the complete vessels, small and large bowls, a bowl with a spout and a handle, deep bowls with a base hole, large jars, pot stands and two “pilgrim bottles” were found. Beer could be stored longer than water, contained fewer bacteria due to the alcohol content, and was a nutritious drink for all members of the society (Curtis 2001: 210-219). The use of pottery vessels in brewing beer is attested in many cuneiform sources throughout Mesopotamian history (e.g. Powell 1994, Stol 1994), and also at Sabi Abyad the brewer would have used pottery containers to prepare this popular drink. The Sabi Abyad beer does not seem to have been sieved or strained, as is suggested by the find of several bronze beer straws (filters) that were used to keep the larger particles out while drinking.

Experiments in traditional beer brewing at Tell Bazi in Syria, using ancient vessels dating from the Late Bronze Age, have clarified the possible uses of large storage pots and deep bowls with base holes. The experiments took place in early summer. The large pots were identified as “beer vats”, while the pots and bowls with base holes could be identified as soaking and germinating vats. First grain was soaked and brought to germinate in a pot with a base hole, placed on a pot stand with a bowl under it. The base hole was closed with a plug, and a piece of cloth was put inside the pot over the hole. Water was added to the grain and the mixture was left to soak. Dirt and weed seeds would come floating and could be scooped from the top, which is why an open vessel shape is best. When the grain had soaked and germinated enough, the plug was drawn from the hole and the remaining water could drain through the cloth into the bowl below. This bowl was only necessary to keep the floor dry, as this water would not be used anymore. In Bazi the germination took place inside the mud-brick house in four days, at a room temperature of about 24°C. Then the pot and its contents were carried to the roof, where the green malt was spread on a mat to dry in the hot sun. By doing this the germination is stopped. After drying the malt was ground with a basalt grinding stone. The next step was to mix water and malt in a large beer vat that was fixed into the floor (for a cooling effect), to add some yeast and to let the beer stand for 36 hours. The low proportion of malt to water (ca. 1:8) means that with one large pot of prepared malt a lot of beer could be produced. The resulting beer was low in

[225] Indeed, one huge bowl (fig. IV.58.f) was found in square M9, a building associated with the “kitchen” in square K9. Possibly communal meals were served to *dunnu* staff in this area (cf. also Akkermans and Wiggermann in press). Interestingly, a cook is not among the professions attested in the texts at Sabi Abyad until now (F.A.M. Wiggermann, personal communication).

alcohol, tasty and stable for more than two months afterwards. The presence of calcium oxalate (resulting from the mixing of grain and water and a clear indication for beer production) in the vessel walls was proved for the ancient Bazi vessels through chemical analysis (Zarnkow *et al*. 2006, A. Otto personal communciation). Although at Sabi Abyad the use of the base-hole pots as germination vats is not proved by chemical analyses, we may suggest in analogy with the Bazi experiments that at least some of them may have been used as such. Their capacities range between 11 and 18 litres for the smaller bowls to 97 and even 150 litres for the big pots (fig. VI.17, 18). The ready-made beer could have been stored in the large closed storage vats or in large jars, awaiting further distribution.

The correspondence of pots with base holes with the word *nazzītu / namzītu*, a fermenting vat used in beer production and known from texts, has already been suggested by Gates (1988: 66-68) for vessels found in Tell Hadidi. However, a *namzītu* is usually interpreted by Assyriologists as having been used to squeeze the mash and let the beer drip into a lower vessel placed under it (Stol 1994: 170-171, Curtis 2001: 217).[226] From the experiments at Bazi it is clear that no squeezing is necessary, unless a filtered beer is being produced. The vessels with base holes from Sabi Abyad seem to be too big and heavy to place them on top of another vessel to collect liquid dripping from it, and this reconstruction is not favoured for Bazi either (A. Otto, personal communcation).

Another vessel mentioned in texts from Sabi Abyad and Tell Chuera and associated with beer is a *tarīḫu*. It is unlikely that this otherwise rarely mentioned vessel is related to beer production, beer transport or storage, as it has to be delivered to another location together with the beer. Perhaps it was used in the consumption of beer, but its meaning is as yet unclear (Jakob 2003: 407, see also Appendix F). A stand called *kannu* was sometimes used under a beer vat, but this kind of stand was usually made of wood (Stol 1994: 170-171, Maul 1994: 361, 365). The large ceramic pot stand P93-177 was found at Sabi Abyad in connection with a large pot with a base hole, and could have been used together with it. Other vessels mentioned in texts related to beer production are a *marsattu* (a soaking vessel?) and a *mašḫulu* (strainer).

Other preparations of food

At Sabi Abyad oil was pressed from sesame, both for domestic use as well as for transport to the residence of Ilī-padâ and to Aššur, as is clear from the texts (Wiggermann 2000: 192). Olives have not been attested so far. How the pressing of sesame for oil took place is not clear, and no obvious oil pressing installations have been found at the site. Perhaps oil pressing took place at one of the subsidiary settlements around Sabi Abyad. In any case, the resulting sesame oil could have been stored in pottery jars for distribution at Sabi Abyad and for transport to other sites. Curtis (2001: 232) suggests that jars with holes in the upper or lower body could have been used to separate olive oil from water during olive-oil production; perhaps, some of the pots with base holes or the large pot with a hole drilled in the lower vessel wall (fig. IV.67.f) were used for these purposes. The deep bowls with a spout and handles (fig. IV.60, 61.a-c) may also have been used to separate some material floating on top of a mixture, including oil, and to decant it into another vessel. Middle Assyrian vessel names associated with the production of oil are absent so far; words related to the storage of oil are *kirru*, *kukkubu*, *kūtu*, *šapputu* and *tallu*.

Although cooks are not mentioned in the texts, the baker (*alaḫḫinu*) Paya is (Wiggermann 2000: 190). His workshop was located at the southern end of the settlement, where an unusual number of tannur ovens and grinding stones was found. Besides, texts dealing with Paya and with bread and flour are concentrated in this area. The baker would probably not have used pottery vessels for the actual baking of bread (no bread moulds have been found). Nevertheless, a baker could have used vessels for (short or long-term) storage of grain, flour and dough, as well as for spices and condiments used for the baking of special breads. Interestingly, it is in this area of the site that a small carinated bowl filled with charred garlic was found. Vessel names associated with the storage of grain or flour in Middle Assyrian texts are *ḫari'u* (a large storage pot for barley), *kirru* and *qulli'u* (a large vessel and a bowl, both for flour).

[226] Depictions of beer brewing in Egypt suggest that there the beer was squeezed through a basket into a vessel with a spout; see Faltings 1998.

Storage and transport

The proper storage of enough foodstuffs, seed corn and grain for rations was a central concern of the *dunnu* staff at Sabi Abyad. There are several different ways to store perishable goods, whether dry or liquid, including bulk storage in sacks, baskets or without a container in storage rooms or silos. Drying, roasting or smoking, and salting or pickling of meat, fruits and grain may have been common practice, too, for preserving foodstuffs (Curtis 2001, Bottéro 2004: 56-63). In this context, especially, the absence of mats, sacks, leather containers and baskets from the archaeological record is most disturbing: especially dry goods like grain, sesame, dried fruits and salted foodstuffs would have been most easily stored in baskets or bags. Large storage spaces especially built for bulk storage of grain have not been identified at the site of Sabi Abyad.[227] Perhaps the yields of the harvest were not stored at the tell itself but elsewhere (Wiggermann 2000: 184). Dry storage of goods in smaller quantities must have been common practice in individual households all over the site. The most important of these dry goods was grain, received in rations at set intervals of time (although it is not known how often). A typical monthly ration would be 0.3 *imēru* (= 30 *qû*) of grain for an adult male, 0.2 *imēru* (= 20 *qû*) for a female and 0.1 *imēru* (10 *qû*) for children, and people would produce some extra grain on their own fields (on average 0.13 *imēru* per person monthly; Wiggermann 2000: 186-187). A small family of a husband, wife and three children would thus need 145 *qû* (or ca. 120 litres) of storage space in a month for grain or flour, but of course households may have been composed of more people (between 3 and 24, cf. Wiggermann 2000: 191). If not stored in bags or baskets, the grain could have been stored in four large jars or in one very large pot (see above for Middle Assyrian vessel names associated with the storage of grain products). Other dry goods needed to be stored as well, mostly again in baskets and bags, but perhaps sometimes in deep bowls or pots and jars as well.

Liquids could only be stored in leather sacks or in pottery or metal vessels. The storage of drinking water for long periods of time seems to have been unnecessary, as Sabi Abyad is located close enough to water sources to enable the daily fetching of fresh water. Possibly only the amount of water needed for a day was fetched and stored short term in the house. In analogy with the modern villagers of Northern Syria, this could have been done using the deep open bowls and pots (types 141, 142, 221, 222). Nevertheless, several sherds of very large storage pots (figs. F.6, F.7) have the cuneiform sign for water incised at the shoulder of the vessel, done before the vessel was fired. One of these vessels is coated with bitumen on the inside, making the vessel extra watertight. Possibly these vats were used for long-term storage of drinking water or water used for other tasks (washing, brewing, etc.). An important liquid requiring storage at home is beer. As discussed above and contrary to the situation in Tell Bazi (Zarnkow *et al.* 2006), it is not likely at Sabi Abyad that every household produced its own beer. Rather, the brewer would provide the inhabitants with the drink. The brewer kept daily records of his production; two small texts each mention the delivery of 4 *sūtu* (= 40 *qû,* ca. 33 l.) of beer for the meal of Ilī-padâ (Wiggermann 2000: 175), possibly delivered in a large jar. Ordinary people would store beer in large or smaller jars at home; it is not known how much beer an individual would consume on average. Vessel names related to the storage of beer in Middle Assyrian texts include *kirru* (a large vessel for beer), *kukubbu* (a small jar or drinking flask), and *laḫannu* (a jar that may be closed with a stopper).

The transport of goods from Sabi Abyad to other sites took place especially in the context of sending revenues and (ritual) contributions and taxes to the capital of Aššur, as well as in the context of the provisions needed in Ilī-padâ's residence. Transported goods include clothes, bedlinen, grain, sesame, cress and spice plants, as well as oil and honey (Wiggermann 2000: 173). Whereas for the dry commodities bags and baskets would have made light and strong containers, honey and oil could only be transported in leather skins or in pottery vessels, perhaps the medium-sized or large jars. Goods imported from elsewhere include honey; one contract mentioned the delivery of 0.25 *imēru* (25 *qû,* ca. 21 l.) of honey (Wiggermann 2000: 197). Jars like the so-called pilgrim flasks, themselves not produced at the site, could have served as packaging material for imported liquids like honey or wine. Although wine has not been attested in the texts at Sabi Abyad, similar globular jars were identified as wine jars at other sites (cf. Gates 1988: 68-73; even

[227] A small square space attached to the central tower in squares J9-K9 could be identified as a (grain) storage space, but its capacity of a maximum of 50 m^3 is not enough for the total production at the site. In addition, the northern courtyard of the residence was used for grain storage towards the end of level 5 (see Chapter III).

the capacity of those wine jars (ca. 10 l.) is similar to our "pilgrim flasks" (ca. 7.5 l.). Chemical analysis of residues in the vessel walls may prove or disprove this suggestion.

Other needs for ceramics

Of the other craftsmen attested in the texts from Sabi Abyad, several could have used pottery vessels in their craft. They include perfume makers and "servants of the Temple of Aššur" (Wiggermann 2000). The Sabi Abyad texts give us no clues as to the kind of pottery vessels a perfume maker may have used; however, texts from Aššur present a clearer picture. For the production of 20 *qû* of oil, first aromatic plants are cooked in water in a *diqāru* vessel, already identified above as a cooking pot. Then the mixture is put in a *ḫari'u*, a large vessel, other ingredients are added and the mixture is left to stand overnight. In the morning the mixture is strained into a *ḫersu*-vessel, and from this vessel it is again decanted into another *ḫersu*-vessel and the residue is removed. Only then the oil is added to the now perfumed water in the cooking pot, and again heated on fire. It will be kept cooking or standing for two to three days. The perfumed oil is then strained through a cloth into a *šapputu* jar. An *agannu*-bowl seems to have been used as well (Jakob 2003: 477-486). From this recipe it becomes clear that all mentioned vessels most probably had a capacity over 20 *qû* (ca. 17 litres); *diqāru* and *ḫari'u* are possibly larger.

The "servants of the Temple of Aššur" probably also made use of ceramic vessels in their rituals. The only "ritual" use of pottery attested through the archaeological context is the use of small bowls as gifts in burials. Furthermore, the vessels decorated with elaborate appliqué shapes of humans and animals (fig. IV.64.a-b) may have been used in a special, perhaps ritual, context if they did not just serve as a decoration. However, in cuneiform texts from the Middle Assyrian period more vessels occur in a ritual context. Of the vessel names listed above, these are the *agannu*, the *ḫari'u*, the *kallu*-bowl (for scattering flour, salt, water and oil), the *kannu* stand and the *nazzītu* beer vat, the *kāsu* cup and the *kirru* vessel (for libations of liquids into the *kirru*), the *laḫannu* vessel (for libations and to hold medicines), the *mākaltu* and *maqqû* bowls (for offerings and libations of beer, dates, figs and oil), the *nignakku* and *šeḫtu* incense burners, the *pursītu* (a ritual bowl), the *sūtu*, and the *šapputu* jar. Text Sabi Abyad T98-131, listing vessels for a ritual or ceremony (Appendix F), includes the *ḫuruppu*, *makkusu, kukkubu, ḫapaltu and saḫḫarru* vessels as well. All of these vessels except for the *pursītu, maqqû, ḫapaltu, makkusu* and *šēḫtu* are attested in other more profane contexts as well. This suggests that for rituals not many special pottery vessels were produced. Rather, the vessels merely seem to have the role of container for the materials to be offered to the gods. Or, if vessels were specifically made for ritual purposes, they carried names similar to their day-to-day counterparts. In rituals the small bowls and cups (like *kāsu, maqqû*) are used to pour libations into a larger vat (like *sūtu, kirru*). Platters or bowls (*mākaltu*) are used for offerings of bread or other foodstuffs.

Vessels in iconography

The second contemporary source of information on the use of ceramics is iconography. In the Middle Assyrian period the number of preserved iconographic material on reliefs, wall paintings and objects is extremely limited. The main source of iconographic information are the numerous cylinder seals and their impressions on tablets and sealings. However, the subject matter on cylinder seals of the Middle Assyrian period mostly deals with religious, mythical or natural scenes, and not with scenes from daily life (unlike seals from the third millenium BC on which all kinds of crafts and subsistence activities are depicted, cf. Collon 1987). Indeed, the situation in Mesopotamia is in general very different from, for example, Egypt, where ample illustration of the use of pottery vessels is available from a number of sources, including wall paintings and miniature models (cf. Faltings 1998 and also Nicholson and Shaw 2000 for a good overview of iconographic evidence for the use of ceramic vessels in food production in Egypt). Apart from the limitations of the sources, a second important issue restricts the interpretation of iconographic material in the context of this study. Even less than in cuneiform texts, the images show what material the vessels are made of. All vessels discussed in this paragraph could be pottery, but metal and stone vessels may have been depicted as well. In some contexts it is even more likely that vessels were luxury metal or stone vessels rather than the common pottery containers. The shapes of the depicted vessels rarely give any clues as to the material (in the absence of spouts, intricately wrought handles, cannelures, applications etc.). We will therefore speak of "vessels" and not of "ceramics". The present paragraph is an attempt to collect all existing information on vessel use from the Middle Assyrian period. Several vessels are depicted on the so-called White Obelisk, a monument of debated dating but possibly belonging to the 11th century BC (cf. Börker-Klähn 1982, including references to relevant literature). Where illustrative, depictions of the Neo-Assyrian period will be discussed as well, since the iconographic material from the Iron Age is available in much larger numbers, more varied and more detailed in its execution. Moreover, there is a strong cultural continuity in texts (vocabulary and style), iconography and material culture between the Middle Assyrian and Neo-Assyrian period, even to such an extent that the division between the two is still a matter of debate (e.g. Postgate 1997).

In the absence of scenes depicting craft activities, the illustration of vessels in the Middle Assyrian period is limited to banquet scenes and religious scenes of offerings or libations. As can be expected, vessels are absent from scenes of nature, contests with mythical beasts, or combat. Indeed, even in the iconography-rich Neo-Assyrian period (ceramic) vessels are rarely depicted in the many illustrations of soldiers carrying away booty or bringing tribute: materials are packed in bags, sacks and boxes for transport. This is not true for metal containers, and bowls on tall conical stands as well as large metal cauldrons are shown to be taken as booty after the sacking of a city (fig. VI.33). This means that in this paragraph we are looking mainly at the use of vessels in a special context of religious, ritual, or royal nature. The range of depicted vessels is restricted as well. Forms include small cups and bowls, large deep bowls on a foot or stand, small jars, large jars with pointed bases on a stand, and conical stands for incense burners (cf. fig. VI.44).

When large jars are depicted on Middle Assyrian seals, they are always set in a wooden stand or rack (fig. VI.19, 21, 28). The stands seem to be rather high, so that a person does not have to bend down to lift the jar. Remarkably, all jars are rather slender and have clear necks and pointed bases. Middle Assyrian pottery jars, as we have seen, rarely have clear necks and if so (in type 315, 318 for example), they do not have pointed bases. In contrast, tall and slender jars with necks become more popular in the Early Iron Age (cf. Hausleiter and Reiche 1999). This can also be seen in the depictions of jars in Neo-Assyrian art (figs. VI.35, 38, 39, 42, 43). Of course, the necked jars depicted on Middle Assyrian seals could have been meant to indicate metal jars. However, if pottery jars were depicted, their shape would suggest a date very late in the Middle Assyrian period (not considering other stylistic or archaeological arguments). Pottery jar stands similar to the ones found at Sabi Abyad do not seem to have been depicted on seals.

Small jars are also present on seals. They, too, seem to have a clear neck, although these shapes are so small that they are not detailed enough to draw conclusions. Middle Assyrian small jars type 311 could have been meant as well. Small jars are set on the floor or on the table (fig. VI.23, 24b), but more often they are carried in the hands as in a seal impression and a libation scene on the White Obelisk (fig. VI.27, 30, 31 no. 2, 32). Perhaps they can be identified as the *laḫannu* and possibly the *šapputu* jar. In Neo-Assyrian art small jars are offered to a another person, too, presumably for drinking (fig. VI.34, 38). This supports the possible function of small jars as (beer?) drinking jars (see above).

Deep bowls on Middle Assyrian seals are in shape comparable to the deep straight-sided pottery bowls found at Sabi Abyad. However, the pottery shapes never have a tall conical foot as the bowls on the seals do (fig. VI.20, 24). Again, perhaps the depicted bowls were thought of as metal bowls, with an attached metal foot or stand. Or, if pottery bowls are depicted, a short conical stand was used. These stands could be similar to the pottery jar stands from Sabi Abyad. Deep bowls of this shape are never depicted together with large necked jars, and in the pottery corpus of the Neo-Assyrian period this shape seems to have become much less popular as well (cf. Hausleiter and Reiche 1999). The presence of these deep bowls might be an indication for an earlier date of the seals. The large pot on a stand depicted on the White Obelisk, in front of the king offering to the temple, seems to have a clear outward-bent rim (but cf. the different line drawings in figs. VI.30, 31 and 32). Perhaps a metal vessel is meant. In any case, this shape does not occur in the Middle Assyrian pottery corpus. It is comparable, however, to the metal cauldrons carried away as booty by Neo-Assyrian soldiers (fig. VI.33) and used in Neo-Assyrian camps for cooking (figs. VI.39). The deep bowls seem to have the function of receiving the libation poured in front of the god and the table with offerings. Perhaps they can be identified with the *agannu*, the *sūtu* or the *kirru* mentioned in religious texts that mention pottery vessels (see above).

Small cups, goblets and bowls are shown on Middle Assyrian seals and on the White Obelisk in the hands of a person, lifting the cup to the mouth for drinking (fig. VI.26, 29 (from Sabi Abyad), VI.31 no. 4) or used to pour libations (fig. VI.24). Perhaps these are the *kallu, kāsu, maqqû* and *pursītu* mentioned in religious texts for pouring libations (see above). The depictions are too tiny to draw any conclusions on the exact shape of the cups and bowls. However, we may suggest that not only goblets were used for drinking but small bowls as well, as already suggested above for the pottery bowls from Sabi Abyad. Sometimes cups or bowls were perhaps put on a table in offering and banquet scenes (fig. VI.20, 22, 25).

The conical stands or incense burners (*nignakku*) are mostly believed to have been made of metal (cf. figs. VI.33, 35) for Neo-Assyrian reliefs showing metal examples). However, the shape is included here because of the find at Sabi Abyad of a tall conical pottery stand (fig. VI.16) with an inner ledge, suitable for holding another vessel (a bowl?). Perhaps, in analogy with the conical shape of the incense burners on seals, this could be a pottery example of such an item. However, the incense burners in iconography are all much taller than the pottery example (cf. fig. VI.44), and the identification must remain tentative. On top of the incense burners a small bowl seems to have been placed to contain the incense or fire.

The value of iconography for drawing conclusions about vessel function in the Middle Assyrian period is limited. The scenes on seals and other media show that vessels (whether made of pottery or other materials) were used during religious ritual and during banquets. The use of vessels for eating and drinking was of course no new insight. The iconographic material is not detailed enough to draw conclusions about the specific shape of the vessels, and hardly any comparable finds of metal or stone vessels are available for the period.

VI.5 Conclusions

At the end of this chapter we still do not know much about the enigmatic "*tarīḫu*"-vessels that Mudammeq-Aššur needed for his dinner with the Suteans. However, by combining information contained in the pottery vessels themselves, the archaeological context and the information from texts and iconography, a start has been made with sketching a picture of how pottery vessels were used at Sabi Abyad. An understanding of the role of pottery containers is not only indispensable for the understanding of pottery as a find category at the site. It is also a prerequisite for understanding and explaining the organization of the production of pottery. Any insight into the ways people used their pots contributes to the understanding of the demand for pottery by the consumers. In Chapter V we have seen that the demand for vessels is an integral part of the pottery production organization. As was already expected in the preceding chapters, most of the pottery produced at the site was of a practical, day-to-day nature. The vessels that were produced in the largest quantities almost all seem to have had multiple functions and uses, and functional specialization of a vessel is rare. Although some clearly special shapes were found, most of them were most probably not produced at the site.

The results and conclusions from this chapter can be used as a starting point for a detailed functional and spatial analysis of the settlement at Sabi Abyad. A detailed assessment of the archaeological contexts might also yield more specific clues as to the use of certain vessels. A better insight into the use of pottery containers could also be reached through a systematic programme of chemical analysis of residues in or on the vessel walls. Such an analysis would ideally include the study of the relations between pottery containers and other containers and tools, and between containers and the wider cultural context.

Chapter VII: Conclusions

Listen again. One evening at the close
of Ramadan, ere the better moon arose,
in that old potter's shop I stood alone
with the clay population round in rows.

And strange to tell, among that earthen lot
some could articulate, while others not:
and suddenly one more impatient cried,
"*Who is the Potter, pray, and who the Pot?"*
Omar Khayyam (The Rubaiyat, verses LIX and LX)

The last chapter in this study will present the conclusions drawn from the present work, and an outlook on directions for future research. Since each of the former chapters (IV, V and VI) already summarizes the conclusions drawn in those chapters, we do not need to repeat them again here. Rather, this is the place to reflect on the results as well as on the many new questions raised.

VII.1 The ceramic sequence

Chapter IV presented an extensive overview of the ceramics at the site, the developments between levels and the comparisons with other sites. Suggestions for relative and absolute dating of the Sabi Abyad sequence were also presented. As such, Chapter IV fulfils one of the basic requirements of the documentation and publication of the fieldwork at Sabi Abyad. It provides excavators of other contemporary sites and students of survey material with a well-documented collection of comparison material. However, this study only discussed part of all the Late Bronze Age ceramics excavated at the site until now, and fieldwork is still in progress. Future publications of the Middle Assyrian ceramics from Sabi Abyad can build on the framework presented here, while at the same time choosing a different focus and explore areas not covered here.

A clear break was visible, as expected, between the assemblage of level 7 and those of levels 6 to 3. At first sight this distinction between the "Mitanni" level and the Middle Assyrian occupation of the site is straightforward. There seems to be a chronological as well as a cultural (if not political) break between the two. Another major difference between level 7 and the Middle Assyrian levels is the absence of evidence for local pottery production in level 7, while the assemblages in levels 6 to 4 are dominated by pottery produced by the workshops at the site. Since these workshops were affiliated with the Middle Assyrian royal estate administration and aimed at efficient production of large amounts of utilitarian vessels (see Chapter V), the assemblages in these levels leave a more uniform impression than the more varied collection from level 7. In contrast, the assemblage in level 7 most probably originated from more than one source, and was most probably produced in a less rigidly organized production tradition with more room or demand for decorations, special shapes and finishing.

However, there is also much continuity between the two assemblages. Typical Middle Assyrian shapes (carinated bowls, goblets, etc.) already occurred in rather large numbers in level 7. Other vessels, with shapes and decorations generally seen as typical of the Mitanni period (rounded bowls, "grain measures," carinated bowls with white inlayed decoration, red painted bands, etc.) still occur in the Middle Assyrian levels. If we use the term "Middle Assyrian" strictly in the chronological / geographical sense, meaning the Jezira east of the Euphrates in the 13th and 12th centuries BC, we should then conclude that there were at least two Middle Assyrian ceramic traditions. On the one hand, some potters continued to produce pots in the traditions prevalent in the region before, or produced pottery at home, while on the other hand those potters affiliated to the official administration produced a rather uniform collection of utilitarian wares at the order of the administration. This would mean that in Middle Assyrian times one could distinguish an "official" production and a "local" or "domestic" production, as was concluded by P. Pfälzner (1995). However, it is probably more realistic to suggest that the term Middle Assyrian has cultural and political connotations as well, as was suggested by Pfälzner (1995: 232-232). In fact, the Assyrians themselves often mentioned the "other" people living in their territory in the provinces: in Sabi Abyad mainly Šubareans and Suteans, who were the people living in the area before the Assyrians came. It seems that the distinction in the Middle Assyrian state between "official" or "state-owned" and "non-official" was hardly relevant, and that private and state business were closely intertwined. In that case, the term "official Middle Assyrian production" is meaningless, especially in the provinces. If the appearance and uniformity of the Middle Assyrian pottery is related to the organization of its production, we may assume that all pottery we recognize as Middle Assyrian (characterized by a striking uniformity over the whole region) was produced in a production organization similar to the one described here for Sabi Abyad. Indeed, until now all excavated Middle Assyrian sites have proved to be state-organized. The presence at Sabi Abyad of pottery that relates much more to other, more ancient traditions must then be studied in the light of the presence of different social, cultural or ethnic groups in the area and the contacts between them and the Assyrians of the *dunnu*.

Either way, the continuity of 14th century ceramic traditions in the Middle Assyrian levels raises questions about the dating of survey material in the Late Bronze Age Jezirah. More chronological control, not only over Middle Assyrian ceramics but especially over non-Middle Assyrian material, would open new directions of research into the organization of the empire and the regional dynamics between Middle Assyrian *dunnus* or cities and other settlements or non-settled populations. The inhabitants of Sabi Abyad had regular contacts with other regions, as we already know from the cuneiform texts. Several pottery vessels were transported or imported to the site, either for their contents or for their specific technical properties. Comparisons of these vessels with assemblages from other sites, as well as the archaeometric analyses, suggested links with the Euphrates and Khabur regions, southern Anatolia and the Syrian coast.

Despite the striking similarity of Middle Assyrian pottery assemblages all over the Jezirah region, several aspects of the assemblage seemed to be peculiar to Sabi Abyad. Some shape variants were not or less often found at other Middle Assyrian sites, while chronological developments were not always mirrored elsewhere. Although the assemblage in levels 6 to 3 looked similar throughout the sequence, it is interesting to see that there were many changes from level to level as well. Some types were present only in one or two levels, while other types increased or decreased in popularity over time. In addition, within many types minor differences in rim shapes and vessel wall shapes could be noted. The securely dated sequence from Sabi Abyad thus provides a tool for the relative dating of other collections, especially at sites where dates from cuneiform texts are absent so far. A topic not fully explored in this thesis are the processes behind these finer chronological changes. Partly, answers to this question can be found in Chapter V, dealing with the organization of production. Changes in the scale and intensity of production as well as in the organization of production may be related to formal changes in the vessels themselves. Changes in consumer demands, partly explored in Chapter VI, may be involved as well. However, from a more general theoretical point of view as well as from other perspectives (e.g. style, fashion, tradition, differences between individuals, learning patterns) the reasons behind change in material culture deserve more study.

A methodological problem that became apparent during the work on Chapter IV as well as Chapter V, as in many other publications of material culture, is that of the comparability of different typologies and classification systems. Many aspects of the current study, including formal comparisons and relative dating, but also questions dealing with standardization, technology, and other aspects of production organization, would greatly benefit from comparisons with data from other sites. However, and not surprisingly, data are hardly ever presented in such a way as to be easily accessible for questions other than those put to the material in that specific publication. Unfortunately, therefore, most conclusions had to remain limited to the Sabi Abyad data only. Although in this study I tried to keep the data as transparent as possible, by offering raw data in tables allowing others to recalculate them according to their own groups and classes, others will meet the same problems using this thesis as well. Each study collects and organizes data differently, because each project has its own particular research questions. Without expecting or aiming at a standardized way of pottery recording or publication, our field would benefit from more consideration both with practical classification systems as well as with publication formats. The French initiative of "collection référentiels,"[228] offering integrated digital and printed publications that in theory allow for complete databases to be distributed, is very interesting in this context.

[228] La Maison des sciences de l'homme, Éditions Épistèmes, Paris.

VII.2 The techniques and organization of pottery production

Chapter V reconstructed the organization of pottery production, using a variety of sources as pieces of the puzzle. But in itself, the conclusions from this chapter and this thesis are themselves pieces of an even larger puzzle that of the reconstruction of Middle Assyrian society. A similar approach to other groups of artefacts or material remains from Middle Assyrian sites, integrating textual information with a reconstruction of production technology and organization, would be needed to complete the picture. Interesting subjects seem to be metalworking, building and architecture, food processing, and seal and stone cutting, among others.

When we stay within the area of pottery production, a comparative approach on two levels would greatly increase the value of this study and the insights into the development of pottery production at large. As I stated at the beginning of Chapter V, many terms used in this and similar studies are relative. They are only meaningful when compared to the same aspects in other production organizations. Whereas the present study mainly concentrated on the material from Sabi Abyad, it would be very interesting to broaden the scope of the topic both geographically or culturally as well as chronologically. Contemporary assemblages from other regions, as well as assemblages from earlier and later (e.g. Neo-Assyrian) contexts in the same region, could be studied in a similar way. This would result in a broader view of the variety of different production organizations in the Near East as well as of the relations between the Sabi Abyad pottery organization and other systems. The main task would then be to explain the changes in production organization and the differences between organizations in various regions, sites or periods, thus reaching a deeper understanding of the relations between society and production organization.

What has been most apparent during the work on Chapter V, is the complexity both of the topic and of the models employed to study it, models which are mainly derived from ethnoarchaeology. Although at first sight the literature about pottery production organization seems to be rather practical, there are some serious problems underlying these models. One of the most pressing issues is the often-unclear relation between the different aspects that are studied. The task for archaeology and ethnoarchaeology is not just to study or describe the state of variables like spatial arrangement of facilities, standardization of products, scale of production, craft specialization, function of the products, consumer population, and so on, but first and foremost to study the relationships between these variables of production organization. It seems clear that most aspects of production organization are interdependent or related, but the nature and causality of the relations is not always clear. Since in ethnoarchaeological cases there are theoretically fewer “unknowns” and it should be easier to control different variables, more studies from this field dealing with pottery production organization are still much needed. Even if this study did perhaps not present much information on the nature of the relation between the different aspects of pottery production, I hope that the detailed presentation of information on each of the different aspects from a site that yielded so much information on production in antiquity, combined with the story of Middle Assyrian society and craft production at large, will at least present a body of material that can be used for further theoretical research into the topic.

VII.3 The functions and uses of the Middle Assyrian ceramics

A better insight into the purposes for which vessels were made and into the way pottery was used has proved to add a lively and colourful dimension to the reconstruction of ceramics in the society at Sabi Abyad. Although the information from texts and iconography is scarce for this period, a combination of various different sources of information has yielded interesting insights. Again, broadening this part of the study towards other contemporary sites and towards assemblages from other periods would be useful. Partly this has already been done for Babylonian pottery (Sallaberger 1996). A topic that could not be explored in this study was residu analysis. A future research programme of pottery at Sabi Abyad could be designed to include an extensive sampling programme aimed at acquiring information on the ancient contents or uses of the vessels. Especially vessels used in beer production (on which a lot of textual information is available) and cooking vessels would be interesting objects for study.

As was stated earlier, this study has prepared the ground for a comprehensive spatial and functional analysis of the settlement of Sabi Abyad. Especially if other categories of artefacts were studied in a similar way, such an analysis would yield extremely interesting insights into the organization and functioning of a *dunnu* settlement in the provinces.

VII.4 Middle Assyrian pottery production and technological style

When asking why a certain technology is used and not another, or why artefacts look the way they do, craftsmen would probably often answer “I don’t know, this is just the way we do it”. That does not mean an anthropologist or archaeologist should not enquire about the (social, political, ritual, economic, etc.) mechanisms and processes that are behind or embedded in a technological action. In the past chapters we have seen in detail what the Middle Assyrian pottery looked like and how it changed through time. We have studied the way it was made, which techniques were used for paste preparation, shaping, finishing and firing. Several suggestions were made as to the ultimate functions and uses of the pottery. However, although all these aspects were explicitly placed in the cultural, organizational, political and economic background of Middle Assyrian society (as far as we know it), the question “why” was not fully explored in this study. Why does the pottery look the way it does, with these characteristic nipple-based goblets, carinated bowls and oval jars? Why do minor changes occur over time? Why were certain shaping techniques used and not others that would have yielded similar or even better results? Why was pottery production organized the way we think it was? Was other craft production organized similarly? The past chapters have discussed only part of the answers to these questions. They focussed on chronology, production organization and function/use of vessels.

An increasing body of literature is exploring technical behaviour as social production, such as the studies by Lemonnier (1986, 1992, 1993), Pfaffenberger (1992), Gosselain (1998), Roux (2003b), Dobres and Hoffman (1994) and Miller (1985). They convincingly show that the answer to the question “why did they do it in this way” can no longer exclusively be “because that is how they did it, tradition”, or “because environmental or engineering constraints forced them to do it this way”. Rather, the study of technological style and technological choices opens up a rich and powerful way for archaeologists to reach conclusions about the way society functioned. It is increasingly clear that the symbolical, social or other role of pottery and pottery production in Mesopotamian society is important when we want to fully understand the subject.

The typical nipple-based goblets may serve as an example. If we look at these vessels from a utilitarian or technical point of view only, we cannot explain the presence of the characteristic nipple-shaped bases. Not only are they difficult to make, requiring special skills from the potter, but the vessels are unable to stand because of them. If simple drinking cups were needed, much simpler shapes requiring less technical skill would have sufficed: from a technical point of view the addition of a nipple base is redundant. Why were nipple bases made, and why only on goblets? Several issues may be included in an attempt to answer these questions. For example, because they cannot stand on their base but have to be held in the hand during drinking these vessels force a certain body posture and perhaps a social practice (the use of servants to refill the cup) during the consumption of liquids. Social practice (traditions of consumption and presentation) and vessel shape and technology may have interacted and influenced each other. Or goblets may be ceramic imitations of valuable and rare glass cups. The nipple, created as a normal result of the technology of shaping a glass vessel, may have been the most characteristic aspect of these glass cups. The social environment may have recognized the vessel as a glass imitation because of the shape of the nipple. Here, processes of imitation, emulation and status may have played a role in the technical choices made for shaping a drinking cup. In another example we may look at the uniformity and recognizability of the Middle Assyrian pottery, something that springs to the eye of every archaeologist. Surely the Assyrians themselves recognised this pottery as their own as well. It was argued in this thesis that the potters at the *dunnu* of Sabi Abyad were producing vessels for all the dependents of the settlement. We know from texts that these people were often not ethnically Assyrian and that many were displaced from other regions. What did it mean to them to have to use Middle Assyrian pottery? Could the uniformity of the pottery have played a purposeful role in the incorporation of these people into the Assyrian empire? What meaning did this pottery have for its (Assyrian and non-Assyrian) users?

These questions and related problems concerning the technological style and the technological choices made by the Assyrian potters, and the relations between technological style and issues like ethnicity, power, religion, social relations and so on, could not be explored in this thesis. To my opinion, they deserve a more thorough study which I hope to publish separately.

APPENDIX A
LIST OF PROCESSED LOTS

The following table is a list of all the lots from which pottery was processed. The data on the pottery from these lots formed the basis of this thesis. All lots have been included in the list, including those from levels 2 and 1 (not part of this thesis). The list can be used as a reference for later pottery processing activities in the field, and for a spatial analysis project. Lots have been sorted on square, locus and then on lot number.

LE	= Level. If no level is mentioned, the lot has not yet been assigned to a level. Level "-" means that the lot could not be assigned to a level, for example because it came from top soil. Level "m" means that the lot comes from a mixed context.
LES	= Multiple levels, when a lot is from a mixed context.
SQUA	= Square number
LOCU	= Locus number
LOT	= Lot number

The remark "objects only" is used for those lots for which only the pottery objects (with rim and base preserved and entered into the object Masterfile registration system) were described; the other diagnostics from these lots still await processing.

LE	LES	SQUA	LOCU	LOT	
		G7	34	108	objects only
4		H7	1	002	
4		H7	3	007	
4		H7	3	010	
4		H7	3	013	
4		H7	4	006	
4		H7	4	012	
4		H7	4	014	
4		H7	4	016	
4		H7	4	017	
4		H7	5	008	
4		H7	5	009	
4		H7	5	011	
5		H7	6	016	
5		H7	6	017	
5		H7	6	018	
5		H7	7	020	
4		H8	2	007	
-		H8	10	023	
4		H8	12	041	
4		H8	12	042	
4		H8	13	043	
m	4/5	H8	13	046	
m	4/5	H8	13	047	
5		H8	13	050	
5		H8	13	053	
5		H8	13	058	
5		H8	13	061	
5		H8	13	062	
5		H8	13	063	
5		H8	13	064	
5		H8	13	067	
5		H8	13	070	
5		H8	13	073	
5		H8	13	076	
5		H8	13	078	
5		H8	13	079	
5		H8	13	080	
5		H8	13	083	
5		H8	13	084	
5		H8	13	085	
5		H8	13	086	
5		H8	13	087	
5		H8	13	088	
5		H8	13	089	
5		H8	13	090	
5		H8	13	091	
5		H8	13	092	
5		H8	13	093	
5		H8	13	094	
5		H8	13	095	
5		H8	13	096	
5		H8	13	097	
5		H8	13	099	
5		H8	13	100	
5		H8	13	102	
5		H8	13	103	
5		H8	13	104	
5		H8	13	105	
5		H8	13	106	
5		H8	13	107	
5		H8	13	108	
5		H8	13	109	
5		H8	13	111	
5		H8	13	112	
5		H8	13	114	
5		H8	13	115	
5		H8	13	116	
5		H8	13	117	
5		H8	13	119	
5		H8	13	120	
5		H8	13	121	

LE	LES	SQUA	LOCU	LOT
5		H8	13	122
5		H8	13	123
5		H8	13	124
5		H8	13	126
5		H8	13	127
5		H8	13	130
5		H8	13	131
5		H8	13	132
5		H8	13	133
5		H8	13	136
5		H8	13	137
5		H8	13	139
5		H8	13	141
5		H8	13	142
5		H8	13	143
5		H8	13	144
5		H8	13	145
5		H8	13	146
5		H8	13	147
5		H8	13	148
5		H8	13	149
5		H8	13	151
5		H8	13	152
5		H8	13	153
5		H8	13	154
5		H8	13	157
5		H8	13	159
5		H8	13	160
5		H8	13	162
5		H8	13	163
5		H8	13	165
5		H8	13	168
5		H8	13	169
5		H8	13	171
5		H8	13	175
5		H8	13	179
5		H8	13	182
-		H8	14	056
5		H8	16	184
5		H8	16	185
5		H8	16	186
4		H8	22	192
m	4/5	H8	22	195
m	4/5	H8	22	199
m	4/5	H8	22	202
m	4/5	H8	25	206
5		H8	25	214
5		H8	25	218
5		H8	26	205
5		H8	26	215
5		H8	26	217
5		H8	26	227
5		H8	27	204
5		H8	27	209
5		H8	27	211
5		H8	27	213
5		H8	27	223
5		H8	27	225
5		H8	27	226
5		H8	27	228
m	4/5	H8	28	207
5		H8	28	210
5		H8	28	212
5		H8	28	216
5		H8	28	222
5		H8	28	224
5		H8	29	219
5		H8	29	220
5		H8	29	283
5		H8	29	285
5		H8	30	230
5		H8	30	232
5		H8	30	233
5		H8	30	234

LE	LES	SQUA	LOCU	LOT	
5		H8	31	235	
5		H8	31	238	
5		H8	31	241	
5		H8	31	242	
5		H8	31	243	
5		H8	31	244	
5		H8	31	245	
5		H8	31	246	
5		H8	31	247	
5		H8	31	248	
5		H8	31	249	
m	4/5	H8	31	255	
5		H8	32	236	
5		H8	32	237	
5		H8	33	239	
5		H8	33	240	
5		H8	33	250	
5		H8	33	251	
5		H8	34	252	
m	4/5	H8	34	253	
-		H8	35	254	
m	4/5	H8	37	281	
m	4/5	H8	37	282	
-		H8	37	284	
m	4/5	H8	38	256	
m	4/5	H8	38	257	
m	4/5	H8	38	258	
m	4/5	H8	38	259	
5		H8	39	260	
5		H8	39	262	
m	4/5	H8	40	263	
4		H8	40	265	
5		H8	40	266	
5		H8	40	267	
4		H8	40	268	
5		H8	40	269	
5		H8	40	270	
5		H8	40	272	
5		H8	40	273	
4		H8	40	286	
5		H8	40	287	
5		H8	40	288	
4		H8	41	274	
4		H8	41	275	
5		H8	41	276	
5		H8	41	278	
5		H8	41	279	
5		H8	41	280	
5		H8	42	290	
5		H8	42	291	
5		H8	43	292	
5		H8	43	293	
5		H8	44	294	
-		H8	45	295	
-		H8	?	?	
-		H9	1	010	
-		H9	2	003	
4		H9	2	006	
4		H9	2	007	
4		H9	2	014	
4		H9	2	019	
4		H9	3	009	
m	3/4	H9	4	004	
m	3/4	H9	4	008	
4		H9	5	013	
4		H9	5	020	
4		H9	8	022	
4		H9	9	023	
4		H9	9	025	
4		H9	10	027	
4		H9	10	030	
4		H9	11	028	
4		H9	12	029	
4		H9	14	042	
4		H9	14	059	
4		H9	15	038	
4		H9	15	045	
m	4/5	H9	17	035	
m	4/5	H9	17	041	
4		H9	18	036	
4		H9	18	046	
4		H9	26	049	
4		H9	26	050	
m	4/5	H9	26	052	
4		H9	26	053	
m	4/5	H9	26	058	
m	4/5	H9	26	063	
5		H9	26	064	
4		H9	29	056	
4		H9	29	061	
4		H9	29	077	
5		H9	35	076	
4		H9	37	079	
5		H9	38	080	
4		H9	39	082	
4		H9	40	083	
4		H9	41	084	
?		H9	44	087	
5		H9	46	093	
5		H9	51	100	
m	4/5	H10	1	007	objects only
5		H10	7	017	
5		H10	7	028	
5		H10	7	029	
5		H10	7	033	
5		H10	7	049	
5		H10	7	057	
5		H10	7	063	
5		H10	7	139	
4		H10	9	010	
4		H10	9	032	
4		H10	9	034	
4		H10	9	037	
4		H10	9	041	
4		H10	9	043	
m	4/5	H10	9	051	
m	4/5	H10	9	054	
m	4/5	H10	9	081	
5		H10	10	035	
5		H10	10	047	
5		H10	10	052	
5		H10	10	060	
5		H10	10	066	
5		H10	10	110	
5		H10	10	140	
5		H10	10	142	
5		H10	11	021	
5		H10	11	036	
5		H10	12	022	
5		H10	12	023	
5		H10	12	024	
5		H10	12	026	
5		H10	12	030	
5		H10	12	040	
5		H10	13	025	
5		H10	13	027	
5		H10	13	031	
5		H10	16	038	
5		H10	16	042	
-		H10	18	044	
-		H10	18	056	
-		H10	18	062	
-		H10	19	077	
-		H10	20	048	
5		H10	21	058	
5		H10	21	064	

LE	LES	SQUA	LOCU	LOT
5		H10	21	069
5		H10	21	071
5		H10	21	072
5		H10	21	074
5		H10	21	079
5		H10	21	111
5		H10	21	112
5		H10	21	113
5		H10	21	115
5		H10	21	117
5		H10	21	121
5		H10	21	122
5		H10	21	123
5		H10	21	124
5		H10	21	125
5		H10	21	144
5		H10	21	145
5		H10	21	146
5		H10	21	147
5		H10	21	148
5		H10	21	150
5		H10	21	900
5		H10	22	055
5		H10	22	059
5		H10	22	065
5		H10	22	070
5		H10	22	073
5		H10	22	080
5		H10	22	087
5		H10	22	092
5		H10	22	095
5		H10	22	127
5		H10	22	129
5		H10	22	130
5		H10	22	133
5		H10	22	134
5		H10	22	136
5		H10	22	137
5		H10	22	149
5		H10	22	151
?		H10	26	049
-		H10	26	086
5		H10	28	053
4		H10	29	082
-		H10	31	068
5		H10	34	075
5		H10	34	076
m	4/5	H10	35	083
5		H10	35	088
5		H10	35	093
5		H10	36	089
5		H10	36	094
4		H10	37	090
-		H10	38	096
-		H10	38	099
-		H10	38	101
5		H10	38	102
5		H10	38	106
m	4/5	H10	39	100
-		H10	40	098
-		H10	41	104
-		H10	41	105
-		H10	41	108
-		H10	41	109
-		H10	41	128
6		H10	44	159
5		H10	45	157
m	5/6	H10	45	177
5		H10	53	167
5		H10	53	169
m	5/6	H10	57	176
-		H11	3	004
5		H11	5	005
5		H11	5	009
5		H11	5	012
5		H11	5	015
5		H11	5	016
5		H11	11	020
5		H11	11	021
5		H11	14	024
5		H11	17	027
5		H11	17	029
5		H11	17	030
m	4/5	H11	18	028
5		H11	18	031
-		H11	18	052
5		H11	21	034
5		H11	22	035
5		H11	22	048
5		H11	22	062
5		H11	22	069
5		H11	22	080
5		H11	22	081
5		H11	23	036
5		H11	23	070
5		H11	25	037
5		H11	25	038
5		H11	25	039
5		H11	25	040
5		H11	25	042
-		H11	25	053
5		H11	25	066
5		H11	25	073
5		H11	25	075
5		H11	25	076
5		H11	25	082
5		H11	25	083
5		H11	25	085
5		H11	25	086
5		H11	25	088
5		H11	25	100
5		H11	25	101
5		H11	25	102
5		H11	25	105
5		H11	25	106
5		H11	25	107
5		H11	25	108
5		H11	25	109
5		H11	25	111
5		H11	25	112
4		H11	26	043
5		H11	30	044
5		H11	30	049
5		H11	30	051
5		H11	30	054
5		H11	30	057
5		H11	30	114
5		H11	30	115
5		H11	30	116
5		H11	30	117
5		H11	30	119
5		H11	30	120
5		H11	30	121
5		H11	30	122
4		H11	31	045
m	4/5	H11	31	050
5		H11	31	056
5		H11	31	094
5		H11	31	095
5		H11	31	096
5		H11	31	097
5		H11	31	098
-		H11	34	059
-		H11	34	060
5		H11	37	064
5		H11	37	071
5		H11	38	063

LE	LES	SQUA	LOCU	LOT	
5		H11	38	077	
5		H11	38	078	
5		H11	39	068	
5		H11	41	089	
5		H11	41	090	
5		H11	41	091	
5		H11	41	092	
5		H11	41	093	
5		H11	43	126	
5		H11	48	135	
		H12	3	008	
		H12	3	009	
		H12	4	007	
		H12	6	016	
		H12	11	034	
4		I7	3	011	
4		I7	3	015	
4		I7	3	019	
4		I7	3	024	
5		I7	3	036	
-		I7	4	005	
4		I7	5	007	
4		I7	5	008	
4		I7	5	012	
4		I7	7	025	
4		I7	8	014	
4		I7	8	020	
4		I7	9	013	
4		I7	9	016	
4		I7	9	018	
4		I7	9	021	
4		I7	10	023	
4		I7	10	028	
4		I7	10	029	
4		I7	10	030	
4		I7	10	031	
m	4/5	I7	10	032	
m	4/5	I7	10	035	
m	4/5	I7	10	041	
5		I7	13	037	
5		I7	13	046	
5		I7	14	043	
5		I7	14	049	
5		I7	14	050	
5		I7	14	051	
m	4/5	I7	15	047	
5		I7	15	048	
m	1/3	I8	12	067	objects only
m	1/3	I8	29	075	objects only
4		I8	45	148	objects only
3		I8	46	138	objects only
4		I8	52	187	objects only
-		I8	61	186	objects only
1		I9	4	004	objects only
m	1/3	I9	11	018	objects only
3		I9	23	026	objects only
3		I9	23	052	objects only
3		I9	23	059	objects only
m	3/4	I9	23	068	objects only
m	1/3	I9	25	030	objects only
m	1/3	I9	35	046	objects only
4		I9	35	072	objects only
1		I9	36	051	objects only
m	3/4	I9	38	071	
m	3/4	I9	45	073	
4		I9	48	083	
4		I9	48	087	
m	4/5	I9	48	090	
m	4/5	I9	48	099	
m	4/5	I9	48	105	

LE	LES	SQUA	LOCU	LOT
5		I9	48	107
5		I9	48	110
5		I9	48	112
5		I9	48	114
m	4/5	I9	51	089
m	4/5	I9	51	091
5		I9	51	097
5		I9	51	103
m	4/5	I9	51	106
5		I9	51	108
5		I9	51	111
m	4/5	I9	51	113
-		I9	54	117
3		I10	1	012
3		I10	1	013
3		I10	1	014
-		I10	2	001
m	1/3	I10	2	003
m	1/3	I10	2	006
-		I10	3	009
3		I10	3	011
m	3/5	I10	3	015
-		I10	4	002
m	1/3	I10	4	004
3		I10	4	007
3		I10	4	010
-		I10	5	005
5		I10	10	017
5		I10	11	018
5		I10	11	028
3		I10	12	019
4		I10	12	029
3		I10	13	020
3		I10	14	021
3		I10	14	022
3		I10	14	023
3		I10	14	024
3		I10	15	025
3		I10	15	038
3		I10	15	046
m	3/5	I10	15	047
m	3/5	I10	15	052
5		I10	15	057
5		I10	15	058
5		I10	15	064
5		I10	15	071
5		I10	15	076
5		I10	15	080
5		I10	15	088
m	3/5	I10	15	089
5		I10	15	092
3		I10	16	026
3		I10	16	036
3		I10	16	042
3		I10	18	030
3		I10	18	031
5		I10	19	054
5		I10	19	060
5		I10	19	065
5		I10	19	068
5		I10	19	072
5		I10	19	083
5		I10	19	085
5		I10	20	035
5		I10	20	053
5		I10	20	059
5		I10	20	062
5		I10	20	066
5		I10	20	069
5		I10	20	073
-		I10	20	075
5		I10	20	077
5		I10	20	081

LE	LES	SQUA	LOCU	LOT
5		I10	20	086
5		I10	20	091
3		I10	24	044
4		I10	25	041
m	4/5	I10	27	097
5		I10	27	104
5		I10	27	107
5		I10	27	110
m	3/4	I10	28	050
m	3/4	I10	28	095
m	3/4	I10	28	096
5		I10	28	099
5		I10	28	101
5		I10	28	103
5		I10	28	106
5		I10	28	109
5		I10	28	111
m	3/4/5	I10	29	094
m	4/5	I10	29	105
m	1/3	I10	34	070
m	3/5	I10	34	074
5		I10	34	079
5		I10	34	082
5		I10	34	090
5		I10	34	114
3		I10	35	093
m	3/5	I10	38	108
-		I10	39	113
-		I10	41	118
5		I10	42	119
m	3/5	I11	1	003
m	3/5	I11	6	009
m	3/5	I11	6	010
5		I11	6	012
5		I11	6	017
5		I11	6	023
5		I11	6	024
5		I11	6	027
5		I11	6	028
5		I11	6	037
-		I11	9	035
-		I11	9	041
5		I11	12	013
5		I11	12	020
5		I11	14	033
5		I11	14	047
5		I11	14	051
5		I11	14	070
5		I11	14	071
-		I11	15	025
5		I11	15	030
5		I11	16	019
5		I11	17	029
5		I11	17	054
5		I11	17	058
5		I11	18	032
5		I11	19	036
5		I11	19	044
5		I11	19	046
5		I11	19	049
5		I11	19	052
5		I11	19	073
5		I11	20	040
5		I11	21	043
5		I11	22	045
5		I11	23	048
5		I11	23	072
5		I11	24	053
5		I11	24	056
-		I11	25	059
-		I11	25	060
-		I11	25	064
5		I11	27	061

LE	LES	SQUA	LOCU	LOT	
5		I11	27	069	
-		I11	28	065	
		I12	4	056	
		I12	10	043	
		I12	18	053	
		I12	18	057	
		I12	21	061	
4		J7	34	075	objects only
4		J7	35	073	objects only
4		J7	47	145	objects only
4		J7	58	111	objects only
-		J7	79	151	objects only
4		J7	81	153	objects only
m	5/6	J7	82	158	objects only
4		J7	87	168	objects only
4		J8	53	170	objects only
3		J8	59	152	objects only
-		J9	17	033	objects only
1		J9	39	080	objects only
1		J9	43	079	objects only
5		J9	49	128	objects only
3		J9	53	112	objects only
3		J9	55	120	objects only
3		J9	57	124	objects only
3		J9	57	130	objects only
3		J9	80	183	objects only
m	3/4	J9	82	188	objects only
4		J9	84	190	objects only
3		J10	2	010	
3		J10	2	012	
3		J10	2	016	
3		J10	3	008	
3		J10	3	013	
3		J10	3	015	
3		J10	6	020	
3		J10	8	022	
-		J10	9	014	
3		J10	10	023	
3		J10	11	024	
3		J10	14	027	
-		J10	16	028	
-		J10	17	030	
3		J10	17	031	
-		J10	18	032	
m	3/4	J10	19	033	
4		J10	21	034	
m	4/5	J10	21	036	
m	4/5	J10	21	039	
m	4/5	J10	21	040	
m	3/4	J10	21	051	
5		J10	21	054	
5		J10	21	056	
5		J10	21	057	
5		J10	21	065	
5		J10	21	066	
5		J10	21	071	
3		J10	22	037	
m	3/4	J10	22	041	
5		J10	22	078	
m	3/4	J10	23	043	
4		J10	23	044	
4		J10	23	045	
3		J10	23	049	
4		J10	25	047	
4		J10	25	048	
m	4/5	J10	28	053	
m	4/5	J10	31	061	
5		J10	32	062	
m	4/5	J10	33	067	

LE	LES	SQUA	LOCU	LOT	
m	4/5	J10	34	068	
m	4/5	J10	34	070	
5		J10	36	073	
5		J10	36	076	
5		J10	37	080	
5		J10	38	078	
5		J10	38	082	
5		J10	40	079	
-		J10	41	081	
-		J10	43	099	
m	3/4/5	J10	43	100	
-		J10	43	101	
5		J10	44	091	
5		J10	45	089	
5		J10	46	090	
5		J10	47	093	
-		J10	49	096	
-		J10	50	097	
m	4/5	J11	2	009	
m	4/5	J11	2	010	
5		J11	2	011	
5		J11	13	091	
m	6/7	J11	13	092	
7		J11	13	101	
5		J11	14	093	
5		J11	14	094	
5		J11	14	095	
m	5/6	J11	14	096	
6		J11	14	097	
6		J11	14	099	
m	6/7	J11	14	100	
m	6/7	J11	14	102	
m	6/7	J11	15	103	
m	6/7	J11	15	104	
m	6/7	J11	16	105	
m	6/7	J11	17	107	
7		J11	19	106	
7		J11	20	108	
6		J11	21	110	
5		J11	28	116	
5		J11	28	119	
5		J11	28	124	
5		J11	28	127	
5		J11	28	130	
5		J11	28	136	
5		J11	29	117	
5		J11	29	118	
5		J11	29	122	
5		J11	29	125	
5		J11	29	128	
5		J11	30	123	
5		J11	30	126	
5		J11	30	129	
5		J11	30	131	
5		J11	30	132	
5		J11	30	137	
5		J11	31	901	
5		J11	32	134	
5		J11	32	135	
5		J11	32	138	
-		J11	33	140	
m	0/2/3/4	J11	2/3	004	
-		J12	2	001	objects only
-		J12	7	015	objects only
m	4/5	J12	9	018	objects only
5		J12	12	039	objects only
5		J12	20	053	objects only
5		J12	21	057	objects only
5		J12	22	058	objects only
		J12	-	a	
		J12	-	b	

LE	LES	SQUA	LOCU	LOT
-		K7	1	001
4		K7	1	002
4		K7	2	003
4		K7	2	004
4		K7	3	006
4		K7	4	007
4		K7	4	008
4		K7	4	010
4		K7	4	011
4		K7	4	013
m	4/5	K7	4	014
m	4/5	K7	4	015
m	4/5	K7	4	016
5		K7	4	017
5		K7	4	018
5		K7	4	019
5		K7	4	020
5		K7	4	026
4		K7	5	009
4		K7	6	021
4		K7	6	022
4		K7	6	024
4		K7	6	027
-		K7	8	028
-		K7	9	029
-		K7	10	030
5		K7	11	031
5		K7	11	032
5		K7	11	034
4		K7	12	033
-	topsoil	K8	1	001
1		K8	1	003
-	topsoil	K8	2	002
1		K8	2	004
1		K8	3	005
1		K8	4	006
-		K8	5	007
-		K8	5	017
1		K8	6	008
-		K8	7	013
1		K8	8	009
m	1/2	K8	8	014
m	1/2	K8	9	011
m	1/2	K8	11	016
m	1/2	K8	12	018
2		K8	12	019
1		K8	13	020
2		K8	15	023
2		K8	15	025
2		K8	16	026
-		K8	17	027
2		K8	17	039
2		K8	18	029
2		K8	18	035
2		K8	19	031
2		K8	20	032
2		K8	20	046
2		K8	20	052
2		K8	22	040
2		K8	22	050
-		K8	23	041
2		K8	24	042
2		K8	25	043
2		K8	26	047
m	2/4	K8	26	048
4		K8	27	049
2		K8	28	051
m	2/4	K8	29	053
4		K8	29	062
4		K8	29	077
4		K8	29	091
2		K8	30	054
2		K8	30	055

LE	LES	SQUA	LOCU	LOT
2		K8	31	056
m	2/4	K8	32	057
2		K8	33	058
m	2/4	K8	34	059
4		K8	34	063
4		K8	34	066
2		K8	34	074
4		K8	36	064
4		K8	37	065
4		K8	37	068
4		K8	37	073
4		K8	37	080
4		K8	37	097
4		K8	37	100
4		K8	37	101
4		K8	38	069
4		K8	38	084
4		K8	39	070
m	4/5	K8	39	085
m	4/5	K8	39	087
4		K8	40	071
4		K8	40	078
4		K8	40	082
5		K8	41	072
5		K8	41	102
4		K8	42	081
4		K8	42	086
4		K8	43	134
5		K8	44	088
m	4/5	K8	44	107
5		K8	44	108
5		K8	45	089
-		K8	47	093
5		K8	48	096
5		K8	48	103
4		K8	49	098
4		K8	50	099
4		K8	51	105
5		K8	52	106
m	4/5	K8	53	110
4		K8	54	111
5		K8	55	112
5		K8	55	114
5		K8	55	115
m	4/5	K8	56	113
-		K8	56	118
5		K8	57	119
5		K8	57	122
5		K8	57	123
5		K8	57	124
5		K8	57	125
5		K8	57	126
5		K8	57	127
5		K8	57	128
5		K8	57	130
5		K8	58	120
5		K8	59	131
5		K8	59	132
5		K8	59	136
5		K8	59	149
m	4/5	K8	60	135
5		K8	61	137
5		K8	63	139
?		K8	64	141
m	4/5	K8	65	142
-		K8	70	148
2		K8	73	155
2		K8	73	158
2		K8	73	159
2		K8	73	160
2		K8	73	162
2		K8	73	165
2		K8	73	171
2		K8	73	173

LE	LES	SQUA	LOCU	LOT
2		K8	73	185
2		K8	84	179
4		K8	99	206
4		K8	100	211
5		K8	102	214
5		K8	102	222
5		K8	102	226
5		K8	102	230
5		K8	102	234
5		K8	102	235
5		K8	102	238
5		K8	102	239
5		K8	102	242
5		K8	102	250
5		K8	102	253
m	4/5	K8	102	264
5		K8	102	265
5		K8	102	266
5		K8	102	268
5		K8	102	270
5		K8	102	271
5		K8	102	272
5		K8	102	274
5		K8	103	224
-		K8	110	228
5		K8	111	278
5		K8	111	280
5		K8	112	233
5		K8	118	262
5		K8	147	335
5		K8	152	344
5		K8	158	358
5		K8	158	364
5		K8	162	380
1		K9	24	006
1		K9	24	007
1		K9	24	008
1		K9	24	009
1		K9	24	010
m	1/2	K9	24	011
m	1/2	K9	24	012
m	1/2	K9	25	013
1		K9	26	014
1		K9	27	015
2		K9	29	017
m	1/2	K9	30	025
1		K9	32	021
1		K9	32	024
1		K9	32	107
1		K9	32	184
1		K9	33	026
1		K9	33	088
1		K9	33	101
1		K9	33	136
1		K9	33	144
1		K9	33	145
1		K9	33	147
1		K9	33	151
1		K9	34	023
1		K9	34	027
1		K9	34	029
1		K9	34	057
1		K9	35	028
1		K9	35	084
1		K9	35	091
1		K9	36	031
1		K9	36	032
1		K9	36	041
1		K9	36	043
1		K9	36	074
-		K9	37	053
m	2/3	K9	38	036
m	2/3	K9	38	042

LE	LES	SQUA	LOCU	LOT
3		K9	38	050
m	3/4	K9	38	073
4		K9	38	081
m	2/3	K9	39	035
m	2/3	K9	39	040
2		K9	41	046
1		K9	41	060
1		K9	41	071
2		K9	41	114
2		K9	41	122
2		K9	41	902
1		K9	42	903
m	4/5	K9	45	186
-		K9	46	059
-		K9	46	062
-		K9	46	064
-		K9	46	111
-		K9	46	116
-		K9	46	118
-		K9	46	121
-		K9	46	174
4		K9	47	065
4		K9	47	066
5		K9	47	070
4		K9	47	169
m	4/5	K9	47	175
-		K9	47	284
m	4/5	K9	48	078
m	4/5	K9	48	109
5		K9	48	110
5		K9	48	113
5		K9	48	119
5		K9	48	154
5		K9	48	155
5		K9	48	176
5		K9	48	179
5		K9	49	120
5		K9	49	123
5		K9	49	126
5		K9	49	157
3		K9	50	075
3		K9	51	076
4		K9	52	077
4		K9	52	104
4		K9	53	079
4		K9	54	082
5		K9	54	106
m	3/4	K9	55	083
m	3/4	K9	55	087
m	3/4	K9	55	090
m	3/4	K9	56	086
4		K9	56	093
4		K9	56	096
3		K9	57	089
3		K9	57	102
4		K9	58	095
5		K9	58	097
m	4/5	K9	59	092
-		K9	60	094
5		K9	61	100
5		K9	61	103
m	2/3	K9	61	129
m	2/3	K9	61	132
4		K9	61	137
4		K9	61	141
5		K9	61	142
5		K9	61	146
5		K9	61	148
5		K9	62	112
5		K9	63	133
5		K9	63	135
5		K9	63	139
5		K9	63	161
5		K9	63	190

LE	LES	SQUA	LOCU	LOT
5		K9	63	192
5		K9	63	194
m	3/4	K9	64	125
m	4/5	K9	65	130
m	4/5	K9	65	134
m	4/5	K9	65	138
5		K9	66	150
5		K9	67	149
5		K9	67	152
5		K9	67	153
5		K9	67	156
5		K9	67	158
5		K9	67	159
5		K9	67	160
-		K9	69	205
-		K9	69	206
5		K9	70	163
5		K9	70	164
5		K9	70	171
5		K9	70	195
5		K9	70	207
5		K9	70	208
5		K9	70	211
5		K9	70	213
5		K9	70	214
5		K9	70	215
5		K9	70	220
5		K9	70	222
5		K9	70	225
5		K9	70	232
5		K9	70	233
5		K9	70	234
5		K9	70	235
5		K9	70	236
5		K9	70	242
5		K9	70	243
5		K9	70	248
5		K9	70	250
5		K9	70	251
5		K9	70	252
5		K9	70	254
5		K9	70	255
5		K9	70	257
5		K9	70	263
5		K9	70	264
5		K9	70	265
5		K9	70	266
5		K9	70	267
5		K9	70	271
5		K9	70	274
5		K9	70	275
5		K9	70	275
5		K9	70	276
5		K9	70	278
5		K9	70	279
5		K9	70	280
5		K9	70	281
5		K9	70	283
5		K9	72	167
5		K9	72	197
5		K9	72	201
5		K9	73	173
5		K9	73	178
5		K9	73	189
5		K9	75	282
5		K9	76	199
5		K9	76	204
-		K9	77	285
1		K9	77	286
1		K9	78	290
m	1/2	K9	78	302
1		K9	79	287
1		K9	79	288
1		K9	79	291

LE	LES	SQUA	LOCU	LOT
m	1/2	K9	79	296
m	1/2	K9	79	301
m	1/2	K9	79	305
m	1/2	K9	79	311
m	2/3	K9	79	317
m	2/3	K9	79	319
1		K9	82	294
m	1/2	K9	82	299
m	1/2	K9	82	303
1		K9	86	304
2		K9	86	309
m	2/3	K9	86	318
m	1/2	K9	87	307
m	1/2	K9	88	308
1		K9	88	310
2		K9	90	312
3		K9	92	314
3		K9	93	315
m	3/4	K9	93	321
m	3/4	K9	93	322
m	3/4	K9	93	325
4		K9	93	329
4		K9	93	331
4		K9	93	334
-		K9	93	402
3		K9	94	316
m	3/4	K9	94	320
m	3/4	K9	94	326
4		K9	94	328
4		K9	94	330
4		K9	94	335
4		K9	96	327
4		K9	96	336
m	4/5	K9	97	337
m	4/5	K9	97	407
m	4/5	K9	99	338
m	4/5	K9	100	339
5		K9	100	405
4		K9	101	400
m	4/5	K9	101	401
m	4/5	K9	101	404
m	4/5	K9	101	406
5		K9	102	417
5		K9	103	426
5		K9	104	408
5		K9	104	410
5		K9	104	412
5		K9	104	415
5		K9	104	419
5		K9	104	420
5		K9	104	423
5		K9	104	425
5		K9	105	409
5		K9	105	411
5		K9	105	413
m	3/4/5	K9	105	416
5		K9	105	421
5		K9	105	424
5		K9	105	428
5		K9	105	429
5		K9	105	431
5		K9	105	432
5		K9	105	433
5		K9	107	427
5		K9	107	430
-		K9	109	434
m	0/2/3	K10	5	008
m	0/2/3/4	K10	5	012
m	0/2/3/4	K10	5	024
m	0/2/3/4	K10	5	026
m	2/3/4	K10	6	025
m	2/3/4	K10	6	027
4		K10	6	029

LE	LES	SQUA	LOCU	LOT
4		K10	6	032
4		K10	6	035
2	0/2?	K10	16	015
2	0/2?	K10	16	022
m	1/2	K10	17	011
2	0/2?	K10	17	028
2	0/2?	K10	17	031
2	0/2?	K10	17	049
2	0/2?	K10	17	052
2	0/2?	K10	17	055
2	0/2?	K10	17	057
2	0/2?	K10	17	067
2	0/2?	K10	17	069
2	0/2?	K10	17	073
2	0/2?	K10	17	076
2	0/2?	K10	17	081
2	0/2?	K10	17	086
2	0/2?	K10	17	089
2	0/2?	K10	17	093
3		K10	19	030
3		K10	19	033
4	0/4	K10	20	034
4	0/4	K10	20	037
4		K10	21	038
m	4/5	K10	21	041
4		K10	21	043
5		K10	21	045
m	4/5	K10	22	047
4		K10	22	048
4		K10	22	051
5		K10	22	056
5	0/5	K10	23	039
5	0/5	K10	23	042
5	0/5	K10	23	044
5	0/5	K10	23	046
5		K10	23	050
m	5/6	K10	23	053
6		K10	23	058
m	0/2/3/4/5	K10	24	040
5		K10	25	059
5		K10	25	060
m	5/6	K10	25	061
6		K10	26	062
6		K10	26	063
m	2/3	K10	27	066
m	2/3	K10	27	068
6		K10	29	071
7		K10	30	072
7		K10	32	074
7		K10	36	075
6		K10	40	080
6		K10	40	082
6		K10	43	084
6		K10	43	094
6		K10	44	085
6		K10	44	095
5		K10	45	088
5		K10	45	091
7		K10	46	087
7		K10	46	090
7		K10	46	096
7		K10	47	092
7		K10	47	097
7		K10	47	110
7		K10	48	098
7		K10	48	120
7		K10	50	099
7		K10	52	102
m	6/7	K10	57	103
7		K10	59	107
7		K10	61	121
7		K10	61	122
7		K10	61	123
7		K10	61	129

LE	LES	SQUA	LOCU	LOT
7		K10	61	130
7		K10	61	131
7		K10	61	132
7		K10	64	119
m	4/5	K11	6	032
m	4/5	K11	6	035
5		K11	6	036
m	2/3/4/5	K11	10	033
5		K11	10	034
m	2/3/4	K11	12	020
m	4/5	K11	12	021
m	4/5	K11	12	022
5		K11	12	023
5		K11	12	024
5		K11	12	025
m	3/4/5	K11	12	026
5		K11	12	027
5		K11	12	028
5		K11	12	030
m	4/5	K11	12	031
5		K11	13	037
m	4/5	K11	15	045
5		K11	15	046
5		K11	15	048
6		K11	16	049
6		K11	16	051
7		K11	20	055
7		K11	20	056
7		K11	20	057
7		K11	20	060
7		K11	20	062
7		K11	20	065
7		K11	20	066
7		K11	20	067
7		K11	21	054
7		K11	21	063
5		K11	22	053
7		K11	23	068
7		K11	27	061
7	7/LN	K11	30	069
7	5/6/7/LN	K11	31	072
7	5/6/7/LN	K11	33	077
5		K11	35	080
7		K11	37	082
7		K11	38	083
5		K11	40	085
7		K11	48	118
4	0/4	K12	8	005
4		K12	8	006
4		K12	8	019
4		K12	8	023
4		K12	8	025
4		K12	9	007
4		K12	9	014
4		K12	9	022
4		K12	10	008
4		K12	10	013
4		K12	10	026
4		K12	11	009
4		K12	12	010
4		K12	13	011
4		K12	13	016
4		K12	13	024
4		K12	14	012
4		K12	14	021
4		K12	15	015
4		K12	15	018
4		K12	15	027
4		K12	16	017
4		K12	17	020
4		K12	18	029
4		K12	19	030

LE	LES	SQUA	LOCU	LOT
4		K12	20	031
5		K12	21	032
5		K12	21	035
5		K12	21	049
5		K12	21	051
5		K12	21	056
5		K12	21	057
5		K12	22	033
5		K12	22	041
5		K12	22	042
5		K12	23	034
5		K12	23	036
5		K12	23	037
5		K12	23	044
5		K12	23	046
5		K12	23	048
5		K12	24	038
5		K12	24	040
5		K12	24	043
5		K12	25	039
5		K12	27	045
5		K12	28	053
5		K12	28	060
5		K12	29	047
5		K12	29	058
5		K12	30	050
5		K12	30	059
5		K12	31	052
5		K12	32	061
5		K12	32	062
5		K12	32	063
5		K12	32	064
5		K13	3	006
5		K13	3	014
5		K13	3	025
5		K13	3	026
		K13	3	044
5		K13	4	005
5		K13	4	011
5		K13	4	019
5		K13	4	032
5		K13	4	033
5		K13	4	034
5		K13	4	035
5		K13	4	036
5		K13	4	037
5		K13	4	038
5		K13	4	039
		K13	4	040
		K13	4	041
		K13	4	042
		K13	4	043
5		K13	5	007
5		K13	5	012
5		K13	5	023
		K13	5	055
		K13	5	056
5		K13	6	008
5		K13	6	030
5		K13	7	009
5		K13	7	010
5		K13	7	016
5		K13	7	021
		K13	7	045
		K13	7	046
		K13	7	047
		K13	7	048
		K13	7	049
		K13	7	050
		K13	7	051
		K13	7	052
		K13	7	053
		K13	7	054

LE	LES	SQUA	LOCU	LOT
5		K13	9	017
?		K13	9	028
5		K13	10	018
5		K13	11	020
5		K13	12	024
m	0/5/6	K13	13	057
m	0/5/6	K13	13	058
6		K13	13	059
6		K13	13	060
6		K13	13	063
6		K13	13	071
		K13	14	062
6		K13	14	064
6		K13	14	065
6		K13	14	067
		K13	17	061
m	5/6	K13	19	066
6		K13	19	068
6		K13	20	070
6		K13	21	069
6		K13	21	073
6		K13	21	081
6		K13	21	082
6		K13	21	083
		K13	21	096
6		K13	22	074
6		K13	23	072
		K13	24	075
6		K13	25	076
m	0/5/6	K13	26	077
m	5/6	K13	26	078
		K13	26	084
m	0/5/6	K13	27	079
m	0/5/6	K13	27	080
-		L8	1	001
-		L8	1	003
2		L8	1	008
2		L8	1	012
-		L8	2	002
2		L8	2	007
2		L8	2	013
2		L8	2	031
-		L8	3	004
2		L8	3	005
2		L8	3	014
-		L8	4	009
2		L8	4	016
2		L8	4	026
2		L8	9	025
2		L8	9	041
2		L8	9	049
2		L8	9	058
2		L8	10	020
2		L8	10	036
2		L8	13	038
2		L8	20	039
2		L8	20	042
m	2/4	L8	20	048
4		L8	20	051
4		L8	20	054
m	2/4	L8	21	040
m	2/4	L8	21	050
4		L8	21	055
5		L8	24	101
4		L8	31	061
4		L8	32	062
4		L8	33	063
4		L8	33	070
4		L8	33	074
4		L8	33	076
m	4/5	L8	33	081
4		L8	34	064
4		L8	34	072
m	4/5	L8	34	079
5		L8	34	105
5		L8	34	108
5		L8	34	110
5		L8	34	117
5		L8	34	118
5		L8	34	126
5		L8	34	135
5		L8	34	136
5		L8	34	137
2		L8	34	138
m	2/4	L8	35	065
m	4/5	L8	35	080
5		L8	35	106
5		L8	35	112
5		L8	35	132
m	4/5	L8	40	083
m	4/5	L8	40	084
5		L8	40	086
5		L8	40	094
5		L8	40	096
5		L8	40	098
5		L8	40	099
5		L8	40	102
5		L8	40	103
5		L8	40	107
5		L8	40	109
5		L8	40	111
5		L8	40	113
5		L8	40	114
5		L8	40	115
5		L8	40	116
5		L8	40	119
5		L8	40	120
5		L8	40	121
5		L8	40	124
5		L8	40	125
5		L8	40	127
5		L8	40	128
5		L8	40	129
5		L8	40	139
5		L8	40	141
5		L8	40	142
5		L8	40	143
5		L8	40	145
5		L8	40	147
m	2/3	L9	1	002
2		L9	2	001
m	2/3	L9	3	008
m	2/3	L9	3	010
2		L9	4	009
2		L9	4	013
m	2/3	L9	10	014
m	2/3	L9	10	016
m	2/3	L9	12	018
m	2/3	L9	14	011
2		L9	15	012
2		L9	16	015
2		L9	16	017
2		L9	16	022
3		L9	17	032
3		L9	17	038
3		L9	17	041
3		L9	17	041
3		L9	17	046
3		L9	17	053
3		L9	17	057
3		L9	17	065
3		L9	17	067
m	3/4	L9	17	072
3		L9	18	033
2		L9	19	034
2		L9	19	039

LE	LES	SQUA	LOCU	LOT
3		L9	23	019
3		L9	23	020
3		L9	29	021
m	2/3	L9	34	042
m	2/3	L9	34	049
3		L9	34	052
3		L9	34	056
3		L9	34	058
3		L9	34	061
3		L9	34	068
3		L9	34	073
4		L9	45	051
4		L9	45	059
4		L9	45	082
4		L9	45	084
4		L9	45	092
4		L9	45	094
4		L9	45	095
4		L9	45	098
4		L9	50	089
m	3/4	L9	53	078
4		L9	53	090
m	4/5	L9	62	106
m	4/5	L9	62	107
5		L9	62	108
5		L9	62	109
5		L9	62	112
5		L9	62	114
5		L9	62	118
5		L9	62	119
5		L9	62	124
5		L9	62	128
5		L9	62	132
5		L9	62	163
5		L9	67	133
5		L9	67	162
4		L9	68	126
4		L9	68	130
m	4/5	L9	70	139
5		L9	74	150
5		L9	79	151
5		L9	79	158
5		L9	80	156
m	0/2/3	L10	3	031
2		L10	5	015
2		L10	7	026
5		L10	10	050
5		L10	10	051
m	0/2/3?	L10	16	052
m	0/2/3?	L10	16	056
m	0/2/3?	L10	16	059
4		L10	18	084
m	4/6/7	L10	18	085
m	4/6/7	L10	18	086
4		L10	18	097
m	5/6	L10	19	053
m	5/6	L10	19	057
m	5/6	L10	19	060
m	5/6	L10	19	061
m	5/6	L10	19	079
m	5/6	L10	19	083
m	5/6	L10	22	055
m	5/6	L10	24	062
m	5/6	L10	24	064
m	0/2/3	L10	25	066
m	2/3	L10	25	068
m	2/3	L10	25	070
m	2/3	L10	25	071
m	2/3	L10	26	067
m	2/3	L10	28	073
4		L10	28	074
m	2/3	L10	28	080
m	4/5	L10	30	075

LE	LES	SQUA	LOCU	LOT
5		L10	30	078
5		L10	30	082
7	7/NL	L10	38	092
5		L10	44	058
m	4/6/7	L10	47	098
m	4/6/7	L10	47	099
m	4/6/7	L10	47	115
m	2/3	L10	48	100
4		L10	48	101
4		L10	49	102
5		L10	51	106
5		L10	52	105
m	5/6	L10	52	113
m	5/6	L10	52	114
5		L10	53	111
6		L10	56	108
		L10	73	152
5		L10	79	198
5		L10	79	211
-		L10	82	171
-		L11	1	001
m	0/4/5	L11	2	004
m	4/5	L11	2	905
m	3/4	L11	12	916
5		L11	13	007
5		L11	13	008
5		L11	13	009
5		L11	13	011
m	5/6	L11	13	012
5		L11	13	013
5		L11	13	918
5		L11	13	919
5		L11	13	920
5		L11	13	921
5		L11	13	922
5		L11	14	015
5		L11	14	016
5		L11	14	017
5		L11	14	018
5		L11	14	019
5		L11	14	020
5		L11	14	021
5		L11	14	925
5		L11	14	926
6		L11	15	022
6		L11	19	023
7		L11	20	024
7		L11	20	025
3		L11	22	026
m	3/4	L11	22	029
3		L11	22	039
-		L11	23	027
4		L11	24	038
4		L11	24	084
m	3/4	L11	25	029
4		L11	25	036
4		L11	25	036
4		L11	25	036
4		L11	25	036
4		L11	26	030
4		L11	26	041
m	3/4	L11	27	031
4		L11	27	037
4		L11	27	043
-		L11	27	072
4		L11	28	032
4		L11	28	033
4		L11	28	040
4		L11	28	044
4		L11	28	046
4		L11	28	058
4		L11	28	060
4		L11	28	067

LE	LES	SQUA	LOCU	LOT
m	4/5	L11	28	082
m	4/5	L11	29	034
m	4/5	L11	29	042
m	4/5	L11	29	052
m	4/5	L11	29	054
m	4/5	L11	29	057
m	4/5	L11	29	061
m	4/5	L11	30	035
4		L11	30	049
3		L11	31	045
4		L11	32	047
4		L11	32	074
4		L11	33	048
4		L11	33	055
4		L11	33	065
4		L11	33	075
4		L11	34	050
4		L11	35	053
5		L11	36	056
6		L11	37	063
m	6/7	L11	38	062
m	6/7	L11	39	064
7		L11	40	066
7		L11	40	068
6		L11	40	069
m	3/4	L11	42	077
m	4/5	L11	43	078
m	4/5	L11	43	086
m	4/5	L11	43	092
-		L11	43	099
5		L11	43	101
5		L11	43	116
m	4/5	L11	44	079
m	4/5	L11	44	088
m	4/5	L11	44	090
5		L11	44	100
5		L11	44	118
m	4/5	L11	45	080
5		L11	45	085
5		L11	45	093
5		L11	45	105
5		L11	45	117
-		L11	46	081
4		L11	47	083
4		L11	47	089
m	4/5	L11	47	098
5		L11	47	121
m	4/5	L11	48	087
m	4/5	L11	48	096
5		L11	48	104
5		L11	48	108
5		L11	49	094
5		L11	49	141
5		L11	49	142
5		L11	49	143
5		L11	50	095
-		L11	51	097
5		L11	53	103
5		L11	54	106
5		L11	54	120
5		L11	54	123
5		L11	54	127
5		L11	54	129
5		L11	54	131
5		L11	54	132
5		L11	54	133
5		L11	54	134
5		L11	54	140
5		L11	55	107
5		L11	55	115
5		L11	55	124
5		L11	55	125
5		L11	55	126
5		L11	55	135

LE	LES	SQUA	LOCU	LOT
5		L11	55	136
5		L11	55	138
5		L11	55	139
5		L11	57	112
5		L11	59	114
5		L11	60	128
5		L11	61	145
5		L11	63	147
5		L11	64	148
7		L11	68	150
		L11	70	152
5		L11	71	153
		L12	1	003
		L12	3	001
		L12	3	004
		L12	3	005
		L12	3	007
5		L12	4	010
5		L12	4	011
m	5/6	L12	4	012
6		L12	4	013
6		L12	4	014
7	7/LN	L12	12	017
7	7/LN	L12	14	019
4		L12	15	022
4		L12	15	024
4		L12	15	028
4		L12	16	023
m	4/5	L12	16	035
m	4/5?	L12	16	043
m	4/5	L12	16	053
m	4/5	L12	16	065
m	4/5	L12	16	070
m	4/5	L12	16	071
5		L12	16	079
5		L12	16	083
5		L12	16	105
		L12	16	112
4		L12	17	025
4		L12	17	031
4		L12	17	040
4		L12	17	046
		L12	17	149
m	4/5?	L12	18	026
5		L12	18	030
5		L12	18	033
5		L12	18	034
5		L12	19	027
5		L12	19	032
5		L12	19	047
m	4/5	L12	19	084
		L12	19	109
		L12	19	110
5		L12	20	029
5		L12	20	036
5		L12	20	054
4		L12	20	066
5		L12	20	078
5		L12	20	106
		L12	20	113
5		L12	21	073
5		L12	21	100
		L12	21	115
5		L12	23	038
5		L12	24	042
4		L12	25	039
5		L12	26	041
5		L12	26	044
5		L12	26	045
5		L12	26	050
5		L12	26	057
5		L12	26	058
m	4/5	L12	26	061

LE	LES	SQUA	LOCU	LOT
5		L12	26	064
5		L12	26	067
5		L12	26	072
		L12	26	116
		L12	26	117
		L12	26	118
5		L12	27	075
5		L12	27	076
5		L12	27	087
5		L12	27	102
		L12	27	114
5		L12	28	049
5		L12	29	055
5		L12	29	063
5		L12	29	085
		L12	29	120
5		L12	29	121
5		L12	29	122
5		L12	29	123
5		L12	29	125
5		L12	29	126
5		L12	29	127
5		L12	29	128
5		L12	29	129
5		L12	29	130
5		L12	29	131
5		L12	29	132
5		L12	29	133
5		L12	29	135
5		L12	29	137
5		L12	29	138
5		L12	29	139
5		L12	31	068
5		L12	31	077
5		L12	32	069
5		L12	32	074
5		L12	32	081
m	4/5	L12	33	082
5		L12	33	108
5		L12	34	086
5		L12	34	143
5		L12	34	148
4		L12	35	088
5		L12	36	091
		L12	36	119
4		L12	37	089
5		L12	37	092
5		L12	37	094
5		L12	38	090
5		L12	38	093
5		L12	38	096
5		L12	39	095
5		L12	39	097
		L12	39	111
5		L12	40	098
5		L12	40	099
5		L12	40	144
6	0/6	L12	41	103
5		L12	47	107
5		L12	48	140
5		L12	48	141
5		L12	48	142
5		L12	49	145
5		L12	50	146
4		L12	51	147
		L12	51	152
		L12	51	154
m	0/5/6	L12	501	509
5	0/5	L12	506	506
m	5/6	L12	506	516
5	0/5	L12	507	507
6		L12	515	521
-		L12	ts	0

LE	LES	SQUA	LOCU	LOT	
6		L13	1	002	
6		L13	2	035	
5		L13	3	003	
5		L13	3	005	
5		L13	3	010	
5		L13	3	015	
5		L13	3	023	
5		L13	3	049	
5		L13	3	051	
6		L13	4	004	
m	5/6	L13	6	007	
5		L13	7	008	
5		L13	7	014	
5		L13	7	019	
m	5/6	L13	8	009	
m	5/6	L13	8	013	
m	5/6/LN	L13	8	024	
6	6/LN?	L13	8	030	
6		L13	8	040	
6		L13	8	043	
6		L13	8	054	
4		L13	9	011	
4		L13	9	016	
4		L13	9	028	
4		L13	9	032	
4		L13	9	048	
m	5/6	L13	10	012	
m	5/6	L13	10	018	
m	5/6	L13	10	031	
6		L13	10	050	
6		L13	11	017	
5		L13	12	020	
5		L13	12	022	
5		L13	14	025	
5		L13	15	021	
5		L13	15	033	
6		L13	15	041	
m	5/6	L13	15	052	
6		L13	15	055	
5		L13	17	027	
5		L13	17	036	
m	5/6	L13	18	029	
m	5/6	L13	18	038	
m	5/6	L13	18	042	
m	5/6	L13	18	046	
5		L13	20	047	
		L13	21	057	
		L13	21	058	
		L13	21	060	
		L13	21	062	
		L13	22	061	
		L13	22	063	
-		M8	1	002	
-		M8	2	003	
4		M8	18	041	
4		M8	26	067	objects only
-		M8	28	043	objects only
4		M8	30	050	objects only
4		M8	30	051	objects only
4		M8	33	061	objects only
m	4/5	M8	35	063	objects only
m	4/5	M8	35	071	
5		M8	40	076	objects only
5		M8	42	079	objects only
5		M8	42	082	objects only
5		M8	42	094	objects only
5		M8	42	098	objects only
5		M8	42	100	objects only
5		M8	42	102	objects only
5		M8	42	103	objects only
5		M8	67	133	objects only
5		M8	71	141	objects only
5		M8	81	164	objects only

LE	LES	SQUA	LOCU	LOT	
5		M8	81	175	objects only
m	4/5	M8	83	163	objects only
m	4/5	M8	83	166	objects only
5		M8	84	168	objects only
5		M8	85	172	objects only
-		M8	87	176	objects only
-		M9	2	002	
-		M9	3	006	
m	2/4	M9	8	025	
m	2/4	M9	8	028	
4		M9	11	027	
4		M9	11	034	
m	4/5	M9	18	038	
5		M9	18	048	
5		M9	18	054	
5		M9	18	059	
5		M9	18	102	
5		M9	18	103	
5		M9	18	145	
5		M9	18	150	
5		M9	18	155	
5		M9	18	159	
5		M9	18	238	
5		M9	18	239	
5		M9	18	240	
5		M9	18	241	
5		M9	18	242	
5		M9	18	243	
5		M9	18	244	
5		M9	18	245	
5		M9	18	246	
5		M9	18	247	
5		M9	18	248	
5		M9	18	249	
5		M9	18	253	
5		M9	18	254	
5		M9	18	255	
5		M9	18	256	
5		M9	18	257	
5		M9	18	258	
5		M9	18	259	
5		M9	18	260	
m	5/6	M9	18	264	
m	5/6	M9	18	265	
5		M9	25	138	
5		M9	25	147	
4		M9	32	069	
5		M9	32	130	
5		M9	32	146	
m	4/5	M9	34	077	
5		M9	34	082	
m	2/5	M9	34	089	
m	2/5	M9	34	093	
5		M9	34	095	
5		M9	34	104	
5		M9	34	107	
5		M9	34	108	
5		M9	34	131	
m	2/5	M9	34	148	
m	2/5	M9	34	152	
5		M9	34	161	
5		M9	34	162	
5		M9	34	163	
5		M9	34	165	
5		M9	34	165	
5		M9	34	166	
5		M9	34	168	
5		M9	34	169	
5		M9	34	170	
5		M9	34	171	
5		M9	34	176	
5		M9	34	177	
5		M9	34	180	

LE	LES	SQUA	LOCU	LOT	
5		M9	34	181	
5		M9	34	183	
5		M9	34	187	
5		M9	34	191	
5		M9	34	192	
5		M9	34	193	
5		M9	34	195	
5		M9	34	198	
5		M9	34	199	
5		M9	34	202	
5		M9	34	203	
5		M9	34	204	
5		M9	34	205	
5		M9	34	206	
5		M9	34	207	
5		M9	34	208	
5		M9	34	209	
5		M9	34	210	
5		M9	34	213	
5		M9	34	217	
5		M9	34	218	
5		M9	34	220	
5		M9	34	221	
5		M9	34	222	
5		M9	34	223	
5		M9	34	224	
5		M9	34	225	
5		M9	34	226	
5		M9	34	227	
5		M9	34	228	
m	2/5	M9	34	229	
5		M9	34	230	
m	2/5	M9	34	236	
?		M9	34	239	
5		M10	1	040	objects only
5		M10	2	019	objects only
5		M10	13	064	objects only
5		M10	13	067	objects only
4		M11	4	089	
4		M11	5	010	
4		M11	5	013	
m	4/5	M11	6	075	
m	4/5	M11	7	014	
m	4/5	M11	7	017	
5		M11	7	069	
5		M11	7	088	
5		M11	9	126	
m	0/4/5	M11	13	051	
m	0/4/5	M11	13	072	
5	0/5	M11	13	083	
5	0/5	M11	13	094	
5	0/5	M11	13	100	
5		M11	13	108	
5		M11	13	109	
5		M11	13	113	
5		M11	13	117	
5		M11	13	123	
5		M11	13	124	
5		M11	13	127	
5		M11	13	137	
5		M11	13	142	
5		M11	13	150	
5		M11	13	159	
5		M11	13	161	
5		M11	13	166	
5		M11	13	167	
5		M11	13	168	
5		M11	13	169	
4		M11	17	071	
5		M11	21	143	
5		M11	21	174	
5		M11	33	096	

LE	LES	SQUA	LOCU	LOT
5		M11	33	119
5		M11	33	128
5		M11	33	135
5		M11	33	141
5		M11	33	145
5		M11	33	149
5		M11	33	151
5		M11	33	158
5		M11	33	162
5		M11	33	163
5		M11	33	164
5		M11	33	173
5		M11	34	103
5		M11	34	125
5		M11	35	191
5		M11	38	138
5		M11	38	157
5		M11	40	131
4		M11	46	178
4		M11	46	182
5		M11	508	506
5		M11	511	512
5		M11	517	532
5		M11	520	542
6		M11	526	574
6		M11	526	578
6		M11	526	581
5		M11	537	660
5		M11	538	632
4		M12	1	001
m	4/5	M12	2	002
4		M12	2	009
4		M12	2	010
m	4/5	M12	3	003
5		M12	4	004
5		M12	4	012
6		M12	4	015
6		M12	4	019
6		M12	4	022
5		M12	4	026
5		M12	5	005
5		M12	5	008
5		M12	5	011
5		M12	5	013
4		M12	6	006
5		M12	7	007
5		M12	8	014
5		M12	8	018
m	5/6	M12	8	020
5		M12	8	021
5		M12	9	016
5		M12	10	017
5		M12	11	024
5		M12	11	025
5		M12	13	027
6		M12	13	032
5		M12	15	043
5		M12	16	029
6		M12	17	028
6		M12	17	031
6		M12	18	030
6		M12	19	033
6		M12	19	037
6		M12	19	041
6		M12	20	039
6		M12	20	053
6		M12	21	034
6		M12	22	035
6		M12	23	036
6		M12	24	038
6		M12	27	044
5		M12	29	045
6		M12	30	047

LE	LES	SQUA	LOCU	LOT
6		M12	32	061
6		M12	32	072
6		M12	39	073
6		M12	39	078
6		M12	500	509
		M12	500	521
6		M12	500	531
6		M12	503	506
5		M13	1	031
m	5/6	M13	2	009
6		M13	2	025
6		M13	2	026
6		M13	2	030
		M13	2	034
6		M13	3	004
6		M13	3	012
6		M13	3	020
6		M13	3	027
		M13	3	033
6		M13	4	001
6		M13	4	003
6		M13	4	007
6		M13	4	019
6		M13	4	024
6		M13	4	028
		M13	4	032
6		M13	5	006
6		M13	5	011
6		M13	7	010
6		M13	8	029
6		M13	9	014
6		M13	9	022
m	4/5/?	M13	10	015
m	4/5/?	M13	10	021
m	4/5/?	M13	10	023
6		M13	11	017
6		M13	11	018
-		M13	ts	
m	4/5	N8	6	004
6		N8	30	048
-		N9	1	001
-		N9	1	004
-		N9	1	008
5		N9	1	011
-		N9	2	002
-		N9	2	003
-		N9	2	005
-		N9	2	007
-		N9	2	009
m	5/6	N9	2	010
m	5/6	N9	2	012
m	5/6	N9	2	014
5		N9	3	013
5		N9	4	015
m	5/6	N9	5	016
m	5/6	N9	5	017
-		N9	6	019
-		N9	6	050
-		N9	6	052
m	5/6	N9	7	045
m	5/6	N9	7	047
m	5/6	N9	7	051
6		N9	7	055
6		N9	7	056
m	6/7	N9	7	057
m	5/6	N9	10	048
m	5/6	N9	10	053
5		N9	11	030
m	5/6	N9	13	039
7		N9	17	059
7		N9	17	060

LE	LES	SQUA	LOCU	LOT	
7		N9	17	061	
7		N9	17	062	
7		N9	17	063	
7		N9	17	900	
6		N9	18	058	
		N11	4	006	
		N11	6	009	objects only
		N11	7	011	objects only
		N11	7	012	objects only
		N11	8	013	objects only
		N11	8	016	objects only
		N11	16	033	objects only
		N11	17	040	objects only
		N11	18	046	objects only
		N11	22	060	objects only
		N11	25	075	
		N11	25	078	
		N11	26	070	objects only
		N11	26	076	objects only
		N11	26	077	
		N11	26	077	
		N11	26	083	
		N11	26	084	
		N11	26	089	
		N11	28	079	
		N11	28	080	
		N11	29	081	
		N11	29	114	
		N11	29	117	
		N11	29	130	
		N11	29	133	
		N11	29	134	
		N11	30	082	
		N11	31	085	
		N11	31	087	
		N11	31	091	
		N11	31	092	
		N11	31	102	
		N11	31	106	
		N11	31	121	
		N11	31	127	
		N11	31	132	
		N11	32	085	
		N11	32	086	
		N11	32	090	
		N11	32	093	
		N11	32	107	
		N11	33	088	
		N11	34	094	
		N11	34	108	
		N11	35	095	
		N11	35	097	
		N11	36	098	
		N11	36	099	
		N11	36	100	
		N11	36	101	
		N11	36	104	
		N11	37	103	
		N11	37	110	
		N11	37	111	
		N11	37	112	
		N11	38	105	
		N11	39	109	
		N11	40	113	
		N11	41	115	
		N11	42	116	
		N11	42	123	
		N11	42	125	
		N11	42	126	
		N11	42	128	
		N11	42	129	
		N11	42	133	
		N11	42	137	

LE	LES	SQUA	LOCU	LOT
		N11	42	141
		N11	43	118
		N11	43	120
		N11	43	122
		N11	43	125
		N11	44	119
		N11	44	131
		N11	45	135
		N11	45	138
		N11	45	139
		N11	45	147
		N11	45	148
		N11	45	150
		N11	45	151
		N11	46	142
		N11	47	143
		N11	48	144
		N11	48	145
		N11	48	146
-		N12	1	001
5		N12	2	002
5		N12	3	010
5		N12	5	007
6		N12	12	020
6		N12	14	022
6		N12	14	023
6		N12	14	025
6		N12	15	026
6		N12	17	029
6		N12	17	030
6		N12	17	032
6		N12	17	034
6		N12	19	036
-		N12	20	038
6		N12	21	039
6		N12	21	046
6		N12	21	047
6		N12	21	049
-		N12	22	042
m	5/6	N12	23	052
m	5/6	N12	23	053
6		N12	23	055
6		N12	24	051
6		N12	24	054
6		N12	25	056
6		N12	26	057
6		N12	26	058
6		N12	26	059
6		N12	27	060
6		N12	27	061
6		N12	27	062
6		N12	28	063
6		N12	28	064
6		N12	28	066
6		N12	29	065
6	6/LN	N12	30	079
6	6/LN	N12	30	079
6	6/LN	N12	31	080
m	5/6	N12	31	082
6	6/LN	N12	32	081
		N12	32	086
6		N12	33	083
		N12	34	085
		N12	34	085
		N13	1	001
		N13	1	003
		N13	2	002
		N13	2	004
		N13	3	005
		N13	3	006
		N13	3	007
		N13	3	017

LE	LES	SQUA	LOCU	LOT
		N13	4	008
		N13	5	009
		N13	5	011
		N13	5	016
		N13	5	019
		N13	6	010
		N13	6	015
		N13	6	017
		N13	6	020
		N13	6	021
		N13	7	012
		N13	7	014
		N13	7	018
		N13	8	022
		N13	8	024
		N13	9	023
		N13	9	025
		N13	33	083
		O9	1	001
		O9	1	003
		O9	1	004
		O9	1	005
		O9	1	006
		O9	1	007
		O9	2	008
		O9	2	009
		O9	2	012
		O9	2	013
		O9	3	014
		O9	3	015
		O9	3	029
		O9	5	017
		O9	7	019
		O9	8	020
		O9	8	023
		O9	8	025
		O9	9	021
		O9	9	024
		O9	9	032
		O9	10	026
		O9	11	028
		O9	12	030
		O9	12	031
		O9	12	034
		O9	12	036
		O9	12	037
		O9	12	038
		O9	13	033
		O9	14	035
		O10	5	003
		O10	6	007
		O10	6	008
		O10	6	011
		O10	6	016
		O10	7	013
		O10	7	027
		O10	8	014
		O10	8	018
		O10	8	020
		O10	8	026
		O10	10	053
		O10	11	019
		O10	11	021
		O10	11	025
		O10	11	034
		O10	11	039
		O10	11	046
		O10	11	060
		O10	11	083
		O10	11	086
		O10	12	032
		O10	13	047

LE	LES	SQUA	LOCU	LOT
		O10	14	035
		O10	14	044
		O10	14	049
		O10	15	028
		O10	15	031
		O10	15	036
		O10	16	024
		O10	16	030
		O10	16	033
		O10	16	038
		O10	16	040
		O10	17	043
		O10	18	045
		O10	18	055
		O10	20	061
		O10	21	051
		O10	21	062
		O10	21	065
		O10	21	066
		O10	23	050
		O10	23	056
		O10	23	063
		O10	23	081
		O10	23	082
		O10	23	087
		O10	23	090
		O10	23	091
		O10	24	052
		O10	25	057
		O10	28	084
		O10	28	085
		O10	29	059
		O10	30	064
		O10	30	068
		O10	32	069
		O10	32	080
		O10	32	089
		O10	32	097
		O10	32	111
		O10	32	112
		O10	32	113
		O10	36	070
		O10	37	072
		O10	39	073
		O10	39	075
		O10	41	076
		O10	41	078
		O10	41	079
		O10	41	094
		O10	41	095
		O10	44	096
		O10	46	093
		O10	48	092
		O10	49	101
		O10	51	104
		O10	51	105
		O10	51	106
		O10	51	107
		O10	53	108
		O10	54	115
		O11	3	013
		O11	4	023
		O11	4	027
		O11	6	010
		O11	7	034
		O11	9	029
		O11	15	023
		O11	15	042
		O11	18	045
		O11	20	047
		O11	22	049
		O11	24	054
		O11	24	084

LE	LES	SQUA	LOCU	LOT	
		O11	26	062	
		O11	27	125	
		O11	28	083	
		O11	30	095	
		O11	30	126	
		O11	30	129	
		O11	41	110	
		O11	55	153	
		O11	83	209	
		O11	87	213	
		O12	16	040	
6		O12	17	024	
6		O12	19	045	
m	5/6	O12	25	069	
m	5/6	O12	27	070	
m	5/6	O12	27	072	
m	5/6	O12	27	075	
m	5/6	O12	28	071	
6		O12	29	076	
m	5/6	O12	30	074	
6		O12	30	077	
6		O12	31	078	
6		O12	31	087	
6		O12	31	095	
6		O12	31	102	
6		O12	31	108	
6		O12	31	119	
6		O12	31	125	
6		O12	31	131	
6		O12	31	143	
6		O12	31	144	
6		O12	31	145	
6		O12	31	146	
6		O12	31	147	
6		O12	31	148	
?		O12	31	150	
6		O12	31	158	
6		O12	31	159	
6		O12	32	086	
6		O12	33	081	
6		O12	33	085	
6		O12	33	096	
6		O12	33	099	
6		O12	33	117	
6		O12	33	139	
6		O12	34	082	
6		O12	34	088	
6		O12	35	084	
?		O12	36	090	
6		O12	36	114	
6		O12	36	129	
6		O12	36	133	
6		O12	37	091	
6		O12	37	113	
6		O12	37	120	
6		O12	37	130	
6		O12	37	137	
6		O12	37	138	
6		O12	37	154	
6		O12	37	155	
6		O12	38	092	
6		O12	38	105	
6		O12	38	112	
?		O12	39	073	
6		O12	39	097	
6		O12	39	110	
6		O12	39	136	
6		O12	39	140	
6		O12	40	098	
5		O12	41	106	
6		O12	42	115	
6		O12	43	116	
6		O12	44	124	
LE	LES	SQUA	LOCU	LOT	
6		O12	44	126	
6		O12	44	132	
6		O12	44	157	
6		O12	44	183	
6	6, LN	O12	44	190	
6		O12	46	142	
6		O12	46	151	
6		O12	46	177	
6		O12	48	160	
?		O12	48	164	
6		O12	49	161	
?		O12	49	165	
6		O12	50	162	
6		O12	55	169	
6		O12	56	170	
6	6, LN	O12	57	171	
6		O12	58	172	
6		O12	59	173	
6		O12	60	174	
6	6, LN	O12	62	176	
6	6, LN	O12	63	180	
6	6, LN	O12	63	182	
?		O12	64	187	
6	6, LN	O12	64	188	
		O13	1	001	
		O13	1	003	
		O13	1	010	
		O13	1	012	
		O13	2	002	
		O13	2	004	
		O13	2	006	
		O13	2	011	
		O13	3	007	
		O13	3	008	
		O13	3	009	
		S12	51	076	objects only
		S12	51	095	objects only
		S12	80	167	objects only
		T11	1	002	objects only
		T11	2	004	objects only
		T11	2	005	objects only
		T11	2	011	objects only
		T11	2	014	objects only
		top	1008		
m	02/3/4/5/6	top	1009	038	
		top	1016	013	
		top	1016	018	
		top	1019	023	
		top	1026	028	
		top	1027	029	
		top	1032	030	
		top	1034	032	
		top	1036	034	
3		top	1049	052	
3		top	1049	052	
3		top	1049	053	
m	2/3	top	1054	056	
2	0/2?	top	1055	057	
3		top	1057	056	
		top	1070	059	

APPENDIX B
SHAPE TYPOLOGY

This Appendix lists the Late Bronze Age shape classification used in the field for the ceramics of Tell Sabi Abyad[229]. See Chapter II for an explanation of classification procedures. Initial classification in the field has been extended in this Appendix with information about apparent size groups and manufacturing technology.

CV = Coefficient of Variation. This is a measure of variation around the mean of a group. CV is calculated as (standard deviation : mean diameter) x 100. The lower the value of CV, the closer the values in the group are to the mean.

1 – BOWLS
Bowls are defined as vessels with an unrestricted shape with flaring walls and/or a rim diameter > vessel height.

<u>1.1 Bowls with a carinated wall.</u>

1.1.1 Bowls with a slightly concave wall, a slight carination just below the rim, and a simple rounded or slightly thickened rim. These are the typical Middle Assyrian carinated bowls or "*Knickwandschale*", although they also appear in Mitanni and Late Assyrian contexts. Fig. IV.1.a-i, fig. IV.12 – IV.16.a-n, fig. IV.36 – IV.43.a-k, fig. IV.99 – IV.100.a-m, fig. IV.114.a-u.

Based on an analysis of the measurements, three size groups are distinguished (figs. B.1 and B.2):
111a: rim diameter < 115 mm, mean rim diameter = 91 mm (CV = 10.9%).
111b: rim diameter ≥ 115 mm and < 175 mm, mean rim diameter = 143 mm (CV = 11.0%).
111c: rim diameter ≥ 175 mm, mean rim diameter = 216 mm (CV = 12.4%).

These bowls are most probably all thrown from the cone (technology group A).

1.1.2 Bowls with a slightly concave wall, a more pronounced carination just below the rim, and a simple rounded rim that is strongly bent over outwards. Fig. IV.16.o-q, fig. IV.43.l-q, fig. IV.100.n-u, fig. IV.114.v-aa.

Based on an analysis of the measurements, two size groups are distinguished (fig. B.3):
112a: rim diameter < 170 mm, mean rim diameter = 137 mm (CV = 10.6%).
112b: rim diameter ≥ 170 mm, mean rim diameter = 206 mm (CV = 11.6%).

Types 111b and 112a may be variants of the same vessel group, as may be the case with 111c and 112b. These bowls are most probably all thrown from the cone (technology group A).

1.1.3 Bowls with a straight or slightly concave wall, a carination low in the wall while the wall above the carination is straight, and a simple rounded rim. Fig. IV.1.j-l, fig. IV.17.a-j, fig. IV.43.r-t, IV.44, IV.45.a-q, fig. IV.100.v-ad, fig. IV.114.ab-ag, IV.115.a-d.

Mean rim diameter = 253 mm, no size groups are discernible.
These bowls are most probably all thrown from one lump of clay (technology group B), although smaller specimens may have been thrown from the cone.

[229] This typology lists only those types that are discussed in this thesis. Type numbers that are missing from this list were either attributed to diagnostics from levels 2, 1 or mixed contexts, or have been assigned to diagnostics by others during fieldwork and are not discussed in this thesis.

1.1.4 Bowls with a carinated wall that is convex below the carination. Fig. IV.17.k, fig. IV.46.a-b.
There are only a few examples of this rim type. The shape was not investigated for the technology used.

1.1.6 Deep bowls with carinated, slightly convex walls. The vessel wall is rather thick. The rim is thickened on both the in and outside. Fig. IV.46.c.
Only one example of this rim type. The shape was not investigated for the technology used.

1.1.7 Deep bowls with a carinated wall. Above the carination the wall is bent inwards. The rim is folded over and has a square section. Fig. IV.1.m-n.
Only two examples of this rim type. The shape was not investigated for the technology used.

1.1.8 Carinated bowl with a rather thick wall, rounded carination and a rounded rim. Fig. IV.17.l-n.
Only a few examples of this rim type. The shape was not investigated for the technology used.

1.1.9 Carinated bowl, the wall part above the carination is vertical. Fig. IV.45.r, fig. IV.115.e.
Only a few examples of this rim type. The shape was not investigated for the technology used.

1.2 Bowls with a convex wall

1.2.1 Bowls with a convex wall, and an outward-bent, bevelled "beak"-rim or pinched rim. Fig. IV.1.o, fig. IV.46.d-m, fig. IV.101.a.

The analysis of the measurements of this shape shows an uneven distribution without clear size groups (fig. B.5). There are several peaks in rim diameters, at 230, 300 and 360 mm. No size groups are distinguished for the moment.

These bowls are most probably thrown from one lump of clay (technology group B), although smaller specimens may have been thrown from the cone (A).

1.2.2 Bowls with a convex wall and a simple rounded rim. Fig. IV.2, fig. IV.18.a-b, fig. IV.47.a-p, fig. IV.101.b-e.

Based on an analysis of the measurements, four size groups can be distinguished (fig. B.6):
122a: rim diameter < 110 mm, mean rim diameter = 88 mm (CV = 8.5%).
122b: rim diameter ≥ 110 mm and < 155 mm, mean rim diameter = 130 mm (CV = 7.3%).
122c: rim diameter ≥ 155 mm and < 275 mm, mean rim diameter = 209 mm (CV = 14.3%).
122d: rim diameter ≥ 275 mm, mean rim diameter = 307 mm (CV = 11.6%).

The smaller bowls are most probably all thrown from the cone (technology group A).
The largest bowls (122d) are most probably thrown from one lump of clay (technology group B).

1.2.3 Bowls with a convex wall and a slightly bevelled, slightly thickened rim. Fig. IV.3.a-l, fig. IV.18.c, fig. IV.47.q-y, IV.48.a-e, fig. IV.101.f-j, fig. IV.115.f.

Based on an analysis of the measurements of this shape, no size groups could be discerned (fig. B.7).
Mean rim diameter = 269 mm (between 140 and 420 mm), CV = 21.4%.

These bowls are most probably thrown from one lump of clay (technology group B), although smaller bowls may have been thrown from the cone (A).

1.2.4 Bowls with a convex and very thin, rather straight wall and a simple rounded rim. Sometimes the wall has a slight S-profile. Fig. IV.48.f-i.
Only a few examples were found of this rim type. The shape was not investigated for the technology used.

1.2.5 Bowls with a convex or almost straight wall, and a bevelled rim that is square in section. Fig. IV.3.m-v, fig. IV.18.d, fig. IV.48.j-m, fig. IV.101.k.

The analysis of the measurements of this shape shows an uneven distribution without clear size groups (fig. B.8). There are three peaks in rim diameters, at 190, 250 and 290 mm. No size groups are distinguished for the moment. Mean rim diameter = 247 mm (between 160 and 380 mm), CV = 23.2%.

These bowls are most probably thrown from one lump of clay (technology group B), although smaller specimens may have been thrown from the cone (A).

1.2.7 Bowls with a convex wall and an outward-bent, simple rim. The wall shows an S-profile. Fig. IV.48.n-r.
Only few examples of this rim type. The shape was not investigated for the technology used.

1.2.8 Bowls with a convex, thin and inward-bent wall, and a simple rounded rim. Fig. IV.101.l.
Only six examples of this rim type. The shape was not investigated for the technology used.

1.2.9 Bowls with a convex or almost straight wall and a bevelled rim. The wall is thinner just below the rim, giving the rim section a "mushroom" shape. Fig. IV.4.a, fig. IV.101.m.
Only three examples of this rim type. The shape was not investigated for the technology used.

1.2.10 Bowls with a convex wall and a folded rim. The top of the rim is sloping inwards, and the rim section has an angular shape. Fig. IV.4.b, fig. IV.48.s.
Only four examples of this rim type. The shape was not investigated for the technology used.

1.2.11 Bowls with a convex wall with an S-profile. The rim is bent outwards and square in section, while the top of the rim is sloping inwards. Fig. IV.18.e.
Only one example of this rim type. The shape was not investigated for the technology used.

1.2.13 Bowls with a convex wall. The rim is strongly bent outwards and square in section. Fig. IV.4.c.
Only one example of this rim type. The shape was not investigated for the technology used.

1.2.14 Bowls with a convex wall. The rim is thickened on the outside and rounded, bulging in shape. Fig. IV.4.d.

1.2.15 Bowls with a convex wall. The rim is slightly incurved, sloping outwards and triangular in section. Fig. IV.48.t-w, fig. IV.115.g.

1.2.17 Bowls with a convex wall. The upper part of the wall is straight and vertical like a short neck, and the rim is simple and rounded or pointed. Fig. IV.18.f-g.

1.3 Bowls with a straight wall

1.3.1 Bowls with a straight wall and a bevelled rim, slightly thickened on the outside. Fig. IV.18.h-m, IV.19, fig. IV.49-50, fig. IV.101.n-w, IV.102.a-e, fig. IV.115.h-n.

Mean rim diameter = 302 mm, but variation in rim diameters is large (between 140 and 440 mm), CV = 19.0%. No size groups were discernable (cf. figs. B.9 and B10).

These bowls are most probably thrown from one lump of clay (technology group B), although smaller specimens may have been thrown from the cone (A).

1.3.2 Bowls with a straight wall and a bevelled rim, thickened on the inside. Fig. IV.4.e-f, fig. IV.20.a-l, fig. IV.51, fig. IV.102.f-k.

Based on an analysis of the measurements of this shape, two size groups are distinguished (fig. B.11):
132a: rim diameter < 260 mm, mean rim diameter is 206 mm.
132b: rim diameter ≥ 260 mm, mean rim diameter is 307 mm.

The smaller bowls are most probably all thrown from the cone (technology group A).
The largest bowls (132b) are most probably thrown from one lump of clay (technology group B).

1.3.3 Bowls with a straight wall. The rim is thickened on the inside and the top of the rim is horizontal and flat. Fig. IV.115.o-p.
Only two examples of this rim type. The shape was not investigated for the technology used.

1.3.4 Bowls with a straight wall and a bevelled rim that is square in section. Fig. IV.20.m-p, fig. IV.52.a-e, fig. IV.102.n-o.
Mean rim diameter is 248 mm (between 180 and 370mm, CV is 22.7%), no size groups are discernible.
These bowls are most probably thrown from one lump of clay (technology group B)

1.3.5 Bowls with a straight wall and a rim that is horizontal and flat on the top, sometimes a little thickened on the outside. Fig. IV.20.q, fig. IV.52.g-l, fig. IV.102.l-m.
Several examples of this rim type. The shape was not investigated for the technology used.

1.3.6 Bowls with a straight wall and a slightly thickened rim, with a groove in the top of the rim. Fig. IV.52.f, fig. IV.115.q-s.

1.4 Deep bowls (without carination)
Deep bowls do not exactly fit the description of bowls because the vessel height often exceeds the rim diameter. Nevertheless, the shapes are unrestricted and thus do not fit the category of pots either.

1.4.1 Deep bowls with a horizontally flattened, "hammer"-shaped rim. Fig. IV.21, fig. IV.52.n-p, IV.53.a-e, fig. IV.103.a-b, fig. IV.116.a.

Mean rim diameter is 273 mm (between 90 and 440 mm, CV is 24.3%), no size groups are discernible for the moment although several peaks are present in the histogram (fig. B.12).

These bowls were thrown from one lump of clay (technology group B).
These bowls are similar in shape and size to the pots with rim type 221 (fig. B.13).

1.4.2 Deep bowls with a "hammer"-shaped rim sloping inwards. Fig. IV.22.a-c, fig. IV.53.f-o, IV.54.a-e, fig. IV.103.c-e, fig. IV.116.b.

Mean rim diameter is 281 mm (between 145 and 410 mm, CV is 21.9%), no size groups are discernible for the moment although peaks are visible in the histogram of rim diameters (fig. B.14).

These bowls were thrown from one lump of clay (technology group B).

N.B. Bowls 141 and 142 are very similar, only the direction of the rim is different. Compare these shapes also with the smaller pots of rim types 221 and 222.

1.4.3 Deep bowls with a bevelled rim that is thickened on the in and/or outside and sometimes pinched. This shape includes several minor rim variations. Fig. IV.4.g-h, fig. IV.22.d-e, fig. IV.54.f-j, IV.55.a-j, fig. IV.103.f-j, fig. IV.116.c.

Mean rim diameter is 327 mm (between 150 and 450 mm, CV is 20.4%), no size groups are discernible for the moment (fig. B.15).

These bowls are most probably thrown from one lump of clay (technology group B), although smaller specimens may have been thrown from the cone (A).

N.B.: These bowls are comparable to shapes 131 and 132, but generally deeper (steeper walls, vessel height generally > 100 mm). Classification in type 131/132 or 143 bowls was difficult for small rim fragments.

1.4.4 Deep bowls with straight or slightly concave and rather thin walls, and a simple rounded rim. Fig. IV.4.i, fig. IV.22.f-i, fig. IV.55.j-n.

Mean rim diameter is 227 mm (between 120 and 360 mm, CV is 30.6%), no size groups are discernible for the moment. The shape was not investigated for the technology used.

1.4.5 Very deep bowls. Up to about 5 cm below the rim the wall is thickened. Fig. IV.4.j-k, fig. IV.23, fig. IV.55.f-i, IV.56, IV.57, fig. IV.104.a-c, fig. IV.116.d.

Mean rim diameter is 405 mm (between 260 and 740 mm, CV is 23.8%), no size groups are discernible for the moment. The shape was not investigated for the technology used, but very large examples were most probably made by hand (technology group E).

When very large (rim diameter > ca. 410 mm), this shape and rim shape is comparable to the larger type 221 pots.

1.4.6 Deep bowls with slightly convex wall. The rim is bent outwards, and has a groove on top.
Only two examples of this rim type. The shape was not investigated for the technology used.

1.4.8 Deep bowls with convex wall. The rim is horizontal and flat on the top and thickened on the outside. The thickened part of the rim is bevelled. Fig. IV.24.a-b, fig. IV.58.a-c, fig. IV.103.k.
Only six examples of this rim type. The shape was not investigated for the technology used.

1.4.9 Deep bowls with a straight wall. The rim is sloping inwards, and sometimes a little

thickened on the inside. Fig. IV.58.d, fig. IV.103.l.
Only five examples of this rim type. The shape was not investigated for the technology used.

1.4.10 Deep bowls with simple, bevelled rim that is thickened on the outside. Fig. IV.24.c-d, fig. IV.58.g.
Mean rim diameter is 290 mm (between 230 and 430 mm, CV is 24.2%), no size groups are discernible for the moment. The shape was not investigated for the technology used.

1.4.11 Deep, very large bowls with a thick wall. The rim is bevelled and sometimes a little ribbed. Fig. IV.24.e-f, fig. IV.58.f, h-i, fig. IV.104.d.
Only a few examples of this rim type. Very large rim diameter, around 700 mm. This shape was built in coils or slabs by hand (technology group E).

1.4.12 Deep bowls with simple rounded rims. Fig. IV.24.g, fig. IV.103.n.
Only four examples of this rim type. The shape was not investigated for the technology used.

1.4.13 Deep bowls with a rim thickened on the outside. Fig. IV.24.h.
Only six examples of this rim type. The shape was not investigated for the technology used.

1.4.14 Deep bowls with a rounded, oval-shaped rim thickened on the outside. Often the upper part of the wall is decorated with wavy incised lines. Fig. IV.25.a-c, fig. IV.59.a-d, fig. IV.103.o.

1.4.15 Deep bowls with a thick square rim sloping outwards. Fig. IV.25.d, fig. IV.59.e-g.

1.4.16 Deep bowls with a strongly outward-bent rim. Fig. IV.25.e.

1.4.17 Deep bowls with a slightly thickened rim. Fig. IV.59.h-j, fig. IV.103.m.

<u>1.5 Convex bowls with a spout and handle</u>

1.5.1 Convex bowls with a spout and one or two handles. Fig. IV.60, IV.61.a-c.
Mean rim diameter 345 mm (between 300 and 385 mm, CV is 9.4%). One size group. The shape was not investigated for the technology used.

2 – POTS

Pots are defined as vessels with a restricted shape or with vertical walls, while the rim diameter ≤ vessel height.

<u>2.1 Pots with a convex wall (restricted shape)</u>

2.1.1 Pots with a convex wall and outward-bent, but inward-bevelled rim. Fig. IV.5.a, fig. IV.25.f-i, fig. IV.61.d-k, IV.62.a-b, IV.63.a, fig. IV.104.e-f, fig. IV.116.e-f.

The analysis of the measurements of this shape shows an uneven distribution. There are peaks at 220, 240, 260 and 340 mm, but no clear size groups appear (fig. B.16). For the moment the shape has been divided into two groups:
211a: rim diameter < 290 mm. Mean rim diameter = 213 mm (CV = 16.8%).
211b: rim diameter ≥ 290 mm. Mean rim diameter = 340 mm (CV = 10.2%).

Although this shape group was not investigated in detail for shaping technology, the smaller shapes were probably thrown from one lump of clay (technology group B) while cooking pots and the larger pots were probably built by hand (technology group E).

2.1.2 Pots with a convex wall and a rolled or bevelled rim, thickened on the outside. Fig. IV.5.b-n, IV.6.a-b, fig. IV.26.a-c, fig. IV.62.c-m, IV.63.b-j, IV.64, IV.65, IV.66.a-d, fig. IV.105, fig. IV.116.g-i.

The analysis of the measurements of this shape shows an uneven distribution without clear size groups (fig. B.17). For the moment, the shape has been divided into two groups:
212a: rim diameter < 290 mm. Mean rim diameter = 216 mm (CV = 19.1%).
212b: rim diameter ≥ 290 mm. Mean rim diameter = 357 mm (CV = 12.1%).

Although this shape group was not investigated in detail for shaping technology, the smaller shapes were probably thrown from one lump of clay (technology group B) while the cooking pots and the larger pots were probably built by hand (technology group E).

2.1.3 Large pots with a convex wall and a heavy, outward-bent rim that is bevelled on the inside. The rim is thickened on the in and outside. Fig. IV.6.c-d, fig. IV.26.e, fig. IV.66.e-h, IV.67.

Mean rim diameter = 347 mm (between 250 and 440 mm, one outlier at 750 mm, CV = 18.6%). No size groups.

These large pots were most probably made by hand, built in slabs or coils (technology group E).

2.1.4 Small pots with a convex wall that is strongly bent inwards, and a simple rounded rim. Fig. IV.105.h.
Only a few examples of this rim type. The shape was not investigated for the technology used.

2.1.5 Large pots with a convex wall and a heavy rim that is thickened on the in and outside. The rim is horizontally flattened or slightly ribbed on the top. Fig. IV.68.a-c, fig. IV.106.h.
Only a few examples. Mean rim diameter = 340 mm (between 270 and 390 mm).

These large pots were most probably made by hand, built in slabs or coils (technology group E).

2.1.9 Pots with a convex wall and thickened or rolled rims with ridges on the outside. Fig. IV.68.d-e.

2.1.10 Pots with a convex wall and a very low pointed rim that is bent upwards. Fig. IV.26.d, fig. IV.68.f.

<u>2.2 Pots with a straight or slightly convex wall</u>

2.2.1 Pots with a straight or slightly convex wall and a horizontally flattened, "hammer"-shaped rim or a rim that is thickened on the outside. Fig. IV.6.e, fig. IV.26.f-i, IV.27.a, fig. IV.69, fig. IV.106.a-g, fig. IV.117.a-d.

The analysis of the measurements of this shape shows a rather even distribution without clear size groups (fig. B.18). There are several peaks in the distribution. The very large pots seem to form a separate group, also when comparing rim diameter and vessel height (fig. B.19). For the moment the shape has been divided into two groups:

221a: rim diameter ≤450 mm. Mean rim diameter = 288 mm (CV = 24.4%).
221b: rim diameter > 450 mm. Mean rim diameter = 741 mm (CV = 15.3%).

The smaller pots were thrown from one lump of clay (technology group B), although in shape group 221a there may be some larger pots built by hand (technology group E). The large pots 221b were built by hand (technology group E).

2.2.2 Pots with a straight or slightly convex wall and an inward-bevelled, "hammer"-shaped rim. Fig. IV.6.f-h, fig. IV.27.b-e, IV.28.a-d, fig. IV.70, IV.71, fig. IV.107.a-c, e-g.

The analysis of the measurements of this shape shows a rather even distribution without clear size groups. There are several peaks in the distribution. When comparing rim diameter and vessel height, two groups appear (fig. B.20). For the moment the shape has been divided into two groups:
222a: rim diameter < 280 mm. Mean rim diameter = 228 mm (CV = 13.6%).
222b: rim diameter ≥ 280 mm. Mean rim diameter = 331 mm (CV = 12.9%).

The smaller pots were thrown from one lump of clay (technology group B), although in shape group 222a there may be some larger pots built by hand (technology group E). The large pots 222b were built by hand (technology group E).

N.B. Also compare these shapes with bowls type 141 and 142.

2.2.4 Pots with a straight or slightly convex wall and a slightly inward-bevelled rim with a groove in the top. Fig. IV.71.i.
Only a few examples of this rim type. The shape was not investigated for the technology used.

2.2.5 Tall pots with a straight, thin wall and a rim that is slightly thickened on the outside, also called "*grain measure*". Fig. IV.7.a-e, fig. IV.27.f, fig. IV.72.a-q, fig. IV.107.d.

The analysis of the measurements of this shape shows a rather even distribution without clear size groups. A small group of larger pots with rim diameters ≥ 250 mm can be discerned (fig. B.21). There is no obvious relation between rim diameter and vessel height, something that would be expected in case a set volume was aimed for. For a discussion whether these pots have been used as measuring vessels, see Chapter VI.
225a: rim diameter < 250 mm, mean rim diameter = 140 mm, CV = 25.2%
225b: rim diameter ≥ 250 mm, mean rim diameter = 287 mm, CV = 11.5%

These pots are thrown from one lump of clay (technology group B).

2.2.6 Pots with a thick straight wall and a heavy rim that is thickened on the in and outside. Fig. IV.72.w, fig. IV.107.h-j, fig. IV.117.e.
Mean rim diameter = 381 mm (between 210 and 450 mm, CV = 15.6%). No size groups.

These large pots were most probably made by hand, built in slabs or coils (technology group E).

2.2.7 Pots with a straight wall and a bevelled, overhanging "beak"-rim. Fig. IV.27.g.
Only a few examples of this rim type. The shape was not investigated for the technology used.

2.2.8 Pots with a straight vessel wall, and a square, outward-bent, bevelled rim. Fig. IV.72.r.
Only a few examples of this rim type. The shape was not investigated for the technology used.

2.2.9 Pots with a straight wall and a bevelled, pinched rim thickened on the in and outside. Fig. IV.107.k.
Only a few examples of this rim type. The shape was not investigated for the technology used.

2.2.10 Pots with a straight wall and a rim that is slightly thickened on the inside and bevelled inwards. Fig. IV.107.l.
Only a few examples of this rim type. The shape was not investigated for the technology used.

2.2.11 Pots with a slightly convex wall and a thickened rim, which is oval in section. Fig. IV.7.f-h.
Only a few examples of this rim type. The shape was not investigated for the technology used.

2.2.14 Pots with a straight wall and an outward-bevelled rim with ridges. Fig. IV.72.s-t.

<u>2.3 Pots with S-shaped wall profile</u>

2.3.1 Pots with an S-shaped wall profile and an inward-bevelled, "mushroom"-shaped rim. Fig. IV.117.f.
Mean rim diameter 329 mm (between 230 and 430 mm, CV = 18.01%). No size groups.

The shape was not investigated for the technology used.

2.3.2 Pots with an S-shaped wall profile and an inward-bevelled, simple rounded rim. Fig. IV.107.m.
Only a few examples of this rim type. The shape was not investigated for the technology used.

2.3.3 Pots with an S-shaped wall profile, the rim is strongly rolled inwards. Fig. IV.72.u.

2.3.4 Pots with an S-shaped wall profile, the rim is mushroom-shaped and bent outwards. Fig. IV.72.v.

3 – JARS
Jars are defined as restricted shapes with a small rim diameter or narrow neck.
When comparing rim diameters and total vessel height, three groups appear (fig. B.22):

small jars (vessel height < 250 mm)
middle jars (vessel height ≥ 250 but <500 mm)
large jars (vessel height ≥ 500 mm)

The group of large jars contains mainly 3.2 jars without a neck, the group of small jars contains mainly 311 jars with a neck. The middle group contains a variety of rim types.

<u>3.1 Jars with a neck</u>

3.1.1 Jars with a neck and a simple rounded rim. Fig. IV.28.e-j, fig. IV.73, IV.74, IV.75.a-c, fig. IV.108.a-h, fig. IV.117.g, i.

Based on the comparison of rim diameters and vessel height, type 311 jars could be classified into three groups (fig. B.23): very small (311x), small (311a) (both belonging to the general group of "small jars") and large (311b, belonging to the general group of "middle sized jars"). Vessel height and maximum vessel diameter are the best indicators for size, while the rim diameters overlap between groups.

311x: very small, rim diameter < 70 mm, or rim diameter ≥ 70 mm but vessel height < 160 mm, maximum vessel diameter < 120 mm. Mean rim diameter = 59 mm, CV = 20%.
311a: small, rim diameter < 100 mm, or rim diameter ≥ 100 mm but vessel height < 250 mm, maximum vessel diameter < 180 mm. Mean rim diameter = 87 mm , CV = 8.6%.
311b: large, rim diameter ≥ 115 mm, or rim diameter < 115 mm but vessel height ≥ 250 mm, maximum vessel diameter > 180 mm. Mean rim diameter = 127 mm , CV = 9.7%.
311?: rim diameter ≥ 100 but < 115 mm while the vessel height has not been preserved.

Mean rim diameter of all type 311 jars = 106 mm (between 48 and 190 mm), CV = 19.7%.

These jars are thrown from one lump of clay (technology group B), although the very small jars also could have been thrown from the cone (technology group A).

3.1.2 Jars with a neck and a simple rounded rim that is slightly thickened on the outside. Fig. IV.8.a, fig. IV.29.a-b, fig. IV.75.h-l, IV.76.a-b, fig. IV.108.i, fig. IV.117.h, j.

The majority of 312 jars belongs to the group of "middle-sized" jars, with vessel heights between 250 and 500 mm. One is classified as a small jar (vessel height = 215 mm), and one is a large jar (vessel height = 550 mm). However, no differences are discernible in the rim diameters (fig. B.24), and these two exceptions are rather close to the core group of middle-sized jars. Size groups have not been made.

Mean rim diameter = 113 mm (between 60 and 150 mm), CV = 14.1%.

These jars are thrown from one lump of clay (technology group B).

3.1.3 Jars with a neck and a bevelled rim that is slightly thickened on the outside. Fig. IV.29.c-d, fig. IV.76.c-j, fig. IV.108.j-k, fig. IV.118.a-d.

No size groups are apparent (fig. B.25). Two completely preserved vessels fall into the "small" jars group; for the rest of the cases no vessel height was preserved.
Mean rim diameter = 105 mm (between 80 and 140 mm), CV = 13.7%.

The shape was not investigated for the technology used.

3.1.4 Jars with a neck and a rim that is thickened on the outside and flattened vertically on the outside. Fig. IV.8.b-c, fig. IV.29.e, fig. IV.75.m, fig. IV.108.l, fig. IV.118.e-f.

No size groups are apparent. One completely preserved vessel falls into the "small" jars group, for the rest of the cases no vessel height was preserved.
Mean rim diameter = 107 mm (between 70 and 150 mm), CV = 22.3%.

The shape was not investigated for the technology used.

3.1.5 Jars with a neck and an outward-bent rim that is horizontally flattened on the top. Fig. IV.8.d-i, fig. IV.29.f-h, fig. IV.76.k, IV.77, fig. IV.108.m-n, fig. IV.118.g-h.

No size groups are apparent. One completely preserved vessel falls into the "small" jars group (vessel height 160 mm, rim diameter = 95 mm), while four belong in the "medium" jars group (vessel height ≥ 430 mm, rim diameters ≥ 120 mm); for the rest of the cases no vessel height was preserved, but most probably they are "medium" jars. These are too few data to base a size grouping on, while the rim diameters alone do not show any grouping either (fig. B.26).

Mean rim diameter = 107 mm (between 70 and 150 mm), CV = 22.3%.

These jars are most probably thrown from one lump of clay (technology group B).

3.1.8 Jars with a neck and an outward-bent rim that is bevelled on the inside. Fig. IV.8.j, fig. IV.29.i-k, fig. IV.78, fig. IV.108.o-s.

Mean rim diameter = 119 mm (between 80 and 150, not counting one outlier of 230 mm), CV = 13.6%. Apart from one larger vessel, no size groups are apparent (fig. B.27).

The shape was not investigated for the technology used.

3.1.9 Jars with a neck and a rim that is strongly bent outwards and thickened on the outside. Fig. IV.8.k-m.
Only a few examples of this rim type. The shape was not investigated for the technology used.

3.2 Jars without a neck
The majority of these jars is classified as “large jars”. No internal size groups were found within this category. Mean rim diameter of all type 32 jars = 155 (between 85 and 220 mm), CV = 14.9%

3.2.1 Jars without a neck and a thickened, "ribbon"-rim that is grooved on the outside. Fig. IV.29.l-p, fig. IV.79, IV.80.a-k, fig. IV.108.t-y, IV.109.a-j, fig. IV.118.i-v.

Six jars in this group were classified as “medium” jars (vessel height between 288 and 474 mm, rim diameters < 140 mm), and four were “large” jars (vessel height > 600 mm, rim diameter ≥ 150 mm). However, this distinction was not visible in the distribution of rim diameters and size groups could not be made for the rest of the cases (fig. B.28).
Mean rim diameter = 138 mm (between 90 and 220 mm), CV = 15.8%.

These jars have been thrown in two parts (technology group C).

3.2.2 Jars without a neck and a thickened rim that is oval or slightly square in section. Fig. IV.9.a-b, fig. IV.30, IV.31.a-d, fig. IV.80.l-m, IV.81-85, fig. IV.109.k-n, fig. IV.118.w-z.

Apart from one vessel that is classified as a “medium” jar, most vessels of this rim type are “large” jars. The rim diameters and height show no further size groups (fig. B.29).
Mean rim diameter = 146 mm (between 70 and 230 mm), CV = 12.3%.

These jars have been thrown in two parts (technology group C).

3.2.3 Jars without a neck and a thickened rim that is bevelled on the outside. Fig. IV.32.b-e, fig. IV.86-87, IV.88.a-e, IV.89.a-b, fig. IV.109.o-s, fig. IV.118.aa, ac.

All completely preserved jars in this group are “large” jars. Size groups cannot be made according to rim diameter (fig. B.30).
Mean rim diameter = 148 mm (between 90 and 320 mm), CV = 16.6%.

These jars have been thrown in two parts (technology group C).

3.2.4 Jars without a neck and a convex rim that is slightly curved inwards. Fig. IV.88.f, fig. IV.109.t.
Only a few examples of this rim type. The shape was not investigated for the technology used.

3.2.6 Jar without a neck, with a pointed rim strongly sloping inwards. Fig. IV.9.c-d, fig. IV.88.g.

<u>3.3 Jars with a spout and handles</u>

3.3.1 Small jars, with a spout attached to the body, and a handle. Fig. IV.109.u.
Only a few examples of this rim type. The shape was not investigated for the technology used.

3.3.2 Jars with a spout made from the rim and a handle attached to the rim. Fig. IV.109.w.
Only a few examples of this rim type. The shape was not investigated for the technology used.

3.3.3 Jars with a simple rounded rim and one or two handles attached to the rim or the neck, no spout. Fig. IV.89.c-h, fig. IV.109.v, fig. IV.119.a-d.
Only a few examples of this rim type. The shape was not investigated for the technology used.

4 – GOBLETS
Goblets are defined as cups with a thin wall and a rim diameter around 10 cm. Size groups are not present within the goblets category (figs. B.31 and B.32).

<u>4.1 Goblets with a V-shaped wall profile</u>
4.1.1 Goblets with a V-shaped wall profile and a simple rounded rim. Fig. IV.33.a-e, fig. IV.90, fig. IV.110.a-h, fig. IV.119.e.
Mean rim diameter = 89 mm (between 60 and 160 mm), CV = 15.6%.

The goblets were thrown from the cone (technology group A).

4.3.1 Goblets with a closed V-shaped wall profile. Fig. IV.119.h-i.

<u>4.2 Goblets with an S-shaped wall profile</u>
4.2.1 Goblets with an S-shaped wall profile and a simple rounded rim. Fig. IV.33.q-t, y, fig. IV.91.a-ae, fig. IV.110.i-t, fig. IV.119.f-g.
Mean rim diameter = 78 mm (between 45 and 130 mm), CV = 14.7%.

The goblets were thrown from the cone (technology group A).

5 - STRAINERS

5.1.1 A convex bowl with holes through the whole surface of the wall. Fig. IV.33.z-aa, fig. IV.91.ah-ak, fig. IV.110.u-v.

No apparent size groups are visible in the histogram (fig. B.33). However, possibly two size groups can be discerned in analogy with the bowls (which are made in the same technology):
511a: rim diameter < 175 mm, mean rim diameter = 136 mm, CV = 12.9%
511b: rim diameter > 175 mm, mean rim diameter = 190 mm, CV = 4.3%

The sieves were thrown from the cone (technology group A) and then pierced by hand.

6 – POT STANDS

6.1.1 Pot stands with a straight or slightly concave wall, and generally with an upper rim diameter that is smaller than the lower rim diameter. Both rims are bevelled and rounded or pinched. Fig. IV.34.a-l, fig. IV.92-93, fig. IV.110.w-y, IV.111, fig. IV.119.j-m.

No size groups are apparent. Mean rim diameter = 199 mm (between 90 and 400 mm), CV = 15.5%

7 – BASES

Bases are defined as the lowermost part of the vessel. Bases are mostly illustrated with complete vessels in figs. IV.1-120, or separately in the figures listed below.

7.1.1 Nipple base. Fig. IV.33, fig. IV.90, fig. IV.110, fig. IV.120.
Mean diameter = 9 mm (between 3 and 18 mm), CV = 24.3%

7.1.2 Knob base. Fig. IV.10.a-d, fig. IV.33, fig. IV.91, fig. IV.110, fig. IV.120.
Mean diameter = 14 mm (between 6 and 26 mm), CV = 22.8%

7.2.1 Pedestal base. Fig. IV.10.e-f, fig. IV.34.m-q, fig. IV.113, fig. IV.120.
Mean diameter = 40 mm (between 10 and 100 mm), CV = 31.0%

7.3.1 Flat base. Fig. IV.10.g-m, fig. IV.35.a-c, fig. IV.96.a, fig. IV.113, fig. IV.120.
Mean diameter = 53 mm (between 4 and 330 mm), CV = 41.8%

7.4.1 Ring base. Fig. IV.11, fig. IV.35.d-l, fig. IV.96.b-d, fig. IV.113, fig. IV.120.
Mean diameter = 84 mm (between 6 and 230 mm), CV = 19.8%

7.5.1 Round base. Fig. IV.33.w, x, fig. IV.96.e-h, fig. IV.113, fig. IV.120.
No diameter.

9 – BOTTLES / FLASKS

9.1.1 Globular jar with a very narrow neck and a handle. Simple rounded rim. This shape is also called "*pilgrim flask*". Fig. IV.33.ab, fig. IV.94.

No size groups. Mean rim diameter = 50 mm (between 26 and 80 mm, including some very small bottles), CV = 31.3%.

10 – MINIATURES

A group of very small vessels, some thrown from the cone and some made by hand. Fig. IV.7.i-j, fig. IV.31.e, fig. IV.95.a-c, fig. IV.112.b.

11 – TRAYS

Low handmade trays and platters, some with sharp stones on the inside surface. Fig. IV.7.k, fig. IV.31.h, fig. IV.95.l-m, fig. IV.112.a, f, fig. IV.119.n.

12 – MISCELLANEOUS

Various shapes. Fig. IV.31.f, g, fig. IV.95.d-k, IV.96.i, fig. IV.112.c, d, fig. IV.119.p.

APPENDIX C
DETAILED DESCRIPTIONS OF POTTERY KILNS [230]

All pottery kilns are two-chambered updraft kilns. An updraft kiln basically consists of a lower fire chamber in which the fuel is burnt. The upper chamber is the actual pottery chamber, in which the vessels are stacked to be fired. The floor of the pottery chamber has flue holes to let the hot gases pass from the fire chamber through the stack of vessels. The floor rests on arches.[231] Two different types of updraft kiln construction were used at Tell Sabi Abyad.

1. A large kiln with real arches supporting the pottery chamber floor. The side walls of the fire chamber are usually made of half bricks in normal masonry.
2. A smaller kiln with two bricks leaning on the side walls and touching each other in the middle, forming a pointed arch supporting the pottery floor. The side walls of the fire chamber can be made of half bricks in normal masonry. However, less well-constructed forms of this type have only upright bricks covering the fire chamber wall, use existing walls as a fire chamber wall, or have just a layer of plaster against the inside of the fire chamber pit.

Ethnographic studies show that updraft kilns like the ones at Sabi Abyad are generally used by specialized potters or a well developed ceramic industry. Simple updraft kilns are occasionally used in a household-industry type of production, but in general updraft kilns (and especially the large ones like the Sabi Abyad kiln K in square J7 or kiln Q in square N11) are mostly found in individual workshops, nucleated workshops and manufactories (Peacock 1982, Annis 1988). Updraft kilns require some skill and investment to build them, and sometimes specialized kiln builders work in areas with many pottery workshops (Peacock 1982: 42). Especially when potting is a regularly recurring event, potters seem to have invested in kiln building because of the advantages compared to open firing (P. Arnold 1991, Rice 1987: 162). Once a kiln is built it saves time each next time vessels are fired because the same kiln can be used several times. Although a kiln needs constant maintenance and repair, it has a reasonably long lifespan (Swan 1984: 33). Temperatures are generally somewhat higher than in open firings and easily reach 900-1000 °C, and the rise of the temperature and the kiln atmosphere can be controlled much easier. Moreover, a kiln saves fuel and the amount of firing losses tends to be smaller than in open firings (Rice 1987: 162, P. Arnold 1991: 109, Rye 1981: 98-100).

In this Appendix a detailed description of all ten updraft pottery kilns found at Tell Sabi Abyad is presented. A table listing the dating and the summary data on kiln sizes is included at the end of the Appendix (table C.1).

[230] Not all stratigraphical and architectural documentation was already available in detail during the preparation of this appendix. Please await the final publication of stratigraphy and architecture for detailed information.
[231] Updraft pottery kilns have been found at many other sites in the pre-classical Near East, cf. e.g. Alizadeh 1985, Al-Maqdissi and Badawi 2002, Anderson 1987, 1989, Bounni 1974, Crawford 1981, Dämmer 1985, Kletter and Gorzalczany 2001, Machule et al. 1990: 30-31 and Abb. 16, Majidzadeh 1975, Nicholson 1989, Salonen 1964, Simpson 1991.

N11 – Kiln Q

Level:	6
Orientation:	N-S
Dug from elevation:	324.59
Upper elevation:	324.74-65
Fire chamber floor elev.:	322.55
Upper construction:	2.70 m x 2.10 m (preserved)
Fire chamber top:	2.25 m x 1.26 m
Fire chamber inside:	1.76 m x 0.78 m
Fire chamber near floor:	1.52 m x 0.54 m
Depth of fire chamber:	2.25 m (total)
Brick size:	36 x 37 x 12 cm, 18 x 37 x 12 cm
Samples:	none
Figures:	C.1-7, V.2.

Description:
This was a very large updraft kiln preserved up to the pottery chamber floor. It was free-standing. It had a rectangular fire chamber with a semi-circular fueling entrance in the south. The fire-chamber pit tapered towards the bottom, creating sloping sides (fig. C.2). The sides of the fire-chamber pit on the north side and at the semi-circular fueling entrance in the south were covered with whole bricks standing on their sides. There were four courses of bricks on top of each other. The longer, eastern and western sides of the pit were covered in 10 courses of half bricks in normal masonry, although the section shows that bricks on their sides were occasionally used here as well. Sometimes sherds and plaster were used between bricks to fill up holes and create the slanting angle needed to cover the tapering walls. The lower 39 cm of the walls of the firing-chamber pit was not covered in bricks but only plastered with a thick mud plaster. Three real arches, made of whole bricks set obliquely against the fire-chamber wall, covered the fire chamber and supported the pottery-chamber floor (fig. C.3). Only the first part of the arches was preserved, while the pottery-chamber floor was only preserved at the sides of the kiln (figs. C.4 and C.5). The arches were most probably pointed as in the case of kiln K in J7 (see below). The space between the arches was filled with plaster and debris, leaving four flue holes along the sides of the floor. Probably the pottery-chamber floor originally had 16 flue holes. The whole inside of the fire chamber, including the brickwork, arches and inside of flue holes, was covered in at least 5 layers of thick mud plaster, resulting in a plaster layer now 8 cm thick (figs. C.6 and C.7). This repeated plastering points to at least four occasions of repair work carried out on the kiln. The plaster layers alternated in colour between bright green and dark green. All brickwork and plaster were heavily fired and sintered due to the high temperatures in the fire chamber. The upper pottery-chamber construction was most probably built in normal masonry using whole mud bricks surrounding the fire chamber pit.

Description of the fire-chamber fill:
No sections have been made through the kiln fill; one section was made east-west through the fire chamber wall to study the construction (fig. C.2).

The top of the kiln fill consisted of brown-green medium-hard soil, with no ash or charcoal parts. Probably this deposit mainly consisted of rubble from the pottery floor and upper structure. Next, up to an elevation of 324.00, the soil was dark brown and soft, mixed with ashes and small red burnt debris fragments, as well as animal bones, pieces of green sintered plaster, sherds and unfired ceramics. Large pieces of broken mud brick, rubble from the upper construction, were still present. This deposit seems to consist of garbage, perhaps used to fill up the oven to level the surface for later construction. Up to an elevation of 322.85, the soil became looser, dark in colour, mixed with more ashes. Sherds and plaster fragments were still present, but no more mud-brick debris. The lowest fill, around 20 cm (up to 322.65), consisted of a soft layer of almost pure white and grey/black ash, with some charcoal fragments. The last 10 cm of fill were similar, but mixed with the brown earth of the floor surface. The floor of the kiln was reached at 322.55.

Most finds from the kiln fill came from the upper part of the kiln fill, probably a layer of garbage. Finds included unbaked pottery, a bowl fragment, a pestle, a pierced disc and a jar stopper. From the bottom of the kiln came a fragment of a bowl. Sherds were found in the whole fill, about 100 diagnostics, in a large variety of shapes and sizes.

<u>N12 – kiln L</u>

Level:	6
Orientation:	N-S
Dug from elevation:	324.46? Or from floor F at 324.61?
Upper elevation:	324.65
Fire chamber floor elev.:	ca. 323.36
Upper construction:	not preserved
Fire chamber top:	-
Fire chamber inside:	1.74 x 0.90
Fire chamber near floor:	-
Depth of fire chamber:	at least 1.20 m
Brick size:	36 x 37 x 12 cm, 18 x 37 x 12 cm
Samples:	none
Figures:	C.8-10 and V.2, V.5.
Remarks:	2 Middle Assyrian burials covered with large sherds were placed inside the kiln after the kiln had gone out of use.

Description:
Kiln L was a large updraft kiln. The arches supporting the pottery chamber floor were partly preserved but the floor itself was not. It was dug into the corner of a courtyard. It had a rectangular fire-chamber pit, probably with a fueling hole in the south. The construction of the fueling hole was not very well preserved. The fire-chamber walls tapered slightly towards the bottom, but not much. All sides were covered in whole mud bricks standing on their sides, three courses high. The mud bricks at the south side were placed slanting towards the south, allowing for the fueling hole opening, but seem to have been damaged here by a pit (perhaps created when the burials were put in). Two arches made of whole mud bricks covered the fire chamber and supported the pottery-chamber floor. The arch construction was not preserved very well and its shape is unclear. The pottery-chamber floor probably originally had nine flue holes. The bricks on the inside of the fire chamber do not seem to have been plastered. The whole preserved structure was heavily fired and greenish-grey due to the high temperatures in the firing chamber. Nothing was preserved of the upper structure, although it might be suggested that wall J was part of it.

Kiln L was possibly dug from elevation 324.46, the Neolithic tell surface. According to the daynotes floor F, at an elevation of 324.61 in this room, is 10-20 cm above the surface of the Neolithic site, recognized at 324.48-30. Floor F probably did not cover the remains of L, because remains of L were already visible when the floor was cleaned. It is also possible that L was dug from slightly higher up, because the kiln seems to have been made only after the door in the northern wall had been blocked.

Description of the fire-chamber fill:
No sections have been made through the kiln fill. The deposition inside the fire chamber was described as a sandy soil with some small bones, sherds, unbaked bricks, and unfired pottery. This is the soil covering the burial, and therefore it is of a secondary and mixed nature. From the excavation of the rest of the deposit in 2005 no documentation is available as yet.

<u>N13 – kiln H</u>

Level:	5
Orientation:	N-S
Dug from elevation:	not preserved
Upper elevation:	higher than 324.71 (rubble of the kiln already seen at approximately 325.33?).
Fire chamber floor elev.:	323.89
Upper construction:	> 2.65 x 2.54, not preserved up to pottery floor (estimate from field plans).
Fire chamber top:	-
Fire chamber inside:	> 1.85 x 1.10 (estimate from field plans)
Fire chamber near floor:	-
Depth of fire chamber:	> 0.80 m
Brick size:	-
Samples:	none
Figures:	C.11 and V.14
Remarks:	part of the kiln is still preserved in southern section baulk of square N13.

Description:
Kiln H was a large updraft kiln, but it was not very well preserved. It was located just under the topsoil; only the lower part of the fire chamber was preserved. The inside of the fire-chamber walls was covered in a thick mud plaster. The shape of the plaster suggests that the flue holes started not much higher, but if that is true the fire chamber would have been very undeep compared to its width. Behind the plaster, burnt brickwork in normal masonry was visible, but it is unclear whether this belonged to the kiln construction or not. No proper drawings and documentation are available as yet.

It is unclear from what level kiln H was constructed. According to the daynotes, the rubble from the upper kiln construction reached up to at least 324.71 and probably some 20 cm higher than that. The depositions surrounding the kiln all seem to belong to the levels into which the kiln was dug. Also the preserved depth of the fire chamber (0.80 m) seems to be very low for a kiln this size: most probably the construction was originally considerably deeper than this (cf. also the sizes of other, similar kilns, table C.1). Possibly the kiln was dug from a level no longer preserved in N13, perhaps level 5.

Description of the fire-chamber fill:
No sections have been made through the kiln fill. Up to an elevation of around 324.25, the fill of the fire chamber consisted of sandy soil with pieces of baked bricks, many sherds and pottery objects. Down to 323.95, soil was more ashy, black and grey and soft, and contained fewer sherds. Down to 323.89, where the earth floor was reached, the fill was an ashy layer.

<u>L8 – Kiln AR</u>

Level:	5B or earlier
Orientation:	N-S
Dug from elevation:	not preserved, higher than 326.13
Upper elevation:	326.10
Fire chamber floor elev.:	324.53
Upper construction:	2.25 x 1.26 m
Fire chamber top:	-
Fire chamber inside:	1.76 x 0.78 m
Fire chamber near floor:	-
Depth of fire chamber:	1.60 m
Brick size:	38 x 39 x 14 cm
Samples:	SN03-182, charcoal and burnt grains.

Figures:	V.22
Remarks:	backfilled, the kiln still has to be drawn.

Description:
Kiln AR was a large updraft kiln. The fire chamber was preserved up to the start of the air flues and the beginning of the arches that supported the pottery-chamber floor, but the arches themselves were not preserved. It was dug into the corner of a room. It had a rectangular fire chamber with a semi-circular fueling hole in the south. The walls of the fire chamber tapered towards the bottom, creating sloping walls. Against all sides of the fire chamber pit whole mud bricks had been placed on their sides, three courses high on the long sides and two courses high on the short side. The lower 39 cm of the fire chamber pit were not covered in mud bricks but just plastered. The bottom of the fire chamber is an earthen floor. Along the long sides, the beginning of three flue holes on each side were visible. The pottery-chamber floor originally probably had nine flue holes. Two arches were probably made of whole mud bricks in a real arch construction, but they are only very fragmentarily preserved. The whole inside of the fire chamber, including the flue holes, was plastered with at least four layers of mud plaster fired to alternating blue and green colours. The total layer of plaster is now 4 to 8 cm thick. All plaster and bricks were heavily burnt, the bricks were grey and reddish in colour.

Description of the fire-chamber fill:
No sections have been made through the kiln fill. On the kiln floor, up to elevation 325.15, a layer of almost pure white and dark-grey ash was found. A bronze ring, a baked clay wedge (kiln furniture? fig. V.7, O03-198) and a clay sealing were found in this ash. On top of this fill ashy soil was found, on top of which soft soil including burnt mud-brick pieces and debris of the collapsed kiln construction was deposited. This fill contained stones, burnt bone, burnt and sintered plaster pieces and mud-brick pieces and some pottery slag.

<u>M11/M12 – Kiln AC/AI</u>

Level:	5B
Orientation:	N-S
Dug from elevation:	326.12-05 (floor AN)
Upper elevation:	top of arch in southern section M11 at approximately 326.35, bin W in M12 upper fill 326.24, lowest level 326.12
Fire chamber floor elev.:	325.07
Upper construction:	not preserved, perhaps bin W? (>1.10 x 1.10 m)
Fire chamber top:	-
Fire chamber inside:	1.50 x 0.90 m
Fire chamber near floor:	-
Depth of fire chamber:	1.28 m
Brick size:	?
Samples:	none
Figures:	V.13
Remarks:	Bin W, the northern part of the fire chamber and the southern part were found separately on either side of the section baulk, the middle part in the section baulk was excavated later. The kiln is heavily damaged by later pits, and its position in the section baulk initially hampered proper identification and excavation.

Description:
Kiln AC/AI was a smaller updraft kiln, badly preserved and badly damaged by later pits. It was free-standing. Most probably bin W in square M12 was part of the upper structure, and perhaps the east wall of bin X was, too. The fire chamber was an irregular oblong oval pit

with a rounded part or a semicircular fueling hole in the north. The sides of the pit tapered towards the fire-chamber floor. It is not clear whether the sides of the fire chamber were covered in mud bricks like those of the other kilns. Some mud bricks were visible in the section but they were not very clear. The inside of the fire-chamber pit was plastered. Over the northern and southern part of the fire chamber, two whole bricks were put leaning on the fire-chamber edge and meeting in the middle, forming two simple arches over the fire chamber and supporting the pottery-chamber floor. The whole inside of the fire chamber and the arch were burnt to a reddish colour. Part of the floor was still preserved in the middle part of the kiln, and perhaps in the lower level of bin W. If bin W is part of the structure, it extended a bit more to the south than the fire-chamber pit itself (cf. kiln CJ/V in square K8, see below).

Description of the fire- chamber fill:
Soft brown/grey fill with ash pockets and a lot of unbaked-clay vessel fragments, some sherds and small bone fragments. The fill of W was soft brown soil, dark grey-brown ashy material with charcoal, and patches of burnt loam. The fill of W also contained baked bricks.

M11 – kiln T/U

Level:	5B
Orientation:	E-W
Dug from elevation:	326.15-04 (floor AN)
Upper elevation:	326.66
Fire chamber floor elev.:	325.80
Upper construction:	1.53 x 0.89
Fire chamber top:	-
Fire chamber inside:	1.30 x 0.55
Fire chamber near floor:	-
Depth of fire chamber:	approximately 0.60 m
Brick size:	?
Samples:	none
Figures:	C.12 and V.13
Remarks:	Initially not recognized as a double-chambered updraft kiln. Not very well preserved.

Description:
Kiln T/U was a smaller updraft kiln, not very well preserved. It was built in the corner of courtyard 2. It had a rectangular and undeep fire chamber with a rounded western end, without a clear fueling hole. A rectangular wall made of half mud bricks surrounded the fire-chamber edge on the western, southern and part of the northern side, and was probably part of the upper structure. Wall P formed the side of the kiln on the eastern side. The inside of the fire chamber was covered in thick mud plaster. Part of the plaster of an arch over the fire chamber was still present. The whole inside was heavily fired.

Description of the fire-chamber fill:
On the fire-chamber floor, black and grey ashy soil with some burnt pottery was found. Higher up in the fill, the soil was browner, and still contained burnt pottery as well as some big stones and large sherds. To the south of the kiln structure there was a grey ashy layer perhaps associated with this kiln.

<u>H8 – kiln H/AE</u>

Level:	between 5B and 4D
Orientation:	E-W
Dug from elevation:	unknown, higher than 326.95.
Upper elevation:	326.95
Fire chamber floor elev.:	325.85
Upper construction:	not preserved
Fire chamber top:	-
Fire chamber inside:	1.44 x 0.68 m
Fire chamber near floor:	-
Depth of fire chamber:	1.10 m
Brick size:	40 x 40 x 10 cm
Samples:	none
Figures:	C.13 – 17 and V.20, 21.
Remarks:	the surface from which kiln H/AE was dug and used was cut away by the levelling activities for making floor F at elevation 326.95-83.

Description:
Kiln H/AE was a smaller updraft kiln. Only the lower part of the fire chamber was preserved. The whole structure cut floor J and was cut and levelled by floor F. It was built in the corner of room 14. It had a rectangular fire chamber with a rounded western side. The fueling hole was probably located on this side. The fire chamber tapered slightly towards the earthen floor. The southern side of the fire-chamber pit had been covered with half mud bricks in normal masonry; six courses were preserved. The western and northern part had been covered with whole mud bricks on their sides; two courses were preserved. In the east, wall E/AB served as the fire-chamber wall. The inside walls of the fire chamber were plastered with mud plaster. Both bricks and plaster were heavily fired to a bright green colour, just as the part of wall E/AB that served as a kiln wall. Perhaps wall AB was repaired in this spot with the building of floor F.

Description of the fire-chamber fill:
The upper part was filled with mud-brick debris. Under the debris, very soft red-brown ashy soil with red burnt and unburnt loam pieces was found. Three kiln wasters and a lot of unbaked vessel fragments were found in this fill. A lot of clay lumps and burnt sherds were found as well. Under this was a layer containing baked pottery and red or green loam pieces, covering red brown ashy soil and grey ashes.

<u>H8 – Kiln I</u>

Level:	between 5B and 4D
Orientation:	N-S
Dug from elevation:	unknown, higher than 326.95
Upper elevation:	at least 326.80, plaster and bricks of wall C are burnt up to elevation 327.46?
Fire chamber floor elev.:	325.88
Upper construction:	not preserved
Fire chamber top:	-
Fire chamber inside:	1.12 x 0.65
Fire chamber near floor:	-
Depth of fire chamber:	0.90 – 1.58
Brick size:	?
Samples:	none
Figures:	V.20

Remarks:	the surface from which kiln I was dug and used was cut away by the levelling activities for making floor F at elevation 326.95-83. Middle Assyrian burial B1 cut kiln I.

Description:
Kiln I was a smaller updraft kiln. Only the lower part of the fire chamber was preserved. It was built in a corner of the walls in room 14. The fire chamber tapered slightly towards the floor on the eastern side; on the western side it made use of wall C. The eastern side of the fire-chamber pit had been covered by whole mud bricks on their sides, possibly two courses were preserved. Sherds were stuck inbetween for stability. The lower part of the pit was not covered in bricks but plastered with a thick mud plaster, and so was the southern part. The northern and western side used the bricks of wall B and C as a fire chamber wall. The whole inside of the fire chamber was heavily burnt, changing the bricks of the walls and the kiln to a bright green colour. In the southern part of the fill a Middle Assyrian child burial was found. The burial cut the kiln wall.

Description of the fire chamber fill:
Two levels were visible in the fill: the lower part was filled with blue-grey ashes, on top of which soft blue-grey, grey-brown oven fill was found, containing ash, loam, burnt loam, and mud-brick fragments.

<u>K8 – Kiln CJ/V</u>

Level:	between 5B and 4B
Orientation:	N-S
Dug from elevation:	326.80
Upper elevation:	327.62
Fire chamber floor elev.:	326.16
Upper construction:	ca. 1.60 x 1.00 m
Fire chamber top:	-
Fire chamber inside:	approximately 1.40 x 0.68 m
Fire chamber near floor:	-
Depth of fire chamber:	1.06
Brick size:	35 x 15 x 10 cm (half bricks)
Samples:	SN99-5, ash with burnt grains. Not analysed yet.
Figures:	C.21 – 25, and V.22.

Description:
Kiln CJ/V was a smaller updraft kiln, preserved up to the pottery chamber floor and lower part of upper structure. It was built in the corner of the walls behind the former city gate. The kiln was dug into the fill and debris of an unused room; at elevation 326.80 there was no real floor. It was built after the city gate had gone out of use, but before the gate and the recesses were blocked up. The kiln rested against wall M/AO but did not make use of its bricks. The kiln cut floor CM (level 5B) and was covered by a surface dating to level 4B. A rectangular fire-chamber pit was dug into the soil, with sides slightly tapering towards the concave earthen floor. The sides of the fire chamber were covered with whole mud bricks on their sides, two courses high. Then, around the fire-chamber pit, the rectangular walls of the kiln were built with half mud bricks in normal masonry; six courses had been preserved. The upper structure of the kiln is longer than the fire chamber, extending about 35 cm more towards the south. On the northern side of the upper structure an arched fueling hole was left open. In the middle of the fire chamber, two mud bricks had been set on their sides on top of the side walls and touching a half brick in the middle, thus creating a simple arch. The spaces next to the arch were filled with brick parts, plaster and sherds creating the pottery-chamber floor, in which six flue holes were still preserved. The original floor probably had at least 12

flue holes. The whole inside of the fire chamber was plastered and fired to a greenish colour. The pottery-chamber floor and the preserved wall of the pottery chamber were plastered on the inside and outside, but only the inside was fired to a red and black colour. The walls seemed to be more burnt in the north than in the south, perhaps due to the location of the fueling hole. Perhaps the fueling hole was blocked with bricks during the firing of the kiln.

Description of the fire-chamber fill:
On the floor of the fire chamber, an approximately 4 cm thick layer of soft, pure fine black to grey ash was deposited, including charred grains. The botanical sample was taken from this layer. On top of it, there was loose brown and grey sandy and ashy soil. The fill of the pottery chamber contained brown soil with plaster fragments and charcoal.

<u>J7 – Kiln K</u>

Level:	4C
Orientation:	N-S
Dug from elevation:	327.10 (surface S)
Upper elevation:	327.35
Fire chamber floor elev.:	325.55
Upper construction:	3.00 x 2.34 m
Fire chamber top:	
Fire chamber inside:	2.16 x 0.64 m
Fire chamber near floor:	
Depth of fire chamber:	1.70
Brick size:	39 x 39 x 10; 20 x 39 x 10 (half bricks)
Figures:	C.26 – 31, and V.23, 24.
Samples:	SN98-10, slags in ashy layer; SN98-351, sintered plaster of fire chamber wall. Not analysed yet.
Remarks:	Published earlier in Akkermans and Duistermaat 2001.

Description:
Kiln K was a large updraft kiln, preserved up to and including the pottery-chamber floor. It was free-standing. It had a rectangular fire chamber with a semi-circular fueling hole at the south and at the north. The fire-chamber pit was more or less straight down to the slightly concave earthen floor. The sides of the fire chamber were covered in half bricks in normal masonry, seven courses high. The wall of the northern side was bonded with the walls on the long sides. The southern side of the fire-chamber pit was a bit curved, and covered in whole bricks standing on their sides, 2.5 courses high. At the top of the side walls, the fire-chamber pit widened a bit to give space to the whole bricks lying on the edge of the fire chamber pit and forming the start of the arches. Four real arches were built of whole bricks leaning inwards and touching at the top in a V-shape. A space of about 20 cm was left open between each arch. Around the fire-chamber pit a square wall was built to form the upper structure. The space between the wall and the arches, and between the arches themselves, was filled up with pieces of mud brick, plaster and sherds, leaving nine flue holes open in the pottery-chamber floor. The inside of the fire chamber, including the arches and the inside of the flue holes, were covered in thick mud plaster. From the inside, the bricks in the fire chamber and the arches have been fired to a bright green colour, fading to red/orange and then to unburnt bricks further away from the fire chamber.

Description of fire-chamber fill:
The first 45 cm or so on top of the unburnt fire-chamber floor consisted of alternating layers of blackish, yellowish and pink, very soft powdery ashes. Above that, the fire-chamber fill consisted of soft dark-grey and lighter-grey ashy soil with charcoal and some burnt mud-brick fragments. On top of that, the fill was more mixed containing dark-brown mud-brick debris,

soft grey ashy soil, pieces of grey burnt mud bricks, sherds and bones. In the south part, in the ashy layers, some large jar bases and large sherds, animal bones and stones were found.

Level	**Kiln**	Outer structure (max. dimensions) **L x W**	Pottery-chamber floor (inside) **L x W**	Surface of pottery chamber (inside)	Fire chamber **L x W**	Depth of fire chamber	Volume of fire chamber
4C	J7 - K	3.00 x 2.34	(1.60 x 1.60)	(2.56 m2)	2.16 x 0.64	1.70	2.35 m3
5B – 4B?	K8 – CJ/V	(1.60) x 1.00	(1.46) x 0.60	0.88 m2	(1.40) x 0.68	1.06	(1.00 m3)
5B – 4D	H8 – H/AE	(1.84) x (1.10)	-	-	1.44 x 0.68	> 1.10	> 1.07 m3
5B – 4D	H8 - I	(1.40) x (0.80)	-	-	1.12 x 0.65	> 0.90	> 0.65 m3
5B	M11 – T/U	1.53 x 0.89	(1.25) x (0.70)	(0.88 m2)	1.30 x 0.55	0.60	0.43 m3 ?
5B	M11/M12 – AC/AI	> 1.10 x 1.10 (W)	(?) x (0.75) (W)	-	1.50 x 0.90	1.28	1.73 m3
5B or earlier?	L8 - AR	2.25 x 1.26	(1.90) x (0.90)	(1.71 m2)	1.76 x 0.78	> 1.60	(> 2.20 m3)
5	N13 - H	> 2.65 x 2.54	(>2.13) x (1.68)	(> 3.58 m2)	> 1.85 x 1.10	> 0.80	> 1.62 m3
6	N12 - L	Not preserved	Not preserved	-	1.74 x 0.90	1.20	1.88 m3
6	N11 - Q	2.70 x (2.45)	(2.27) x (1.73)	(3.92 m2)	1.76 x 0.78	2.25	3.08 m3

Table C.1: Sizes of updraft kilns at Sabi Abyad. Numbers between brackets are estimates.

APPENDIX D
TECHNOLOGICAL, PETROGRAPHICAL AND CHEMICAL ANALYSES
OF LATE BRONZE AGE POTTERY CLAYS AT TELL SABI ABYAD.

This appendix will present the results of the archaeometric analyses of all pottery and clay samples that were analysed for this study. The appendix is organized according to the ware groups that could be distinguished on the basis of the results of the petrographical (thin-section) analysis. In this way, pottery made from similar fabrics is presented together. The results of the analyses are integrated in the discussions and conclusions of the other chapters.

Several kinds of analysis have been performed. The Department of Pottery Technology of Leiden University performed a low-tech analysis of the properties and workability of the unfired clays used for the pottery produced at Sabi Abyad. These included investigations of the colour, plasticity, workability, strength, non-plastic inclusions and shrinkage (cf. Van As 2004). The study was carried out by testing the performance of the clays in different circumstances, by studying both unfired sherds and raw clays using a stereo zoom-microscope, and by firing test bars at different temperatures. The analysis of the shaping methods also performed by the Department at the site in 1996 was presented in Chapter V.

Under the supervision of G. Schneider (FU Berlin), I have carried out a basic analysis of 45 thin-section slides from the Sabi Abyad pottery dating from levels 7-3. The samples were first impregnated with a bonding substance and then abraded to a thickness of 0.025 mm and fixed between glass plates. Under the polarizing microscope under parallel polarized light (ppl) or crossed polarized light (xpl) each mineral has its own optical characteristics. In this way non-plastic mineral (and organic) inclusions can be identified and described. In addition, the matrix itself can be described, although the clay minerals themselves are too small to be seen separately (Rice 1987: 376-382; Schneider and Daszkiewicz 2002; Whitbread 1995: 365-396). The results include descriptions of the colour and homogeneity of the matrix; the amount, size, shape and distribution of non-plastic inclusions; the determination of minerals and rock fragments; and the estimation of firing temperatures. The following terms are used to describe the sizes of non-plastic mineral inclusions (Rice 1987: 38):

Clay	< 2 µm (0.002 mm)
Silt	> 2 µm and < 20 µm (0.02 mm)
Fine sand	> 20 µm and < 200 µm (0.2 mm)
Coarse sand	> 200 µm and < 2000 µm (2 mm)
Gravel	> 2000 µm

To estimate the amount of inclusions, general percentages were estimated with the help of comparison charts for all inclusions together,[232] and rough counts per view were made at an enlargement of 10x:

Very few	less than 1 particle per view (occasionally seen, but not in every view)
Few	1-3 particles per view
Medium amount	4-15 particles per view
Many	15-30 particles per view
Very many	more than 30 particles per view

Furthermore, the following terms are used:

Matrix	The fine clay or silt material in which the coarser particles are embedded (Whitbread 1995: 369-371), grain sizes smaller than 0.02 mm.
"Clay aggregates"	Concentrations of fine-grained clay material without larger inclusions, often of a different colour than the matrix. They are also called "textural concentration features" (Whitbread 1995: 386). These concentrations (aggregates) may be

[232] According to Schneider (2006: 400) these estimates of non-plastic inclusions are always too low, since very small particles are not included.

	naturally present in the clay and can remain in the matrix when the clay is not soaked or mixed very well before shaping.
Organic inclusions	Fine organic fibres. The plant species or kind is not determined. It could be chopped straw or grasses, chaff, or organic fibres derived from animal dung.
Ppl	Parallel polarized light. The polarizer of the microscope lets light in a single plane through the sample.
Xpl	Crossed polarized light, or crossed Nicols. The analyser is used to let light through the sample only in the direction opposite to the direction of the polarizer (see Rice 1987: 377 for a short explanation).

To estimate firing temperatures, the following aspects have been taken into consideration:

Organic inclusions	At low temperatures charred skeletons of organic inclusions frequently remain in the voids.
Decomposition	At firing temperatures above approximately 700 °C primary calcite starts to decompose.
Iron oxides	At temperatures around 800-850 °C iron oxides give a more reddish colour to the matrix in calcareous clays.
Matrix	Calcareous clays become olive-green in colour and isotrope (“glassy”) above approximately 900-1000 °C.
Mica	Above approximately 1050 °C mica starts to disappear. At lower temperatures the colourfulness and brightness of mica under crossed Nicols can begin to decrease.

It should be remembered that these are only approximate estimates, since these aspects depend not only on the firing temperature but also on the duration of the firing and the firing atmosphere as well as on the presence of salts in the clay (Schneider 2006: 399; see also Chapter II and V).

These analyses resulted in the formation of several different ware groups. These groups and the correspondence with the ware descriptions made in the field were discussed in Chapter II and Chapter V. In this appendix the ware groups and separate samples will be presented in more detail. With each sample information of both the field descriptions and the thin-section analysis will be given. In this way the field descriptions can be compared with the thin-section results.

G. Schneider furthermore analysed the chemical composition of four samples of unfired pottery, as well as two samples of cooking-ware pottery, using wavelength-dispersive X-ray Fluorescence (WD-XRF). Samples were prepared using 1 gr of pulverized sherd, ignited at 880 °C and melted into glass discs using lithium borate as a flux. These discs were then exposed to X-rays. The intensities of the characteristic secondary X-rays were measured and calculated to concentrations of the oxides of the elements in percentage of weight (for major elements) or in parts per million (ppm, for trace elements). This characteristic composition could then be compared to other samples or to source materials (Duistermaat and Schneider 1998; Schneider and Daszkiewicz 2002). The full data of these analyses is presented with each sample.

Also in Berlin, M. Daszkiewicz tested two Middle Assyrian cooking pots (samples J728 and J730) for water permeability and thermal-shock resistance (Daszkiewicz et al. 2000). Water permeability was tested by applying a constant stream of water to the surface of the sample, and measuring the amount of water that penetrated the sherd. Thermal-shock resistance was measured by establishing the water permeability of the sherd after applying thermal shock at 400 °C. The results of this analysis are presented with each sample.

These archaeometric analyses together yielded many useful insights into the composition of clay and inclusions, the preparation of the fabric, firing temperatures, etc. Moreover, the samples could be grouped in several groups related to the possible origin of the clay. The following origins were suggested:

Sabi Abyad:	This group includes the pottery that was made locally at the site. Clays would have been taken from the immediate surroundings of the site, but not necessarily from one location only.

Balikh Valley: Calcareous clays that could well have come from the region, if not from areas close to Sabi Abyad. However, an origin further away cannot be completely excluded either.

Jezira: Calcareous clays that most probably do not come from the Balikh Valley, because of small basalt inclusions in the natural clay or added as a temper. These clays would be expected in sediments closer to volcanic outcrops, perhaps in the upper Khabur Valley. Most of northern and eastern Syria is covered with calcareous marly clay sediments, so these sherds may come from the region at large and from more than one place.

Non-Jezira Non-calcareous clays that are not found in northern and eastern Syria. Perhaps they are from the Upper Euphrates further north. For one sample the region of origin could be exactly determined in the northwestern coastal area.

LOCAL SABI ABYAD CLAYS

Low-tech technological analysis of local pottery clays (with the cooperation of L. Jacobs and A. van As)

Two samples of unfired Middle Assyrian pottery from the pottery workshops at Tell Sabi Abyad (level 5, M11 33-162).

SN96-12 Body fragments of a type 111 middle-sized bowl, wall thickness 7-12 mm. This sample was also analysed with WD-XRF, see below.
SN96-130 Body fragment of a large bowl, wall thickness 17 mm (see fig. D.1).

Both samples were analysed for technical properties in April 2006 by the Department of Pottery Technology of Leiden University, by L. Jacobs and A. van As. The following report is theirs.

<u>SN96-12 (fig. D.2)</u>
In a raw bone-dry condition the clay is strong, has much cohesive strength and does not crumble easily. The loam shows much resistance when a piece is snapped by hand, which indicates that there is a rather high clay content in the material. The clay is clean; there are no coarse mineral inclusions. Apart from the negative impressions of vegetable fibres, fabric analysis[233] revealed nothing but some very fine quartz grains ≤ 250 µ, in a negligible quantity of less than 2% by weight. This indicates that these sporadic grains are natural to the clay. The rest of the mineral non-plastics belong to the silt fraction. The loam gives a spontaneous reaction with HCl (++), which betrays the presence of finely divided lime. The lime content, however, is not present as grains. The colour of the bone-dry loam is 7.5 YR 6/4 (light brown). When water is added the clay immediately dissolves and becomes plastic again. (PH-value 5 to 6, which is neutral).

Originally the clay was mixed with about 15% of fine organic fibres by volume. These fibres of chopped straw have a maximum size of about 5 mm in length. The fibres themselves have completely gone, even though the clay has not been fired. The only remainder is a dark-brown residue 7.5 YR 4/2 - 4/1 (brown to dark grey), partly visible against the wall of the cavity and partly on the surface of the unbaked sherd.

<u>SN96-130 (figs. D.3, D.4)</u>
In a bone-dry condition this clay, like the other one, is strong. In fact, both clays are quite equal regarding this point. Differences are only marginal, if any. The dry colour is the same as well; 7.5 YR 6/4 (light brown). By adding water to the clay, it immediately dissolves and becomes plastic again (The PH-value is also 5 to 6, neutral).

The amount and size of the organic fibres does not differ much from SN96-12 either. The quantity of fibres is about 15% by volume and the size varies with a maximum length of about 5 mm. It is also interesting to note that the orientation of the fibres is not random, but mostly parallel to the surface and in one direction. This in itself points to the applied shaping technique. With the throwing technique eventual fibres are known to orient themselves parallel to the surface. There are some other similarities between both clay mixtures. In both cases the fibres themselves have disappeared. Only the cavity is visible as negative fibre shapes. In both cases there is some dark brown residue in part of the cavity. This might suggest that the fibres were added as green grasses, with part of the juices still in them. In this way they could have rotted away more quickly and easily than completely pre-dried straw.[234]

The outcome of the observations is that both clay-straw mixtures are quite equal. This is confirmed by the firing colour of both samples at a temperature of 750˚C under oxidizing conditions. The firing colour is 5YR6/6 (reddish yellow) in both cases. Part of the Balikh clay samples (numbers 3, 5 and 6, collected in 1996) correspond with these clays. In these cases the firing colour is practically the same: 7.5YR6/6 (reddish yellow).

[233] Fabric analysis was carried out with a stereo zoom-microscope using 10 to 50X magnification.
[234] On the other hand, we should not forget that the sherds have been deposited for more than 3000 years, and that other than carbonized material no organic material is preserved at Sabi Abyad at all (K. Duistermaat).

Workability of the clay of both samples

By mixing the dry clay with water it was brought in a plastic condition. It was clear that after 3000 years the clay was plastic enough, but that it missed some “bones”. The clay is considered good for coiling and just suited for throwing. When water is added the clay becomes more workable and softer. In the soft condition it allows the piglet’s tail test without showing cracks, or only the beginning of cracks, but without snapping (indicating that the cohesive strength increases: cf. figs. D.5 and D.6). The problem with this soft condition is that the substance now misses the firmness necessary for successfully making pottery. Working these clays in a drier condition is not an option since in that case they start to crack (the cohesive strength decreases, while the resistance increases). Therefore the best solution is to bring the paste to its maximal plasticity. In the case of these loams this is a relatively soft condition, just before the point where they start to get sticky. Next some non-plastic material[235] has to be added. Fibrous organic material is preferable in this case, because it adds firmness and at the same time cohesive strength to the mass. To avoid cracks during the shaping process, cohesive strength is necessary during shaping but also during drying.

To get a good impression of the technical properties, the clay was first tested pure as it was, without the addition of any fibres (fig. D.7). This way the effect of the addition of fibres could become clear by comparison. Linear dry-shrinkage was measured on the original clay first. This was possible because the original organic addition had completely disappeared. Linear dry-shrinkage was 6% for SN96-12 and 7% for SN96-130, which is exactly in correspondence with some of the Balikh clay samples taken in 1996 (see Chapter V). These samples show a linear shrinkage-range from 6 up to 11%. The fact that both loams are in the lowest part of this range may indicate that the particular clays SN96-12 and SN96-130 are not the most plastic loams of the region. What makes them favourable, however, is probably the almost complete lack of larger calcite grains. This is different from the Balikh clay samples, which contain 5 to 15% of small calcite lumps (0.5 to 1.5 mm in diameter) (see Nieuwenhuyse 2006: 65-108).[236] Another advantage of a limited dry-shrinkage is that it helps to avoid cracks during drying and firing.

As a next step the clay was tested after adding fibres. The completely dried sample was moistened again and fine fibres of dried grasses were added (about 15% by volume, to mimic the original situation). Again the sample’s workability was tested and linear shrinkage measured. After 15 volume percents of fine organic fibres had been added to the clay, the mixture was markedly shorter. On modelling it even tended to crack a bit, which at the same time indicates that about 15% by volume is about the maximum desirable quantity of fibrous material. However, the great advantage of the addition was that the mixture had much more firmness, which is necessary for shaping pottery. This exactly must have been the reason that the Assyrian potters added fibrous organic material to these clays. The experiment thus confirmed what was expected theoretically. Moreover, it became clear by the experiment that both loams behaved exactly the same as to workability. Again test bars were made of the mixtures. The quality of the loams mixed with fine chopped grasses had markedly improved after a day of damp storage. This is because the fibres need some time to absorb moisture from the clay, which makes them less stiff. At the moment when the final test bars were made the workability of both mixtures was judged to be good. Dry-shrinkage of the mixtures of loam and 15 volume percents of fine straw is around 6% for both samples SN96-12 and SN96-130. It is interesting to note that the addition of fibres hardly influenced linear shrinkage. Fibres may also have been added to the paste in the form of animal dung. Addition of dung is a very effective way of increasing the cohesion and plasticity of the mixture, qualities that may have been desirable for these clays. A more detailed study of the size, shape and kind of vegetal inclusions in the pottery, and comparison with reference materials of different kinds of dung (sheep/goat, donkey, etc.) and different kinds of chaff, chopped grasses, etc. may solve this question.

[235] Larger portions of clay and straw are best mixed when the clay is in a thick liquid condition.
[236] However, see also the petrographical analysis of Middle Assyrian sherds on the following pages. They often do show calcite grains (K. Duistermaat).

LOCAL SABI ABYAD CLAYS

WD-XRF analyses of the chemical composition of local clays

SN96-12 Several body fragments of type 111 middle-sized bowls, wall thickness 7-12 mm. Sample numbers from the laboratory in Berlin are: V404, V405, V406, and V407. Part of this sample was also tested for technical properties, see above.

1744 Clay collected from the banks of the Balikh River near Tell Hammam et-Turkman, a few kilometres from Sabi Abyad, by G. Schneider in 1983.

4421 Clay from mud bricks from Tell Hammam et-Turkman, collected by G. Schneider in 1983.

Sealings The average composition of 132 unfired Neolithic clay sealings from Sabi Abyad, proved to be of local provenance (data taken from Duistermaat and Schneider 1998).

Walls The average composition of unfired Neolithic pisé walls at Sabi Abyad (data taken from Duistermaat and Schneider 1998).

	Elements																					
Sample no.	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	(S)	(Cl)	V	Cr	Ni	Zn	Rb	Sr	Y	Zr	Ba	(Ce)	GV
V404	48.87	0.853	13.18	6.66	0.095	4.85	21.39	0.89	2.92	0.28	0.17	0.17	128	250	105	95	66	455	26	170	375	75	17.66
V405	48.83	0.850	13.08	6.66	0.105	4.85	21.47	0.94	2.89	0.33	0.13	0.15	135	255	107	98	70	428	25	171	389	70	17.81
V406	49.19	0.845	12.96	6.64	0.090	4.77	21.42	0.86	2.90	0.32	0.20	0.17	129	250	106	95	66	526	26	172	513	47	17.66
V407	49.17	0.854	13.15	6.70	0.089	4.75	21.24	0.87	2.90	0.28	0.14	0.16	137	249	105	92	69	406	26	173	349	55	17.67
average unfired pottery	49.02	0.851	13.09	6.66	0.095	4.80	21.38	0.89	2.90	0.30	0.16	0.16	132	251	106	95	68	454	26	172	407	62	
1744	47.66	0.863	15.34	7.41	0.113	5.13	21.06	0.31	1.87	0.23	0.12	0.02	129	206	167	93	84	552	28	159	324	65	0.00
4421	47.89	0.834	14.58	7.00	0.111	5.18	19.32	1.17	3.52	0.40	0.58	0.58	114	188	152	89	75	619	22	151	316	54	0.00
average sealings	49.28	0.867	13.35	6.70	0.116	4.75	20.61	1.04	2.87	0.43	0.65	0.13	127	286	132	106	70	415	27	182	345	59	
average pisé walls	50.03	0.841	14.97	7.38	0.122	4.85	16.89	0.98	3.37	0.57	1.16	0.13	123	219	152	118	74	407	28	164	315	68	

Table D.1: WD-XRF analyses of the chemical composition of local clays. Wavelength dispersive X-ray fluorescence analysis (WD-XRF) of ignited samples, major elements are normalized to a constant sum of 100% not including S and Cl. Sample weight = 1 gr. Major elements in % oxide by weight, trace elements in parts per million (ppm). Samples analysed by dr. G. Schneider, Freie Universität Berlin.

The WD-XRF-analyses show that the chemical composition of the unfired pottery is very similar to the local Balikh clays (modern) and other local clay samples (Neolithic) from Sabi Abyad. A multivariate cluster analysis resulting in a dendrogram (not illustrated) also confirmed the similarity of unfired pottery and other Sabi Abyad clay samples. All clays contain a rather high amount of CaO around 21%. We see that the salt content (Na_2O) of the unfired pottery is relatively low, although evidence for the presence of salts in the pottery was found in several thin-sections (see below, sample nos. 03, 14, 18, 26, 24). The low salt content in the unfired pottery samples could perhaps be due to leaching during deposition. The samples from sealings and pisé walls from the same site show similar Na_2O levels. The clay from the riverside contains even less salt, perhaps suggesting that slightly brackish water instead of sweet water was used for making pottery, sealings and bricks. However, the data is ambiguous. See also the discussion about the possible addition of salt in Chapter V. The slightly lower amount of K_2O in the unfired ceramics and the sealings, as opposed to the samples from mud-brick walls, could be related to levigation processes possibly employed to obtain finer clays for sealings and pottery (Schneider 2006: 395).

LOCAL SABI ABYAD CLAYS

Thin-sections – Group A: Local calcareous clays with fine inclusions

Group A is characterized by calcareous clays with fine sand inclusions, with or without organic inclusions. Several sherds in Group A (samples 02, 05, 44 in group A1, samples 16, 22, 24, 47 in group A2; mostly from level 7 or 6) contain fragments of shells or microfossils, perhaps indicating a slightly different clay bed for these sherds.[237]

Group A includes the most common Middle Assyrian shapes. The pottery in group A was most probably made from a clay derived from a local clay source in the immediate surroundings of Sabi Abyad, and is therefore comparable to the local clays discussed on the previous pages. The group is subdivided into several subgroups according to the composition. Differences are either due to intentional temper additions of the potter (organic inclusions only) or to a slightly different location of clay collection, although all samples from group A are considered to be local to Sabi Abyad or the immediate surroundings.

A1 Local clay including a large amount of rounded cryptocrystalline calcite inclusions or calcite aggregates, and many "clay aggregates". This group includes mainly samples from level 7, and it is possible that the clay for the pottery from level 7 was taken from a slightly different spot in the area or a different clay deposit. Or, perhaps, the pottery was produced at a site not far from Sabi Abyad instead of at the site itself (there are no indications for pottery production from the excavations of level 7).

- A1a with organic inclusions added by the potter
- A1b without organic inclusions (fine wares)
- A1c with (intentional?) fine sand inclusions, no organic inclusions. Possibly not local? See the description of sample 12 below.

A2 Local clay with calcite inclusions. Inclusions are generally fewer or finer than in group A1 and better mixed, not containing any "clay aggregates". The clays either come from a slightly different location than group A1 or have been better soaked by the potter. This group includes the common Middle Assyrian shapes and may be considered to be the clay obtained close to Sabi Abyad. The presence of a kiln waster (sample 31) in this group is extra evidence for the local provenance of these sherds. This group would compare best to the samples of local potters' clay described above (SN96-12, SN96-130, low-tech and WD-XRF analysis).

- A2a with organic inclusions added by the potter
- A2b without organic inclusions (fine wares)
- A2c with fine sand inclusions and many calcite inclusions, with organic inclusions added by the potter. Possibly not local from the site? See the description of sample 08 below.

[237] It was noted that the pottery from Middle Assyrian Tell Sheikh Hamad very rarely contained these calcite microfossils (Schneider 2006: 403).

LOCAL SABI ABYAD CLAYS
Thin-sections – Group A1a

Sample no. **02**
Field no. N9 17-63:5
Level 7
Shape type 132 bowl rim
Illustration Fig. D.8

Field description:
Ware I (organic inclusions and calcite and sand)
Fired at a medium temperature in an incompletely oxidizing atmosphere.

Thin-section description:

Matrix
Calcareous clay containing iron. A lot of fine-grained calcite in silt fraction is present in the matrix. Brownish, anisotrope matrix. At the core of the sherd the colour is darker brown due to the deposition of carbon of unburnt organic inclusions (in the upper left of the thin-section illustrated in fig. D.8). At the surface of the sherd the colour is lighter brown. Several "clay aggregates" are present in coarse-sand fraction (up to 2 mm; in the lower right of the thin-section in fig. D.8).

Organic inclusions
Approximately 15% or fewer inclusions of fine organic fibres, rather evenly distributed through the matrix. Mostly triangular shapes (possibly the section of more longitudinal particles) of 0.625 – 0.75 mm long. Also some long and thin parts, max. 1.875 mm long but many are shorter, and some long and slightly bent shapes up to 1 mm long and 0.15 mm thick. In many voids, especially at the core of the sherd, there are still carbonized skeletons of the fibres (visible as a black skeleton in a grey void, at the centre top of the thin-section in fig. D.8).

Mineral inclusions
Generally small non-plastic inclusions, evenly distributed throughout the matrix. Approximately 40-50%, including organic inclusions. Mineral inclusions were most probably present in the natural clay, no mineral inclusions were added by the potter.

Many to very many smaller cryptocrystalline and crystalline, rounded or sometimes more angular primary calcite grains spread evenly through the matrix, most probably part of the natural clay. Up to 0.35 mm in size but most are smaller (white and beige rounded dots in the thin-section in fig. D.8). Also some calcite microfossils, up to 0.4 mm long, rectangular and curved in shape. Some calcite grains seem to be of biogene origin. The decomposition of calcite has barely started.

Iron oxides are mixed through the whole matrix in fine-sand or silt fraction. A few larger quartz grains in the coarse-sand fraction, and many much smaller quartz grains (fine-sand fraction), both have angular shapes. A few rounded or oval grains of chert, somewhat unevenly distributed, in coarse-sand fraction but mostly smaller. A few rock fragments in fine-sand fraction. A few mica (muscovite?) grains in fine-sand fraction, bright blue-pink under xpl. Very few small grains of feldspar (plagioclase, fine-sand fraction); very few grains of epidote, pyroxene, and hornblende in silt fraction.

Estimate of firing temperature
Low. Matrix is still anisotrope, the decomposition of calcite has not started yet. Fibres and carbon from organic inclusions have not fully burnt away.

LOCAL SABI ABYAD CLAYS
Thin-sections – Group A1a

Sample no.	**05**
Field no.	N9 17-900:5
Level	7
Shape	type 315 jar rim
Illustration	fig. D.9

Field description:
Ware I (organic inclusions and calcite and sand)
Fired at medium temperatures in an incompletely oxidizing atmosphere

Thin-section description:

Matrix
Calcareous clay containing iron. A lot of fine-grained calcite in silt fraction and smaller is present in the matrix. Brownish, mostly anisotrope matrix with red-brown clouding. Several dark red-brown "clay aggregates" in coarse-sand and gravel fraction. Sometimes these have cracked or shrunk, leaving a void around the particle. This is visible at the right side of the thin section illustrated in fig. D.9.

Organic inclusions
About 10% or fewer fine fibres, not very evenly distributed through the matrix. Mostly long and thin particles, some thicker longitudinal shapes, up to 1.5 mm long. Very few triangular-shaped inclusions, up to 0.5 mm long. Hardly any charred skeletons remain in the voids.

Mineral inclusions
Generally small non-plastic inclusions, evenly distributed throughout the matrix. Mineral inclusions were most probably present in the natural clay, no mineral inclusions were added by the potter.

Very many crystalline or cryptocrystalline, rounded, oval or irregular-shaped calcite grains spread evenly through the matrix, most probably part of the natural clay. Up to 0.5 mm in size, but most are much smaller, in silt and fine-sand fraction (up to 0.2 mm; rounded beige particles in the thin-section on fig. D.9). At the core of the sherd primary calcite is still preserved, but towards the surface of the sherd calcite has started to decompose. At the very surface the grains have turned grey in colour under xpl. A few calcite microfossils, up to 0.4 mm long, with a curved shape.

Iron oxides mixed through the whole matrix in fine-sand or silt fraction. A few angular quartz grains in coarse-sand fraction (up to 0.5 mm), many smaller quartz grains of fine-sand fraction (up to 0.1 mm) (shiny bright white particles in the thin-section on fig. D.9). A few mica grains (muscovite?) in fine-sand fraction (up to 0.1 mm). A few and small hornblende grains in fine-sand fraction (up to 0.06 mm). Very few rock fragments in fine-sand fraction, very few chert grains in fine-sand fraction (up to 0.1 mm). Very few epidote and pyroxene particles, and very few feldspar (plagioclase) grains, all in fine-sand fraction (up to 0.07 and 0.1 mm respectively).

Estimate of firing temperature
Low to medium. No charred organic remains are left, and calcite has decomposed at the surface of the sherd. The matrix is still largely anisotrope.

LOCAL SABI ABYAD CLAYS
Thin-sections – Group A1a

Sample no.	**32**
Field no.	K10 61-132:59
Level	7
Shape	type 117 bowl rim
Illustration	fig. D.10; IV.1.n

Field description:
Ware I (organic inclusions and calcite and sand)
Fired at a medium temperature in an oxidizing atmosphere.

Thin-section description:

Matrix
Calcareous clay containing iron. Fine-grained calcite in silt fraction and smaller, evenly mixed through the matrix. Reddish green-brown homogeneous matrix, largely anisotrope.

Organic inclusions
About 10% inclusions of fine organic fibres. Some longitudinal thick shapes up to 3.25 mm, longitudinal thick curved shapes up to 1.25 mm long, and some triangular-shaped particles up to 0.75 mm long. Hardly any charred skeletons of organic remains are left in the voids.

Mineral inclusions
Generally small non-plastic inclusions, evenly distributed throughout the matrix. About 40-50% including organic inclusions. Mineral inclusions were most probably present in the natural clay, no mineral inclusions were added by the potter.

The fabric is dominated by very many (up to 100 per view at 10x!) rounded and oval particles of cryptocrystalline calcite, in coarse-sand fraction (up to 0.5 mm) and smaller, spread evenly through the matrix and most probably part of the natural clay. All calcite has decomposed, no primary calcite is preserved. Some secondary deposition of calcite has started at the edge of voids.

Iron oxides are mixed through the whole matrix in fine sand and silt fraction, some larger particles up to 0.35 mm (visible in the thin-section in fig. D.10 as orange translucent and dark non-translucent oval particles). A few larger quartz grains in coarse-sand fraction (up to 0.5 mm) but very many smaller angular quartz grains in fine-sand fraction. A medium amount of mica particles in fine-sand fraction (up to 0.06 mm). A few chert particles in fine and coarse-sand fractions (up to 0.4 mm but mostly smaller). A few feldspar grains (plagioclase) in fine-sand fraction (up to 0.2 mm). A few rock particles in fine-sand fraction. A few hornblende grains in fine-sand fraction. Very few epidote and pyroxene grains in fine-sand fraction.

Estimate of firing temperatures
Medium. Matrix is still largely anisotrope, but calcite has completely decomposed.

LOCAL SABI ABYAD CLAYS
Thin-sections – Group A1a

Sample no.	**42**
Field no.	K10 61-122:38
Level	7
Shape	type 315 jar rim
Illustration	fig. D.11; IV.8.i

Field description:
Ware I (organic inclusions and calcite and sand), very many calcite inclusions.
Fired at a medium temperature in an oxidizing atmosphere.

Thin-section description:

Matrix
Calcareous clay containing iron. Fine-grained calcite in silt fraction mixed evenly through the whole matrix. Brown, slightly olive-grey green matrix, starting to become isotrope. Not very homogeneously mixed. Towards the outer surface of the sherd the matrix is greener than at the core of the sherd.

Organic inclusions
Very few, fewer than 5% inclusions of fine organic fibres. Mostly longitudinal thin and straight or slightly curved particles, up to 2 mm long, a few triangular-shaped particles up to 0.5 mm long.

Mineral inclusions
Generally small non-plastic inclusions, evenly mixed in the matrix. About 30% including voids of organic inclusions. Mineral inclusions were most probably present in the natural clay, not added by the potter.

The fabric is dominated by many rounded or oval cryptocrystalline grains of calcite. Some very large parts in gravel fraction (2 mm), but many are much smaller in coarse and fine-sand fractions. All calcite has decomposed. Some redeposition of secondary calcite has started at the edge of voids, mainly at the surface of the sherd.

Iron oxides are mixed through the matrix in silt and fine-sand fractions. Also some spiral iron-oxide aggregates. Many angular quartz particles in fine-sand fraction (up to 0.2 mm). Medium amount of mica grains in fine-sand fraction. A few angular feldspar (plagioclase) grains in fine-sand fraction (up to 0.1 mm). A few angular chert fragments in fine to coarse-sand fraction (up to 0.3 mm), and few radiolarite chert fragments in fine-sand fraction. A few hornblende and pyroxene grains in fine-sand fraction. Very few rock fragments in fine to coarse-sand fraction (up to 0.25 mm).

Estimate of firing temperatures
Medium to high. Matrix is starting to become isotrope, calcite has completely decomposed.

LOCAL SABI ABYAD CLAYS
Thin-sections – Group A1b (fine wares)

Sample no.	**44**
Field no.	K10 61-121:P93-110
Level	7
Shape	type 122 bowl
Illustration	fig. D.12; IV.2.c

Field description:
Ware C (fine sand inclusions)
Fired at a medium temperature in an oxidizing atmosphere. Different (but not grey) core colour.

Thin-section description:

Matrix
Calcareous clay containing iron. Orange brown, anisotrope matrix. The matrix is not very homogeneous: there are irregular bands of darker brownish and darker-red clay, as well as some oval "clay aggregates". Very small irregularly-shaped voids, most probably from air bubbles in the clay.

Mineral inclusions
Small to slightly larger non-plastic inclusions, not very homogeneously mixed in the matrix. Approximately 15%. Mineral inclusions were most probably present in the natural clay, not added by the potter.

The mixture is dominated by many crystalline and cryptocrystalline grains of calcite, rounded and oval or irregularly-shaped; some crystalline grains have retained the original crystal rhomboid shape. Some are quite large, up to 0.8 mm (coarse-sand fraction), most are smaller in the fine-sand and coarse-sand fractions. Some grains include very small iron-oxide inclusions. Several microfossils or calcite grains of biogene origin, up to 0.4 mm. One is visible at the top centre of the thin-section in fig. D.12. All calcite is still primary, decomposition has not started yet.

Many angular quartz particles in coarse-sand fraction (up to 0.4 mm) and smaller, also including microcrystalline grains. A few mica particles, sometimes very large (up to 0.25 mm) but mostly smaller. A few feldspar grains in fine-sand fraction. A few angular and rounded chert grains in coarse-sand fraction (up to 0.4 mm). A few rock fragments in coarse-sand fraction. Very few epidote and pyroxene particles in fine-sand fraction (up to 0.06 mm), very few hornblende particles in fine-sand fraction (up to 0.1 mm).

Estimate of firing temperatures
Low. Matrix is not isotrope, calcite is still present in primary form.

LOCAL SABI ABYAD CLAYS
Thin-sections – Group A1b (fine wares)

Sample no.	**45**
Field no.	K9 48-113:16
Level	5 (but intrusive, probably from level 7)
Shape	body sherd of a goblet with "Nuzi"-style decoration
Illustration	fig. D.13, D.14; IV.98.c

Field description:
Ware B (with calcite and fine sand)
Fired at a medium temperature in an oxidizing atmosphere.

Thin-section description:

Matrix
Calcareous clay containing iron. Deep dark olive-green matrix with dark brown-red stains from iron oxides. The matrix is largely isotrope. The matrix is not very homogeneous. The outer 0.12 mm or so at the surface of the sherd (towards the upper left of the thin-section in fig. D.13) is more deeply greenish and seems to contain fewer iron oxides, creating a lighter cream colour in the sherd when viewed macroscopically. A few small circular or rounded voids are present, most probably from air bubbles or from decomposed calcite.

Mineral inclusions
Generally very small non-plastic inclusions, not very evenly mixed in the matrix. Approximately 20%. Mineral inclusions were most probably present in the natural clay, not added by the potter.

Very many rounded and oval cryptocrystalline grains of calcite in coarse-sand fraction (up to 0.4 mm), although most are much smaller. All calcite has decomposed. Some redeposition of secondary calcite has started at the edges of voids left by decomposed calcite grains. Many angular quartz grains in fine-sand fraction. Medium amount of mica (muscovite, biotite?) in fine-sand fraction (up to 0.08 mm). A few feldspar (plagioclase) grains in fine-sand fraction. A few angular chert grains in fine-sand fraction. A few hornblende grains in fine-sand fraction. Very few rock fragments in fine-sand fraction. Very few pyroxene grains in silt fraction.

Estimate of firing temperatures
Rather high. Matrix is largely isotrope and started to turn olive-green, calcite has completely decomposed.

Remarks
The dark-brown painted bands of the "Nuzi"-style decoration are visible in the thin section as a thin (0.05 mm) layer of iron-rich clay at the surface, well bonded with the matrix (visible in close-up at the top of the thin-section in fig. D.14). Due to the high firing temperature, the iron-rich clay paint has melted into the matrix. The white motives are not visible at all.

LOCAL SABI ABYAD CLAYS ?
Thin-sections – Group A1c

Sample no.	**12**
Field no.	N9 6-52:1
Level	5?
Shape	body sherd of a type 911 “pilgrim bottle”
Illustration	fig. D.15

Field description:
Ware A (calcite inclusions), many calcite inclusions
Fired at a medium temperature in an oxidizing atmosphere.

Thin-section description:

Matrix
Very calcareous, iron-rich clay. Fine-grained calcite in silt fraction spread evenly through the matrix. Dark deep olive-green-brown matrix, starting to become isotrope. Several small (0.3 mm) “clay aggregates” with few inclusions are mixed unevenly in the matrix (visible at the top of the thin-section in fig. D.15). Very few small irregular voids up to 0.4 mm are present, perhaps air bubbles or voids left after the decomposition of calcite.

Mineral inclusions
Mostly very fine and many non-plastic inclusions, up to 40%, spread rather evenly in the matrix. Most probably not added intentionally by the potter.

Many to very many rounded and oval cryptocrystalline grains of calcite in coarse-sand fraction (up to 0.3 mm) and smaller. All calcite has decomposed. Redepostion of secondary calcite has started at the edges of some voids, but not everywhere.

Iron oxides are mixed through the matrix in silt or fine-sand fraction. Many angular quartz grains in coarse-sand fraction (up to 0.4 mm) and smaller. A medium amount of pyroxene in fine-sand fraction (up to 0.05 mm). A few rock fragments in fine-sand fraction. A few mica particles in fine-sand fraction. A few hornblende particles in fine-sand fraction (up to 0.1 mm). A few feldspar (plagioclase) grains in fine-sand fraction (up to 0.05 mm), few epidote grains in fine-sand fraction (up to 0.2 mm). In general it seems that this fabric contains more colourful and brighter mineral grains than the other fabrics in the same group.

Estimate of firing temperatures
Medium – high. Matrix is starting to become isotrope, all calcite has decomposed.

Remarks
This fabric is a bit different from the rest of the fabrics in Group A1, because it seems to contain slightly more mixed fine sand inclusions than the other sherds in the group. However, there is no immediate reason to suggest a non-local origin for this sample.

LOCAL SABI ABYAD CLAYS
Thin-sections – Group A2a

Sample no.	**01**
Field no.	H7 5-8:1
Level	4
Shape	type 311 small jar rim
Illustration	fig. D.16

Field description:
Ware H (organic inclusions and calcite), many calcite inclusions
Fired at a medium temperature in an incompletely oxidizing atmosphere. Cream surface colour and orange core.

Thin-section description:

Matrix
Calcareous clay containing iron. Fine-grained calcite in silt fraction mixed through the matrix. Towards the surface of the sherd, this secondary calcite started to form "clouds". Olive-grey-brown matrix, towards the surface becoming darker green-brown and more isotrope than at the core (the surface is towards the top of the thin-section in fig. D.16).

Organic inclusions
Around 10% or fewer, fine organic fibres, rather evenly distributed through the matrix. Triangular shapes between 0.375 and 0.8 mm long, longitudinal thin and straight or slightly curved fibres up to 1.25 mm long, spherical shapes up to 1.125 mm in diameter and more irregularly-shaped inclusions. A few carbonized "skeletons" of fibres are left in the voids.

Mineral inclusions
Generally small non-plastic inclusions, evenly distributed through the matrix. Approximately 30% including voids left by organic inclusions. Mineral inclusions were most probably present in the natural clay and not added intentionally.

A few larger cryptocrystalline calcite inclusions retained their original crystal shape (for example in the upper right part of the thin-section in fig. D.16, the rhomboid bright white shape), in coarse-sand fraction (up to 0.75 mm), but many smaller rounded and oval calcite grains in fine-sand fraction. Inside one grain a small oolite (0.175 mm) has built around a quartz particle. All calcite has decomposed, and some has started to disappear at the edges of the larger particles. Redepostion of secondary calcite has started at the edges of voids.

Iron oxides are mixed through the whole matrix in fine-sand and silt fraction. Also some cloudy or rounded iron-oxide aggregates. Very many angular quartz inclusions in fine-sand fraction (up to 0.075 mm). A medium amount of mica (muscovite?) in fine-sand fraction (up to 0.07 mm). A few hornblende and epidote grains in fine-sand fraction (up to 0.03 mm). Very few feldspar grains in fine-sand fraction (up to 0.1 mm).

Estimate of firing temperatures
Medium to high. Matrix is starting to become more isotrope at the surface. Calcite has completely decomposed and partly disappeared.

Remarks
Gypsum minerals are building at the edges of voids left by organic inclusions and decomposed calcite, and adhering to the sherd surface. This is probably related to the deposition in the soil, or to contact with gypsum for the reparation of cracks by the potter (see Chapter V).

LOCAL SABI ABYAD CLAYS
Thin-sections – Group A2a

Sample no.	**03**
Field no.	H7 5-9:3
Level	4
Shape	type 111 carinated bowl rim.
Illustration	fig. D.17

Field description:
Ware I (organic inclusions and calcite and sand).
Fired at a medium temperature in an oxidizing atmosphere (core colour orange, surface colour red)

Thin-section description:

Matrix
Calcareous clay containing iron. Fine-grained calcite in silt fraction is mixed through the whole matrix, and concentrated in a thin zone just below the surface of the sherd. Dark brown largely anisotrope matrix at the core of the sherd (at the thickest point), becoming more reddish-brown towards the surface. At the surface of the sherd, a thin zone (0.2 mm thick) is darker olive-green and slightly more isotrope. Perhaps this is due to a "salt effect", where salts present in the wet clay migrated to the surface of the sherd during drying and acted as a flux during firing (visible at the top of the thin-section in fig. D.17).

Organic inclusions
Approximately 10% or fewer fine organic fibres, mostly thicker curved shapes up to 1.5 mm long and triangular shapes up to 0.75 mm long. Not very evenly mixed in the matrix. Hardly any charred skeletons of fibres left in the voids.

Mineral inclusions
Generally small and very homogeneously mixed non-plastic inclusions, approximately 40% including the voids left by organic inclusions. Mineral inclusions were most probably present in the natural clay, not intentionally added by the potter.

A few larger cryptocrystalline calcite grains retained their original crystal shape (up to 0.75 mm), but very many smaller oval and rounded calcite grains in fine-sand fraction (up to 0.25 mm). All calcite has decomposed and is yellow or grey in colour under xpl. Only at the very core of the sherd there are some primary grains left.

Iron oxides in fine-sand and silt fraction mixed through the whole matrix. Many angular quartz grains in fine-sand fraction (up to 0.25 mm). Medium amount of mica (muscovite?) grains in fine-sand fraction. A few rock fragments in fine-sand fraction. Very few feldspar grains (plagioclase) in fine-sand fraction, very few chert grains in fine-sand fraction, very few epidote, hornblende and pyroxene particles in fine-sand fraction.

Estimate of firing temperatures
Medium. Matrix is largely anisotrope, primary calcite is still preserved at the core of the sherd. At the surface of the sherd the temperature may have been a bit higher, or the fabric sintered earlier due to a "salt effect."

Remarks
Gypsum minerals are adhering to the sherd surface. This is probably related to the deposition in the soil, or to contact with gypsum for reparation of cracks by the potter (see Chapter V).

LOCAL SABI ABYAD CLAYS
Thin-sections – Group A2a

Sample no. **04**
Field no. I7 3-24:4
Level 4
Shape type 313 small jar rim.
Illustration fig. D.18

Field description:
Ware I (organic inclusions and calcite and sand).
Fired at a high temperature in an oxidizing atmosphere.

Thin-section description:

Matrix
Calcareous clay containing iron. Fine-grained secondary calcite in silt fraction spread through the matrix and forming cloudy concentrations, partly molten into the matrix. Calcite clouding concentrates at the outside surface of the sherd and around voids. At the inside surface of the sherd, calcite grains concentrate in a very thin zone just below the surface, while the surface itself is more isotrope and contains fewer calcite grains (not shown in picture). Dark olive-grey-green matrix that is largely becoming isotrope.

Organic inclusions
A few, maximally 5%, fine organic fibres. Some longitudinal thin or thicker fibres up to 2.5 mm long, and some triangular particles up to 0.75 mm long, evenly distributed through the matrix. Hardly any charred remains of fibres are left in the voids.

Mineral inclusions
Fine non-plastic inclusions, evenly distributed through the matrix and most probably already partly molten into it. Approximately 15% including voids left by organic inclusions. Mineral inclusions present in the natural clay, not added by the potter.

Very few rounded calcite grains in coarse-sand fraction (up to 0.5 mm) are still present in the matrix. Most grains were much smaller but have completely decomposed and disappeared or fused with the matrix. No primary calcite is present. Redepostion of secondary calcite at the edges of voids is rare.

Iron oxides in silt and fine-sand fraction mixed through the matrix. No concentration of iron is visible around the voids (sometimes seen in highly fired calcareous clays, cf. sample nos. 21 and 09 below). Many angular quartz grains in fine-sand fraction (most up to 0.04 mm and some up to 0.1 mm). Very few rock fragments and chert particles in fine-sand fraction. Very few pyroxene and hornblende grains in fine-sand fraction.

Estimate of firing temperatures
High. Matrix is largely isotrope and calcite has completely decomposed or disappeared. Mica and other finer inclusions have lost their brilliance or have fused with the matrix.

LOCAL SABI ABYAD CLAYS
Thin-sections – Group A2a

Sample no. **11**
Field no. H7 4-14:10
Level 4
Shape type 221 pot rim
Illustration fig. D.19

Field description:
Ware H (organic inclusions and calcite).
Fired at a medium temperature in an oxidizing atmosphere.

Thin-section description:

Matrix
Calcareous clay containing iron. Fine-grained secondary calcite present in large amounts in silt fraction and forming clouds in the matrix, especially towards the inner surface of the sherd (the inner surface of the sherd is on the left of the thin-section in fig. D.19). The core and outer surface of the sherd show less clouding but instead the fine calcite is more evenly mixed here. The matrix is dark grey-olive-green and largely isotrope. At the surface of the sherd the matrix is darker and more isotrope.

Organic inclusions
Approximately 10% of fine organic fibres. Longitudinal straight and curved shapes up to 1.25 mm long, as well as triangular shapes up to 0.75 mm long or smaller, rather evenly distributed through the matrix. One heart-shaped void left by an organic inclusion. No charred remains of organic inclusions are left in the voids.

Mineral inclusions
Generally fine inclusions, dominated by fine-grained calcite in silt fraction forming clouds (see above). Approximately 20% including voids of organic inclusions, but difficult to estimate because of clouding.

Only a few grains of calcite are still preserved, cryptocrystalline and decomposed, in coarse-sand fraction (up to 0.625 mm). Many grains have disappeared leaving a small void. Redepostion of secondary calcite has started at the edges of some voids, but not everywhere.

Iron oxides in fine-sand and silt fractions mixed evenly with the matrix. A few larger angular quartz grains in coarse-sand fraction up to 0.5 mm, but very many smaller particles in fine-sand fraction. A few angular and radiolarite chert particles in fine-sand fraction (up to 0.2 mm). A few rock fragments in fine-sand fraction. A few feldspar (plagioclase) grains in fine-sand fraction. A few mica grains in fine-sand fraction, colours are starting to become dull and do not include blue and pink anymore under xpl. A few hornblende particles in fine-sand fraction.

Estimate of firing temperatures
High. Matrix is largely isotrope, calcite grains have decomposed or disappeared. Mica has lost its brilliance and is probably already fusing with the matrix.

LOCAL SABI ABYAD CLAYS
Thin-sections – Group A2a

Sample no.	**13**
Field no.	H8 13-141:1
Level	5
Shape	type 212 large storage-pot rim
Illustration	fig. D.20

Field description:
Ware I (organic inclusions and calcite and sand). Many fine calcite inclusions. Handmade. Fired at a medium temperature in an oxidizing atmosphere.

Thin-section description:

<u>Matrix</u>
Calcareous clay containing iron. Fine-grained secondary calcite in silt fraction mixed evenly with the matrix, forming cloudy concentrations towards the surface of the sherd. Grey-olive-green brown homogeneous matrix, starting to become isotrope. Towards the surface of the sherd, the matrix becomes darker green and more isotrope.

<u>Organic inclusions</u>
A large amount, approximately 20%, of fine organic fibres. These fibres were noted to be less clearly oriented in a preferred orientation than in the other sherds. On the contrary, they seem to be rather randomly mixed with the matrix. This is probably related to the slab-building method of shaping (see Chapter V). Longitudinal thin straight and thicker bent fibres, up to 2.5 mm long, and some triangular fibres up to 0.75 mm long. Hardly any charred remains preserved in the voids.

<u>Mineral inclusions</u>
Generally small mineral inclusions, evenly mixed with the matrix. Approximately 40% or less, including voids left by organic inclusions. Mineral inclusions were most probably present in the natural clay, not added by the potter.

Very many rounded and oval cryptocrystalline calcite grains, in coarse and fine-sand fraction (up to 0.375 mm but mostly smaller). All calcite has decomposed and many grains have left voids. Redepostion of secondary calcite is present at the edges of many voids.

Iron oxides in fine-sand and silt fraction mixed evenly through the matrix. Very many angular particles of quartz, occasionally in coarse-sand fraction (up to 0.6 mm) but mostly in fine-sand fraction (up to 0.1 mm). A few mica grains in fine-sand fraction. A few hornblende and pyroxene (?) grains in fine-sand fraction. A few rock fragments in fine-sand fraction.

<u>Estimate of firing temperatures</u>
Medium to high. Matrix is becoming largely isotrope, calcite has completely decomposed.

<u>Remarks</u>
Orientation of organic inclusions seems to be related to the shaping method.

LOCAL SABI ABYAD CLAYS
Thin-sections – Group A2a

Sample no. **14**
Field no. H7 3-7:7
Level 4
Shape type 111 carinated bowl rim
Illustration fig. D.21

Field description:
Ware H (organic inclusions and calcite).
Fired at a medium temperature in an oxidizing atmosphere.

Thin-section description:

Matrix
Calcareous clay containing iron. Fine-grained calcite in silt fraction mixed evenly in the matrix, but not that much. Dark red-brown anisotrope matrix. At the surface of the sherd, a zone of 0.35 mm is a deeper dark-green and more isotrope. This is visible in the sherd as a cream outer-surface colour as opposed to the red inner colour (visible towards the upper left of the thin-section in fig. D.21). This effect is most probably due to the migration of salts during the drying of the pottery. Salt then acted as a flux at the surface of the sherd, sintering the clay more easily than at the core.

Organic inclusions
Approximately 15% or fewer, fine organic fibres. Most of them have a triangular shape (these could be the sections of more longitudinal shapes, oriented parallel to the sherd surface due to the wheel throwing), up to 1 mm long. Longitudinal fibres are few and concentrated at the core of the sherd, and up to 1.5 mm long. Hardly any charred skeletons of organic inclusions remain in the voids.

Mineral inclusions
Generally fine mineral inclusions, mixed evenly through the matrix. Approximately 20% including voids left by organic inclusions. Mineral inclusions were most probably present in the natural clay, not added by the potter.

Many rounded or oval cryptocrystalline calcite grains in coarse and fine-sand fraction (up to 0.5 mm but many are smaller), some retaining a bit of their original crystal shape. All calcite has decomposed. There is hardly any redepostion of secondary calcite at the edges of voids.

Iron oxides in fine-sand and silt fraction are evenly spread in the matrix. Many angular quartz grains in coarse and fine-sand fraction, up to 0.4 mm. A medium amount of mica (muscovite, biotite?) in fine-sand fraction. A few angular chert particles in coarse and fine-sand fraction (up to 0.35 mm) and radiolarite chert particles in fine-sand fraction (up to 0.1 mm in diameter). A few feldspar (plagioclase) particles in fine-sand fraction. A few rock fragments in coarse and fine-sand fraction (up to 0.3 mm). A few hornblende grains in fine-sand fraction. Very few epidote (?) grains in fine-sand fraction, up to 0.1 mm.

Estimate of firing temperatures
Medium. Matrix is still largely anisotrope, but all calcite has decomposed. Mica is still present in rather large amounts.

Remarks
Gypsum minerals are building at the edges of voids left by organic inclusions and decomposed calcite. This is probably related to the deposition in the soil, or to contact with gypsum for the reparation of cracks by the potter (see Chapter V).

LOCAL SABI ABYAD CLAYS
Thin-sections – Group A2a

Sample no.	**16**
Field no.	M13 2-30: P93-184
Level	6
Shape	type 113 bowl, burnished and decorated with white-filled impressions
Illustration	fig. D.22; IV.17.b

Field description:
Ware J (organic inclusions and fine sand)
Fired at a medium temperature in a reducing atmosphere.

Thin-section description:

Matrix
Calcareous clay containing iron. A lot of fine-grained calcite in silt fraction mixed evenly through the matrix. Brownish, anisotrope matrix.

Organic inclusions
A few, approximately 10% or fewer, fine organic fibres. Longitudinal shapes up to 0.625 mm long and smaller, as well as triangular shapes up to 0.75 mm long (as visible at the top of the thin-section on fig. D.22). Hardly any charred skeletons of charred fibres remain in the voids. Around voids at the core carbon has deposited, but not so much around voids near the surface of the sherd.

Mineral inclusions
Generally fine non-plastic inclusions, evenly distributed through the matrix. Approximately 30% or less, including the voids left by organic inclusions. Mineral inclusions were most probably present in the natural clay, not added by the potter.

The fabric is dominated by the fine-grained calcite mixed through the matrix. Calcite is also present as very many crystalline or micro-crystalline angular, geometrically-shaped or more rounded particles, in coarse and fine-sand fraction up to 0.5 mm. Also a few curved calcite microfossils. All calcite is still primary, decomposition has not yet started.

Iron oxides in fine-sand and silt fractions are mixed through the matrix. They are less apparent because there is so much fine-grained calcite present. Many angular particles of quartz, in fine-sand and sometimes coarse-sand fraction (up to 0.25 mm). A medium amount of mica (muscovite?) in fine-sand fraction up to 0.12 mm long (lengthy thin bright blue/violet particles, for example near the centre of the thin-section in fig. D.22). A few feldspar (plagioclase) grains in fine-sand fraction. A few angular or irregular chert particles in coarse and fine-sand fraction up to 0.3 mm. A few rock fragments in coarse and fine-sand fraction (up to 0.3 mm). A few epidote and hornblende particles in fine-sand fraction (up to 0.05 mm).

Estimate of firing temperatures
Low. Matrix is still anisotrope, and decomposing of calcite has not yet started. Mica is still abundant and colourful under xpl. The dark brown colour of the sherd could thus have been created by a low firing temperature and an incompletely oxidizing atmosphere, and not necessarily by a reducing firing atmosphere. Moreover, a reducing atmosphere would probably have quickened the decomposition of calcite (Rice 1987: 98).

Remarks
The incisions made for the decoration show no traces of a white inlay in the thin-section.

LOCAL SABI ABYAD CLAYS
Thin-sections – Group A2a

Sample no.	**17**
Field no.	I7 3-19: 4
Level	4
Shape	type 112 carinated bowl rim.
Illustration	fig. D.23

Field description:
Ware H (organic inclusions and calcite).
Fired at a high temperature and in an oxidizing atmosphere.

Thin-section description:

Matrix
Calcareous clay containing iron. Fine-grained secondary calcite mixed through the matrix and forming cloudy stains at the core of the sherd. Dark olive-grey-green matrix, largely isotrope. Towards the surface of the sherd the matrix is darker green and does not contain as much cloudy calcite (visible towards the bottom right of the thin-section in fig. D.23).

Organic inclusions
Approximately 10% fine organic fibres. Mostly triangular and oval shapes up to 0.75 mm long, perhaps because the fibres are oriented along with the surface of the sherd due to the wheel-throwing technique, and we are looking at the sections. Hardly any charred skeletons of fibres remaining in the voids.

Mineral inclusions
Generally small non-plastic inclusions, mixed evenly in the matrix. Approximately 20% including voids left by organic inclusions. Mineral inclusions were most probably present in the natural clay, not added by the potter.

Fabric is dominated by the fine-grained secondary calcite clouding. A few larger cryptocrystalline calcite grains are preserved, in fine-sand fraction. All calcite has decomposed, some leaving voids.

Iron oxides in fine sand and silt fraction mixed with the matrix. Many angular quartz particles in fine-sand fraction. A few angular and rounded chert grains in fine and coarse-sand fraction (up to 0.25 mm). A few mica particles in fine-sand fraction, losing its brilliance (blue colours disappeared under xpl). A few rock fragments in coarse and fine-sand fraction, up to 0.3 mm. A few hornblende grains in fine-sand fraction. A few small pyroxene particles in silt fraction. Very few epidote (?) and feldspar (plagioclase) particles in fine-sand fraction.

Estimate of firing temperatures
High. Matrix is largely isotrope, calcite has decomposed. Secondary calcite is present in clouds. Mica has lost its brilliance.

Remarks
Orientation of organic inclusions seems to be related to the shaping method.

LOCAL SABI ABYAD CLAYS
Thin-sections – Group A2a

Sample no. **18**
Field no. I7 10-28:2
Level 4
Shape type 111 carinated bowl rim.
Illustration fig. D.24

Field description:
Ware I (organic inclusions and calcite and sand).
Fired at a medium temperature in an incompletely oxidizing atmosphere.

Thin-section description:

Matrix
Calcareous clay containing iron. Fine-grained calcite in silt fraction mixed evenly through the matrix. Dark brown to grey-green-brown largely anisotrope matrix. Towards the surface of the sherd, especially on the inside of the sherd, the fine-grained calcite forms a thin band below a slightly more isotrope surface. This has created a lighter surface colour and is probably due to the effects of the migration of salts to the surface during drying (visible at the top of the thin-section in fig. D.24).

Organic inclusions
Approximately 20% fine organic fibres, more than usual. Both triangular, 0.875 mm long, as well as longitudinal thin straight or thick curved fibres up to 1.5 mm long. One very large piece of 2.75 mm. Also some more irregularly-shaped voids, perhaps also from air bubbles. No charred skeletons of organic fibres have remained in the voids. Around the voids at the core of the sherd carbon has deposited.

Mineral inclusions
Generally small non-plastic inclusions, mixed evenly with the matrix. Mineral inclusions were most probably present in the natural clay, not added by the potter.

Very many calcite particles, both in crystalline and in micro-crystalline form, angular as well as more rounded, in coarse and fine-sand fractions up to 0.6 mm but mostly smaller. At the core primary calcite is preserved, at the surface the calcite has started to decompose.

Iron oxides in fine-sand and silt fraction mixed with the matrix. Many angular quartz inclusions in fine-sand fraction. A medium amount of mica (muscovite? Biotite?) in fine-sand fraction up to 0.15 mm long, bright blue colours under xpl are still preserved. A few rounded chert grains in fine-sand fraction. A few rock fragments in fine-sand fraction. A rare serpentinite (?) inclusion of 0.3 mm in size. A few feldspar (plagioclase) grains in fine-sand fraction. A few hornblende and epidote grains in fine-sand fraction up to 0.05 mm.

Estimate of firing temperatures
Low to medium. The matrix is still largely anisotrope, and calcite has started to decompose only at the surface.

Remarks
Gypsum minerals are building at the edges of voids left by organic inclusions. This is probably related to the deposition in the soil, or to contact with gypsum for the reparation of cracks by the potter (see Chapter V).

LOCAL SABI ABYAD CLAYS
Thin-sections – Group A2a

Sample no.	**21**
Field no.	I7 10-23:3
Level	4
Shape	type 322 large jar rim.
Illustration	fig. D.25

Field description:
Ware H (organic inclusions and calcite).
Fired at a high temperature, in an oxidizing atmosphere.

Thin-section description:

Matrix
Calcareous clay containing iron. Fine-grained calcite in silt fraction has mostly molten into the matrix and is less well visible. Matrix is olive-grey-green, largely isotrope. At the inside surface of the sherd the matrix is a little more reddish.

Organic inclusions
Approximately 10% fine organic fibres. Mostly thick and curved longitudinal shapes up to 1.25 mm long and triangular shapes of 0.75 mm long. A few thin longitudinal shapes. This is perhaps because fibres show a preferred orientation along the surface of the sherd due to the wheel throwing. Some more irregular voids are present as well. No charred skeletons of organic fibres left in the voids.

Mineral inclusions
Generally small non-plastic inclusions, mixed evenly with the matrix. Approximately 20% including voids left by organic inclusions. Mineral inclusions were most probably present in the natural clay, not added by the potter.

Some larger particles of calcite up to 1 mm long, but many rounded or oval calcite grains in coarse and fine-sand fraction (up to 0.3 mm). All calcite has decomposed, leaving many voids. Only at the inside surface of the sherd, some redepostion of secondary calcite has taken place at the edges of voids.

Iron oxides in fine-sand and silt fraction are mixed through the matrix. Iron oxides also seem to concentrate in cloudy stains around voids, creating the illusion of reddish particles in the fresh fracture of the sherd (as visible at the top of the thin-section in fig. D.25). Many angular quartz particles in fine-sand fraction. A few mica grains in fine-sand fraction, golden-brown colours under xpl dominate. A few chert grains in fine-sand fraction, up to 0.1 mm. A few rock fragments in fine-sand fraction up to 0.25 mm. A few feldspar (plagioclase) grains in fine-sand fraction, up to 0.04 mm. A few hornblende and pyroxene grains in fine-sand fraction up to 0.04 mm. Very few epidote particles in fine-sand fraction.

Estimate of firing temperatures
High. Matrix is isotrope, all calcite has decomposed, and finer-grained calcite has started to melt into the matrix. Mica is losing its brilliance under xpl. Iron oxides cloud around the edges of voids.

Remarks
Orientation of organic inclusions seems to be related to the shaping method.

LOCAL SABI ABYAD CLAYS
Thin-sections – Group A2a

Sample no.	**22**
Field no.	I7 3-24:3
Level	4
Shape	type 111 carinated bowl.
Illustration	fig. D.26

Field description:
Ware I (organic inclusions and calcite and sand).
Fired at a medium temperature in an oxidizing atmosphere.

Thin-section description:

Matrix
Calcareous clay containing iron. A lot of fine-grained calcite in silt fraction is mixed evenly through the whole matrix. Beige-brown anisotrope, homogeneous matrix.

Organic inclusions
Approximately 15% or fewer, fine organic fibres. Mostly thick curved longitudinal shapes up to 1.25 mm long, and triangular-shaped inclusions up to 0.75 mm long. This is perhaps because fibres show a preferred orientation along the surface of the sherd due to the wheel throwing. Few thin longitudinal ones and few irregular voids, among which two heart-shaped voids. No charred skeletons of organic inclusions left in the voids.

Mineral inclusions
Generally small non-plastic inclusions, mixed evenly with the matrix. Approximately 25% including voids left by organic inclusions. Mineral inclusions were most probably present in the natural clay, not added by the potter.

Many crystalline and micro-crystalline primary calcite grains in rounded as well as more angular shapes, in coarse and fine-sand fractions up to 0.3 mm. Also some curved microfossils or shell fragments, up to 0.2 mm. Most calcite is primary, only at the very edge of the sherd some decomposition occurs. No redepostion of secondary calcite.

Iron oxides in fine-sand and silt fraction are mixed through the matrix. A medium amount of angular quartz particles in fine-sand fractions up to 0.25 mm. A medium amount of mica in fine-sand fraction up to 0.1 mm long, bright blue-pink colours under xpl still present. A few feldspar (plagioclase) grains in fine-sand fraction up to 0.15 mm. A few rounded or oval chert particles in fine-sand fraction. A few rock fragments of fine-sand fraction. A few hornblende grains in fine-sand fraction up to 0.15 mm. A few epidote grains in fine-sand fraction up to 0.06 mm. A possible grain of chlorite (?), 0.04 mm.

Estimate of firing temperatures
Low. Matrix is still anisotrope, calcite has only just started to decompose at the surface of the sherd.

Remarks
Orientation of organic inclusions seems to be related to the shaping method.
Gypsum minerals are building in voids at the surface of the sherd. This is probably related to the deposition in the soil, or to contact with gypsum for the reparation of cracks by the potter (see Chapter V).

LOCAL SABI ABYAD CLAYS
Thin-sections – Group A2a

Sample no.	**26**
Field no.	K9 47-169:2
Level	4
Shape	type 111 carinated bowl.
Illustration	fig. D.27; IV.99.ae

Field description:
Ware I (organic inclusions and calcite and sand), some larger calcite inclusions up to 1 mm.
Fired at a medium temperature in an oxidizing atmosphere.

Thin-section description:

<u>Matrix</u>
Calcareous clay containing iron. Fine-grained secondary calcite in silt fraction mixed through the matrix, and forming clouds around voids left by decomposed calcite. Below the surface of the sherd, secondary calcite has built a 0.25 mm thin band (visible at the top right corner of the thin-section in fig. D.27). The matrix is dark olive-brown, largely isotrope. At the surface of the sherd, the matrix is greener and more isotrope, and less secondary calcite is present here. This is probably due to the effects of the migration of salts to the surface during drying.

<u>Organic inclusions</u>
Approximately 10% or fewer, fine organic fibres. Mostly thick curved longitudinal ones of up to 1 mm long, and triangular shapes up to 0.75 mm long (two triangular shapes visible at the bottom of the thin-section in fig. D.27). This is perhaps because fibres show a preferred orientation along the surface of the sherd due to the wheel throwing. Few thin longitudinal fibres. Hardly any charred skeletons of fibres left in the voids.

<u>Mineral inclusions</u>
Generally small non-plastic inclusions, mixed evenly with the matrix. Approximately 20% including voids left by organic inclusions. Mineral inclusions were most probably present in the natural clay, not added by the potter.

A few cryptocrystalline calcite grains are still preserved in fine-sand fraction. Most calcite grains of fine and coarse-sand fraction up to 0.6 mm have disappeared, all calcite has decomposed. Sometimes voids retain the original rhomboid crystal shape. Redepostion of secondary calcite at the edges of voids has only started near the surface of the sherd.

Iron oxides in fine-sand and silt fraction are mixed through the matrix. Very many quartz grains of fine-sand fraction up to 0.25 mm but mostly smaller, around 0.06 mm. A medium amount of mica in fine-sand fraction (up to 0.06 mm), but colours are not so brilliant anymore under xpl. A few rock fragments in fine-sand fraction. A few rounded chert particles in fine-sand fraction. A few feldspar (plagioclase) grains in fine-sand fraction (up to 0.05 mm). A few pyroxene grains in fine-sand fraction (up to 0.04 mm). A few hornblende grains in fine-sand fraction (up to 0.05 mm).

<u>Estimate of firing temperatures</u>
Medium-high. A largely isotrope matrix and the complete decomposition of calcite point to higher temperatures. Micas are still abundant but the colours are less brilliant.

<u>Remarks</u>
Orientation of organic inclusions seems to be related to the shaping method.
Gypsum minerals are building in voids at the surface of the sherd. This is probably related to the deposition in the soil, or to contact with gypsum for the reparation of cracks by the potter (see Chapter V).

LOCAL SABI ABYAD CLAYS
Thin-sections – Group A2a

Sample no.	**29**
Field no.	K9 47-66:3
Level	4
Shape	type 113(?) bowl rim.
Illustration	fig. D.28; IV.100.v

Field description:
Ware I (organic inclusions and calcite and sand).
Fired at medium temperatures, in an incompletely oxidizing atmosphere.

Thin-section description:

<u>Matrix</u>
Calcareous clay containing iron. Fine-grained calcite in silt fraction is evenly mixed through the matrix. Around voids at the surface of the sherd secondary fine grains of calcite start to cloud, as well as in a 0.1 mm thin zone at the surface of the sherd. Dark olive-green-brown, not very isotrope, homogeneous matrix. At the surface of the sherd the matrix has become a bit greener and more isotrope, possibly due to the effects of salts migrating to the surface of the sherd, but the effect is minor.

<u>Organic inclusions</u>
Approximately 20% or fewer, fine organic fibres. Mostly longitudinal curved thicker fibres up to 1 mm long, and triangular particles up to 0.75 mm long. Fewer thin longitudinal fibres up to 1 mm long. Hardly any charred skeletons of organic inclusions left in the voids.

<u>Mineral inclusions</u>
Generally small non-plastic inclusions, mixed evenly with the matrix. Approximately 40% including voids left by organic inclusions? Mineral inclusions were most probably present in the natural clay, not added by the potter.

Very many cryptocrystalline calcite grains in fine and coarse-sand fractions, up to 0.5 mm. Oval or slightly angular in shape. One very big inclusion of 3.75 mm at the surface of the sherd. All calcite has decomposed, and particles appear yellow or greyish blue in xpl. Redepostion of secondary calcite has started in clouds around voids, at the edges inside many voids and in a zone at the surface of the sherd.

Iron oxides in fine-sand and silt fraction are mixed through the matrix. Many angular quartz grains in fine-sand fraction. A medium amount of mica in fine-sand fraction, but largely losing its brilliance under xpl. A few rock fragments in fine-sand fraction. A few feldspar (plagioclase) grains in fine-sand fraction, up to 0.1 mm. A few rounded and angular chert grains in fine-sand fraction. A few hornblende, epidote and pyroxene grains in fine-sand fraction, up to 0.04 mm.

<u>Estimate of firing temperatures</u>
Medium. Matrix is not very isotrope, but calcite has completely decomposed. Mica is still abundant but has lost its brilliant colours under xpl, indicating that temperatures tend towards high.

LOCAL SABI ABYAD CLAYS
Thin-sections – Group A2a

Sample no.	**31**
Field no.	L12 29-120: P93-311
Level	5?
Shape	type 611 pot stand, total kiln waster
Illustration	fig. D.29

Field description:
Ware I (organic inclusions and calcite and sand).
Fired at very high temperatures (over fired), totally warped crumbly fabric, fired in an oxidizing atmosphere.

Thin-section description:

Matrix
Calcareous clay containing iron. Fine-grained secondary calcite in silt fraction still preserved in the matrix, evenly mixed. Very dark grey-green, isotrope and glassy matrix.

Organic inclusions
Approximately 10% fine organic fibres. Long thin ones up to 2 mm long, some triangular ones up to 0.75 mm, and several more irregularly-shaped voids left by organic inclusions. No charred skeletons of organic fibres left in the voids.

Mineral inclusions
Originally probably mostly small non-plastic inclusions, mixed evenly with the matrix. Mineral inclusions were most probably present in the natural clay, not added by the potter. Not many mineral inclusions left.

Larger calcite particles have decomposed and disappeared, leaving small voids. Secondary calcite has built along the edges of voids. Iron oxides are mostly molten into the matrix, some dark non-translucent particles in fine-sand fraction are still preserved. A medium amount of angular quartz particles in fine-sand fraction up to 0.2 mm. A few feldspar and rock fragments in fine-sand fraction. A few or very few epidote and hornblende grains in very fine-sand fraction up to 0.05 mm. A few and very small mica fragments.

Estimate of firing temperatures
Very high, too high. The matrix is completely glassy and isotrope, calcite has disappeared and also mica has started to disappear.

LOCAL SABI ABYAD CLAYS
Thin-sections – Group A2a

Sample no.	**47**
Field no.	K10 61-132:19
Level	7
Shape	type 315 jar rim.
Illustration	fig. D.30; IV.8.d

Field description:
Ware I (organic inclusions and calcite and sand).
Fired at a medium temperature, in a mostly reducing atmosphere. Fracture is almost completely grey, only the surface is lighter.

Thin-section description:

Matrix
Calcareous clay containing iron. Fine-grained calcite in silt fraction mixed evenly through the whole matrix. Olive-green-brown, largely anisotrope matrix. At the surface of the sherd a thin layer of 0.1 mm thick is more isotrope and a bit greener, and seems to contain more fine-grained calcite particles. The rest of the matrix is very dark due to carbon deposition around the voids left by organic inclusions.

Organic inclusions
Approximately 20% or fewer, fine organic fibres. Rather a lot of organic inclusions compared to the other sherds. The thin-section was cut obliquely to the plane of the rim, thus revealing more longitudinal and longer inclusions than in perpendicular thin-sections. Very long thin straight fibres up to 5 mm long, triangular-shaped inclusions up to 0.75 mm long, shorter and very thin fibres up to 1.25 mm long and thicker curved ones up to 1.25 mm long. Some charred skeletons of organic inclusions are preserved in the voids: not all carbon has burnt away. The lighter surface colour of the sherd is due mainly to the burning away of the carbon deposits around the voids, and not to a salt effect as is sometimes the case with other sherds.

Mineral inclusions
Some larger but generally small non-plastic inclusions, mixed evenly with the matrix. Approximately 35% including voids left by organic inclusions. Mineral inclusions were most probably present in the natural clay, not added by the potter.

Many oval and rounded particles of cryptocrystalline calcite, in coarse and fine-sand fractions up to 0.6 mm. Some are cryptocrystalline aggregates including tiny particles of quartz and other minerals. Most are primary, but decomposition of calcite has started at the surface of the sherd. A few rounded and more angular crystalline primary calcite in fine-sand fraction, as well as a few curved parts of shells or calcite of biogene origin (microfossils), up to 0.4 mm long.

Iron oxides in silt and fine-sand fraction are mixed evenly through the matrix. Many angular quartz inclusions of coarse and fine-sand fraction up to 0.3 mm, also in more microcrystalline form. A few to medium amount of rock fragments, different kinds, in fine and coarse-sand fraction up to 0.35 mm. A few chert particles in fine-sand fraction up to 0.25 mm. A few feldspar (plagioclase) grains in silt to fine-sand fraction up to 0.03 mm. A few epidote and pyroxene grains in fine-sand fraction, rather large compared with other sherds, up to 0.18 mm. A few mica grains in fine-sand fraction up to 0.07 mm. A few hornblende grains in fine-sand fraction.

Estimate of firing temperatures
Low to medium. Matrix largely isotrope, decomposition of calcite has started on the surface. The sherd was probably fired in a mostly reducing atmosphere, with a short oxidizing period at the end colouring the surface light reddish.

LOCAL SABI ABYAD CLAYS
Thin-sections – Group A2b (fine wares)

Sample no.	**09**
Field no.	I7 10-30:9
Level	4
Shape	type 712 goblet base
Illustration	fig. D.31

Field description:
Ware A (fine calcite inclusions).
Fired at a high temperature in an oxidizing atmosphere.

Thin-section description:

<u>Matrix</u>
Calcareous clay containing iron. Fine-grained secondarily-built calcite is spread through the matrix in cloudy concentrations. Matrix is dark grey-olive-green and isotrope, glassy. Small voids have been caused by the disappearance of calcite and are rounded or irregular in shape, up to 0.75 for the longitudinal ones.

<u>Mineral inclusions</u>
Generally fine mineral inclusions, approximately 20%. Apart from quartz and calcite inclusions, other mineral inclusions are very small. Mineral inclusions were certainly part of the natural clay, not added by the potter.

All calcite has decomposed. Calcite is only visible as secondarily redeposited calcite in cloudy concentrations in the matrix and around voids of former calcite inclusions (in fine-sand fraction up to 0.25 mm). Just below the outer surface of the sherd calcite is concentrated more strongly in a milky-way type zone of around 0.125 mm thick (running through the middle of the thin section in fig. D.31, the surface of the sherd is at the bottom of the thin section).

Iron oxides are present in silt and fine-sand fraction. Iron oxides are also concentrated together with the secondary calcite around voids, creating orange “rims” around the voids (on the right of the thin section in fig. D.31). Very many very fine quartz grains, mostly in fine-sand fraction up to 0.075 mm and smaller, but also some grains up to 0.25 mm. A few small mica fragments in fine-sand fraction, they have lost their bright blue-pink colours completely under xpl. A few rock fragments in fine-sand fraction. Very few small chert particles in fine-sand fraction up to 0.07 mm.

<u>Estimate of firing temperatures</u>
High. Matrix is isotrope and calcite has decomposed completely, redeposited around voids and in cloudy concentrations. Iron oxides concentrate around voids as well. Mica has lost its brilliance under xpl.

LOCAL SABI ABYAD CLAYS
Thin-sections – Group A2b (fine wares)

Sample no.	**10**
Field no.	I7 10-31:10
Level	4
Shape	type 421 s-shaped goblet rim
Illustration	fig. D.32

Field description:
Ware A (fine calcite inclusions)
Fired at a medium temperature in an oxidizing atmosphere.

Thin-section description:

Matrix
Calcareous clay containing iron. Fine-grained calcite in silt fraction mixed evenly through the sherd. Matrix is largely anisotrope, greenish-red-brown in colour. Towards the surface of the sherd, the colour becomes slightly more reddish (the surfaces of the sherd are in the left upper and right lower corner of the thin-section in fig. D.32). Some small voids are present, perhaps air bubbles or burnt-out occasional organic inclusions.

Mineral inclusions
Very fine non-plastic inclusions, evenly distributed through the matrix. Approximately 15%. Certainly part of the natural clay, not added by the potter.

Many cryptocrystalline calcite inclusions, some up to 0.6 mm but most are smaller in fine-sand fraction up to 0.2 mm. Some have retained their original crystal rhombohedric shape, but all are decomposed. Decomposition is stronger towards the surface of the sherd.

Iron oxides in silt and fine-sand fractions are evenly mixed through the matrix. Very many angular quartz particles in fine and coarse-sand fractions up to 0.3 mm. A few feldspar (plagioclase) grains in fine-sand fraction up to 0.06 mm. A few rock fragments in fine and coarse-sand fractions up to 0.3 mm. A few radiolarite and angular chert fragments in fine-sand fraction. A few mica (muscovite?) grains in fine-sand fraction, yellow-pink under xpl. A few epidote and hornblende grains, rather small up to 0.05 mm.

Estimate of firing temperatures
Medium. Matrix is largely anisotrope, but calcite has decomposed.

LOCAL SABI ABYAD CLAYS
Thin-sections – Group A2b (fine wares)

Sample no.	**15**
Field no.	I7 10-35:1
Level	mixed 4/5
Shape	type 421 s-shaped goblet rim.
Illustration	fig. D.33

Field description:
Ware B (fine calcite and sand).
Fired at a medium temperature in an oxidizing atmosphere.

Thin-section description:

<u>Matrix</u>
Calcareous clay containing iron. Fine-grained secondary calcite is spread in cloudy concentrations in the matrix. Dark olive-grey-green matrix, isotrope. Occasionally small voids left by decomposed calcite inclusions or occasional small organic inclusions. Longitudinal irregular voids tend to be oriented parallel to the surface of the sherd.

<u>Mineral inclusions</u>
Generally fine non-plastic inclusions but including some larger particles, evenly distributed through the matrix. Approximately 30%. Certainly part of the natural clay, not added by the potter.

Very many cryptocrystalline, rounded or oval calcite grains were present in the matrix, in fine and coarse-sand fractions occasionally up to 0.8 mm. All have decomposed. Fine-grained secondary calcite has redeposited in cloudy concentrations under the surface of the sherd in two zones of approximately 0.3 mm, while redepostion is less apparent at the very surface and at the core (visible at the upper right and lower left corners of the thin-section in fig. D.33). Redepostion also took place in and around the voids of former inclusions, together with an enrichment of iron oxides creating an orange edge around the void.

Iron oxides in silt and fine-sand fraction are still visible mixed with the matrix. Also in a few oval aggregates. Very many angular quartz particles in fine-sand fraction up to 0.15 mm. A medium amount of hornblende, small (up to 0.04 mm) but relatively much in comparison to other sherds. A few chert particles in fine-sand fraction. A few mica grains in fine-sand fraction, golden yellow under xpl. A few rock fragments in fine-sand fraction. Very few feldspar (plagioclase) particles in fine-sand fraction up to 0.04 mm.

<u>Estimate of firing temperatures</u>
High. Matrix is isotrope, calcite is only present in secondary form, and mica has lost its brilliance under xpl.

<u>Remarks</u>
A relatively large amount of calcite, quartz and hornblende inclusions may suggest a slightly different origin for this sample?

LOCAL SABI ABYAD CLAYS
Thin-sections – Group A2b (fine wares)

Sample no. **24**
Field no. L12 21-73:26
Level 5
Shape type 711 goblet nipple base
Illustration D.34

Field description:
Ware B (fine calcite and sand)
Fired at a medium temperature in an incompletely oxidizing atmosphere.

Thin-section description:

Matrix
Calcareous clay containing iron. Fine-grained calcite in silt fraction is mixed through the whole sherd. Matrix is largely anisotrope. At the core the matrix is greenish brown, becoming more reddish brown towards the surface of the sherd. On the inside surface of the sherd there is a small band of secondary calcite clouding about 0.25 mm wide, after which the matrix is dark brown and more isotrope (the inside surface of the sherd is visible in the top part of the thin-section in fig. D.34). Perhaps this is due to the effect of salt in the clay, or to variations in firing temperatures and atmospheres. This zoning is also clearly visible macroscopically in the sherd and led to the description of the incompletely oxidizing atmosphere. Some irregularly-shaped voids with fringed edges are possibly due to air bubbles in the clay.

Mineral inclusions
Generally fine non-plastic inclusions but including some larger particles, evenly distributed through the matrix. Approximately 30%. Certainly part of the natural clay, not added by the potter.

Very many cryptocrystalline and crystalline particles of calcite, rounded in shape and in fine and coarse-sand fractions up to 0.4 mm. Also some curved fragments of shell or microfossils, around 0.15 mm. Towards the surface of the sherd calcite has started to decompose.

Iron oxides in silt and fine-sand fraction are mixed evenly with the matrix. Many angular quartz particles in fine and coarse-sand fractions up to 0.3 mm. A medium amount of mica (muscovite?) in fine-sand fraction up to 0.05 mm, partly retaining the bright blue-pink colours under xpl. A few rounded or oval chert particles in fine-sand fraction. A few rock fragments in fine-sand fraction. A few feldspar (plagioclase) particles in fine-sand fraction up to 0.06 mm. A few hornblende grains in very small fine-sand fraction up to 0.03 mm. Very few epidote and pyroxene grains in fine-sand fraction up to 0.15 mm.

Estimate of firing temperatures
Low to medium. Matrix is largely anisotrope, calcite has begun to decompose only at the surface.

LOCAL SABI ABYAD CLAYS
Thin-sections – Group A2b (fine wares)

Sample no. **25**
Field no. L12 21-73:23
Level 5
Shape type 711 goblet nipple base.
Illustration fig. D.35

Field description:
Ware A (fine calcite)
Fired at a medium temperature in an oxidizing atmosphere.

Thin-section description:

Matrix
Calcareous clay containing iron. Not too much fine-grained calcite in silt fraction spread in the matrix. Dark reddish-brown, mostly anisotrope matrix. Rather compact fabric with only a few voids smaller than 0.25 mm.

Mineral inclusions
Generally fine non-plastic inclusions, evenly distributed through the matrix. Approximately 20%. Certainly part of the natural clay, not added by the potter.

Very many rounded or oval but also some angular calcite particles, mostly cryptocrystalline but also a few crystalline ones. Most are primary but decomposition has started in many places.

Iron oxides in silt and fine-sand fraction are mixed through the matrix, sometimes forming cloudy concentrations. Very many small angular quartz particles, some up to 0.25 mm but most are smaller, up to 0.1 mm. A few feldspar inclusions in fine-sand fraction up to 0.05 mm. A few angular and rounded chert particles in fine-sand fraction up to 0.1 mm. A few rock fragments in fine-sand fraction. A few hornblende grains in fine-sand fraction up to 0.15 mm. A few mica grains in fine-sand fraction. A few epidote and pyroxene particles in fine-sand fraction up to 0.05 mm.

Estimate of firing temperatures
Low to medium. Matrix is largely anisotrope, decomposition of calcite has started but is not complete.

LOCAL SABI ABYAD CLAYS
Thin-sections – Group A2b (fine wares)

Sample no.	**40**
Field no.	K10 61-131:1
Level	7
Shape	small type 314 jar rim with "Nuzi"-style decoration
Illustration	fig. D.36; IV.8.b

Field description:
Ware A (fine calcite inclusions)
Fired at medium temperatures in an oxidizing atmosphere.

Thin-section description:

<u>Matrix</u>
Calcareous clay containing iron. Fine-grained calcite grains in silt fraction mixed through the matrix, more at the core and less towards the surface of the sherd. Just below the inner surface of the sherd, a thin zone (0.2 mm) of clouding secondary calcite grains has started to form. Dark olive-green, not very isotrope, homogeneous matrix. At the inner surface of the sherd the matrix is greener and more isotrope (the surfaces of the sherd are towards the the lower right and upper left corners of the thin-section in fig. D.36). Some voids from air bubbles and small rounded voids from decomposed calcite inclusions.

<u>Mineral inclusions</u>
Generally fine non-plastic inclusions apart from some larger calcite grains, evenly distributed through the matrix. Approximately 15%. Certainly part of the natural clay, not added by the potter.

A medium amount of oval or rounded, cryptocrystalline calcite particles in fine to coarse-sand fraction up to 0.5 mm but mostly smaller. All have decomposed, some have disappeared and left voids. Redepostion of secondary calcite is present at the edges of voids.

Iron oxides in silt and fine-sand fractions are spread through the whole matrix. Many angular quartz particles in fine-sand fraction up to 0.25 mm. Medium amount of mica in fine-sand fraction up to 0.05 mm, it has largely lost its blue-pink colours under xpl. A few radiolarite and angular chert particles, rather small up to respectively 0.08 and 0.03 mm. A few rock fragments in fine-sand fraction. A few feldspar (plagioclase) particles in fine-sand fraction up to 0.04 mm. A few hornblende grains in fine-sand fraction up to 0.04 mm.

<u>Estimate of firing temperatures</u>
Rather high. Matrix is not completely isotrope, but all calcite has decomposed and mica seems to have lost its brilliant colours.

<u>Remarks</u>
The reddish painted bands in "Nuzi"-style are visible in the thin-section only as a thin zone of more iron-rich, dark reddish-brown matrix at the surface of the sherd. The paint has fused with the matrix and no longer forms a separate layer.

Possibly there is some deposition of gypsum crystals in the voids, most probably related to post-depositional processes.

LOCAL SABI ABYAD CLAYS
Thin-sections – Group A2b (fine wares)

Sample no.	**43**
Field no.	K10 47-110:1
Level	7
Shape	type 721 goblet pedestal base with "Nuzi"-style decoration
Illustration	fig. D.37; IV.10.e

Field description:
Ware A (fine calcite inclusions)
Fired at a high (too high) temperature in an oxidizing atmosphere.

Thin-section description:

Matrix
Calcareous clay containing iron. Fine-grained calcite in silt fraction has mostly disappeared or fused with the matrix. A few cloudy concentrations are still visible. Matrix is deep grey-olive-green, isotrope and glassy and homogeneous. Small voids have been left by decomposed calcite. The fabric seems to be very compact.

Mineral inclusions
Generally fine non-plastic inclusions apart from some larger calcite grains, evenly distributed through the matrix. Approximately 10%. Certainly part of the natural clay, not added by the potter.

A medium amount of rounded and oval particles of calcite was present, in fine and occasionally coarse-sand fraction up to 0.5 mm, but they have mostly disappeared. All calcite has decomposed. Redepostion of secondary calcite is present around voids, also containing iron oxides building an orange edge around the void (visible at the top of the thin-section in fig. D.37). Redepostion of secondary calcite is also present inside some voids.

Iron oxide in silt fraction still mixed in the matrix, and concentrated in rings around voids left by former calcite grains. Many small angular quartz particles in fine-sand fraction. A few feldspar (plagioclase) particles in fine-sand fraction. A few radiolarite and angular chert grains in fine-sand fraction. A few mica particles in fine-sand fraction, but they have lost their brilliant blue-pink colours completely under xpl. Very few and very small hornblende and pyroxene grains in silt fraction up to 0.03 mm.

Estimate of firing temperatures
High. Matrix is glassy, all calcite has decomposed or disappeared, mica has lost its brilliance under xpl.

Remarks
The "Nuzi"-style paint is not visible at all in the thin-section, all traces of it have fused completely with the matrix.

LOCAL SABI ABYAD CLAYS ?
Thin-sections – Group A2c

Sample no.	**08** (possibly not from Sabi Abyad itself)
Field no.	L8 40-114: P97-147
Level	5
Shape	type 151 deep bowl with spout and handle. Surface completely flaking off.
Illustration	fig. D.38; IV.61.b

Field description:
Ware I (organic inclusions and calcite and sand)
Fired at a medium temperature in an oxidizing atmosphere.

Thin-section description:
<u>Matrix</u>
Calcareous clay containing iron. Many fine-grained calcite particles in silt fraction are mixed with the matrix. Dark olive-brown homogeneous anisotrope matrix. Some carbon deposition colours the matrix darker around the voids left by organic inclusions.

<u>Organic inclusions</u>
Approximately 10%, fine organic fibres. The thin-section was cut from a body sherd. The section was cut parallel to the plane of the rim. This is clearly visible in the preferred lengthwise orientation of the organic inclusions, parallel to the surface of the sherd. This is related to the wheel-throwing method of shaping. Mostly longitudinal, rather thin fibres, up to 1.75 mm long. No triangular-shaped voids were found. Hardly any charred skeletons of fibres have remained in the voids.

<u>Mineral inclusions</u>
Generally fine non-plastic inclusions, evenly distributed through the matrix. Approximately 40% including voids left by organic inclusions. Mineral inclusions present in the natural clay, not added by the potter.

Very many rounded as well as more angular, cryptocrystalline as well as crystalline primary calcite inclusions, in fine-sand and coarse-sand fractions up to 0.5 mm. It seems there are rather more calcite inclusions than normal for the sherds in this group. Decomposition of calcite has started at the surface of the sherd. Redepostion of secondary calcite (or another material?) has filled most of the voids left by organic inclusions (visible in the thin-section on fig. D.38 as bright white concretions), and is certainly due to post-depositional processes or to the use of the vessel.

Iron oxides in silt and fine-sand fraction are many and spread evenly in the matrix. Many mica inclusions, much more than in other sherds, showing a preferred orientation parallel with the sherd surface like the organic inclusions. A medium amount of angular quartz grains in fine-sand and coarse-sand fraction, up to 0.4 mm. A few to medium amount of rock fragments in fine and coarse-sand fractions up to 0.35 mm. A few chert fragments in fine-sand fraction. Very few feldspar (plagioclase) grains in fine-sand fraction. A few hornblende and epidote particles, in fine-sand fraction.

<u>Estimate of firing temperatures</u>
Low to medium. Matrix is anisotrope, and decomposition of calcite has only started at the surface of the sherd. This is perhaps also the reason for the flaking of the sherd surface?

<u>Remarks</u>
Preferred orientation of organic fibres is related to the shaping method.
Deposition of secondary calcite (or other minerals) in the voids is due to vessel use or post-depositional processes.

The relatively large amount of calcite inclusions, rock fragments and mica particles, as well as the relatively small amount of quartz inclusions might point to a slightly different location for the raw materials for this vessel. Perhaps it was not made at Sabi Abyad itself?

LOCAL BALIKH VALLEY CLAYS

Thin-sections – Group D: Local calcareous clays with coarse inclusions (cooking wares)

Group D consists of calcareous, iron containing clays with fine sand-inclusions but without volcanic rock inclusions, and could very well be local to the Balikh Valley. In contrast to Group A, the fabrics in Group D contain coarse mineral inclusions that were added on purpose by the potter. Group D contains only vessels of the “cooking-pot” type from level 7.

Group D is subdivided into two subgroups according to the different kinds of coarse temper added by the potter:

D1 With coarse calcite temper

- D1a without chaff inclusions
- D1b with chaff inclusions

D2 With crushed shell temper

LOCAL BALIKH VALLEY CLAYS
Thin-sections – Group D1a

Sample no. **35**
Field no. K10 61-132:28
Level 7
Shape type 212 cooking-pot rim.
Illustration fig. D.39; IV.5.e

Field description:
Ware E (coarse calcite). Coarse angular white and grey particles, cooking ware.
Fired at a low temperature in an oxidizing atmosphere.

Thin-section description:

Matrix
Calcareous clay containing iron. Very many fine-grained calcite particles in silt fraction mixed evenly with the matrix. Beige-brown anisotrope matrix. Some irregularly-shaped voids from air bubbles. Very rarely an organic inclusion, up to 1 mm long.

Mineral inclusions
Smaller inclusions evenly mixed with the matrix and most probably part of the natural clay. Large angular calcite inclusions were added by the potter as a temper. Approximately 30%.

Calcite is by far the predominant non-plastic inclusion. Many larger and smaller very angular or crystal-shaped grains of primary calcite, both crystalline and more micro-crystalline, in very coarse-sand fraction up to 1.75 mm and smaller (visible as angular pastel-coloured particles in the thin-section on fig. D.39). Also some curved calcite microfossil grains. All calcite is primary.

Finer non-plastic inclusions belong to the natural clay body. Iron oxides mixed through the matrix in silt and fine-sand fraction. A medium amount of quartz grains in fine-sand fraction (up to 0.1 mm). A few irregular and rounded, also radiolarite, chert grains in fine-sand fraction (up to 0.15 mm). A few feldspar grains (plagioclase) in fine-sand fraction (up to 0.06 mm), few mica particles in fine-sand fraction (up to 0.05 mm), very few epidote grains in small fine-sand fraction (up to 0.03 mm).

Estimate of firing temperatures
Low. Calcite is completely primary, matrix is anisotrope.

Remarks
It is remarkable that the fabric does not show any severe cracking, like most of the other cooking-ware samples (cf. samples 33 and 46). Perhaps this vessel broke before it had been used very often, so that no cracks from thermal shock could form?

LOCAL BALIKH VALLEY CLAYS
Thin-sections – Group D1b

Sample no. 46
Field no. K10 61-132:34
Level 7
Shape type 212 cooking-pot rim
Illustration fig. D.40, D41; IV.5.l

Field description:
Ware D (coarse sand)
Fired at a low temperature in an oxidizing atmosphere.

Thin-section description:

Matrix
Calcareous clay containing iron. Perhaps slightly less calcareous than sample 35 in Group D1. Fine-grained calcite in silt fraction is mixed evenly through the matrix. Brown, anisotrope matrix. A lot of fine cracks have formed between the inclusions, probably due to use (thermal shock) (visible in purple in the thin-section on fig. D.41).

Organic inclusions
Very few organic inclusions, around 5% at the most, perhaps not added on purpose? Some irregular longitudinal shapes, as well as triangular shapes approximately 0.75 – 1 mm long. Carbon has deposited around the voids left by the organic inclusions.

Mineral inclusions
Many inclusions, approximately 40%, in different sizes. Smaller inclusions most probably present in the natural clay, larger angular calcite particles were added as a temper by the potter.

The fabric is dominated by calcite inclusions. A medium amount of large, angular irregular or cubical/triangular crystalline and microcrystalline calcite grains in coarse-sand fraction, up to 1.5 mm. A medium amount of smaller or larger oval and rounded cryptocrystalline primary calcite grains in coarse-sand fraction (up to 0.625 mm). A few microfossils or calcite grains of biogene origin, curved and straight particles up to 0.25 mm. All calcite is primary, except for the calcite at the outer surface of the sherd where decomposition has started, to a depth of approximately 0.9 mm (decomposition of calcite is visible at the top of the thin-section in fig. D.40, where calcite has turned grey or beige. The upper edge of the large calcite grain in the middle left has also started to decompose).

Other inclusions are fine and probably part of the natural clay. Iron oxides in fine-sand fraction mixed through the matrix. A medium amount of angular quartz grains in fine-sand fraction (up to 0.06 mm). A few mica grains in fine-sand fraction (up to 0.08 mm). A few hornblende and feldspar grains (plagioclase) in fine-sand fraction (up to 0.05 mm). Very few rounded chert grains in fine to coarse-sand fraction up to 0.2 mm, and very few pyroxene particles in fine-sand fraction.

Estimate of firing temperatures
Low. Matrix is anisotrope and calcite is still preserved in primary form. The decomposition of calcite at the outer surface of the sherd may have occurred in the kiln during firing, or during cooking on the fire.

Remarks
This vessel is probably not made of the same natural clay bed as sample 35, although both may very well come from the Balikh region.

LOCAL BALIKH VALLEY CLAYS
Thin-sections – Group D2

Sample no.	**34**
Field no.	K10 61-132:35
Level	7
Shape	type 2211 cooking-pot rim.
Illustration	fig. D.42; IV.7.h

Field description:
Ware F (grog inclusions), grey particles, perhaps grog?
Fired at a medium temperature in a reducing atmosphere.

Thin-section description:

Matrix
Calcareous clay. Dark-brown matrix, anisotrope but difficult to see because of the enormous amount of inclusions. Small voids are cracks in the fabric or small air bubbles.

Mineral inclusions
The fabric is completely dominated by two kinds of calcite inclusions. One kind: rounded irregular or oval particles of beige cryptocrystalline calcite aggregate in fine and coarse-sand fraction and in gravel fraction up to 2.5 mm, including small voids, brown anisotrope inclusions and very tiny shell fragments (microfossils) up to 0.25 mm (visible mainly in the lower left corner of the thin-section on fig. D.42). The other kind: longitudinal straight particles of finely layered calcite in fine-sand and coarse-sand fraction up to 1.75 mm and up to 0.4 mm thick. Some of these particles have been cut “horizontally”, showing a finer micro-crystalline structure. These are probably fragments of crushed shells (visible mainly in the right half of the thin-section on fig. D.42). Either both or possibly only the shell have been added on purpose by the potter. All calcite is still primary.

Other finer inclusions present in the natural clay are hardly visible because of the large amounts of calcite. They include few angular particles of quartz in fine-sand fraction, few iron oxide grains in silt fraction, very few hornblende grains in silt fraction.

Estimate of firing temperatures
Low. All calcite is still primary.

Remarks
Although this clay is calcareous, it is difficult to establish whether it resembles the Sabi Abyad clays. It could be from the Balikh region, but also from elsewhere.

The determination of the inclusions as “grog” in the field is definitely wrong.

CLAYS FROM THE JEZIRA REGION, BUT PROBABLY NOT FROM THE BALIKH
Thin-sections – Group B: calcareous clays with fine inclusions, including a few volcanic rock fragments

Group B is a heterogeneous group of sherds. The fabrics of this group are in general similar to those in Group A, but the main difference is that the fabrics in Group B contain a few small fragments of volcanic rock (basalt). Since the Balikh River does not flow through regions containing volcanic rock outcrops (see the geological map of Syria, fig. V.1), it is not likely that these sherds originate from the Balikh Valley or from Sabi Abyad. However, the similarity of the fabrics with Group A suggests that these sherds do derive from the greater Jezira or north-eastern Syrian region.[238] It has to be noted that these small basalt inclusions were not visible in the fresh fracture under 10x magnification in the field, and that these sherds were therefore not recognizable in the field as imports.

Group B has been divided into several subgroups according to the composition of the sherds. Each subgroup contains only one or two samples. This is in line with the idea that the origin of these sherds is not local: they may have come from more than one place in the Jezira.

It is remarkable that all sherds in Group B are from level 7 (in which no evidence for pottery production at the site was found), except for the glazed bowl in Group B1, which is from level 5 but very uncommon in the Middle Assyrian corpus.

B1 Calcareous clay with volcanic rock inclusions and many fine chert, quartz and feldspar inclusions, with added organic inclusions.

B2 Calcareous clay with volcanic rock inclusions and a large amount of rounded calcite inclusions and “clay aggregates” (like Group A1), with added organic inclusions.

B3 B3a: Calcareous clay with volcanic rock inclusions and fine-sand inclusions (including garnet?), and added organic inclusions.

B3b: Calcareous clay with volcanic rock inclusions and fine-sand inclusions, no organic inclusions.

[238] At Tell Sheikh Hamad on the lower Khabur, many sherds show a few basalt inclusions. The sherds from Tell Bderi, Rad Shaqrah and Tell Arbid in the Hassake region closer to a basalt outcrop in the landscape, contain basalt inclusions also as an intentionally added temper (Schneider 2006: 401; Daszkiewicz et al. 2006: 423).

CLAYS FROM THE JEZIRA REGION, PROBABLY NOT FROM THE BALIKH
Thin-sections – Group B1

Sample no.	**23**
Field no.	K8 162-380: P99-96
Level	5
Shape	ring base from a large bowl glazed on both sides with a greenish glaze.
Illustration	fig. D.43; IV.51.r

Field description:
Ware I (organic inclusions and calcite and sand).
Fired at a medium temperature in an oxidizing atmosphere.

Thin-section description:

Matrix
Calcareous clay containing iron. The fine-grained calcite in silt fraction has largely fused with the matrix. Matrix is grey-olive-green, isotrope and homogeneous.

Organic inclusions
Approximately 10% of fine organic inclusions. Mostly they are long thin particles up to 1.25 mm. No charred skeletons of organic inclusions are left in the voids.

Mineral inclusions
Generally very fine inclusions, approximately 30%, evenly distributed through the matrix. Mineral inclusions were present in the natural clay, not added by the potter.

A medium amount of cryptocrystalline calcite particles is still preserved, rounded and in fine to coarse-sand fraction up to 0.3 mm. All calcite has decomposed. Redepostion of secondary calcite has taken place at the edges of some voids, but not in all cases.

Iron oxides in silt and fine-sand fraction are present in the matrix, but seem to be fewer than usual with the other samples. Many angular quartz particles in fine-sand fraction up to 0.25 mm. A medium amount of feldspar (plagioclase) particles in fine-sand fraction up to 0.15 mm. A medium amount of chert particles in fine-sand fraction up to 0.25 mm. A few rock fragments in fine-sand fraction. A few volcanic stone inclusions (basalt) in fine and coarse-sand fraction up to 0.6 mm. A few hornblende, epidote, and mica particles in fine-sand fraction up to 0.1 mm.

Estimate of firing temperatures
High. Matrix is isotrope, calcite has decomposed and partly disappeared. Glaze has fused with the matrix.

Remarks
On both surfaces of the sherd a layer of glaze between 0.5 and 1 mm thick is present. It is an isotrope, glassy and colourless layer, with many cracks and radial lines. This alkali glaze has bonded with the upper surface of the sherd, indicating that the glaze was applied before the first firing of the vessel. The surface between glaze and sherd shows thin spikelets of wollastonite in all directions. The glaze has very few tiny non-translucent inclusions and numerous air bubbles up to 0.25 mm (the glaze is visible at the top of the thin-section in fig. D.43). This is a glaze of a rather poor quality. The greenish colour is either due to the minerals originally present in the alkali mixture (iron content), or to the translucency of the glaze showing the underlying greenish colour of the sherd. In this respect it is interesting that when the sherd dried after excavation the greenish colour largely seemed to have disappeared.

This fabric is different from the fabrics in group A, mainly because of its relatively high amounts of quartz, feldspar and chert particles (as well as the basalt inclusions).

CLAYS FROM THE JEZIRA REGION, PROBABLY NOT FROM THE BALIKH
Thin-sections – Group B2

Sample no. **39**
Field no. K10 61-121:P93-111
Level 7
Shape type 123 bowl
Illustration fig. D.44; IV.3.d

Field description:
Ware I (organic inclusions and calcite and sand). Very many calcite inclusions.
Fired at a medium temperature in an incompletely oxidizing atmosphere.

Thin-section description:

Matrix
Calcareous, iron-rich clay. Fine-grained calcite in silt fraction mixed in the matrix. Dark-reddish olive-green brown matrix, starting to become isotrope. Many very fine cracks have formed between inclusions. Several "clay aggregates" of dark red-brown clay with finer inclusions and fewer calcite particles are present in coarse-sand fraction, spread unevenly in the matrix (visible at the upper left side of the thin-section in fig. D.44).

Organic inclusions
Approximately 10% or fewer fine organic fibres, rather evenly distributed through the matrix. Both thick longitudinal curved shapes up to 0.75 mm long and triangular shapes up to 0.75 mm long are present, as well as some more irregular-shaped fragments. No charred skeletons of fibres have been preserved.

Mineral inclusions
Generally small non-plastic inclusions completely dominated by calcite grains, evenly distributed throughout the matrix. Approximately 50% or more, including organic inclusions. Mineral inclusions were most probably present in the natural clay, no mineral inclusions added by the potter.

The fabric is dominated by very many rounded or oval, fine-grained particles of calcite, some in coarse-sand fraction (up to 1.2 mm) but most in fine-sand fraction (up to 0.3 mm and smaller). Evenly mixed in the matrix. All calcite has decomposed. Redepostion of secondarily formed calcite has started at the edges of calcite grains, but not at the edges of voids.

Iron oxides are mixed through the whole matrix in silt and fine-sand fractions. Many angular quartz grains in fine-sand fraction (up to 0.25 mm but mostly much smaller). Medium amount of mica in fine-sand fraction (up to 0.1 mm). A few feldspar grains (plagioclase) in fine-sand fraction (up to 0.08 mm). A few oval or rounded chert fragments in coarse-sand fraction (up to 0.3 mm). A few hornblende in fine-sand fraction. Very few rock fragments in coarse-sand fraction (up to 0.4 mm). Very few volcanic rock (basalt) fragments in fine-sand fraction up to 0.15 mm. Very few pyroxene particles in fine-sand fraction (up to 0.04 mm).

Estimate of firing temperatures
Medium, approximately 850 °C? Matrix starting to become isotrope, calcite has completely decomposed.

Remarks
This fabric is very similar to the fabrics in group A1a, except for the fact that this sample includes some fragments of volcanic rock.

CLAYS FROM THE JEZIRA REGION, PROBABLY NOT FROM THE BALIKH
Thin-sections – Group B2

Sample no.	**41**
Field no.	K10 61-122:4
Level	7
Shape	type 111 carinated bowl rim
Illustration	fig. D.45; IV.1.e

Field description:
Ware I (organic inclusions and calcite and sand)
Fired at a medium temperature in an incompletely oxidizing atmosphere.

Thin-section description:

Matrix
Calcareous clay containing iron. Fine-grained calcite in silt fraction mixed evenly through the matrix. Matrix is dark olive-green red-brown, starting to become isotrope. Some “clay aggregates” have fewer fine-grained calcite inclusions and more iron oxides, as in the fabrics of Group A1.

Organic inclusions
Approximately 15%, fine organic inclusions. Mostly triangular-shaped, up to 1 mm and smaller, longitudinal rather thick particles up to 1.25 mm long and some very thin long ones up to 2 mm.

Mineral inclusions
Non-plastic inclusions generally evenly distributed through the matrix, except for the “clay aggregates”. Approximately 40%, present in the natural clay, not added by the potter.

Very many rounded and oval cryptocrystalline particles of calcite in fine and coarse-sand fraction up to 0.5 mm. A few micro-crystalline grains are preserved. Most calcite is decomposed, but some primary calcite is still preserved. Redepostion of secondary calcite around the voids and in the voids is present at the surface of the sherd.

Iron oxides in silt and fine-sand fraction (up to 0.25 mm) are mixed through the matrix. Very many angular quartz particles in fine and coarse-sand fraction up to 0.3 mm but mostly much smaller. A medium amount of mica in fine-sand fraction up to 0.07 mm, blue-pink colours under xpl are preserved. A few angular chert fragments in fine-sand fraction up to 0.2 mm. A few rock fragments of different kinds, mostly rounded, in fine and coarse-sand fraction up to 0.7 mm (exceptional). A few volcanic rock (basalt) fragments in coarse-sand fraction up to 0.5 mm (visible in the upper right corner of the thin-section in fig. D.45). A few feldspar particles in fine-sand fraction. A few epidote, hornblende, pyroxene particles in fine-sand fraction up to 0.1 mm.

Estimate of firing temperatures
Low to medium. Matrix is starting to become isotrope, but not all calcite has decomposed yet.

CLAYS FROM THE JEZIRA REGION ?, PROBABLY NOT FROM THE BALIKH
Thin-sections – Group B3a

Sample no.	**38**
Field no.	K10 61-132:1
Level	7
Shape	body sherd of a red-slipped jar with vertical burnish.
Illustration	fig. D.46, D.47; IV.9.m

Field description:
Ware I (organic inclusions and calcite and sand)
Fired at a medium temperature in an oxidizing atmosphere.

Thin-section description:
Matrix
Calcareous clay containing iron. Fine-grained calcite in silt fraction mixed evenly through the whole matrix. Beige-brown matrix, homogeneous and anisotrope. Towards the surface of the sherd the matrix becomes more reddish, while at the core it is more greenish-beige.

Organic inclusions
Approximately 10% fine organic fibres. The thin-section was cut parallel to the horizontal plane of the rim (since it was cut from a body sherd), so that all organic inclusions show a preferred orientation parallel to the surface of the sherd. Only longitudinal, thin fibres are visible, triangles are not visible (suggesting that these triangles are really the sections of the longitudinal ones). Up to 3.75 mm long.

Mineral inclusions
Generally fine non-plastic inclusions, around 20% including voids left by organic fibres, homogeneously mixed with the matrix. Mineral inclusions are present in the natural clay and have not been added by the potter.

A medium amount of rounded, more or less cryptocrystalline and some crystalline calcite particles in fine and coarse-sand fraction up to 0.4 mm. Most calcite is primary, only the smaller particles have started to decompose. Redepostion of secondary calcite (from post-depositional circumstances?) has started at the edges of voids. Calcite particles are not very dominant in this fabric.

Iron oxides in silt and fine-sand fraction are mixed evenly through the matrix. Many angular quartz particles in fine and coarse-sand fraction up to 0.3 mm. A medium amount of mica particles in fine-sand fraction up to 0.15 mm, preserving their blue-pink and green colours under xpl. A few angular as well as rounded chert particles, in fine and coarse-sand fraction up to 0.3 mm. A few volcanic rock (basalt) fragments in fine and coarse-sand fraction up to 0.3 mm. A few feldspar (plagioclase) particles in fine-sand fraction (in the upper left corner of the thin-section on fig. D.46, right next to the small basalt particle). A few sedimentary and other rock fragments in fine-sand fraction up to 0.25 mm. A few epidote and pyroxene particles in fine-sand fraction. A single particle of garnet (?), 0.15 mm. Compared to other samples in Group A, this sample contains relatively many colourful mixed fine-sand particles.

Estimate of firing temperatures
Low. Matrix is still anisotrope, calcite has only just started to decompose.

Remarks
Preferred orientation of organic fibres is probably due to wheel throwing. The red slip is a very thin (up to 0.03 mm) layer of dark red, iron-rich fine-grained clay, smoothed or very lightly burnished (visible in the close-up thin-section on fig. D.47). The layer has bonded with the clay of the matrix (this depends on the humidity of the sherd and the fluidity of the slip at the time of application). The slip contains very small quartz, mica and calcite inclusions. The slip covers all irregularities in the surface of the sherd. The iron-rich materials for this slip were most probably not found in the area of Sabi Abyad or the Jezira (Schneider 2006: 402) and so at least the materials for the slip are not local.

CLAYS FROM THE JEZIRA REGION, PROBABLY NOT FROM THE BALIKH
Thin-sections – Group B3b

Sample no.	**48**
Field no.	K10 61-121: P93-109
Level	7
Shape	type 111 carinated bowl, burnished well on the in and outside
Illustration	fig. D.48; IV.1.c

Field description:
Ware B (fine calcite and sand)
Fired at a medium temperature in an oxidizing atmosphere (core colour different from surface colour)

Thin-section description:

Matrix
Calcareous clay containing iron. Fine-grained calcite in silt fraction in medium amount spread evenly through the matrix. Matrix is olive-brown, towards the surface of the sherd becoming more orange-lighter brown (the surface of the sherd is at the lower right corner of the thin-section in fig. D.48). Matrix is homogeneous, not very isotrope. Some small voids are caused by air bubbles, otherwise the fabric is rather compact.

Mineral inclusions
Both very fine and slightly larger non-plastic inclusions, around 20%, creating a slightly more "colourful" impression under the microscope than the samples in Group A. Inclusions other than calcite are generally a bit larger than those in the fine-ware groups A1b and A2b.

Many oval and rounded crystalline or cryptocrystalline particles, in fine and coarse-sand fraction up to 0.35 mm. Decomposition of calcite has started with the finer particles, but primary particles are still preserved as well. Occasional straight pieces of shell or microfossils, up to 0.15 mm.

Iron oxides in silt and fine-sand fraction are evenly mixed through the matrix. Most aggregates and grains are of the non-translucent type. Many angular quartz particles in fine-sand fraction up to 0.25 mm. A medium amount of mica in fine-sand fraction, bright blue-pink colours under xpl are still visible. A few feldspar particles in fine-sand fraction. A few radiolarite and more irregular chert particles in fine-sand fraction up to 0.15 mm. A few rock fragments of different kinds, in fine and coarse-sand fraction up to 0.7 mm (for example in the upper left corner of the thin-section in fig. D.48). A few hornblende, epidote and pyroxene particles in fine-sand fraction.

Estimate of firing temperatures
Low to medium. Matrix is still largely anisotrope, while calcite has not completely decomposed yet.

CLAYS FROM THE JEZIRA REGION, BUT PROBABLY NOT FROM THE BALIKH
Thin-sections – Group C: calcareous clays with coarse inclusions, including volcanic rock fragments

The coarse wares in Group C form a rather diverse group as well, like those in group D. The fabrics of this group are calcareous clays, somewhat similar to those in Group A or D. However, the fabrics in Group C have coarse mineral inclusions, including fragments of volcanic rock (basalt). Since the Balikh River does not flow through regions containing volcanic rock outcrops (see the geological map of Syria, fig. V.1), it is not likely that these sherds originate from the Balikh Valley or from Sabi Abyad. However, it is possible that these sherds do come from the greater Jezira or northeastern Syrian region.[239] The basalt inclusions in the fabrics of Group C are generally large enough to be recognized under 10x magnification in the field. However, during the description of the Sabi Abyad material they were not recognized or described as such.

Group C has been divided into several subgroups according to the composition of the sherds. Even within the larger groups, every single sherd is different from the others. The only aspect they all have in common is the calcareous fabric and the presence of basalt inclusions indicating a non-Balikh origin. The variety of fabrics supports the non-local origin. Any suggestions as to the origin will be discussed with each sample. The following fabrics can be distinguished:

C1 Calcareous clay with basalt fragments and with coarse calcite inclusions (cooking wares)

- C1a with coarse crushed crystalline calcite and calcite of biogene origin, a few small basalt fragments[240]
- C1b with coarse crushed crystalline calcite, and coarse basalt inclusions

C2 Calcareous clay with coarse sand inclusions (including basalt)

- C2a with dominant volcanic stone and radiolarite chert inclusions, no cooking ware
- C2b with coarse sand and coarse calcite of biogene origin, cooking ware

C3 Calcareous clay with medium-coarse sand inclusions (including basalt)

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239 The cooking-ware pots from Tell Bderi, for example, contain basalt inclusions (Schneider 2006: 401).

240 Schneider (2006: 404 footnote 29) remarks that small basalt fragments in pots with large crushed-calcite inclusions may have originated due to the use of a basalt mortar to crush the calcite. In that case, this pot may have come from the Balikh Valley region.

CLAYS FROM THE JEZIRA REGION, PROBABLY NOT FROM THE BALIKH
Thin-sections – Group C1a

Sample no.	**33**
Field no.	K10 61-132:7
Level	7
Shape	type 211 cooking-pot rim
Illustration	fig. D.49; IV.5.a

Field description:
Ware E (with coarse calcite inclusions)
Fired at a low temperature in an oxidizing atmosphere.

Thin-section description:

Matrix
Calcareous clay containing iron. Fine-grained calcite in silt fraction evenly mixed through the matrix. Matrix is light brown, anisotrope and homogeneous. Occasional voids are present from small organic particles, probably accidentally present in the clay. Many voids from small cracks in the matrix, running against the inclusions and probably caused by thermal shock.

Mineral inclusions
Both finer as well as large non-plastic inclusions, approximately 40%. The smaller inclusions are part of the natural clay, but the larger inclusions have most probably been added by the potter as a temper.

A medium amount of crystalline angular or rhombohedric calcite particles, in primary form, in fine-sand fractions up to 0.25 mm. Many other calcite inclusions, e.g. irregular but mostly angular grains of biogene origin in different shapes including curved shell-like fragments and larger rectangular or other shapes, in coarse-sand fraction up to 1.75 mm (visible at the top edge of the thin-section in fig. D.49). Angular or more irregular cryptocrystalline calcite aggregates in coarse-sand fraction up to 1.625 mm. These inclusions were most probably added by the potter. All calcite is still primary; decomposition has not taken place yet.

Iron oxides in silt and fine-sand fraction evenly mixed with the matrix. A medium amount of angular quartz particles in fine and coarse-sand fraction up to 0.3 mm. A few rounded volcanic rock fragments (basalt) in coarse-sand fraction up to 0.4 mm (at the top right of the thin-section in fig. D.49). A few chert particles in fine and coarse-sand fraction up to 0.4 mm, larger than usual. A few pyroxene grains in fine-sand fraction up to 0.17 mm, larger than usual. A few hornblende particles in fine-sand fraction up to 0.2 mm. A few epidote grains in fine-sand fraction. A few mica particles in fine-sand fraction up to 0.05 mm, blue-pink colours under xpl are still preserved. A few feldspar particles in fine-sand fraction up to 0.15 mm. A single olivine particle (?) in fine-sand fraction (0.18 mm).

Estimate of firing temperatures
Low. Matrix is still anisotrope, calcite has not yet decomposed.

Remarks
Apart from the coarse inclusions added by the potter, the non-plastic inclusions in the natural clay also seem to be slightly coarser than is usual for the other samples.

CLAYS FROM THE JEZIRA REGION, PROBABLY NOT FROM THE BALIKH
Thin-sections – Group C1b

Sample no. **36**
Field no. K10 61-132:24
Level 7
Shape type 212 cooking-pot rim
Illustration fig. D.50, D.51; IV.5.i

Field description:
Ware E (coarse calcite), angular white and grey coarse particles, cooking ware.
Fired at a low temperature in an oxidizing atmosphere.

Thin-section description:

Matrix
Calcareous clay containing iron. Fine-grained calcite in silt fraction mixed evenly through the matrix. Dark brown-grey, anisotrope matrix, homogeneously mixed. Many tiny cracks run between the larger inclusions, probably due to thermal shock (visible in purple in the thin-section in fig. D.51). Hardly any other voids.

Mineral inclusions
Both small and larger inclusions, evenly mixed through the matrix, around 40%. The smaller non-plastic inclusions are most probably part of the natural clay, while the larger inclusions were certainly added by the potter as a temper.

Dominant inclusions are calcite, basalt and feldspar fragments. Many primary crystalline and more micro-crystalline angular as well as more rounded particles of calcite in original rhombohedric or more irregular shape, in coarse-sand fraction up to 1.75 mm. Also a few rounded cryptocrystalline particles of calcite in fine and coarse-sand fraction up to 0.5 mm, possibly partly present in the natural clay. A few small fragments of shell or microfossils, up to 0.3 mm long. All calcite is primary, decomposition of calcite has not taken place yet.

Rather many iron oxides in fine-sand fraction and silt fraction mixed with the matrix. A few to a medium amount of oval or irregular volcanic rock (basalt) inclusions in different kinds in coarse-sand fraction, up to 1.25 mm (filling the upper left corner of the thin-section in fig. D.50). A medium amount of feldspar (plagioclase) particles in fine-sand fraction up to 0.2 mm. A few epidote particles in fine-sand fraction up to 0.15 mm, few mica grains in fine-sand fraction up to 0.03 mm. A few pyroxene and olivine (?) grains in fine-sand fraction up to 0.2 mm. A few angular quartz particles in fine-sand fraction up to 0.1 mm. A few rounded chert particles in fine-sand fraction up to 0.2 mm.

Estimate of firing temperatures
Low. Matrix is anisotrope, and all calcite is still primary.

CLAYS FROM THE JEZIRA REGION, PROBABLY NOT FROM THE BALIKH
Thin-sections – Group C2a

Sample no. **07**
Field no. K8 102-239: P97-296
Level 5
Shape type 911 "pilgrim" flask, with burnished outer surface
Illustration fig. D.52, D.53; IV.94.d

Field description:
Ware C (fine sand inclusions).
Fired at a low temperature, in an oxidizing atmosphere.

Thin-section description:

Matrix
Calcareous clay containing iron. A lot of fine-grained calcite grains in silt fraction mixed with the matrix. Matrix is light buff-brown and anisotrope. Some smaller "clay aggregates" up to 0.5 mm are present. Hardly any voids are present: a very compact fabric.

Mineral inclusions
Both small and large inclusions are present, very colourful, rather evenly distributed in the matrix, approximately 30%. The predominant inclusion seems to be basalt. Smaller inclusions were probably present in the natural clay. The larger inclusions have possibly been added by the potter.

A medium amount of crystalline as well as cryptocrystalline rounded or angular calcite particles in fine and coarse-sand fraction up to 0.75 mm. All calcite is primary.

A medium amount of iron oxides in fine-sand and silt fraction mixed with the matrix. A medium amount of volcanic rock (basalt) fragments of different kinds in coarse-sand fraction up to 1 mm (e.g. at the top left of the thin-section in fig. D.52). Also some grains of weathered metamorphic rock in coarse-sand fraction up to 1.375 mm. A few larger angular chert particles in coarse-sand fraction up to 0.875 mm, as well as few radiolarite chert fragments in coarse-sand fraction up to 0.625 mm (visible near the lower left corner of the thin-section in fig. D.52). A few angular quartz particles in fine to coarse-sand fraction up to 0.5 mm. A few feldspar particles in fine-sand fraction.

Estimate of firing temperatures
Low. Matrix is anisotrope and calcite is still present in primary form.

Remarks
The burnishing of the outer surface has flattened the inclusions (visible on the top of the thin-section picture in fig. D.52). However, the burnishing did not cause a preferred orientation of inclusions. The inner surface is completely untreated (due to the "thrown-closed" shaping technique, see Chapter V), in the thin-section recognizable by a rough and irregular surface (fig. D.53).

CLAYS FROM THE JEZIRA REGION, PROBABLY NOT FROM THE BALIKH
Thin-sections – Group C2b

Sample no. **J730**
Field no. I11 27-61:6
Level 5
Shape type 212 cooking pot
Illustration fig. D.54; IV.62.i

Field description:
Ware D (coarse sand inclusions)
Fired at a low temperature, in an oxidizing atmosphere.

Thin-section description:

Matrix
Calcareous clay containing iron. Fine-grained calcite in silt fraction mixed evenly through the whole matrix. Light and darker beige-brown matrix, homogeneous, anisotrope. Rather large cracks are visible between the inclusions, probably due to repeated thermal shock (see also below; visible in the thin-section in fig. D.54).

Mineral inclusions
Both small and large inclusions are present, approximately 20%. It is remarkable that inclusions of medium size between 0.125 and 0.6 mm are largely absent. This indicates that the smaller inclusions were part of the natural clay, while the larger ones had been added by the potter. The inclusions are of a very mixed nature, in fact almost every larger grain in the thin-section slide is of a different kind.

Calcite inclusions are not dominant in this fabric. A few large rounded particles of calcite grains of biogene origin in coarse-sand and gravel fraction up to 2.5 mm. A few cryptocrystalline calcite particles in coarse-sand fraction up to 0.75 mm. A few smaller crystalline calcite particles in fine-sand fraction up to 0.1 mm. All calcite is still present in primary form.

Iron oxides in fine-sand and silt fraction mixed evenly through the matrix. A medium amount of mica in fine-sand fraction up to 0.2 mm, bright colours under xpl preserved. A few radiolarite chert grains in coarse-sand fraction up to 2 mm (at the right edge of the thin-section in fig. D.54). Also few angular pieces of chert in coarse-sand fraction up to 0.75 mm. A few volcanic rock (basalt) inclusions of different kinds in coarse-sand fraction up to 2.25 mm. A few crystalline or more micro-crystalline quartz fragments in coarse-sand fraction up to 1.5 mm, and also few angular quartz particles in fine-sand fraction up to 0.125 mm mixed evenly in the matrix. A few rock fragments of different kinds and colours in coarse-sand and gravel fraction up to 2.5 mm. A few silt-stone fragments in coarse-sand fraction up to 0.75 mm. A few pyroxene and epidote grains in fine-sand fraction up to 0.15 mm. Very few feldspar inclusions in fine-sand fraction up to 0.125 mm. Very few serpentinite (?) and hornblende particles in fine-sand fraction up to 0.08 mm.

Estimate of firing temperatures
Low. Matrix is anisotrope, calcite is still primary.

Remarks
The chemical composition of sample J730 was established with WD-XRF analysis. The data are presented in the table below, including the data for the unfired pottery from Sabi Abyad and the Balikh clay sample for comparison. Not only these data but also the dendrogram resulting from a multivariate cluster analysis (not illustrated) show that sample J730 is largely similar to the local clays. Small differences in composition, mainly in the elements SiO_2, CaO, Na_2O, and S, place the sample at the end of the dendrogram but within the group of local clays and next to the Balikh River clay sample. Sample J730 contains notably less calcium. Since it does contain coarser calcite inclusions, this may point to a slightly less calcareous clay, but it may also be caused by the relatively larger amount of sand inclusions. However, there is no reason to suggest that sample J730 could not have come from the larger Jezira region. The inclusion of volcanic rock fragments in

the fabric indicates that it probably does not come from the Balikh Valley itself. The similarity in chemical composition between J730 and the local samples also in the trace elements (Daszkiewicz et al. 2006: 423) illustrates the similarity of the clay compositions in the larger Jezira region as well.

	Elements																							
Sample no.	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	(S)	(Cl)	V	Cr	Ni	Zn	Rb	Sr	Y	Zr	Ba	(Ce)	GV
average unfired pottery	49.02	0.851	13.09	6.66	0.095	4.80	21.38	0.89	2.90	0.30	0.16	0.16	132	251	106	95	68	454	26	172	407	62	
1744 Balikh clay	47.66	0.863	15.34	7.41	0.113	5.13	21.06	0.31	1.87	0.23	0.12	0.02	129	206	167	93	84	552	28	159	324	65	0.00
J730	54.89	0.682	12.08	6.75	0.131	4.87	16.57	1.52	2.24	0.27	0.06	0.02	134	247	161	96	41	473	24	129	269	29	12.07

Table D.2: Comparison of the chemical composition of sample J730 with a selection of Sabi Abyad clays. The data format is the same as in Table D.1.

Sample J730 was also included in a study of Prehistoric and Bronze Age cooking-ware sherds (Daszkiewicz et al. 2000). It was tested for water permeability and thermal-shock resistance. The study shows that the fabric of J730 was so permeable that water droplets were already appearing at the surface after only 6 minutes of exposure to water from the inside, which suggests that the vessel could only have been used for storage of dry products and not for cooking liquids. This result, which is rather at odds with the suggestion that pots of this material and shape were used for cooking, is probably linked to the fact that we are dealing with discarded material. Possibly the vessel had suffered so much thermal shock during its use-life that the fabric had become unstable, indeed making it unsuitable for cooking and ready to be discarded.

CLAYS FROM THE JEZIRA REGION, PROBABLY NOT FROM THE BALIKH
Thin-sections – Group C3

Sample no.	**37**
Field no.	K10 61-132:4
Level	7
Shape	type 315 jar rim.
Illustration	fig. D.55; IV.8.g

Field description:
Ware B (calcite and fine sand)
Fired at a medium temperature in an oxidizing atmosphere.

Thin-section description:

Matrix
Calcareous clay containing iron. Not too much fine-grained calcite in silt fraction mixed with the matrix. Dark olive-brown homogeneous matrix, largely anisotrope. A relatively compact fabric with only a few voids from air bubbles up to 0.3 mm.

Mineral inclusions
Smaller, but predominantly middle-sized non-plastic inclusions, approximately 30%, mostly rounded or slightly angular. There are no dominant minerals. It seems that the potter added a naturally sorted sand of a very mixed nature (transported over a large distance by a river).

Many oval or more angular fine and larger cryptocrystalline calcite inclusions in fine and coarse-sand fraction up to 0.5 mm. Decomposition of calcite has started in some particles.

Iron oxides in fine-sand and silt fractions mixed with the matrix. Also some larger inclusions up to 0.5 mm. A few to medium amount of chert in different forms (fine-grained, radiolarite, fine-grained with yellow or reddish mineral inclusions), rounded as well as angular, in coarse-sand fraction up to 0.7 mm (at centre top edge of thin-section in fig. D.55). Medium amount of feldspar (plagioclase) particles in fine and coarse-sand fraction up to 0.4 mm (in bottom centre of thin-section in fig. D.55). Medium amount of quartz particles in fine and coarse-sand fraction up to 0.5 mm. A few volcanic rock (basalt) inclusions of different kinds and colours, in coarse-sand fraction up to 0.3 mm (at upper left corner of thin-section in fig. D.55). A few hornblende and pyroxene in fine-sand fraction up to 0.15 mm. A few olivine (?) particles in fine-sand fraction up to 0.2 mm. A few sedimentary and other rock fragments in different kinds and colours, in fine and coarse-sand fraction up to 0.3 mm. A few serpentinite grains in coarse-sand fraction up to 0.8 mm. A few silt-stone particles in fine-sand fraction. A few mica particles in fine-sand fraction up to 0.18 mm, blue-pink bright colours under xpl.

Estimate of firing temperatures
Low to medium, approximately 700-800 °C. Matrix largely anisotrope, calcite has started to decompose.

Remarks
Possibly from the Euphrates River area.

CLAYS NOT FROM THE JEZIRA REGION
Thin-sections – Group E: less calcareous clays with coarse inclusions

There are only two samples that definitely do not come from the larger northeastern Syrian or Jezira region. They are made from clays that contain relatively little calcite. These non-calcareous clays are not found in the Jezira region, where all sediments are highly calcareous (Schneider 2006: 391).

The two samples in group E are very different from each other and most probably have a very different origin. They are combined in this group because they are both made of less-calcareous clays.

E1 with volcanic rock (basalt) inclusions and medium coarse sand inclusions

E2 with steatite (talc) temper

Sample J728 in group E2, with steatite inclusions, almost definitely comes from the region around Ugarit / Ras al-Bassit on the Syrian coast. See below for a more detailed discussion of this sample. For sample 06 in group E1 the origin is less clear.

CLAYS NOT FROM THE JEZIRA REGION
Thin-sections – Group E1

Sample no.	**06**
Field no.	K9 70-264: P93-294
Level	5
Shape	type 911 “pilgrim” flask, outside burnished
Illustration	fig. D.56; IV.94.h

Field description:
Ware B (calcite and fine sand), rather coarse inclusions.
Fired at a medium temperature in an oxidizing atmosphere.

Thin-section description:

Matrix
Not very calcareous (but still containing some fine-grained calcite), iron-rich clay. Dark grey-green reddish, largely anisotrope matrix, finer inclusions mixed rather evenly. In the thin-section, one larger “clay aggregate” is visible, 3 mm, in the lower right corner (fig. D.56). Matrix becomes a little more greenish and isotrope towards the surface of the sherd.

Mineral inclusions
Mostly rather large non-plastic inclusions, approximately 30%, a (naturally?) sorted mixed sand most probably added by the potter.

No visible calcite particles. Iron oxides in fine-sand and silt fraction are evenly mixed in the matrix. Medium amount of angular and irregular quartz grains in fine and coarse-sand fraction, up to 0.625 mm. A few angular and rounded fine-grained and radiolarite chert particles in coarse-sand fraction up to 0.625 mm. A few angular and more rounded volcanic rock (basalt) particles of different kinds and colours, in coarse-sand fraction up to 0.5 mm. A few metamorphic rock fragments in fine-sand fraction. Very few feldspar (plagioclase) particles in fine-sand fraction up to 0.25 mm. Very few pyroxene, serpentinite, hornblende and mica grains in fine-sand fractions.

Estimate of firing temperatures
Low to medium? Matrix is still largely anisotrope.

Remarks
Perhaps from the upper Euphrates region?

CLAYS FROM THE UGARIT REGION
Thin-sections – Group E2

Sample no. **J728**
Field no. K9 72-167: P93-308
Level 5
Shape type 211 large cooking pot, burnished both inside and outside.
Illustration Fig. D.57; IV.62.a

Field description:
Ware D (coarse sand), angular dark-grey inclusions, sand?
Fired at a medium temperature in an oxidizing atmosphere.

Thin-section description:

Matrix
Non-calcareous, iron-rich clay. Dark-brown matrix, turning more grey-brown towards one surface of the sherd. Matrix is difficult to see because of the enormous amount of inclusions. Some small voids and many small cracks are visible, probably due to thermal shock. The large amount of inclusions suggests that the original clay was rather plastic.

Mineral inclusions
The fabric is completely dominated by steatite (talc) inclusions (as identified in the chemical analysis (see below) and confirmed in the thin-section). Steatite inclusions are irregular, sometimes angular, finely laminated particles, in all different sizes up to gravel fraction (up to 4 mm) (in the thin-section in fig. D.57 they have very light pastel colours). They are slightly aligned with the surface of the sherd, but not much. Some include tiny black non-translucent particles.

Other non-plastic inclusions are few. The most apparent are some medium to very large (up to 3 mm) particles of a metamorphic rock (shale?), dark brown in colour under xpl, sometimes including small grains of quartz and feldspar. These particles are often cracked. Other non-plastic inclusions: a medium amount of very small quartz particles in fine-sand fraction (up to 0.04 mm). A medium amount of small iron ore (chromite) particles in fine-sand fraction (e.g. the black particles in the the lower centre of the thin-section on fig. D.57). A medium amount of different rock fragments in coarse-sand fraction (up to 0.8 mm). A few volcanic rock inclusions in coarse-sand fraction (0.4 mm). Very few chert particles and mica grains in fine-sand fraction up to 0.05 mm. Very few feldspar (plagioclase) particles in fine-sand fraction up to 0.1 mm.

Estimate of firing temperatures
Low?

Remarks
The closest source of steatite is in the area around Ugarit and Ras el-Bassit in northern coastal Syria, as well as around Mersin and the Antakya region in Turkey and on Cyprus, where Mesozoic Ophiolite rocks (metamorphic rocks and deep-sea sediments) are exposed. Indeed, the shape of our cooking pot resembles cooking pots from coastal Late Bronze Age sites made from "Handmade Burnished Ware", and also tempered with steatite (L. du Pied personal communication, 8-5-2006). In general, this type of fabric resembles the prehistoric Dark Faced Burnished Ware that originated in the same region (Daszkiewicz et al. 2000).

The chemical composition of sample J728 was established with WD-XRF analysis. The data are presented in the table below, including the data for the unfired pottery from Sabi Abyad and the Balikh clay sample for comparison. The difference with the local Balikh clays is very clear. Sample J728 contains a very large amount of MgO (due to the steatite inclusions) and hardly any CaO (because of the non-calcareous clay). The clay is also very different from the Balikh ones in almost all other elements, including trace elements.

	Elements																							
Sample no.	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	(S)	(Cl)	V	Cr	Ni	Zn	Rb	Sr	Y	Zr	Ba	(Ce)	GV
average unfired pottery	49.02	0.851	13.09	6.66	0.095	4.80	21.38	0.89	2.90	0.30	0.16	0.16	132	251	106	95	68	454	26	172	407	62	
1744 Balikh clay	47.66	0.863	15.34	7.41	0.113	5.13	21.06	0.31	1.87	0.23	0.12	0.02	129	206	167	93	84	552	28	159	324	65	0.00
J728	61.74	0.405	5.30	7.96	0.100	22.33	0.96	0.40	0.74	0.07	-0.02	-0.01	82	1564	1503	56	20	68	12	76	84	38	4.59

Table D.3: Comparison of the chemical composition of sample J728 with a selection of Sabi Abyad clays. The data format is the same as in Table D.1.

Sample J728 was also included in a study of Prehistoric and Bronze Age cooking-ware sherds (Daszkiewicz et al. 2000). It was tested for water permeability and thermal-shock resistance. The study showed that this pot was excellently suited for cooking. It was impermeable (also due to the burnished inner and outer surfaces) and very resistant to thermal shock. It is very likely that the pot had been imported to the site of Sabi Abyad for its excellent properties as a cooking vessel.

sample no.	group	level	figure no.	square	locus	lot	no.	rim type	base type
01	A2a	4	D.16	H7	5	008	1	311	-
02	A1a	7	D.8	N9	17	063	5	132	-
03	A2a	4	D.17	H7	5	009	3	111	-
04	A2a	4	D.18	I7	3	024	4	313	-
05	A1a	7	D.9	N9	17	900	5	315	-
06	E1	5	D.56; IV.94.h	K9	70	264	P93-294	911	751
07	C2a	5	D.52, 53; IV.94.d	K8	102	239	P97-296	911	751
08	A2c	5	D.38; IV.61.b	L8	40	114	P97-147	151	741
09	A2b	4	D.31	I7	10	030	9	-	712
10	A2b	4	D.32	I7	10	031	10	421	-
11	A2a	4	D.19	H7	4	014	10	221	-
12	A1c	-	D.15	N9	6	052	1	-	-
13	A2a	5	D.20	H8	13	141	1	212	-
14	A2a	4	D.21	H7	3	007	7	111	-
15	A2b	4/5	D.33	I7	10	035	1	421	712
16	A2a	6	D.22; IV.17.b	M13	2	030	P93-184	113	741
17	A2a	4	D.23	I7	3	019	4	112	-
18	A2a	4	D.24	I7	10	028	2	111	-
21	A2a	4	D.25	I7	10	023	3	322	-
22	A2a	4	D.26	I7	3	024	3	111	731
23	B1	5	D.43; IV.51.r	K8	162	380	P99-96	-	741
24	A2b	5	D.34	L12	21	073	26	-	711
25	A2b	5	D.35	L12	21	073	23	-	711
26	A2a	4	D.27; IV.99.ae	K9	47	169	2	111	-
29	A2a	4	D.28; IV.100.v	K9	47	066	3	113?	-
31	A2a	5?	D.29	L12	29	120	P93-311	611	611
32	A1a	7	D.10; IV.1.n	K10	61	132	59	117	-
33	C1a	7	D.49; IV.5.a	K10	61	132	7	211	-
34	D2	7	D.42; IV.7.h	K10	61	132	35	2211	-
35	D1a	7	D.39; IV.5.e	K10	61	132	28	212	-
36	C1b	7	D.50, 51; IV.5.i	K10	61	132	24	212	-
37	C3	7	D.55; IV.8.g	K10	61	132	4	315	-
38	B3a	7	D.46, 47; IV.9.m	K10	61	132	1	-	-
39	B2	7	D.44; IV.3.d	K10	61	121	P93-111	123	731
40	A2b	7	D.36; IV.8.b	K10	61	131	1	314	-
41	B2	7	D.45; IV.1.e	K10	61	122	4	111	-
42	A1a	7	D.11; IV.8.i	K10	61	122	38	315	-
43	A2b	7	D.37; IV.10.e	K10	47	110	1	-	721
44	A1b	7	D.12; IV.2.c	K10	61	121	P93-110	122	731
45	A1b	5	D.13, 14; IV.98.c	K9	48	113	16	-	-
46	D1b	7	D.40, 41; IV.5.l	K10	61	132	34	212	-
47	A2a	7	D.30; IV.8.d	K10	61	132	19	315	-
48	B3b	7	D.48; IV.1.c	K10	61	121	P93-109	111	741
J728	E2	5	D.57; IV.62.a	K9	72	167	P93-308	211	751
J730	C2b	5	D.54; IV.62.i	I11	27	061	6	212	-

Table D.4: List of thin-section sample numbers.

APPENDIX E
POTTERS' MARKS AND SIGNS.

Signs that were impressed before firing.
Seventeen signs were impressed in the wet or leather-hard clay, before firing. They can be classified in five groups. Most impressed signs are simple crescent shapes (ten signs).

Cuneiform signs (cf. Appendix F)

Fig. IV.43.j	H9 51-100: P99-21, three cuneiform signs are visible, of which the middle can be identified as "si". See Appendix F for more information. Just below the rim of a tiny fragment of a small carinated bowl type 111. Rim diameter unknown. Level 5.
Fig. IV.67.e	H8 30-232:6, one cuneiform sign in very large script, fragmentarily preserved but no other signs preceding or following. See Appendix F for more information. The sign was placed on the shoulder of a large storage pot (type 213). Rim diameter 320 mm, round base, fragmentary. The capacity was calculated at 132.20 litres from the drawing, but the shape and height are reconstructed. The capacity calculated here is therefore very imprecise. The inside of the pot was completely covered in a layer of bitumen, perhaps to make it watertight, or left over from bitumen contents of the pot. Level 5.
Fig. IV.98.j	I9 48-110:2, one cuneiform sign in very large script, fragmentary. Possibly part of a sign similar to the one on no. 2. On a thick (15 mm) body sherd of a large vessel. Level 5.
Fig. F.7	H12 8-42: P99-339, rim fragment of a large vessel, impressed cuneiform sign. See Appendix F for more information.

Impressed crescent 1 (fig. E.1)
This sign is clearly impressed with a straight-ended, curved tool (possibly a piece of bone?). A similar tool was sometimes used to make curved impressions as a decoration.

Fig. IV.75.i	H11 25-40:1, on the shoulder of a middle-sized type 312 jar. Rim diameter 120 mm, fragmentary. Level 5.
Fig. IV.80.f	M9 18-248:1, on the shoulder of a large type 321 jar. Rim diameter 170 mm, fragmentary. Level 5.
Fig. IV.85.g	H8 40-267:5, on the rim of a large type 322 jar. Rim diameter 130 mm, fragmentary. Level 5.
Fig. IV.87.b	H8 41-280:3, on the shoulder of a large type 322 jar. Rim diameter 120 mm, fragmentary. Level 5.
-	K8 102-239:10, on a body sherd of the shoulder of a small jar. Level 5.
Fig. IV.109.e	L11 28-60:8, on the rim of a large type 321 jar. Rim diameter 140 mm, fragmentary. Level 4.

Impressed crescent 2 (fig. E.2)
This sign is identical to the signs in the group "impressed crescent 1", but then applied upside down. An identical impression was found in Middle Assyrian Tell Bderi, on a jar of the same type as our 322 jars (Pfälzner 1995: Taf. 151a). A jar from Tell Barri (also of the same type) shows two crescent impressions on the rim, of which one is impressed sidewards (Anastasio 1993: fig. 14 no. 3). The sign on K12 8-19:21 is fragmentarily preserved and seems to be S-shaped rather than crescent-shaped.

Fig. IV.80.j	H8 44-294:9, on the rim of a large type 321 jar. Rim diameter 145 mm, fragmentary. Level 5.
Fig. IV.83.k	H11 25-85: P96-527, on the shoulder of a large type 322 jar. Rim diameter 135 mm, height 670 mm, complete, capacity 25 litres. Level 5.

Fig. IV.85.h H8 13-108:4, on the rim of a large type 322 jar. Rim diameter 130 mm, fragmentary. Level 5.
Fig. IV.112.n K12 8-19:21, fragment, on a body sherd of the shoulder of a large jar. Level 4.

Impressed figure (fig. E.3)
A stylized figure or symbol, made with a kind of stamp. Similar signs have been found on sherds from Mitanni / Middle Assyrian Nemrik, Tell Mohammed Arab and Aššur (A. Reiche pers. comm.). Koliński (1993/94: 15) takes the similarities of these signs as an indication for a travelling potter; however, none of the other signs has been illustrated in the publications so it is unclear whether they were made by the same stamp.

Fig. IV.9.i K11 21-54:6, on a body sherd of the shoulder of a large jar. Level 7.

Seal impressions
Seal impressions on ceramics have also been reported at Tell al Rimah (C. Postgate et al. 1997: plate 64 no. 604 (on the body of a pot) and at other sites (cf. Aruz 2005).
- M11 13-113: P96-503, fragmentary seal impression on the base of a fine ware cup, knob base type 712. Fragmentary. From room 1 in the potter's workshop level 5 East. The seal image is only partly legible from the careless rolling on the vessel wall, but it seems to be of a type known from seal impressions on door sealings at Sabi Abyad. Only the top of the cylinder has been impressed. The image shows a lion with an opened mouth looking back towards another animal. For comparable seal impressions from Sabi Abyad, see Duistermaat (in prep.c).
Fig. E.4 M7 30-227: P01-122, carinated bowl type 111, with several impressions of a geometric, circular stamp seal.

Signs that were incised before firing
These 42 signs are all incised with a rather blunt tool in the leather-hard, or sometimes still soft, clay. The signs have been grouped into 11 different groups.

Five-pointed star (fig. E.5)
Fig. IV.98.h K13 4-39:4, on a body sherd. Level 5.
Fig. IV.98.k H8 14-56:2, on a body sherd of the upper body of a large jar. No level assignment.
- K10 23-46:1, on a body sherd. Level 5.

"St. Andrew's" cross (fig. E.6)
Fig. IV.87.c H10 21-123:1, three cross incisions at regular distances on top of the rim of a middle-sized type 323 jar. Rim diameter 110 mm, fragmentary. Level 5.
Fig. IV.87.d K12 21-56: P93-448, on the rim of a large 323 type jar. Rim diameter 190 mm, height 605 mm, complete, capacity 36.8 litres. Level 5.
- K9 100-405:3, fragmentary incision on a body sherd of a "pilgrim flask" (type 911). Level 5.

"Greek" cross (fig. E.7)
A comparison for this sign was found at Tell al Rimah, where it is incised under the rim of a large deep pot (C. Postgate et al. 1997: pl. 64 no. 606).
- O10 21-65:2, mark in the shape of a cross on the base (underside of flat base). Base diameter 50 mm. Level 6?
Fig. IV.52.j H10 7-57:7, fragmentary incision just below the rim of a 131 type bowl. Rim diameter 300 mm, fragmentary. Level 5.

Fig. IV.78.d H8 45: P98-57, on the upper body of a middle-sized type 318 jar. Rim diameter 120 mm, height 395 mm, complete, capacity 12.8 litres. The jar was used to hold a rich cremation burial, and was sealed with cloth and a clay sealing. No level assignment.
Fig. IV.99.al H9 3-9: P93-91, near the base of a 111 type bowl of middle size. Rim diameter 220 mm, height 70 mm, fragmentary, capacity 1.2 litres. Level 4.

"Plough" shape (fig. E.8)
This group combines a number of signs consisting of two or three incised lines forming an irregular triangle.
Fig. IV.78.b K8 102-235: P97-314, on the shoulder of a middle-sized type 318 jar. Rim diameter 90 mm, height 444 mm, fragmentary, capacity 13.9 litres. Level 5.
Fig. IV.85.e H8 22-202:22, on the shoulder of a large type 322 jar. Rim diameter 140 mm, fragmentary. Level 4/5.
Fig. IV.85.f H8 22-202:18, fragmentary sign on the shoulder of a large type 322 jar. Rim diameter 160 mm, fragmentary. Level 4/5.

Crossing lines (fig. E.9)
The signs in this group are all fragmentarily preserved, so it is unclear what their original shape was. They consist of two or more lines crossing each other in a more or less irregular way.
Fig. IV.70.o M9 18-229: P97-320, just under the rim of a deep type 222 pot. Rim diameter 340 mm, height 290 mm, fragmentary, capacity 10.2 litres. Level 5.
\- L8 40-115:15, on a body sherd, probably of a large jar. Level 5.
\- M9 18-48:3, on a body sherd. Level 5.
Fig. E.9 J10 32-62:2, cross in a square, lightly incised on body of a jar base. Level 5.

Trident (fig. E.10)
Fig. IV.80.k K8 57-127:1, three incisions forming a fork on top of the rim of a large type 322 jar. Rim diameter 140 mm, fragmentary. Level 5.
Fig. IV.82.a M9 34-191:1, on the shoulder of a large type 322 jar. Rim diameter 150 mm, fragmentary. Level 5.
\- L8 40-127:19, on the lower body of a bowl, just above the ring base. Base diameter 78 mm, fragmentary. Level 5.

"Tree" (fig. E.11)
This is a somewhat irregular sign, consisting of a vertical line with several "branches" and a horizontal line crossing it.
Fig. IV.98.i J12 12-39: P99-48, on a body sherd, probably of a large jar. Level 5.

Star (fig. E.12)
Fig. IV.32.a O12 57-171: P03-384, incised star made of four crossing lines, on the upper body of a large jar. Level 6.

Crescent (fig. E.13)
Fig. IV.81.d K12 32-61: P93-454, on the shoulder of a large type 322 jar. Rim diameter 150 mm, height 615 mm, complete, capacity 23.4 litres. Level 5.
Fig. IV.89.a L11 55-124:24, on the shoulder of a large type 323 jar. Rim diameter 130 mm, fragmentary. Level 5. This sign is combined with a painted cross on the opposite side of the same jar (see below).
Fig. IV.92.k H8 13-133: P97-282, four crescent-shaped incisions on the rim of a completely preserved fenestrated pot stand with closed base. Rim diameter 280 mm, height 180 mm. Level 5.

<u>Vertical line</u>
This group contains single, vertical lines. All are fragmentary, and may belong to designs of other types.

-	L8 40-115:14, on a body sherd, probably of a large jar. Level 5.
-	L9 45-92:12, on a body sherd. Level 4.
-	L8 1-3:3, on a body sherd. No level assigned.

<u>Notches at rim or base (fig. E.14)</u>
This group includes ten sherds with notches incised at the top of the rim or in the ring or carination of the base. As a comparison, a goblet from Sheikh Hamad shows similar incisions on the rim (Pfälzner 1995: Taf. 135h).

Fig. IV.2.a	K10 61-129: P93-127, on the edge of a flat base of a small type 122 bowl, 1 incision. Rim diameter 100 mm, height 32 mm, fragmentary, capacity 0.1 litre. Level 7.
Fig. IV.2.c	K10 61-121: P93-110, on the edge of a flat base of a small type 122 bowl, 1 incision. Rim diameter 120 mm, height 30 mm, fragmentary, capacity 0.2 litre. Level 7.
Fig. IV.10.g	L11 68-150:4, on the edge of a flat base of a small bowl, 1 incision. Base diameter 43 mm, fragmentary. Tower room 6, level 7.
Fig. IV.30.b	M12 4-15:30, on top of the rim of a large type 322 jar, 3 incisions. Rim diameter 150 mm, fragmentary. Level 6.
Fig. IV.75.d	K9 63-133:7, on top of the rim of a small type 311 jar, 5 incisions. Rim diameter 120 mm, fragmentary. Level 5.
Fig. IV.96.c	K8 48-103:18, on the ring of a ring base, 3 incisions. Base diameter 90 mm, fragmentary. Level 5.
-	K10 25-60:30, on top of the rim of a large type 322 jar, 3 incisions. Rim diameter 180 mm, fragmentary. Tower room 2, level 5.
Fig. IV.113.c	K7 4-8:4, on the edge of a flat base of a small bowl, 1 incision. Base diameter 45 mm, fragmentary. Level 4.
-	K12 8-19:24, on the edge of a flat base, 1 incision. Base diameter 100 mm, fragmentary. Level 4.
-	K10 5-12:92, on top of the rim of a large type 322 jar, 3 incisions. In addition, under the rim a horizontal line of 6 cm with a triangle are incised. Rim diameter 160 mm, fragmentary. Tower room 1, level 3.

<u>Incisions of unknown shape</u>
This group contains sherds that are described as having an incised potters' mark, but for which no drawings are available.

-	N11 40-113:3, incisions on the rim of a straight-sided type 131 bowl. Rim diameter 300 mm, fragmentary. Level 6?
-	N11 31-132:2, incisions on the rim of a large type 322 jar. Rim diameter 130 mm, fragmentary. Level 6?
-	N11 42-128:3, incised mark on the outside of the fragment, rim fragment of a large type 322 jar. Rim diameter 135 mm. Level 6?
-	L12 50-146: P93-249, several sharp incisions at the lower rim of a pot stand. Rim diameter 190 mm, height 135 mm, lower rim diameter 220 mm, fragmentary. Level 5.

Painted signs, applied after firing

Triangle with point up (fig. E.15)

Fig. IV.84.d	K13 4-41:16, on the body of a large type 322 jar. The shoulder of the jar, above a horizontal incised line, is painted completely black. Rim diameter 170 mm, fragmentary. No level assignment.
-	I10 1-14:23, fragmentary sign on a body sherd. Level 3.

Triangle with point down (fig. E.16)

-	H11 17-29:6, fragmentary sign in V-shape, perhaps a triangle, on a body sherd. Level 5.
Fig. IV.109.s	L12 51-147: P93-334, fragmentary sign on the shoulder of a large type 323 jar. Rim diameter 160 mm, height 660 mm, almost complete, capacity 27.4 litres. Level 4.
Fig. IV.112.i	I7 10-29:4, fragmentary but almost complete sign on a body sherd of a large jar. Level 4.

Crescent closed on top (fig. E.17)

This sign is a little disturbed by the many paint drippings, both upwards and downwards. This indicates that the vessel had been standing both on the rim and on the base before the paint was dry.

Fig. IV.83.g	K12 28-60:6, on the body of a large type 322 jar. Rim diameter 150 mm, fragmentary. Level 5.

Crescent (fig. E.18)

Fig. IV.83.h	K9 70-279:1, on the shoulder of a large type 322 jar. Rim diameter 160 mm, fragmentary. Level 5.
Fig. IV.87.e	H10 10-47: P96-555, on the shoulder of a large type 323 jar. Rim diameter 140 mm, height 610 mm, complete, capacity 27.5 litres. Level 5.
Fig. IV.87.f	M9 18-145:4, on the shoulder of a large type 323 jar. Rim diameter 140 mm, fragmentary. Level 5.
-	M9 18-102:3, fragmentary crescent, on the shoulder of a small type 312 jar. Rim diameter 130 mm, fragmentary. Level 5.
-	M9 18-102:4, fragmentary crescent, on a body sherd. Level 5.
-	M9 18-257:7, on a body sherd from the shoulder of a large jar. Level 5.
-	M9 18-257:8, on a body sherd from the shoulder of a large jar. Level 5.
Fig. IV.108.d	H9 18-46: P96-255, on the body of a small type 311 jar. Rim diameter 98 mm, height 215 mm, complete, capacity 1.3 litres, level 4.
Fig. E.18	H10 9-34:1, fragmentary sign perhaps depicting a crescent, below the rim of a large type 226 pot. Rim diameter >400 mm, fragmentary. Level 4.

Circle (fig. E.19)

Fig. IV.32.h	L13 8-54:1, fragmentary but almost complete sign, on a body sherd from the shoulder of a large jar. Level 6.
Fig. IV.83.i	K12 23-46:20, fragmentary sign, could also be part of a "crossed circle" (see below), on the body of a large type 322 jar. Rim diameter 14.5 cm, fragmentary. Level 5.

Crossed circle (fig. E.20)

This sign is made up of a circle filled with a "Greek" cross. A parallel can be found in a sign from Tell al Rimah, where a similar sign is combined with a #-shaped sign on the same vessel (C. Postgate et al. 1997: pl. 86 no. 997).

Fig. IV.82.b K12 28-60:1, on the body of a large type 322 jar. Rim diameter 145 mm, fragmentary. Level 5.
Fig. IV.85.b K12 32-64:4, on the shoulder of a large jar. Only base and body of jar preserved. Base diameter 68 mm. Level 5.
Fig. IV.97.h K8 57-124:6, fragmentary but reconstructable sign, on a body sherd from the shoulder of a large jar. Level 5.
Fig. IV.97.i K8 57-124:7, fragmentary and somewhat carelessly applied sign, on a body sherd from the shoulder of a large jar. Level 5.
Fig. IV.97.j L8 40-102:22, fragmentary sign, on a body sherd from a large jar. Level 5.

<u>Crossed square (fig. E.21)</u>
This sign is made up of a square filled with a "St. Andrew's" cross, and is the most popular painted sign.
Fig. IV.32.f K13 14-64:15, fragmentary sign with thin lines, on a body sherd from the shoulder of a large jar. Level 6.
Fig. IV.88.e K8 57-122:2, on the body of a large type 323 jar. Jar has horizontal incised lines all around the shoulder. Rim diameter 170 mm, fragmentary. Level 5.
Fig. IV.96.a M11 13-166: P96-486, fragmentary but reconstructable sign, on the body of a large jar. The base and body of the jar were reused as a pot after shoulder and rim had broken off, the fractures have been smoothed. "Rim" diameter 430 mm, height 410 mm, base diameter 88 mm. Level 5.
Fig. IV.97.a K13 4-38:1, fragmentary sign with thin lines, on a body sherd. Level 5.
Fig. IV.97.q I10 2-3:17, fragmentary sign, a little obliquely oriented, on a body sherd. Level 1/3.
\- M9 34-224:4, fragmentary sign, on a body sherd. Level 5.
Fig. IV.112.g K8 34-63:13, fragmentary but reconstructable sign, on a body sherd from the shoulder of a large jar. Level 4.
Fig. IV.112.h I7 9-21:6, fragmentary sign, on a body sherd of a large jar. Level 4.
Fig. IV.112.k K12 9-14:2, fragmentary sign with thin lines, on a body sherd from the shoulder of a large jar. Level 4.
Fig. IV.112.l I7 10-23:6, fragmentary sign on a body sherd probably of a large jar. Level 4.
\- I7 10-23:7, very fragmentary sign, on a body sherd. Level 4.

<u>Comb (fig. E.22)</u>
Vertical lines joined at the top by a horizontal line. Since only a fragmentary sign is preserved, it may also be part of a square filled with vertical lines.
Fig. IV.87.g M9 34-227: P97-200, fragmentary sign, on the shoulder of a large type 323 jar. Rim diameter 180 mm, height 624 mm, almost complete, capacity 38.4 litres. Level 5.

<u>Y-shape (fig. E.23)</u>
Fig. IV.83.j L8 40-116: P97-181, on the upper body of a large type 322 jar. Rim diameter 129 mm, height 618 mm, complete, capacity 21.7 litres. Level 5.
Fig. IV.84.g H10 7-33:27, on the shoulder of a large type 322 jar. Rim diameter 120 mm, fragmentary. Level 5.
Fig. IV.97.m H8 33-239:2, fragmentary sign, on a body sherd of a large jar. Level 5.

<u>Triangle (fig. E.24)</u>
Fig. IV.85.a K12 32-62:1, on the body of a large type 322 jar. Rim diameter 160 mm, fragmentary. Level 5.

Rectangle with open base (fig. E.25)

Fig. IV.67.d	L12 29-131: P93-426, on the body of a large type 213 storage vessel. Rim diameter 288 mm, height 694 mm, almost complete, capacity 106 l. Level 5. Next to this sign there are two crescents, but they seem to be drippings of paint rather than real signs.

Crossing lines (fig. E.26)

This sign is irregular and consists of straight and curved lines crossing each other.

Fig. IV.86.b	L11 55-125:1, on the body of a large type 323 jar. Rim diameter 140 mm, fragmentary. Level 5.
Fig. IV.97.g	M9 34-180:2, on a body sherd, probably of a large jar. Level 5.

Cross (fig. E.27)

Fig. IV.89.a	L11 55-124:24, on the shoulder of a large type 323 jar. Combined with an impressed crescent. Rim diameter 130 mm, fragmentary. Level 5.

The other thirteen signs in this group are all very fragmentary and could be parts of crosses or of other designs that contain crossing lines.

Fig. IV.97.b	K8 59-131:6, fragmentary, on a body sherd from the lower body of a vessel. Level 5.
Fig. IV.97.e	L11 71-153:169, fragment, vertical line with horizontal line attached, on a body sherd from a large jar. Level 5.
Fig. IV.97.f	L11 71-153:168, fragmentary, on a body sherd from the shoulder of a large jar. Level 5.
Fig. IV.97.k	H8 33-239:14, fragmentary, on a body sherd from a large jar. Level 5.
Fig. IV.97.l	M11 13-113:12, fragmentary, on a body sherd. Level 5.
Fig. IV.97.o	H8 33-239:15, fragmentary, on a body sherd from a large jar. Level 5.
-	H10 22-127:1, fragmentary, on a body sherd. Level 5.
-	H8 28-212:14, fragmentary, on a body sherd. Level 5.
-	L11 71-153:170, fragment, vertical with horizontal line attached, on a body sherd. Level 5.
-	L11 55-124:23, carelessly painted fragment, on the shoulder of large jar. Only base and body of jar preserved. Base diameter 83 mm. Level 5.
Fig. IV.112.j	L8 33-74:1, fragmentary, on a body sherd from the shoulder of a large jar. Level 4.
Fig. IV.112.p	K12 10-26:4, fragmentary, on body sherd from the shoulder of a jar. Level 4.
-	J10 43-99:6, fragmentary, on a body sherd. No level assigned.
-	N11 32-107:7, T-shape in black paint on fragment of a large 323 jar. Rim diameter 180 mm, fragment. No level assigned.
-	O10 51-106:9, painted shape on a body sherd. No level assigned.

Rectangle (fig. E.28)

This group includes fragmentary signs, showing the corner of a square or rectangle. They do not belong to the "crossed square" group, but may belong to other signs.

Fig. IV.80.m	H10 21-121: P96-569, fragmentary, on the shoulder of a middle-sized type 312 jar. Rim diameter 130 mm, height 550 mm, complete, capacity 13.8 litres. Level 5.
Fig. IV.97.n	H8 41-276:2, fragmentary, on a body sherd from the shoulder of a large jar. Level 5.
-	M9 34-163:2, fragmentary, on a body sherd. Level 5.

Vertical line (fig. E.29)

All signs in this group are fragmentary and may be part of other signs.

Fig. IV.79.n	M12 8-18:9, fragmentary, on the shoulder of a large type 321 jar. Rim diameter 170 mm, fragmentary. Level 5.
Fig. IV.84.c	I10 20-62:4, fragmentary, on the shoulder of a large type 322 jar. Rim diameter 150 mm, fragmentary. Level 5.
Fig. IV.85.c	M9 34-202:1, on the body of a large type 322 jar. Rim diameter 150 mm, fragmentary. Level 5.
-	H8 28-212:21, fragmentary, on a body sherd. Level 5.
-	H8 28-222:14, fragment of vertical line, on a body sherd. Level 5.
-	H10 9-34:19, fragment of oblique line, on a body sherd. Level 4.
-	K12 13-11:29, fragment, on a body sherd from the shoulder of a large jar. Level 4.
Fig. E.29	M13 2-34:19, on the lower body of a large jar. Only the base and body of the jar preserved. Base diameter 77 mm. No level assigned.
-	O10 16-30:18, stripe of bitumen paint on a body sherd. No level assigned.

APPENDIX F
CUNEIFORM TEXTS FROM TELL SABI ABYAD RELATED TO POTTERY

By F.A.M. Wiggermann

Several cuneiform texts found at Tell Sabi Abyad contain information about pottery, or have been written on pottery vessels. This appendix presents a complete transcription, translation, illustration and discussion of these texts, compiled by Frans Wiggermann.

The Sabi Abyad texts presented in this Appendix are:

T98-131	an inventory list.
T93-3	a letter concerning pots to be delivered for a meal.
T99-31 (=P99-21)	an inscribed fragment of a carinated bowl.
T98-46 (=H8 30-232:6)	an inscribed sign on a large storage pot.
P99-339	an inscribed sign on a large storage pot.

T98-131 (Inventory of cult utensils, Tell Sabi Abyad) compared with KAV 118 (MA, Aššur)
Figs. F.1, F.2

1. 10 DUG.*ša-a[p]!?-p[a-tu]*	*šapputu*	[(x)]	"(a container)"[241]
3 DUG.*ḫu-ru-[pu]*	*ḫuruppu*	[(x)]	"(metal) dish"
2 D[U]G.*ma-ku-su*	*makkusu*	7	"(a bowl)"
2 D[U]G.*ku-ku-ba-tu*	*kukkubu*	14	"(a small container)"
5. 1 DUG.*a-ga-nu*	*agannu*	3	"(a large bowl)"
5 DUG.*ka-lu*	*kallu*	10	"bowl"
1 DUG.*ḫa-pa-al-tu*	*ḫapaltu*	3	"(a container)"
1 DUG.*na-zi-tu*	*namzītu/nazzītu*	[(x)]	"(fermenting vat)"
5 DUG.*pu-ur-s[i]-a-[t]u*	*pursītu*	7	"(a bowl)"
10. 5 DUG.*sa-a-[ḫ]a-ra-tu*	*saḫḫarru*	[(x)]	"(a small bowl)"
	adds:	14 *laḫannu*	"(a bottle)"
	and on rev.:	14 large *nignakku*	"censer"
		14 small *nignakku*	

The reverse of T98-131 is sealed with the seal of Tammitte, the steward of the *dunnu* at Tell Sabi Abyad. The tablet was found in square H8 in level 5, in the office in the north-west of the settlement.

Comments:
In line 1 the signs *-a[p]!?-p[a-tu]* are epigraphically uncertain, but since *ša-* is beyond doubt, *šappātu* is the only available word (cf. the list of vessel names beginning with *ša-* in Sallaberger 1996: 116).

The Aššur text (KAV 118) parallels the text from Tell Sabi Abyad in as far as it is preserved (the upper part is lost), and stems from a library/archive in Aššur comprising texts dated to the MA and NA periods (Pedersén 1986: 13f., 21, N 1:28). Palaeographically the text is Middle Assyrian; CAD classifies it sometimes as MA (*kukkubu, laḫannu, pursītu*), and sometimes as NA (*agannu*, *ḫapālu*, *makkasu* B). The pottery names of the Aššur text are treated by Schroeder (1930/31).

Whereas the Sabi Abyad text is sealed, the Aššur text is not, but instead it has an additional line at the lower edge which may have served as the equivalent of a sealing. The reading of this line is not completely certain, but with a slight emendation of the first sign a PN may be recognized: Adad-da'iq (^{d}IŠKUR-SIG$_5$). Schroeder (1930/31: 112) read here "ten liters (BAN$_2$) of good clay (IM SIG$_5$)", banal and out of tune, but not impossible unless clay was measured in mina's only; Saporetti (1970: 43/8) does not list this text under the PN in question, and thus either accepts Schroeder's interpretation, or classifies the text

[241] These translations have been taken from the dictionaries.

as NA. The two texts can be characterized as issues of pottery items under the responsibility of a high (state) official. Their existence implies that such items were inventoried periodically by a still higher authority, but there are no texts to confirm this kind of administrative action.

The non-pottery items that follow the PN in the Aššur text on the reverse are not duplicated by the Sabi Abyad text, and may be taken as an addition to the pottery core that both texts have in common: 14 large censers, 14 small censers. On the basis of the censers Schroeder rightly considers the whole text to be an inventory of "Material für eine kultische Handlung" (1930/31: 112), an opinion adopted by the CAD (*kukkubu*: list of cult utensils). As such the text is comparable to TMH 1-2 no. 250, a NB list of materials (foodstuffs, plants, wool) and utensils (pottery vessels, censers) for a ritual. The fact that the Aššur text and the Sabi Abyad text list the same set of pottery vessels, and that there are no other texts of this type with different sets of pottery vessels, makes it likely that in both cases this specific set served the same specific purpose, some sort of common ritual or ceremony. The narrow relation between the two texts is confirmed by the appearance in the Sabi Abyad text of a word previously known only from the Aššur text (**ḫapālu* in CAD and AHw, now shown to be *ḫapaltu*).

There are two indications as to the nature of the ritual or ceremony underlying the inventory of vessels in the two texts. The first is that the only other LBA attestation of one of the items, *ḫuruppu,* occurs in the MA Laws (Tablet A § 42, Schroeder 1920), where *ḫuruppu*-dishes are brought by the future husband as a token of engagement on the occasion of the (betrothal) banquet (*šākultu*); the passage shows that this dish might function in a private setting. All other pottery items occur in domestic as well as in unspecific ritual contexts, and do not give a clue as to the nature of the underlying ceremony. The quantity of the items varies irregularly between the two texts, which points to a setting with a variable and not very large number of attendants, be it private or public.

The second indication is the official administrative nature of the texts, evidenced not only by their presence in an archive, but also by the identification of the responsable officials (by a sealing in Tell Sabi Abyad, by a name in Aššur). It shows that the items were issued under state supervision, and hence that the underlying ceremony was public rather than private. The recurrence of the numbers 7 and 14 in the Aššur text suggests that the quantity of these items was fixed by standard liturgical requirements (such as the number of gods present), rather than by the contingencies of the occasion (such as the number of people present), and thus seems to confirm the public nature of the underlying ritual.

The two indications can be harmonized by postulating a ceremony involving: a fixed liturgical setting; a banquet (*šākultu* implied by *ḫuruppu*) organized by the authorities, with beer (implied by *nazzītu*) and fumigations (implied by *nignakku* in the Aššur text); and a variable number of attendants.

In fact there *is* evidence for such a banquet (*šākultu*) ceremony at Tell Sabi Abyad. In the letter T97-34, dated early in the reign of Aššur-nādin-apli (*līmu* Urad-Kūbe), when Buriya was still *abarakku*, Ilī-padâ urges his steward to speed up the perfume makers ([7]*mu-ra-qe-e*) for the "yearly occasion" ([8]*ša ša-at-ti-šu*, cf. [12]*ša šat-ti-šu*), since "during the banquet (ceremony) I will be pouring out (scented) oil on behalf of the king" ([14]*i-na ša-kúl-te* [15] I$_3$ *a-na* UGU LUGAL [16]*ú-tab-ba-ak).* A roughly contemporaneous text from Aššur suggests that day and month (8 Ḫibur) of the assignment are significant. The Aššur text in question (KAJ 92, cf. Postgate 1988: no. 65) records a delivery of sheep for the *tākultu* ceremony in Nineveh, and is dated to 10 Ḫibur. R.Frankena, who discussed the text in conjunction with other (later) evidence (1953: 53ff.), concluded that the *tākultu* ceremony was part of the Akītu festival, and that in Nineveh in the MA period it took place yearly not much after Ḫibur 10. Although the MA ritual calendar remains largely unclear, the significance of Ḫibur in the yearly cycle also jumps out in the texts from Dur Katlimmu, where the yearly muster of cattle, donkeys, and ovids took place on the 20th of that month (Röllig 1984: 192).

The little that is known of the Tell Sabi Abyad *šākultu* shows that it involved a ritual act (the pouring of scented oil) and the king. Among the very few literary texts from the site two are centred on the king, confirming the local execution of royal rituals. One (T96-31) addresses the king with good wishes, the other (T04-15) contains two prayers to Ištar on behalf of Aššur-nādin-apli. There were several "singers" (*zammāru*) on duty in the *dunnu* (T98-45 A ii 40', T9-93 rev. 2', 7', T01-3 rev. 19, 30), but it is not clear if they were responsible for the recitation of the liturgical texts.

The yearly occasion of the ceremony (*ša šattišu*), the date (Ḫibur), and the involvement of the king correlate the *šākultu* of T97-34 with the *tākultu* of other MA and NA texts. In connection with an inscription of Šamšī-Adad I it has been plausibly suggested that in the Middle Bronze Age *šākultu* was used for later *tākultu* (Grayson 1987: 58, following Charpin 1984: 49), and it is quite likely that the Tell Sabi Abyad usage is a survival of the past. In any case, since the Tell Sabi Abyad *šākultu* took place at about the same time (Ḫibur) as the national *tākultu,* the provincial royal ritual must have been performed in the absence of the king. Possibly the king was represented by a statue on such occasions; actual royal statues of this period have not yet been found, but they must have existed (cf. *ṣalam šarri* “statue of the king” in MARV III 71:6, Grayson 1987: 301.24, 28, Aššur-nādin-apli).

Special administrative attention to the pottery used in a *šākultu/tākultu* ceremony was deduced above from the existence of the records T98-131 and KAV 118. The special status of this kind of ritual objects is confirmed by the remains of inscribed MA pottery vessels from the Aššur temple in Aššur (Frankena, 1953: 51f., Grayson 1987: 161f. Adad-narari I; 213ff. Salmaneser I); the inscriptions suggest that the pottery was ordered by the king for a *tākultu* ceremony, and then became the property of the Aššur temple.

Another formal (but not ritual) occasion in Tell Sabi Abyad is the “dinner party (*naptunu*) of Ilī-padâ”. On one of these occasions the host served 40 *qû* of beer (T97-23), which implies between 20 and 40 guests. Among the people entertained by Ilī-padâ in the *dunnu* may have been (besides local worthies and regional functionaries) the “foreign delegates” (*ubrūtu*) travelling to and from his capital somewhere in the region (T97-10: 15-17: *i+na p[a-n]i* ^{m}DINGIR-*pa-da*, NINDA.MEŠ *e-ta-na-ku-lu).* Ilī-padâ’s guests must have been seated in the large Mittelsaal of the “palace”, the only space that had the capacity for this number of people. In Aššur such dinner parties were held by the king for his magnates (Müller 1937: 59ff., Harrak 1990: 71:14, Frankena, 1953: 54f., Van Driel 1969: 159ff.); some were apparently cultic (Weidner 1935/36:10, archive of Ninurta-tukul-Aššur, MA).

The steward hosted dinner parties as well (T01-2:2f., Buriya; T99-13:1, Tammitte); these presumably were an internal affair. One text records the issue of respectively 5 and 2 goats for two different (?) dinner parties (T93-9, the name of the host is broken).

T 93-3
Figs. F.3, F.4

a-na ^{m}*[m]a-nu-ki-i-*^{d}IŠKUR
qí-bi-ma
um-ma [^{m}*m]u-*SIG$_5$-^{d}*a-šur-ma*

---

mi-nu-ú-[m]a an-ni-ú
ša am-mar a-qa-bi-a-ku-ni
ki-i pi-[i]a la te-pu-šu-ni
a-na-i-ni L[U$_2$].BAḪAR$_2$
a-na ^{uru}*du-n[i]-*^{d}*a-šur*
a-na UGU LU$_2$.[L]UNGA
la t[a-á]š-pu-ur
na-áš-pé[r-t]a-ka
a-na UGU L[U$_2$].LUNGA-*ka*
ša ^{uru}*saḫ-la-li*
lu tal-li-ka
KAŠ.MEŠ
ù ^{dug}*ta-ri-ḫa-te*
um-ti s[u]-ti-ú
i-lu-ku-ni-n[i] NINDA.MEŠ
i-na pa-ni-ia e-ku-lu-ni
li-di-in ma-an-na-ma
le-r[i]-iš ma-nu-ma
li-di-na
ṭup(!)-pa-[t]e an(!?)-ni(?)-a-te
ar-ḫiš še-bi-la

The text is not sealed. It was found in a pit in square K9.

Translation:
Speak to Mannu-kî-Adad, thus says Mudammeq-Aššur: what is this, that you do not execute any of my commands as I tell you? Why did you not give orders to (your) brewer (to send) a potter to Dunni-Aššur? Let a written order go out from you to your brewer in Saḫlalu, that he must give beer and *tarīḫu*-vessels (for) when the Suteans come to have dinner with me. Whom (else) could I ask, who (else) could give it to me? Do send these(?) tablets (with orders) promptly.

Comments:
A preliminary edition of the text had been given at the XLIth RAI in Berlin 1994, after which it was quoted by Jakob (2003: 474f). Meanwhile a new copy has been made.

Mannu-kî-Adad is the steward of the *dunnu* Tell Sabi Abyad during the reign of Tukulti-Ninurta I, and Mudammeq-Aššur is a regional functionary in the service of the grand vizier Aššur-iddin.

The dinner organized by Mudammeq-Aššur is probably the setting for a more or less formal meeting between representatives of the Assyrian imperial administration and the local Sutean pastoralists, an occasion on which the two parties could confirm their good relations and discuss current affairs. The dinner was to take place in Dunni-Aššur, an Assyrian centre somewhere to the north of Tell Sabi Abyad and Saḫlalu (see most recently Llop-Raduà 2002, Luciani 2001). Not long after the time of Aššur-iddin Ilī-padâ formalized (or reformalized) the relations with the local Suteans (the Niḫsānu tribe) in a treaty (T04-37). There is no evidence for an earlier treaty, but T93-3 implies that such may well have existed, written or unwritten. In the treaty Ilī-padâ represented the Assyrians, while the Niḫsānu tribe was represented by GAL.MEŠ, "sheikhs". It were probably such tribal "sheikhs" who were expected at the dinner party organized under supervision of Mudammeq-Aššur.

Mudammeq-Aššur planned to serve food (NINDA.MEŠ) and, more importantly, beer. The food was probably locally available, but the beer and the proper tableware were a problem. Mudammeq-Aššur had requested a brewer and a potter, but neither of them had arrived in Dunni-Aššur. At the time of the letter Mudammeq-Aššur was desperate and, since there was apparently no more time to prepare the pottery in Dunni-Aššur, he now requested just a brewer, who was to brew the beer on the spot and bring the proper tableware ready-made from Saḫlalu (probably Tell Saḫlan some 12 kilometers north of Tell Sabi Abyad on the Balikh, cf. Lyon 2000: 100, 120). That a brewer could serve more than one Assyrian settlement is known from nearby Tell Chuēra (Kühne 1995: 215, Jakob 2003: 32f.), and T 93-3 shows that the same goes for a potter. In that text it seems that the potter is somehow supervised by the brewer.

The *tarīḫu*-vessels that Mudammeq-Aššur wanted must have been something special; the word is very rare, but attested elsewhere in connection with beer (among other things) (Jakob 2003: 407, Donbaz 1992: 119f. 17, 20). The context of T93-3 indicates that the *tarīḫu*-vessels were to be used during the meal (rather than during the brewing process), while the rarity of the word shows that it did not denote one of the common storing, serving or drinking vessels. The word looks Semitic, but the most likely derivation (*tapris-* to *râḫu* D "to leave", "to spare") does not readily supply a suitable meaning.

Beer is made of grain and thus a specialized product of the settled community. That the pastoralist Suteans appreciated this product appears from the above mentioned treaty, in which two of the six paragraphs regulate their drinking habits - clearly a source of interethnic tension: Suteans are not allowed to buy beer on tick, and they are not allowed to drink the beer that they bought in the pub ("at the brewer's" *pāni sirāšê*), but have to take it back to their camp.

In the administrative texts T98-58 and T96-34 from Sabi Abyad a number of persons (among them Suteans) receive bronze *kappu*-bowls, perhaps distributed at a dinner party (such as the one of T93-3) as honorary gifts. In a MA text from Aššur (MARV VII 102:22') a Kassite messenger receives among other things a *kappu ša ildi* "bowl with a potstand" and a *kappu ša [kabli?]* "bowl with a [leg]" as *rēmūtu* "honorary gift" (the restoration *ša kabli* is based on MARV I 58:1f.).

In the NA period the king gives out *kāsu*-goblets as honorary gifts. They were meant for wine, not for beer (Cf. Radner 1999/01: a *kāsu* inscribed "Stadtherr von Zarātu"; the goblet type is typically NA, and used for drinking wine).

T99-31 (= P99-21)
Fig. F.5.

A rim fragment of a carinated bowl inscribed [...] *x si x* [...].
The fragment was found among large amounts of pottery sherds and other waste deposited in the open area in square H9, in level 5.

The reading can be anything: *[bu]r-si-x* is possible, but the fragmentary last sign is neither *–t[u], -t[a], -t[e],* nor *–i[t],* which does not favour *pursītu/e/a/* or *pursīt*; *-t[i]* instead of *–t[e]* is unlikely. The preserved signs exclude a capacity measure. The other possibility is a PN, which gives a good solution: *[šá ^{p}]a-si-r[i]* (*a-* half preserved): "[of]Asīr[u]". But why is this humble product singled out among its countless anonymous brethren to be honoured with an inscription? Was the owner among the guests at one of Ilī-padâ's dinner parties, and did he forget his honorary gift? Or did he not show up at all?

T98-46 (= H8 30-232:6)
P99-339
Fig. F.6 and F.7

Two rim fragments of large storage pots, inscribed with a single, very large sign.

T98-46 was found in the fill of a room in square H8, level 5. The rest of the vessel was found in fragments, but although the shape could be reconstructed, the vessel remains incomplete. The inside of the vessel is completely covered in a thick bitumen layer, perhaps in an attempt to make it impermeable.
P99-339 was found in square H12 (H12 8-42). No other fragments of the vessel were found in this context.

The inscription is "A", possibly "water", although the spelling A instead of A.MEŠ is unusual. The options are few, however, and another solution does not offer itself.

APPENDIX G
FUNCTIONAL PROPERTIES OF SELECTED SHAPE GROUPS.

Carinated bowls (rim types 111, 112)

Percentage of all rims (levels 6-3):

111	33.8%
112	1.1%
Total:	34.9%

Function-related properties

Fabric and inclusions
The greater majority of the carinated bowls (97.4%) is made of the normal ware with fine organic inclusions (ware group Y, including wares H, I, J, G). The use of a clay with organic inclusions is most probably not related to the function of the bowls, but rather to the shaping technique. Fine wares without organic inclusions were only used for a few small and middle-sized type 111 bowls (0.5%).

Shaping methods
Carinated bowls were thrown from the cone. The larger sizes may also have been thrown from a single piece of clay. The result of these quick shaping techniques is a generally rather carelessly shaped vessel, including especially base cracks and a slanting shape (see below). Approximately 27% of all completely preserved carinated bowls have base cracks, often running through the vessel wall and making the bowl unsuitable for liquids. In some cases (approximately 9% of all carinated bowls with base cracks) these cracks were "repaired" by the potter after firing, by smearing the crack with a gypsum/lime paste or, more rarely, with bitumen. This suggests that the users of the bowls sometimes did care about the presence or absence of base cracks in their bowls. About 1% of all carinated bowls has other cracks as well, mainly in the rim or in the vessel wall parallel to the throwing ridges. These tension cracks most probably originated during the drying or firing stage, and are due to the leanness of the clay combined with the shaping methods.

Shape
These bowls have an open shape in which the contents are very easily accessible. The rim diameter is also the maximum vessel diameter. The smaller bowls are slightly deeper than the larger, flatter bowls. The ratio between vessel height and rim diameter is

Small size:	mean ratio 0.41 (between 0.27 and 0.60)
Middle size:	mean ratio 0.35 (between 0.23 and 0.52)
Large size:	mean ratio 0.33 (between 0.14 and 0.44)
All bowls:	mean ratio 0.37 (between 0.14 and 0.60)

All vessels are very easily transportable, but transport is practical only for very short distances. All vessels can stand without support. However, many are very slanted due to the cutting from the hump in the throwing process. This will sometimes lead to the vessel tipping over or, in extreme cases, to the contents spilling out, especially in the case of liquids. Other bowls are oval in shape, also due to the shaping process. These features are usually seen as characteristic of the Middle Assyrian carinated bowls and around 19% of these bowls was noted to be slanted, oval or otherwise deformed during shaping. Apparently, this was not deemed disadvantageous for the intended function of the bowl. Bowls with a ring base (13% of all carinated bowls; a ring base is in itself already more stable than a flat base) are less often deformed than bowls with a flat base cut from the cone without further treatment. Apparently, in applying the ring base and perhaps scraping the base, care was taken to correct any deformities.

It has been suggested (Pfälzner 1995: 246, abb. 144) that the carinated rim was meant to facilitate the stacking of these bowls in mass quantities. However, the slanting shape makes the stacking of many bowls difficult because the stack starts to lean over to one side and becomes unstable (fig. VI.15). When stacked the bowls tend to rest mostly on their bases and not on the carinated part of the rim (as suggested by Pfälzner), which also makes the stack rather unstable. If there are any functional aspects to the carinated rim shape they may be related to a better grip on the bowl by the user.

Size
Carinated bowls were shown to exist in three size groups according to the rim diameter (Appendix B, fig. B.1, B.2):

Small (appr. 20%):	111a: rim diameter < 115 mm, mean rim diameter = 91 mm (CV = 10.9%).
Middle (appr. 26%):	111b: rim diameter ≥ 115 mm and < 175 mm, mean rim diam. = 143 mm (CV = 11.0%).
	112a: rim diameter < 170 mm, mean rim diameter = 137 mm (CV = 10.6%).
Large (appr. 54%):	111c: rim diameter ≥ 175 mm, mean rim diameter = 216 mm (CV = 12.4%).
	112b: rim diameter ≥ 170 mm, mean rim diameter = 206 mm (CV = 11.6%).

Each larger size group is about 1.5 times larger than the group immediately below.

Capacity
The capacity was measured for 64 carinated bowls of all size groups. Capacity in litres (measured to the rim) is:

Small	mean capacity 0.09 (between 0.03 and 0.14; CV = 24.1 %)
Middle	mean capacity 0.31 (between 0.13 and 0.60; CV = 39.1 %)
Large	mean capacity 1.05 (between 0.55 and 1.60; CV = 27.3 %)
All bowls	mean capacity 0.33 (between 0.03 and 1.60; CV = 119 %)

Each larger size group has a capacity approximately three times larger than the capacity of vessels in the group below. The capacities could very roughly coincide with the Assyrian measures of 1/10, 1/3 and 1 *qû* . It is clear that the Coefficient of Variation (CV) for capacity in each size group is much larger than the CV for the rim diameter. This may suggest that the potter was not interested in the exact capacity of a carinated bowl, and that he did not aim to make vessels with a standard or fixed capacity. In addition, it is highly unlikely that carinated bowls were meant to function as ration bowls (cf. Pfälzner 1995: 243), since the variation of their capacity even within one size group is much too large and rations of 1 *qû* and smaller are very small portions.[242]

Surface treatment
Carinated bowls have untreated surfaces only smoothed by the wet hands of the potter during shaping. Often the wet fingerprints of the potter are still visible on the outside surface. Burnishing and the application of a slip are very rare (0.2% and 0.1% respectively). Burnished or slipped bowls may have had a more representative character than the normal, untreated bowls.

Decoration
Decoration is extremely rare among carinated bowls. Very rarely, painted or incised lines occur (only 0.1%). So it seems that stylistic, decorative or display functions were not among the purposes of the carinated bowls.

[242] Furthermore, it may be doubted whether rations were distributed per person on a daily basis to the hundreds of dependents at the site, or even only to the staff at the dunnu. This would involve an enormous crowd gathering daily at the offices to receive a small ration. It would be much more efficient when an individual or the head of a group of people (family?) would receive the rations for a set period of time (weekly, monthly?). Indeed, in the early 1990s Syrian family heads would collect the flour and sugar distributed to them by the government for the whole family on a monthly basis, although the amounts were calculated per person/child per day (personal observation). Although the Assyrian texts list the rations per day per person, they do not provide any clues as to how the distribution actually took place (F.A.M.Wiggermann, personal communication).

Special features
Eight carinated bowls (0.8%) have one or two holes made on purpose in the base. Half of them were made when the clay was still plastic, before firing, and therefore were related to the intended function of the vessel. They are exclusively present in the smallest carinated bowls (type 111a) and measure about 5 mm in diameter. The other half was drilled or cut into the base after firing, and may be related to a secondary use. The diameter of these holes is between 10 and 27 mm. They are also found in larger bowls. The holes are positioned off-centre in the base, and once in the lower vessel wall. It is clear that carinated bowls with base holes made before firing were not meant to contain liquids. Perhaps they were meant as lids for other vessels, with the holes providing some air circulation, or as a kind of strainers.

Potters' marks and signs
Four carinated bowls show potters' marks, one of which has cuneiform signs written on the upper vessel wall (fig. IV.43.j), and a second is impressed with a stamp seal (P01-122, fig. E.4) . The others show an incised cross and incised lines (fig. IV.99.al, see also Chapter V and Appendix E). The bowl inscribed with cuneiform signs may have been meant for a specific purpose. The inscribed word could have been a personal name (see Appendix F).

<u>Use-related properties</u>

Burning traces
A total of 255 carinated bowls (6.7% of all carinated bowls) shows traces of burning, either related to the use of the vessel or to depositional or post-depositional circumstances. Burning traces are present mostly on small bowls (53% of all bowls with burning traces), and much less on large bowls. Many of the burning traces, especially on the smaller bowls, are situated on or at the rim of the bowl. This could suggest that small bowls were used in an activity that left burning traces on the rim, for example in the use of the bowl as an oil lamp. Indeed, small bowl P92-21 was stuck inside another lamp-shaped bowl and used as a lamp (fig. VI.16). The presence of a base hole in some of these bowls, however, suggests that not all small bowls with burning traces could have been lamps. The majority of the burning traces (53.3%) are located on the inside of the bowls.

	On the rim	Elsewhere
Small bowls	51.1%	48.9%
Middle bowls	31.6%	68.4%
Large bowls	4.1%	95.9%

Table G.1: The location of burning traces on carinated bowls

Remains of contents
A few bowls contained the charred seeds of grains, and once a carinated bowl was found with charred garlic inside (in an area probably used by the baker). Bowl P97-91 (fig. IV.40.j) has a thicker crust of carbonized material on the inside. Middle-sized and large bowls were sometimes used for the preparation of a gypsum/lime paste, most probably used in the repair of other vessels in the workshop of the potter (fig. IV.40.m, n, fig. IV.42.n, q, fig. IV.43.g, i, fig. IV.114.aa, fig. VI.5). Similarly, some bowls were used for the preparation or use of bitumen, which left a black and shiny layer on the inside of the bowl and sometimes dripped over the rim to the outside surface (fig. IV.38.l, IV.99.ak). Two bowls have an unidentified grey-white concretion sticking to the inside, two have a yellowish or orange crust stuck to the surface. One bowl was used for a dark-red kind of paint or colorant, which stuck to the inside surface (M12 4-12:1), while about a dozen bowls have reddish, bluish, greenish, orange or brownish discolourations and stains on the inside surface, possibly connected to their ancient contents.

Traces of use
The fragmentarily preserved bowl P97-208 and sherd K8 102-214:7 have a rim that was cut and severely abraded after firing. These sherds were probably used secondarily as some kind of scraping tool. Other middle-sized and larger carinated bowls show traces of abrasion as well, on the inside or outside surface. They may partly be connected to the use of the bowl for stirring or crushing the contents. About ten bowls

have inside or outside surfaces that are flaking off. This may be connected to their use or contents, but may also be related to post-depositional processes.

Remarkable archaeological context
Carinated bowls are found in large numbers in all contexts all over the settlement. Find contexts that are of special interest here include the find of small carinated bowls used as lids on large or middle-sized jars, mostly in burials (see Chapter VI). Also in burials, carinated bowls are the exclusive ceramic burial gift, next to jewellery and other personal objects. Other bowls were found inside a large jar that was part of some kind of installation of an as yet undefined nature (P93-219, P03-317 (fig. IV.15.a)), or were discarded in the fill of pottery kilns (kiln H, kiln K).

<u>Suggestions for function and use</u>

- Multi-purpose bowls with a variety of different functions and uses, available in 3 non-standardized size groups.
- Serving / consumption of food (display is a minor aspect); not always suitable for liquids.
- Short-term dry storage during food-preparation or other domestic or craft activities.
- Processing of small quantities of food or other materials (gypsum, bitumen, etc.).
- Lids for jars.
- With base holes: strainers?
- Lamps.
- Burial gifts.
- Ritual?
- Secondary use of sherds as scraping tools?

Carinated bowls with a long vessel wall above the carination (type 113)

Percentage of all rims (levels 6-3): 1.8%

<u>Function-related properties</u>

Fabric and inclusions
As with most other pottery, type 113 bowls are mostly (93.8%) made from a clay with fine organic inclusions (ware group Y, including wares G, H, I, J). For many sherds in ware group Y it was noted that the inclusions are very fine, while 4.8% of these bowls are made from a fine clay without any inclusions or with fine sand inclusions (ware group X). The use of organic inclusions is most probably more related to the raw materials and shaping methods than to the function of the vessel. However, a clay with finer inclusions seems to have been desirable more often than usual.

Shaping methods
Most likely, these bowls were thrown from one lump of clay. The initial shaping, secondary shaping and further surface treatment are generally more careful than for the carinated bowls type 111. Base cracks or other cracks caused during the drying or firing stage hardly occur (1.5%), suggesting that the potter took good care to press the air out of the base during shaping. Once, a crack in the vessel wall was “repaired” after firing with some gypsum/lime paste. All except one complete bowls have a carefully shaped ring base, lending more stability to the bowl. The application of a ring base is more labour-intensive than simply cutting the bowl off the wheel.

Shape
These bowls have an open shape in which the contents are easily accessible. The rim diameter is also the maximum vessel diameter. The mean ratio between vessel height and rim diameter is 0.37 (between 0.29 and 0.46). The bowls are markedly deeper than the larger carinated bowls type 111c. The bowls are easily

transportable, but transport is only practical over very short distances. Type 113 bowls are very stable, due to their relatively broad ring bases.

Size
No size groups can be made. The rim diameters vary between 110 and 370 mm, with a mean rim diameter of 253 mm.

Capacity
The capacity was measured (to the rim) for 13 completely preserved bowls.
Mean capacity in litres = 2.45 (between 1.60 and 4.77; CV = 36%).
The high Coefficient of Variation (CV) shows that a standardized capacity was not aimed for.

Surface treatment
A large proportion (21%) of the bowls have a surface that is carefully burnished, most probably by hand (without using the fast rotation of the wheel). Both in and outside surfaces were burnished or, more rarely, only the inside surface. Bowls that were not burnished generally have a more carefully smoothed surface than usual, giving the bowls a pleasantly soft “touch”. Burnishing makes the surface more watertight, and has aesthetic qualities as well.

Decoration
These bowls are relatively often decorated, either with incised horizontal lines under the rim or at the carination (6.3%), or with carefully impressed and incised circles and triangles inlaid with a white paste (9.2%). Bowls with incised lines were mostly buff, orange or reddish in colour. While the horizontal incised lines were probably quickly applied on the wheel, the execution of the white-filled impressed decoration must have required quite some time, effort and skill. This white decoration, applied almost exclusively on bowls with dark (brown, black, grey) colours, has a great effect on the viewer (especially in the absence of decoration on pottery in general). The display of these bowls must have been one of the primary functions.

Firing
The rather low firing temperatures and the mostly incompletely oxidizing or reducing atmospheres in which these bowls were fired had a profound effect on the surface colours. Although orange, red and buff vessels do occur, many have dark colours and it seems that darker colours were aimed for. Perhaps this was done for aesthetic reasons.

<u>Use-related properties</u>

Burning traces
Traces of burning are very rare on these bowls (3.9%) and occur on both inside and outside surfaces. They are most probably related to depositional processes.

Traces of use
Three (1.4%) unburnished, undecorated bowls have abraded outer surfaces, mostly near the base. This is most probably due to (secondary?) use of the bowl, but it is not clear what caused the surface damage.

<u>Suggestions for function and use</u>
While one thin-section sample (no. 16, Appendix D) suggests that these bowls were produced locally, the careful shaping methods, surface treatment and decoration indicates that these bowls were not part of the bulk production of the *dunnu*. Possibly they belong to a different production tradition?

- Serving and presentation; visibility and decoration are important.
- Short-term dry storage?
- (secondary?) use in an activity that damages the outer base surface.

Small and large straight-sided bowls (types 131, 132, 143)

Percentage of all rims (levels 6-3):
131 7.1%
132 2.1%
143 1.4%
Total: 10.6%

Function-related properties

Fabric and inclusions
Almost all of these bowls were made of a clay with organic inclusions (ware group Y, 99.7%). The very rare exceptions were made of a clay with organic and coarser sand inclusions, as well as of a fine ware without any organic inclusions. The use of organic inclusions is most probably more related to the properties of the raw materials and to the shaping methods than to the function of the vessel.

Shaping methods
Although smaller bowls may have been thrown from the cone, the middle and larger sizes were most probably thrown from one piece of clay. The quick shaping techniques, as well as the properties of the raw materials, led to the forming of base cracks during the drying or firing stage in approximately 20% of all cases. Other cracks in the rim or vessel wall occurred in about one out of ten bowls. Almost half of these cracks were "repaired" by the potter with a gypsum/lime paste. The existence of cracks was therefore probably not much appreciated by the users. Occasionally the potter tried to re-shape a damaged rim before the clay was dry. The addition of ring bases, and the scraping of the base, were secondary steps in the shaping process. However, ring bases were often added rather carelessly.

Shape
These bowls have an open shape, and the contents are easily accessible. The rim diameter is also the maximum vessel diameter. The mean ratio between vessel height and rim diameter is 0.34 (between 0.21 and 0.50). They are easily transportable, but transport is only practical over short distances.

The bowls can stand without a support, and most are stable. Slanting shapes due to oblique cutting from the wheel occur only rarely. Two-thirds of these bowls have a ring base, providing for extra stability. The rims that are bent over outwards (types 131, 143) provide a good grip for lifting or tilting the bowl, especially when hands are slippery. Rims that are thickened on the inside (types 132, 143) provide a practical inner edge that prevents the contents from spilling (for example when moving the bowl). It also prevents the contents from being pushed out easily (for example when scooping up morsels of food with bread or a spoon).

Size
This group of deep bowls with straight walls cannot be divided into different size classes on the basis of their rim diameters or vessel heights. A tentative grouping in smaller and larger bowls was tried only for type 132 (Appendix B). Generally, type 132 bowls are smaller than type 143 bowls, while type 131 encompasses the whole range of diameters.

Type 131	mean rim diameter = 300 mm, (between 140 and 560 mm; CV = 20.0%).
Type 132a	rim diameter < 250 mm, mean rim diameter is 206 mm.
Type 132b	rim diameter ≥ 250 mm, mean rim diameter is 308 mm.
Type 143	mean rim diameter = 327 mm (between 150 and 450 mm; CV = 20.4%).
Whole group:	mean rim diameter 295 mm (between 100 and 560; CV = 22.2%).

Capacity
The capacity was calculated for 32 complete bowls of all sizes. The mean capacity for all bowls is 3.46 litres (between 0.49 and 10.76 litres, CV= 89%). Tentatively, three capacity groups can be discerned that loosely relate to the total vessel height:

Small	capacity < 2 litres, vessel height < 90 mm.
	Mean capacity = 0.99 litre (between 0.49 and 1.94 litres; CV = 40%)
Middle	capacity > 2 litres and < 6 litres, vessel height > 90 mm and < 160 mm.
	Mean capacity = 3.82 litres (between 2.50 and 4.87 litres; CV = 21%)
Large	capacity > 6 litres, vessel height > 160 mm.
	Mean capacity = 8.97 litres (between 6.10 and 10.76 litres; CV = 19%).

The mean values for capacity seem to suggest that these groups would represent bowls of roughly 1, 5 and 10 *qû* in size. The CV values, however, are high and it is not likely that precise capacities were aimed for.

Decoration
Two large bowls were covered in a green glaze. This decoration is unique at Sabi Abyad and for the period in general, and the thin-section analysis of one of them shows that glazed pottery was most probably imported (sample no. 23, Appendix D). These very special bowls indicate that presentation, display or serving may have been among the functions of large deep bowls.

<u>Use-related properties</u>

Burning traces
About 4% of all deep straight-sided bowls show traces of burning, mostly inside or both in and outside, and hardly ever on the outside only. The records do not say anything about a preferred location of the burning traces on the vessel. Most probably, these burning traces are largely due to depositional processes.

Remains of contents
Hardly any visible traces of the original contents were reported. Two vessels seem to have contained bitumen, or were used in the preparation of bitumen, and are completely covered with tar on the inside and partly also on the outside (cf. fig. IV.49.c). Some bowls have orange-reddish stains inside, perhaps remains of contents. A greenish-grey crust occurs sometimes.

Traces of use
About 10% of all bowls has a severely abraded or damaged inside (or rarely outside) surface. Once, a larger damaged part was repaired with a gypsum/lime layer. It seems that some of these bowls were used for activities that damaged the surface, perhaps using stone or metal tools to stir, grind or mix.

Remarkable archaeological context
These bowls generally occur all over the settlement. Only in one case did the pottery database make a remark about the find context. This type 131 bowl (fig. IV.48.q) was used as a lid, upside down covering the rim of a large jar that was placed deliberately inside a deep pit and supported with mud bricks.

<u>Suggestions for function/use</u>
The large size range and capacity range suggests that these bowls may have had multiple functions. Possibly, three size groups are present but precise capacities were not aimed for. Display seems to have been a minor aspect.

- Serving and consumption of food.
- Short-term dry storage.
- Processing of food or other materials (e.g. bitumen, washing?), sometimes with hard tools.
- Lid or cover.

Deep bowls and straight-sided pots (types 141, 142, 221a, 222)

Percentage of all rims (levels 6-3):

141	2.3%
142	1.0%
221a	2.4%
222	2.2%
Total:	7.9%

This group includes deep bowls and open pots with almost vertical walls, all with hammer-shaped rims. Although a distinction was made in the type numbering between bowl and pot on the basis of the direction of the wall and proportion of vessel height and rim diameter, this distinction seems less useful from a functional perspective. The bowls and pots of very large size will be discussed separately below.

Function-related properties

Fabric and inclusions
Vessels of this type were made exclusively of a clay with organic inclusions (ware group Y). This is mostly related to the used raw materials and shaping methods. A porous fabric suitable for the cooling of liquids may have been one of the additional advantages.

Shaping methods
Most of these deep vessels were thrown from a single piece of clay. In some cases, an extra layer of clay with many organic inclusions was added at the inside of the base, to obtain a more even base thickness and prevent base cracking. After the vessel and rim had been shaped, and after a short drying period, the vessel was placed upside down on the wheel and the base was scraped. Then a ring base was attached. The extra treatment of the base (turning and application of a ring base) has prevented the occurrence of base cracks: no base cracks are reported for these shapes, and they are therefore very well suited to contain both dry and liquid materials. Cracks in rims and walls, most probably caused during drying or firing, are present in 1% of all fragments. All these cracks were “repaired” by the potter with a gypsum/lime paste; it is likely that cracks in the vessel wall were not appreciated by the users.

Shape
These vessels are deep open shapes in which the contents are easily accessible and easily retained. The rim diameter is also the maximum vessel diameter. The vessel height is smaller (in the case of bowls) or just as large as the maximum vessel diameter. The ratio between vessel height and rim diameter is:

Small	mean ratio = 0.88 (between 0.70 and 1.08; CV = 13%)
Large	mean ratio = 0.84 (between 0.39 and 1.01; CV = 14.5%)
All	mean ratio = 0.85 (between 0.39 and 1.08; CV = 14.4%)

All vessels can stand without support, and are fairly stable due to the generally low point of gravity. Only 2.7% of all complete vessels were reported to be slightly slanting, due to the fact that the vessel was cut obliquely off the wheel or due to the application of an off-centred ring base. Some vessels show slightly oval rims (0.9%), which came about by pressing the walls too much when the clay was still plastic (when lifting the vessel from the wheel or when turning it over to prepare the base; a few show thumb impressions about 10 cm below the rim). All except one of these vessels have ring bases lending them extra stability. Rims have a clearly defined hammer shape, providing a good grip when carrying or lifting the vessel, and providing an edge that can be used when tying a cover over the opening with rope. The vessels can be transported, but over long distances the large opening would be impractical.

Size
Although size groups could hardly be established on the basis of rim diameter per rim type (Appendix B), two groups become apparent when we put all four types in one functional group and look at the relation between rim diameter and vessel height (cf. also fig. B.20).

Small rim diameter < 280 mm; vessel height < 240 mm (including rim types 141, 142 and 222).
Mean rim diameter = 228 mm (between 90 and 270 mm; CV = 15%)
Large rim diameter > 280 mm; vessel height > 240 mm (including rim types 142, 221 and 222).
Mean rim diameter = 338 mm (between 290 and 500 mm; CV = 11%)

The rims of the large vessels are roughly about 1.5 times wider than the small ones.

Capacity
Capacity in litres was calculated for 8 small and 11 large vessels. Measured to the rim, the capacity is:

Small mean capacity = 2.84 litres (between 1.10 and 4.58 litres; CV = 51%).
Large mean capacity = 12.5 litres (between 9.94 and 18.10 litres; CV = 20%).

It seems as though these capacities may be roughly related to measures of 3 and 15 *qû*, but the large CV indicates that a precise capacity measurement was probably not aimed for.

Surface treatment
The surface of these vessels was smoothed during the shaping on the wheel, and not treated further.

Decoration
A small portion (3.4%) of all vessels is decorated with simple incised lines on the upper vessel wall under the rim. One or two horizontal lines, wavy lines and combinations of horizontal and wavy lines all occur. Rarely, the incision is placed on top of the rim. Visibility may have been a minor aspect of the function of these vessels.

Potters' marks and signs
On one deep pot (type 222, fig. IV.70.o), two crossing lines were incised before firing just under the rim of the pot. For a more detailed discussion of potters' marks, see Chapter V and Appendix E.

<u>Use-related properties</u>

Burning traces
Traces of burning were recorded on 3.3% of all fragments in this group, on both the inside and the outside surface of the sherds but not in a specific location on the vessel. They are most probably related to depositional processes rather than to the use of the vessel.

Remains of contents
Only very few vessels show any visible traces of possible contents, including black, brown, orange/red and greenish discolourations or stains on the inside surface. One vessel has a thick bitumen crust on the inside, possibly to improve impermeability. Other artefacts found inside these vessels include a small carinated bowl and a basalt stone (in fig. IV.27.c); a seal, a polished stone and many shell fragments (in fig. IV.27.d); and a lot of colourful stones (fig. IV.32.a).

Traces of use
One large vessel (P92-81) has a hole (18 mm diameter), drilled in the centre of the base after the vessel had been fired. Apparently the user was in need of a vessel with a hole in the base. None of the other vessels of this type has holes in the base. In six mostly large vessels, the inside surface was noted to be severely abraded. This may have been caused by the repeated use of a hard tool, in stirring, mixing, and so on.

<u>Suggestions for function and use</u>
The possible existence of two capacity groups (small and large) may be related to function and use. They are generally deep, stable, multifunctional vessels.

- Short-term dry and liquid storage.

- Long-term dry and liquid storage.
- Short-distance transport (of water)?
- Processing of food or other materials, sometimes with hard tools.

Closed cooking pots (types 211, 212, made of cooking wares)

Percentage of all rims (levels 6-3):

211	0.03%
212	0.34%
Total	0.37%

Function-related properties

Fabric and inclusions
These pots are all made of coarse wares. The coarse non-plastic inclusions are mostly (82%) coarse calcite, coarse sand (or crushed basalt) or a combination of these (thin-section analyses in Appendix D showed that a distinction between these inclusions was largely impossible in the field). About 18% also had some organic inclusions, although not many. Coarse inclusions are thought to improve the thermal-shock resistance of a cooking pot (see Chapter VI for a more elaborate discussion). Thin-section analysis of two of the Middle Assyrian sherds and several sherds from level 7 have indicated that some clays used for cooking pots could have been found regionally while other pots must have come from further away. P93-308 (fig. IV.62.a) was tempered with steatite and came from the Ugarit region (Appendix D). One rim fragment (fig. IV.25.g), identified as a cooking pot on the basis of vessel shape, surface treatment and firing temperature, was made of a clay with finer sand inclusions. Perhaps this was a local imitation of imported cooking pots. A completely preserved handmade pot with thick vessel walls and with a lot of organic inclusions may have functioned as a cooking pot as well (fig. IV.61.k).

Shaping methods
Cooking pots were most probably all shaped by hand, by coiling or slab building and/or with the help of a mould (in the case of P93-308, a mould was certainly used for the shaping of the base part). The shaping method resulted in a very even and rather thin wall thickness, and a very regular globular shape. Thin walls conduct the heat better than thick walls do (see Chapter VI).

Shape
Only one pot has been preserved well enough to allow for a reconstruction of the complete shape including the base (P93-308). This severely limits our data on shape and especially size and capacity. Most pots seem to have had a roughly globular slightly closed shape. The contents are easily accessible but the incurving rim prevents spilling when contents are stirred or when they are boiling. No flat or ring base fragments in cooking ware have been found, suggesting that these pots had rounded bases that were not always recognized as such among the body sherds. The rims are rolled over and provide a thin ledge for better grip when moving the pot. Handles are either completely absent, or are small rounded lug handles with elaborate appliqué decorations (only 2 examples, fig. IV.62.a-b). Since only one complete example was found, the ratio between vessel height and maximum diameter is not known. The maximum diameter is below the rim but in the upper half of the vessel.

Size
Rim diameters vary widely between 170 and 430 mm. The mean rim diameter is 260 mm (CV = 28%). Size groups could not be distinguished.

Capacity
The capacity of P93-308, by far the largest cooking pot found at the site, is 43.56 litres (measured to the narrowest point at the rim). This roughly corresponds with a capacity of 50 *qû* . If we indeed reconstruct the general vessel shape of other fragments as a globular pot, we can calculate a rough estimate for the capacity of these pots. For pot I11 27-61:6 (sample J730 in Appendix D, fig. IV.62.i), with a rim diameter of 210 mm and a reconstructed vessel height of 223 mm, this reconstructed capacity is 8.27 litres. For pot K13 4-5:12 (fig. IV.62.j), with a rim diameter of 240 mm and a reconstructed vessel height of 305 mm, the reconstructed capacity is 18 litres.

Surface treatment
Only three out of 28 cooking-pot rim fragments (10.7%) were burnished carefully on both the in and the outside. Burnishing of cooking pots, especially of the outside surface, is said to reduce the permeability of the vessel wall. The remaining pots were carefully smoothed. It is not known nor has it been analysed whether these pots were treated with some kind of organic resin or coating to reduce permeability.

Decoration
One pot has an incised line just under the rim. The appliqués at the handles of two pots are probably largely decorative as well. Nevertheless, display does not seem to have been among the primary functions of these pots.

Firing
All cooking pots have been fired at rather low temperatures. Partly this is due to the kind of non-plastic inclusions used: when calcite is heated to too high a temperature (above approximately 700 °C), the pot will disintegrate. In other pots not tempered with calcite, for which a low firing temperature is technically not necessary, the low firing temperature may be related to a general tradition or idea about the desired colour and look of a cooking pot. Low firing temperatures yield dark, brownish surface colours.

<u>Use-related properties</u>

Burning traces
A relatively very high proportion of 26.8% of all fragments shows traces of burning. Mostly these traces were found on the outside surface or, less often, on both the in and the outside surface of the (rim) sherd. The high proportion of sherds with burning traces supports the identification of these vessels as cooking pots used over or in a fire.

Remains of contents
No information about any residues or contents is available. This is probably mainly due to the fact that most are rather small rim fragments.

Traces of use
For several pots it was recorded that the inside surface was very damaged. Perhaps this was caused by stirring with a hard tool? The outer base surface of P93-308 is also abraded by use; this probably was the part that would be standing in the fire. The cooking pots studied in thin section (see Appendix D) show that tiny cracks between the larger inclusions in the clay, resulting from repeated heating and cooling, can make a cooking pot unusable or cause it to break (see also Chapter VI).

Remarkable archaeological context
P93-308 was found in the fill of a small hearth or oven (Y) in square K9, which supports its identification as a cooking pot. The room contained more of these ovens, as well as other vessels with a special shape, including "pilgrim flasks" and bowls with a spout and handles, and was tentatively identified as the staff kitchen (Akkermans and Wiggermann in press).

<u>Suggestions for function and use</u>
The shaping techniques and raw materials used suggest multiple regional and supra-regional origins for these pots. Either they were imported because of their superb qualities as a cooking pot (or perhaps for their

contents?), or they could have been brought to the site by immigrants from different places as part of their household equipment (deportees? local women married to Assyrian staff?).

- Cooking liquid or semi-liquid food.
- Processing of liquid or semi-liquid materials over a fire (e.g. in perfume preparation)?

Closed pots (not cooking pots, type 211a, 212a)

Percentage of all rims (levels 6-3):
211a 0.17%
212a 0.53%
Total: 0.7%

A rather diverse group of pots with a closed shape.

Function-related properties

Fabric and inclusions
The greater majority (98%) of all pots was made of a clay with fine organic inclusions (ware group Y), just like the bulk of the pottery at the site. This is most probably related to the raw materials and shaping techniques that were used. A more porous fabric suitable for cooling liquids may have been one of the additional advantages. Only one vessel (P93-446, fig. IV.63.c) was made of a fine ware with many fine-sand inclusions (ware C). The fabric as well as the shape suggest that this vessel was not made at Sabi Abyad itself.

Shaping methods
Most have been thrown from a single piece of clay, although handmade shapes (built in coils) are also present in this collection. It seems that generally these pots were rather carefully made. When bases are preserved, it is clear that the bases were turned or scraped and that ring bases were carefully attached. Appliqué decorations are rather special and perhaps not part of the local production tradition.

Shape
Closed or slightly closed shapes, mostly with a roughly globular vessel shape, sometimes a bit more squat. The contents are easily accessible and easily retained inside. Vessels that have their bases preserved are stable. The ratio between vessel height and rim diameter could only be calculated for 6 vessels. The mean ratio is 1.06 (between 0.87 and 1.33; CV = 15%), illustrating the globular shape. The maximum vessel diameter is below the rim but mostly in the upper half of the vessel. The mean ratio between vessel height and maximum vessel diameter is 0.87 (between 0.59 and 1.03; CV = 17%).

The vessels that are preserved completely can stand easily without support and are rather stable. If bases are preserved, they are always ring bases (and once a rounded base, on a handmade pot, fig. IV.61.k). The incurving rims prevent spilling of the contents. The rims are thickened on the outside or clearly bent outwards, providing a practical ledge to increase the grip when carrying the pot. In addition, the rim shape may have made it easier to tie a cover over the opening with rope. The pots are transportable, but the relatively large vessel opening make transport over large distances impractical.

Size
It was not possible to discern size groups based on the rim diameter or other measurements. Rim diameters vary widely. The mean rim diameter is 216 mm (between 120 and 350 mm; CV = 21%). The mean maximum vessel diameter is 314 mm (between 245 and 397 mm; CV = 20%).

Capacity
The capacity could only be calculated for 5 vessels, and varies widely. The mean capacity is 9.7 litres (between 5.14 and 14.2 litres, CV = 35%). It seems that a certain capacity was not a primary focus of the potter when shaping these vessels.

Surface treatment
All but one vessel were just smoothed and surfaces were not treated further. One vessel was carefully burnished on the in and the outside surface. The shape and colour (brownish) of this vessel (fig. IV.25.g) reminds us a lot of the cooking pots, and perhaps it was tried to imitate a cooking pot in local materials (without coarse mineral inclusions, cf. also Daszkiewicz et al. 2006 for this phenomenon at Iron Age Tell Sheikh Hamad).

Decoration
A relatively high proportion of 28.6% of these pots is decorated in some way. In most cases the decoration consists of simple horizontal or wavy incised lines or a combination of these, or a combination of incised lines with an appliqué rope imitation. Applied decorations include rope imitations with finger impressions, vertical lugs at the rim (see below) and a spectacular applied naturalistic scene with several animals (fig. IV.64.b). Visibility and display were certainly among the functions of several of these pots.

Special features
Three examples of a globular pot with inward-sloping rim and rather thick vessel walls have vertical lugs attached to the rim and shoulder of the vessel. There are 4 to 8 lugs on a vessel. It seems that these lugs are partly decorative and partly functional. The lugs do not seem to fit in the Sabi Abyad tradition; perhaps these pots came from elsewhere. Two other vessels have handles attached to the rim and upper body of the vessel, one handle on each side. Next to the handles is a small "ear-shaped" lobe attached to each side. These vessels are deep pots with a decorative band on the outside between the handles. They seem foreign to the Sabi Abyad tradition as well, which is also clear from the comparisons found at sites along the Euphrates (see Chapter IV). One special vessel has a spout plugged with a gypsum plug. It probably also had at least one handle. This vessel is reminiscent of a similar shape at Hadidi on the Euphrates (see Chapter IV).

The handles may have facilitated lifting and tilting or pouring out of the contents. They may also partly have been decorative. The spout would definitely assist in the pouring out of liquids. The fact that the wide spout was later plugged with a pierced gypsum plug would indicate that the pouring from this vessel had to be slow, or that any coarser particles floating on the liquid were not meant to be poured out as well. The spouted vessel may have had similar functions as the spouted bowls with handles discussed below.

<u>Use-related properties</u>

Burning traces
Only one vessel showed burning traces on the outside surface (fig. IV.61.e, one of the vessels with vertical lug handles), perhaps related to the use of the vessel over a fire.

Remains of contents
Very few remarks were made about the presence of any visible residues or contents. These remarks referred to a vessel with dirty green-brown crusts and stains, a vessel with a yellowish colour on the inside, and a vessel with a blue-grey crust on the inside (fig. IV.61.g, one of the vessels with vertical lugs).

Traces of use
For one vessel (K12 18-29:19) it was remarked that the inside surface had been abraded, possibly through the use of a hard tool in stirring or mixing the contents.

<u>Suggestions for function and use</u>
This is a rather heterogeneous group of vessels, suggesting that multiple functions and uses may be thought of. Visibility and display seem to be relatively important. A relatively large number of vessels was possibly imported from elsewhere (also contributing to the heterogeneity of the group).

- Short-term dry and liquid storage.
- Handling of liquids.
- Long-term dry and liquid storage.
- Processing of foods or other materials, sometimes with hard tools?
- Imitation cooking pots?

Small jars (type 311)

Simple jars in three size classes.
Percentage of all rims (levels 6-3): 5.6%

Function-related properties

Fabric and inclusions
The greater majority (98%) of all jars is made of a clay with fine organic inclusions (ware group Y). This is most probably related to the raw materials and shaping techniques used. A more porous fabric suitable for cooling liquids may have been one of the additional advantages. For a few vessels only, a sandy fabric without any organic inclusions was reported.

Shaping methods
Very small vessels were possibly thrown from the cone, while the small and large jars would have been thrown from one lump of clay. Some vessels show dents in the wall or slightly oval rims, caused by the pressing of the shape while it was still soft (when taking it off the wheel?). After shaping, the jars were simply string-cut off the wheel. Or the base was scraped at a later stage and the shape of the base reworked into a disc shaped flat base or into a pedestal base, or a ring base was added. A rather high percentage of completely preserved jars shows cracks in the base (12%). They seem to be present mostly in the very small jars, which supports the idea that they may have been thrown from the cone (this technique often results in base cracks). The cracks are never repaired. In two bases of larger jars, an extra layer of clay with many organic inclusions was added on the inside of the base, to prevent drying cracks. Other cracks in the vessel wall also occur occasionally, and some are repaired with a bitumen paste. This suggests that some care was taken to prevent cracks in small and larger jars and repair them with watertight material if they did occur.

Shape
The jars have a closed shape in which the contents are not very easily accessible unless by pouring or drinking. A closed fist does not fit into the openings of very small and small jars, and retrieving the contents with the hands or with a scoop would have been impossible in smaller jars and awkward in all. The vessel shape is oval or more globular, with the maximum vessel diameter usually at the middle or at the lower half of the vessel. Larger jars are more slender, and the maximum vessel diameter is a bit higher up. The rims are simple and rounded and always a bit bent outwards, facilitating the pouring of liquids or the drinking from the rim. A cover could be tied over the rim and fastened with a rope, but no special ledge was provided for this. The jars are transportable. The ratios between vessel height and rim diameter, and between vessel height and maximum vessel diameter are:

Very small	Mean ratio (height/rim diameter) = 2.03 (between 1.56 and 2.60; CV = 16%).
	Mean ratio (height/vessel diameter) = 1.49 (between 1.12 and 1.49; CV = 10%).
Small	Mean ratio (height/rim diameter) = 2.14 (between 1.57 and 2.75; CV = 10%).
	Mean ratio (height/vessel diameter) = 1.43 (between 1.17 and 1.62; CV = 7%).
Large	Mean ratio (height/rim diameter) = 3.03 (between 2.0 and 3.91; CV = 17%).
	Mean ratio (height/vessel diameter) = 1.60 (between 1.33 and 2.02; CV = 17%).

Very small jars mainly have ring bases (63.6%) or flat bases (18.2%). Small jars, on the contrary, have mainly pedestal bases (41.9%) or flat bases (44.2%), while only a few have ring bases (11.6%). Larger jars mainly have ring bases (86.7%) or flat bases (13.3%); pedestal bases do not occur in this group. Very small vessels and large vessels are rather stable and can stand without support. The small vessels are less stable, with their relatively small base diameters compared to the vessel height. This is especially true for jars from level 4 when they have predominantly narrow pedestal bases instead of flat bases (cf. Chapter IV). These jars are unstable without support and many of them cannot easily stand alone. However, ceramic pot stands for small jars are absent from the site (although they could have been made from a perishable material like wood; cf. also Chapter VI).

Size
Small jars can be divided into three size groups based on the vessel height and the maximum vessel diameter:

Very small	311x: vessel height < 160 mm, maximum vessel diameter < 120 mm. Mean vessel height is 122 mm (between 100 and 150 mm; CV = 12%). Mean maximum vessel diameter is 98 mm (between 87 and 111 mm; CV = 7.3%).
Small	311a: vessel height > 160 mm but < 250 mm, max. vessel diam. > 120 mm but < 180 mm. Mean vessel height is 193 mm (between 149 and 230 mm; CV = 8,%). Mean maximum vessel diam. is 136 mm (between 125 and 153 mm; CV = 5.5%).
Large	311b: vessel height > 250 mm, maximum vessel diameter > 180 mm. Mean vessel height is 355 mm (between 270 and 460 mm; CV = 19%). Mean maximum vessel diameter is 221 mm (between 199 and 262 mm; CV = 9%).

Rim diameters overlap between groups:

Very small	311x: mean rim diameter is 59 mm (between 48 and 90 mm; CV = 19%)
Small	311a: mean rim diameter is 87 mm (between 67 and 110 mm; CV = 9%)
Large	311b: mean rim diameter is 125 mm (between 100 and 190 mm; CV = 9%)

The relatively small CV values indicate that the potter indeed meant to produce three size groups. The precise size was not very important, however. Each size group is roughly 1.5 times larger than the group below.

Capacity
Capacity in litres could be calculated for 40 vessels of all size groups. Capacities in litres (measured to the rim) are:

Very small	311x: mean capacity is 0.36 litre (between 0.20 and 0.71 litre; CV = 38%)
Small	311a: mean capacity is 1.26 litres (between 0.75 and 1.70 litres; CV = 18%)
Large	311b: mean capacity is 6.6 litres (between 4.55 and 9.37 litres; CV = 24%)

The capacity estimates are almost certainly too high, since the jars would not have been used while filled exactly to the rim. Small jars are roughly three times larger than very small jars, while large jars are roughly five times larger than small jars. The mean values could suggest that the groups would represent values of 0.5, 1.5 and 8 *qû* . However, the large CV values show that the potter probably did not aim at an exact capacity measure.

Surface treatment
The greater majority of all vessels was simply smoothed. Only two fragments show a slip on the outside of the vessel.

Decoration
Only 4.2 % of these jars show a simple decoration in the form of horizontally incised lines. The lines are placed on the neck at the transition to the rim, and only occur on the larger jars.

Potters' marks and signs
One jar (fig. IV.75.d) had five oval impressions on the rim, made while the jar was still wet. Another (fig. IV.108.d) had a crescent shape, painted with bitumen on the shoulder of the vessel. Cf. Appendix E and Chapter V for a discussion of the role of these marks or signs.

<u>Use-related properties</u>

Burning traces
Only about 3% of all jars showed traces of burning, mainly on both the in and the outside surface of the jar. Most probably these traces are related to depositional processes.

Remains of contents
Several vessels were completely covered in bitumen on the inside and partly also on the outside. Perhaps these jars were used to contain bitumen. Or perhaps the bitumen was applied to the surface of the jars to make them more watertight. One vessel had a gypsum/lime crust sticking to the inside. Another contained many small burnt bone fragments, charred seeds and charcoal (a sample of these has not yet been analysed). Charred seeds were found in small jars or amongst the fragments of small jars. Orange, buff-cream, brown and greenish stains occur on the surfaces of some jars, mainly on the outside. One jar contained a cremation burial.

Traces of use
A few jars had inside surfaces that were flaking or had eroded. In a few others the outside surface was flaking or abraded, mostly at the base. These damages may be due to the original use or contents (perhaps with a high acidity?), but could also be related to post-depositional processes. One jar showed vertical and horizontal traces of scraping at the inside surface.

Remarkable archaeological context
These jars were found all over the settlement and seem to form a normal part of the pottery inventory. A large jar (P93-134) was used in a cremation burial. One was found dumped in pottery kiln H, another in an ashy pit.

<u>Suggestions for function and use</u>
Jars meant for liquid, semi-liquid or dry (but pourable) contents, in roughly three size groups.

- Small jars: drinking jars (beer jars?).
- Short-term and long-term storage of liquid or pourable dry material.
- Large jars: cremation burials.

Medium-sized and large jars without necks (types 321, 322, 323)

Percentage of all rims (levels 6-3):
321 2.3%
322 10.2%
323 1.6%
Total: 14.1%

Function-related properties

Fabric and inclusions
The greater majority of these jars (more than 99%) was made of a clay with fine organic inclusions (ware group Y). This is most probably related to the raw materials and shaping techniques used. However, a more porous fabric suitable for cooling liquids may have been one of the additional advantages of organic inclusions.

Shaping methods
These large jars were shaped in two parts that were later joined together. This method results in the regular ovoid shape and the rather low point of gravity. Bases were scraped and a ring base added after the top part had been added. It is very clear that the jar had to be centred a second time on the wheel for shaping the base: bases are often located out of centre compared to the rim, resulting in a slanting and instable vessel. Base cracks were avoided: only 3% of the complete jars have base cracks. Often it was clear that the potter had added a layer of clay with much organic material to the inside of the base, to cover the deep throwing ridges and to make the base thickness more even, to prevent base cracks. Base cracks mostly occurred when the turning of the base wall, on a not exactly centred vessel, resulted in irregular wall thicknesses. Cracks in the wall also occurred; in 2.5% of all fragments serious cracks in the rim and wall were noted. These were almost always repaired, with a gypsum/lime paste or with the more watertight bitumen. Repairs before firing, with some wet clay, were rare. Earlier gypsum/lime repairs that were unsuccessful were sometimes covered with a thick layer of bitumen in an attempt to keep the vessel for use. Apparently cracks were especially unwelcome, suggesting that the contents were often liquid.

Shape
These jars are tall closed shapes in which the contents are not easily accessible except by pouring. The rim diameters generally do allow contents to be reached or taken out by hand or with a scoop, but the depth of the vessel makes it sometimes difficult to reach the bottom. The vessel shape is a long-drawn oval, and the larger jars are generally a bit thicker than the medium-sized ones. The rims are rolled over and sit directly on the vessel shoulder. All rims provide a convenient ledge that is very well suited to tie a cover over the opening with rope.[243] The maximum vessel diameter is mostly located in the middle of the vessel or a bit more to the top, providing a relatively low point of gravity. The greater majority of the jars have ring bases, but these are relatively narrow compared to the vessel diameter and height. Moreover, bases are often located off-centre or in a slightly slanted position with respect to the rim, suggesting they were not meant to support the vessel much. These vessels are not stable and can only rarely stand without support. Especially when full, the risk of tipping over is too big. This instability greatly facilitates the easy pouring out of the contents, and suggests that the vessels were designed for frequent pouring. However, with the help of a support (the wall, other vessels or pot stands; see below), the jars become much more stable and can easily be used for storage as well. In principle, the jars are transportable, and their slender shape facilitates lifting, pouring and carrying. However, when full, the weight of the vessel and contents of especially the larger jars must have been considerable.

[243] That large jars were indeed sealed with a piece of cloth tied with rope, is proved by the reverse surfaces of several clay sealings found at Sabi Abyad. They will be published elsewhere (Duistermaat in prep.c). Large jars were also often closed with an unbaked clay stopper, of which many have been found at the site. The rims of the jars have left their impressions on the flat sides of these conical stoppers.

Medium	Mean ratio (height/rim diameter) = 3.47 (between 2.45 and 4.17; CV = 17 %). Mean ratio (height/vessel diameter) = 2.06 (between 1.35 and 2.36; CV = 18%).
Large	Mean ratio (height/rim diameter) = 3.96 (between 2.92 and 4.96; CV = 13%). Mean ratio (height/vessel diameter) = 1.88 (between 1.27 and 2.45; CV = 14%).

Size
Complete jars could be divided into two groups: medium-sized jars and large jars, on the basis of the vessel height. The relatively low CV values suggest that the potters indeed aimed at two general size groups. The rim diameters, however, are the same in both groups, so the majority of the jar fragments could not be classified in a size group.

Medium	vessel height < 500 mm, mean vessel height = 426 mm (between 368 and 474 mm; CV = 8%). Mean maximum vessel diameter is 211 mm (between 180 and 272 mm; CV = 15%). Mean rim diameter is 125 mm (between 108 and 150 mm; CV = 13%).
Large	vessel height > 500 mm, mean vessel height = 614 mm (between 525 and 680 mm; CV = 5.5%). Mean maximum vessel diameter is 333 mm (between 274 and 435 mm; CV = 13%). Mean rim diameter is 157 mm (between 129 and 190 mm; CV = 11%).
All jars	mean rim diameter is 145 mm (between 70 and 320 mm; CV = 13%).

Large jars are about 1.5 times higher than medium jars.

Capacity
The capacity in litres could be calculated for 23 large and 5 medium-sized jars (measured to the rim).

Medium	mean capacity is 7.16 litres (between 5.56 and 9.06 litres; CV = 18%).
Large	mean capacity is 29.53 litres (between 19.30 and 49.53 litres; CV = 31%).

The mean capacity values seem to suggest that perhaps the groups represent capacity measures of 10 and 35 *qû* . However, the CV values are relatively high and indicate that an exact capacity was most probably not one of the potters' aims.

Surface treatment
Virtually all (99.8%) vessels were simply smoothed during the shaping process. Very few vessels were noted to have a brownish slip; however, it is unclear whether this is a genuine slip.

Decoration
A very small percentage (3.2%) of all jars is decorated. Mostly the simple decoration consists of horizontal (or, more rarely, wavy) incised lines at the shoulder of the jar. Rare decorations are applied horizontal bands or painted surfaces on the upper half of the jar. The decorations were applied on the best visible part of the jar. However, the decoration does not seem to have been very important in the function of the vessel.

Potters' marks and signs
Most vessels that carry potters' marks that have been impressed or incised before firing, or signs painted on the surface after firing, belong to the group of large jars. Signs painted on the surface may be related to the storage function of the jars. For a more detailed discussion, see Chapter V and Appendix E.

<u>Use-related properties</u>

Burning traces
About 7% of all jars show traces of burning, either inside or on both the in and the outside surface. Although a large part of these are probably due to depositional processes, a relatively high proportion show burning traces located especially on the (inside of the) rim. What caused these localized burning traces is unclear. Perhaps, it is related to the use of a textile, flammable cover on the rim?

Remains of contents
Several times amounts of carbonized seeds (grain) were found inside or around a large jar, suggesting that they may have been stored inside. Other indications for ancient contents come from two jars with greenish-yellow stains on the inside surface (L9 62-132:13 and H8 28-207:30). Jar P96-528 (fig. IV.79.a) had a yellowish crust on the inside. These are perhaps residues of ancient contents.

Traces of use
Hardly any abrasions or damages possibly related to use were noted. Sometimes the outside surface and more rarely the inside surface shows traces of abrasion or flaking. A poorly understood phenomenon is especially apparent with these jars and other large storage vessels (see below): the inside surface of some vessels has become soft, chalky and white/pinkish in colour (cf. fig. IV.83.k, fig. IV.31.b). Whether this is due to the use of the vessel (perhaps related to acidic contents?) or whether it is related to processes in the fabric during firing, is uncertain.

Remarkable archaeological context
These jars are very common all over the settlement. In burials they are sometimes used as a coffin for small children. Jar P93-132 was carefully placed in a circular pit of which the walls were covered with mud bricks. The function of this installation is unclear.

The bases of broken jars are sometimes reused as pots (cf. fig. IV.96.a), while the fracture is smoothed. Fig. IV.35.l was used as a basin in some kind of installation with a mud platform in square K13. Rims from broken jars are sometimes used as pot stands.

Suggestions for function/use

- Long-term storage of liquid or pourable dry matter (grain?), with frequent pouring or access to contents.
- Closed with a flexible cover tied over the rim with rope, or with small bowls as a lid, or with a clay stopper.
- Used as a coffin for small children.
- Reuse as pots or pot stands.

Jars with a handle (type 333)

Percentage of all rims (levels 6-3): 0.1%

Function-related properties

Fabric and inclusions
Out of 12 fragments of jars with a handle, five are made of a clay with organic inclusions (ware I). One is made from a rather coarse clay, and perhaps this is a cooking pot rather than a jar (fig. IV.119.b). The others are made of a more sandy clay without organic inclusions, one showing dark grey particles. Perhaps these were not made locally at the site (no thin sections were studied).

Shaping methods
Most probably these jars were thrown on the wheel. However, the shaping techniques were not studied separately. No cracks in bases or walls were noted.

Shape
These jars have a closed shape with rather restricted rim diameters, making the contents inaccessible with the hands. The attachment of a handle from the rim to the shoulder of the vessel indicates that pouring was the way to remove the contents. Rims are mostly simple and always bent outwards, facilitating pouring. A jar from a mixed context (fig IV.109.w) has a trefoil mouth that greatly facilitates pouring (trefoil mouths are

otherwise not attested at the site). A flexible cover could easily be tied to the rim with a rope. Not much can be said about the vessel shape, since only two vessels were preserved completely. They have an oval vessel shape, one with a ring base (fig. IV.89.d) and one with a pointed “amphora”-type base (fig. IV.89.c) that is unusual at Sabi Abyad. Indeed, the use of handles is rare at the site, and is another indication for the foreign origin or different production tradition from which these vessels came. The vessels are easily transportable and the relatively small rim diameters make them suited for transport over longer distances as well.

Size
The size of these vessels seems to vary. Rim diameters vary between 50 and 170 mm (mean rim diameter = 101 mm, CV = 37%). The height of the vessel was only measurable in two cases: 355 mm (fig. IV.89.d) and 630 mm (fig. IV.89.c).

Capacity
The capacity in litres could only be calculated (to the rim) for two vessels: fig. IV.89.d has a capacity of 6.4 litres, while fig. IV.89.c has a capacity of 25.88 litres.

Surface treatment
All jars were simply smoothed during the throwing on the wheel.

Use-related properties

Burning traces
Only one jar shows burning traces on the in and the outside surfaces, most probably due to depositional processes.

Remains of contents
A botanical sample from a jar with a handle (P01-131) was taken, but the results of analysis are not known as yet.

Suggestions for function/use

- Short-term storage and pouring of liquids
- Transport of liquids?

Goblets (types 411, 421)

Percentage of all rims (levels 6-3):
411 2.4%
421 2.7%
Total: 5.1%

Function-related properties

Fabric and inclusions
More than 95% of all goblets was made of a fine clay without any organic inclusions, and with only very fine mineral inclusions (ware group X, including wares A, B, C and N). Only 4.3% of the vessels was noted to contain some organic inclusions, but these are always very fine as well. As shown by the thin-section analyses (Appendix D), the clay was probably not much treated other than by removing the coarser inclusions (perhaps by sieving?), and for such thin-walled vessels relatively large particles have often remained in the clay. The absence of organic inclusions increased the risk of drying and firing cracks, and left the clay less plastic in shaping. This would have increased the amount of effort and skill needed to produce these vessels. Apart from the possibility of achieving a very thin wall thickness, the fine clay might

have been used as a special ware in distinction from the normal organically tempered wares, or in imitation of other materials (glass, faience?).

Shaping methods
The goblets were thrown from the cone in an elaborate shaping processes involving various steps (see Chapter V), demanding skill and effort. This method, together with a clay without any organic inclusions, caused (spiral) base cracks in approximately 7% of all goblets. These cracks were never repaired, because in many goblets they did not run through the whole vessel wall. Many goblets with base cracks were found among the pile of goblets and bowls in the workshop in square M11, where they were probably discarded because they were unacceptably damaged (see Chapter V). Cracks in the wall and rim also occurred among the goblets found in the waster pile in square M11. Small tension cracks in the lower wall are sometimes visible, but do not make the goblet unusable. Because the thin rim is very fragile when it is not yet dry, several goblet rims are more or less oval due to the pressure on the rim when lifting the vessel off the cone.

Shape
These small cups are called goblets because of their resemblance to drinking cups. They exist in two shapes: V-shaped goblets for which the rim diameter is also the largest vessel diameter, and the walls are more or less straight towards a pointed base; and S-shaped goblets with a curved wall and a globular body, with a maximum vessel diameter that is a little larger than the rim diamter. Both shapes have extremely thin walls and rounded rims, often turned outwards to facilitate drinking. The ratios between vessel height and rim diameter or maximum vessel diameter show that the proportions were usually similar, although goblets could vary in height.

V-shaped	mean ratio (height/rim diameter) = 1.16 (between 0.80 and 1.43; CV = 9%)
S-shaped	mean ratio (height/rim diameter) = 1.31 (between 0.94 and 1.90; CV = 12%)
	Mean ratio (height/max diameter) = 1.16 (between 0.92 and 1.36; CV = 10%)

Bases are pointed, and nipple or knob-shaped. These vessels cannot stand on their bases and need to be held in the hand or put into a support (like a small pot stand, a hole in the table, etc.). Small pot stands made of pottery have not been found. It is very well possible that the goblets were meant to be held in the hand when full (see also Chapter VI).

Size
Goblets are small vessels with very thin walls. There are no size groups.

V-shaped	mean rim diameter = 89 mm (between 60 and 160 mm, CV = 15.6%).
	Mean rim thickness = 2.6 mm (between 2 and 5 mm, CV = 23%).
S-shaped	mean rim diameter = 78 mm (between 45 and 130 mm, CV = 14.7%).
	Mean rim thickness = 2.7 mm (between 2 and 6 mm, CV = 24%).

Capacity
The capacity in litres was calculated (to the rim) for 42 completely preserved goblets (21 of each shape type). The capacity per type is:

V-shaped	mean capacity = 0.24 litre (between 0.10 and 0.35; CV = 25%).
S-shaped	mean capacity = 0.31 litre (between 0.16 and 0.50; CV = 28%).
All goblets	mean capacity = 0.28 litre (between 0.10 and 0.50; CV = 31%).

The capacities are almost certainly estimated too high, since the goblets would not have been filled exactly to the rim. The mean capacities suggest that goblets were meant to contain about 1/4 or 1/3 *qû*. However, the large CV values indicate that a standardized, precise capacity was not aimed at.

Surface treatment
Goblets were well-smoothed with wet hands during the shaping process. No further surface treatments were noted.

Decoration
Almost 3% of all goblets were decorated. In earlier levels (mostly levels 6 and 5) decoration consisted of painted horizontal bands, while in later levels (4 and 3) incised horizontal lines were used as well. Perhaps contrary to expectations, the decorative or display role of these drinking cups is not very large.

Special features
Three S-shaped goblets have a thin spout constructed at the belly (fig. IV.91.z-ab). These spouts have a circular section and a rather thin opening, smaller than 3 mm in diameter. One base, probably also from an S-shaped goblet, has a pointed base with a hole, perhaps functioning as a spout (fig. IV.91.af). It is perhaps comparable to the small bottle (fig. IV.31.f) with a spout as a base. These spouts could have been used for pouring small amounts of liquids in a very controlled manner, for example when the liquid was expensive (honey, perfume?). The spouted goblets could also have been children’s feeding bottles. One large mug (fig. IV.91.ag) had a handle from rim to base.

Potters’ marks or signs
One goblet base was impressed with a partial rolling of a Middle Assyrian cylinder seal. See Appendix E and Chapter V for more details.

<u>Use-related properties</u>

Burning traces
Burning traces occur very rarely (1.2%) on goblets, on both the in and the outside surfaces, and are most probably related to depositional processes.

Remarkable archaeological context
Goblets were found in the whole settlement. Four goblets were found in pottery kilns (K, H and AC/AI).

<u>Suggestions for function and use</u>

- Drinking vessels, especially for drinking while seated / reclining.
- With spout: children’s bottle, or small pouring vessel.

Pot stands, pot stands with closed base (type 611)

Percentage of all rims (levels 6-3): 4.0%

<u>Function-related properties</u>

Fabric and inclusions
All pot stands were made of the normal ware with fine organic inclusions (ware group Y).

Shaping methods
Pot stands were thrown on the wheel, in two steps: first the rim was shaped, and after cutting the cylinder off the wheel the base rim was shaped. Some pot stands were cut a little obliquely off the wheel, resulting in a slightly slanting top rim. The overrepresentation of pot stands among wasters, and the relatively high temperatures at which pot stands were fired, suggests that these stands were placed low in the kiln during firing (see Chapter V). Already from the firing stage onwards these shapes had the role of support for other vessels. A small amount (1%) of pot stands has cracks in the rim or in the wall. The large pot stands with a closed base were most probably shaped by hand, with the coiling or slab-building method. Cracks in the walls of large pot stands were repaired with a gypsum/lime paste.

Shape
Pot stands are squat, cylindrical or slightly tapering shapes, open on two sides. The lower rim is wider than the top rim, making the stand very stable. Rim shapes vary from strongly bent over and triangular to more smooth, and the exact rim shape does not seem to have been important. The mean ratio between vessel height and rim diameter is 0.79 (between 0.49 and 1.12; CV = 13%).

A small number of large pot stands, shaped by hand, have a closed base and oval, triangular or rectangular holes cut out of the wall. These holes provide ventilation under the vessel, which is especially important if the vessel on top had a ventilation hole in the base.

Size
The mean top rim diameter is 198 mm (between 90 and 300, CV= 14.5%). The mean base rim diameter is 215 mm (between 170 and 390; CV = 14%). The rim diameters are similar to the lower vessel diameters of large jars (types 321, 322, 323). Large pot stands with a closed base are generally among the largest stands, with rim diameters larger than 280 mm, and vessel height generally over 270 mm.

Decoration
One elaborate and rather large stand (fig. IV.92.l) had holes cut out of the wall and thick appliqué decorations between the holes. Instead of a normal rim, the stand had a ledge on the top on which a vessel can sit. This stand is unique among the pot stands, which are normally undecorated.

Potters' marks
Two stands have several incisions at the rim. See Appendix E for a more detailed discussion of these marks.

<u>Use-related properties</u>

Burning traces
Almost 3% of the pot stands has traces of burning, but they are most probably due to depositional processes. Many of the burning traces occur on the fractures of sherds as well as on the surfaces of the stand.

Traces of use
Less than 1% of the pot stands shows damages like flaking surfaces, while 1% has cracks in the rim or the wall. It is not clear whether these damages are due to the use of the stands.

Remarkable archaeological context
Pot stands are found all over the settlement. A large pot stand (fig. IV.111.n) was found in relation with a big storage vessel (fig. IV.106.f). It may be assumed that the two were used together.

<u>Suggestions for function and use</u>

- Support for large jars (type 321, 322, 323) and other larger, instable vessels.
- Large stands: support for large storage pots.

"Pilgrim flasks" (type 911)

Percentage of all rims (levels 6-3): 0.1%

Function-related properties

Fabric and inclusions
More than 75% of all flask fragments are made of a clay with a lot of fine or slightly coarser mineral inclusions, mostly sand. The rest is made of a clay with mineral inclusions and fine organic inclusions (ware group Y). Since the thin-section analysis (Appendix D) showed that most type 911 flasks do not come from Sabi Abyad but were imported from further away, it is unclear whether the used fabric and inclusions relate mostly to the shaping techniques or rather to the performance charactistics of the vessel. In any case, the vessels with mineral inclusions only have a very compact fabric that is less porous than the fabric of vessels made of clays with organic inclusions. This may have been required for long-distance transport of liquids.

Shaping methods
Type 911 flasks are shaped in a technique that is foreign to the shaping traditions used at Sabi Abyad. They were thrown closed, after which the spout and a handle were added at a later stage. Handles sometimes have organic inclusions while the vessels have not, a technique sometimes used to prevent different shrinkage rates. This is another indication for the foreign origin of these vessels, since the clays used at Sabi Abyad have similar shrinking rates whether they have organic inclusions or not (see Appendix D). The flasks were made very carefully, and cracks or other damages were never noted.

Shape
The flasks generally have a globular, very closed shape, which is not completely symmetrical (flattened). This is related to the shaping techniques (see Chapter V). A narrow spout and one handle are attached to the body. Contents are only accessible by pouring them out, and the flasks are not very easy to fill either. The rims are bent slightly outwards and are a bit thickened. The opening can be closed with a stopper or with a flexible cover tied over the mouth. The handle can be used as an aid in lifting the vessel, but is possibly not always strong enough to carry the vessel when it is full. Perhaps the handles were also used to tie the vessels during transport.

Size
There are two kinds of flasks: miniature flasks and normal-sized flasks. The miniature bottles, of which not many have been preserved, have a rim diameter around 20-26 mm and a vessel height of about 100-135 mm. The normal-sized flasks have a mean rim diameter of 61 mm (between 43 and 85 mm; CV = 24%). The mean vessel height (including the spout) is 359 mm (between 340 and 385 mm; CV = 5.3%).

Capacity
The capacity could be calculated for 5 flasks (measured to the rim). The only miniature flask among them has a capacity of 0.16 litre. The normal-sized flasks have a mean capacity of 7.29 litres (between 6.0 and 7.90 litres; CV = 12%). It seems that this capacity of about 9 *qû* was normal for these flasks, but the sample is small.

Surface treatment
In 38% of all cases the outer surface of the flask was carefully burnished. This was probably done to create a more watertight surface. It is not known whether the surfaces of flasks were treated with some kind of organic resin or coating to make them more watertight.

Potters' marks and signs
A body sherd of a pilgrim flask (K9 100-405:3) shows an incised cross (applied before firing, cf. Appendix E).

<u>Use-related properties</u>

Remarkable archaeological context
Type 911 flasks were mainly found in level 5, and although fragments were found all over the settlement; most of the completely preserved ones came from squares K8 and K9. There they were associated with some other more peculiar shapes like a big cooking vessel and bowls with a spout and handles (see below).

<u>Suggestions for function and use</u>

- Long-distance transport of (imported) liquids.
- Storage of (imported) liquids.
- Miniatures: storage or transport of small amounts of (precious) liquids.

Strainers (type 511)

Percentage of all rims (levels 6-3): 0.4%

<u>Function-related properties</u>

Fabric and inclusions
All strainers are made of the normal clay with fine organic inclusions (ware group Y).

Shaping methods
The strainers were first shaped like small bowls, thrown from the cone. Rims are simply rounded or sometimes a little bevelled. In a second step, the bowl was placed on the rim. The holes were punched from the outside and the base was turned or scraped into a rounded shape. The scraping was sometimes done after the holes had been punched, but mostly before. The mean diameter of the holes is 8 mm (between 5 and 11 mm), so the strainer could be used for straining rather coarse materials only, unless a piece of cloth was used inside. The irregular lumps of excess clay that formed at the edge of the holes on the inside of the strainer were rarely smoothed away. This leaves the inside surface of the strainer very rough. The rough surface may have been functional.

Shape
Strainers have an open, semi-spherical shape with a rounded base. They do not stand upright and tip over on their side when placed on their base. They may have been used as ladles to remove larger chuncks from a liquid (although there are no handles), or they may have been used as strainers sitting on the rim of a jar. They may have been used upside down over the base holes of deep bowls. Especially when combined with a piece of cloth, they may also have been used to drain the liquid out of semi-solid foods, like cheese or curds.

Size
The mean rim diameter is 140 mm (between 80 and 200 mm; CV = 18%). This rim diameter is largely similar to the rim diameters of large jars (types 321, 322, 323), and perhaps strainers were used in combination with these or other jars.

<u>Use-related properties</u>

Remains of contents
Only one strainer had orange/yellow stains on the in and the outside surface. It is not clear whether they are related to the use of the vessel.

Traces of use
One strainer was reused: after the rim had broken, the fractured edge of the remaining base was made smooth again and the base was reused as a strainer. Two rim fragments showed traces of abrasion on the outside.

Remarkable archaeological context
Strainer P93-179 (fig. IV.91.aj) was found among a group of cuneiform tablets in square K9. The presence of two strainers fixed rim-down over the base of a large bowl before firing (fig. IV.59.a, see also below) suggests that strainers may also have been used in conjunction with large bowls with base holes.

Suggestions for function and use

- Strainer for sieving larger fractions from liquids, in conjunction with large jars or large bowls with base holes.
- Ladle for scooping out larger chunks from a liquid.
- Straining the liquid from semi-solid foods like cheese or curds.
- When using a cloth inside, they can be used for fine fractions as well.

Bowls with handles and a spout (type 151)

Percentage of all rims (levels 6-3): 0.1%

Function-related properties

Fabric and inclusions
All of these bowls were made of ware I, with fine organic inclusions. One thin-section sample (sample no. 08, Appendix D) showed that these bowls could have been made in the Balikh region. However, shape, shaping methods and surface treatment place the type outside the Sabi Abyad technical tradition.

Shaping methods
The bowls were most probably thrown from one piece of clay, although the shaping methods were not studied in detail. Spout, handles and a ring base were attached in a later step. In one bowl, the outside surface of the lower body seems to have been pressed or beaten with a blunt object, perhaps to improve the regularity of the wall tickness. Base cracks did not occur in these bowls.

Shape
The bowls have a deep open shape in which the contents are easily accessible. A spout, either cylindrical or pinched from the rim, provides a convenient way to pour the contents from the vessel in a controlled way. The spout would also allow the user to decant only the top of the liquid (including floating material or leaving heavier particles behind). The spouts are sometimes located at the rim, and sometimes a bit lower in the wall of the vessel. Because of that, the bowls could not have been filled to the rim with a liquid. At least one, and sometimes two, handles are placed on the upper vessel wall. If one handle is present, it is placed opposite the spout. When two handles are attached, they are not aligned with the spout. One handle is closer to the spout while the other is further away. This is probably related to a more comfortable body position when holding the vessel at the two handles and pouring the contents. The mean ratio between vessel height and rim diameter is 0.5 (between 0.48 and 0.55; CV = 5%).

Size
The mean rim diameter of these bowls is 345 mm (between 300 and 385 mm; CV = 9%).

Capacity
The capacity could be calculated (up to the level of the spout) for 5 bowls. The mean capacity is 6.35 litres (between 3.74 and 10.27 litres; CV = 40%). The variation in capacity, especially when compared to the similarity in rim diameters, indicates that a precise capacity was not very important.

Surface treatment
Most bowls were very carefully burnished on the in and the outside surfaces, suggesting that impermeability of the surface was desired. A comparable shape from Tell al-Rimah was glazed (Postgate et al. 1997: plate 25a).

Use-related properties

Burning traces
Only one bowl shows traces of burning on both the in and the outside surface. It is not clear whether these can be related to the use of the bowl.

Traces of use
These bowls show very remarkable traces of use. In all of them the inside surface is completely abraded, so that the burnished top layer has been removed. This may have been done by heavy pounding or stirring with a hard tool. The abrasions are always present on the inside base, and in many bowls extend towards the upper vessel wall up to the beginning of the spout. They do not reach the rim.

Remarkable archaeological context
These bowls were found only in level 5, concentrated in squares K9, K8, L8 and H8. In square K9 they are associated with other peculiar shapes, like a large cooking pot and pilgrim flasks, which were imported from elsewhere.

Suggestions for function and use

- In food or craft production: the heavy stirring, pounding or mixing of materials and/or liquids, possibly separation of floating or heavier particles, and decanting liquids.

Large storage pots (types 212b, 213, 215, 145, 221b)

Percentage of all rims (levels 6-3):

212b	0.39%
213	0.1%
215	0.03%
145	1.1%
221b	0.61%
Total	2.23%

Function-related properties

Fabric and inclusions
All large storage pots were made of the normal clay with fine organic inclusions. Probably this is not only related to the properties of the raw materials, but also to the fact that organic inclusions make the vessel lighter and more porous.

Shaping methods
These large vessels were hand-built. The round bases were possibly shaped with a mould. The walls were built with the coiling or slab-building technique, and some vessels gave clear information on the connections

between coils and slabs (see Chapter V). The technique allows the making of thick-walled, heavy and large vessels with regular wall thicknesses and relatively thin, rounded bases. Base cracks are only rarely noted.

Large vats took a long time to make, and were used for considerably periods of time. Cracks in the wall and rim that occurred during the use of the vessel (in about 2.5% of all vessels) were often repaired, with a gypsum/lime crust or with a bitumen paste. Sometimes the impressions of ropes are visible in the paste used for repair, suggesting that ropes were used to stabilize the vessel further. Perhaps large vats were not produced continuously by the potters, and damaged vessels had to be preserved for as long as possible until new ones could be obtained.

Shape

Large vats come in two basic categories: deep open shapes (types 145 and 221b) and deep closed shapes (type 213, 215 and 212b). The open shapes are large bowls or pots with slightly flaring or vertical walls. The contents are easily accessible, but the bottom of especially the very large and deep vessels may be difficult to reach. They have relatively thick walls and the upper vessel wall just under the rim is often thickened. Rims are thickened as well, perhaps to provide a good grip or to allow a flexible cover to be tied over the rim. At the junction of the upper slabs or coils often an appliqué band of rope-imitation was made, perhaps also providing a better grip on the vessel. All have ring bases and are stable when standing alone. About half of all completely preserved pots, mostly large ones, have a hole in the centre of the base. These holes were made before firing while shaping the ring base, and measure 18-24 mm. In two pots the holes were afterwards closed with a bitumen plug, in one with a gypsum/lime plug. The smaller pots (type 145) are transportable and can be lifted without problems. The larger pots (type 221b) are much heavier and were probably not meant for frequent lifting and transport, especially not when full. The mean ratio between vessel height and rim diameter is 0.89 (between 0.51 and 1.09; CV = 20%).

The closed pots have a roughly globular shape and incurving upper walls. The contents are less easily accessible, but it is still possible to reach the contents with the hands. Because these vessels are very deep, the bottom in particular would be difficult to reach. The vessels have relatively thick walls. The rims are thickened on the outside. They provide some grip on the vessel and a convenient ledge for tying a flexible cover over the mouth of the vessel. As with the open pots, many closed pots have a rope-imitation appliqué band at the upper vessel wall. Most closed vessels are so large and heavy that they were probably not lifted often. They were stationary storage vessels. In vessels with ring bases, the maximum vessel diameter is located low in the vessel wall, creating a low centre of gravity and more stability. In vessels with rounded bases, which were set into the floor of a room, the maximum vessel diameter is mostly located higher up in the vessel wall. The mean ratio between vessel height and rim diameter is 2.27 (between 1.98 and 2.63; CV = 10%) while the mean ratio between vessel height and maximum vessel diameter is 1.19 (between 1.09 and 1.27; CV = 6%).

Size

In the group of open shapes, the type 145 pots are usually smaller than the type 221b ones. For many fragments, rim diameters could not be measured with the diameter chart, which ran only up to 400 mm.

Open shapes (145):	mean rim diameter = 404 mm (between 260 and 740 mm; CV = 24%).
Open shapes (221b):	mean rim diameter = 736 mm (between 570 and 860 mm; CV = 14%).
Closed shapes:	mean rim diameter = 368 mm (between 260 and 750 mm; CV = 19%).

Capacity

The capacity in litres could be calculated (up to the rim) for 10 open shapes and for 8 closed shapes.

Open shapes (type 145):	mean capacity is 37.15 litres (between 11.31 and 64.47 litres; CV = 60%).
Open shapes (type 221b):	mean capacity is 151.40 litres (between 97.14 and 212 litres; CV = 32%).
Closed shapes:	mean capacity is 199.31 litres (between 106 and 293.2 litres; CV = 34%). Type 213 vessels generally have larger capacities than the other rim types.

The mean capacities suggest sizes of 50, 200 and 250 *qû* for these vessels. However, the CV values are very high and a precise capacity was probably not aimed for.

Surface treatment
All vessels were simply smoothed during the shaping stage. Four vessels, a closed type 213 pot (fig. IV.67.e) and three open type 221b pots (K8 65-142:6, M11 13-167:2 and P03-438 from N12), were covered on the inside (and the three open pots on the outside as well) with a thick layer of bitumen. The closed pot was incised with the sign for water. Pot P03-438 had a hole in the base that was closed with a bitumen plug. Possibly the coating with bitumen was meant to make these vessels more watertight.

Decoration
A very high percentage of almost 40% of these large pots shows some kind of decoration. Mostly (11%) the decoration consists of an applied rope-imitation band under the rim, often combined with a wavy incised line between application and rim. Appliqués only (11%) or wavy lines only (14%, perhaps the fragment was often too small to include the appliqué decoration) are popular as well. More rarely, combinations of horizontal and wavy incised lines were used. The decorations are always placed on the shoulder or the upper vessel wall, just below the rim, and were very well visible. This indicates that the vessels were probably often seen, and that display was of some importance. Applied decorations may have had an additional function in providing a better grip on the vessel. The association with a thick cabled rope may have given the vessel an impression of sturdiness.

Potters' marks and signs
Three fragments of large type 213 closed pots carry cuneiform inscriptions in a very large script. All three inscriptions can possibly be read as "water", indicating that these pots were meant for water storage. One large closed type 213 pot had a painted sign on the upper vessel body (fig. IV.67.d, Appendix E).

<u>Use-related properties</u>

Burning traces
A small amount (4.8%) of the pots shows traces of burning, mostly on the inside or both the in and the outside of the vessel, sometimes at the base only and sometimes on the inside of the rim only. Most probably most of these traces are related to depositional processes.

Remains of contents
In two type 213 pots found in square H8 a large, heavy spherical stone was found inside. Perhaps this stone was used to weigh down a wooden or basketry lid on the mouth? Many of the vessels found in square H8 have a very thick, grey/whitish crust sticking to the inside, outside or even to the fractures of the vessels. Possibly this crust is related to the use of the vessels. Among the pots in square H8 many charred seeds (possibly of grain, fruits and sesame) were found, as well as charcoal wood fragments. Similarly, charred seeds were found in pots dug into the floor of a room in square M8.

Traces of use
As with the large jars (types 321, 322, 323) discussed above, many of these large pots have an inside surface that is soft and whitish or pinkish in colour. It seems as if the top surface has been abraded or come off. Perhaps this was caused by the (acidic?) contents or by stirring heavily with a hard tool or by cleaning the vessel wall with an abrasive tool. Vessels with this phenomenon are only of the types 145 and 212b. One type 145 pot had a damaged inside surface. In one type 213 pot (fig. IV.67.f), a 7 mm wide hole was drilled from both the in and outside into the lower vessel wall. Perhaps the contents of this large vessel with a rounded base needed extra ventilation.

Remarkable archaeological context
Fragments of large vessels are found all over the settlement. One remarkable findspot of numerous large completely preserved vessels is a small room in square H8. This room was most probably a storage room. Other complete vessels were found in squares K12-K13 and L11, L12, N12. A large open pot (fig. IV.106.f) was found together with the large pot stand in fig. IV.111.n, indicating that they were used together, most probably to provide some space and air under the base of the pot which had a base hole. Large fragments of these pots were sometimes used as a cover in adult burials.

Suggestions for function and use

- Long-term storage of dry and liquid goods in bulk (water, beer or grain?).
- Perhaps used in the processing of food or other materials (pots with holes used in beer brewing?).
- Reuse: large sherds were used as a cover in adult burials

"Grain measures"(type 225)

Percentage of all rims (levels 6-3): 0.3%

Function-related properties

Fabric and inclusions
Almost all of these vessels are made of the normal clay with fine organic inclusions (ware group Y). The use of organic inclusions is most probably more related to the properties of the raw materials and to the shaping methods than to the function of the vessel.

Shaping methods
All "grain measures" were thrown from one piece of clay. The ring bases were carefully finished. Once an extra layer of clay was added at the inside of the base, to create a more even base thickness. Base cracks never occurred. Once a small crack in the wall was repaired with bitumen.

Shape
The "grain measures" are easily recognizable and have a long cylindrical, open shape so that the contents are easily accessible. Their shape seems to stand somewhat apart from the rest of the corpus, and they represent the continuation of a long tradition starting in the Old Babylonian period. The rims are mostly thickened or squarish on the outside, providing some grip. The walls are relatively thin. The bases are wide compared to the maximum vessel width, so that these vessels are stable and stand easily without support. Not many vessels were completely preserved, so that the ratio between vessel height and rim diameter could only be calculated for four vessels. The mean ratio is 1.5 (between 1.32 and 1.67; CV = 12%).

Size
Two size groups were tentatively distinguished on the basis of the rim diameters. However, the rim diameters vary rather widely.

> 225a: rim diameter < 250 mm, mean rim diam. = 140 mm (between 80 and 220 mm, CV = 25.2%).
> 225b: rim diameter ≥ 250 mm, mean rim diam. = 287 mm (between 250 and 320 mm, CV = 11.5%).

Capacity
The term "grain measure" was originally coined by M. Mallowan (1936, 1946) and seems to imply that the vessels were used as a volume measure (see Chapter VI for further discussion). Capacities could be calculated for two completely preserved vessels at Sabi Abyad, but they do not show a unity of volume: 1.01 and 1.83 litres. However, when calculating the capacity of the vessels up to each horizontal incised line, it could be suggested that each vessel holds multiples of 1/2 or 1/3 *qû*. This could also be proved for fragmentarily preserved vessels (see fig. VI.17, no.12). A function as a measuring vessel for dry goods or liquids is therefore not precluded.

Surface treatment
Most vessels are just smoothed, only one has a burnished surface on the outside.

Decoration
A remarkably high percentage of these vessels are decorated: more than two-thirds show incised, painted or appliqué lines, mostly horizontal or in a combination of horizontal and wavy patterns. Some show the characteristic white-filled impressed decoration of lines and circles. Apart from the decorative value, especially the horizontally incised lines may have had a function as volume measuring lines (see above and Chapter VI).

<u>Use-related properties</u>

Remains of contents
The vessel P93-198 contained many different pieces of colourful stones and glass, and was obviously used to store half products of a bead workshop (fig. VI.6). Two vessels contained a thick layer of gypsum/lime, and were secondarily used to hold this material in the pottery workshop in square M11 (fig. IV.72.a).

Remarkable archaeological context
"Grain measures" were found in many squares, but mostly in square K9, in association with the special function room (kitchen?) excavated there, containing other special shapes like "pilgrim flasks" and bowls with a spout and a handle.

<u>Suggestions for function and use</u>

- Short-term storage of dry goods, food and liquids.
- A measuring vessel suitable for measuring different fractions of the *qû*?

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Abbreviations

AAAS	Annales Archéologiques Arabes Syriennes
AfO	Archiv für Orientforschung
AHw	Von Soden, W., 1965/81, *Akkadisches Handwörterbuch*
AJA	American Journal of Archaeology
AoF	Altorientalische Forschungen
BASOR	Bulletin of the American School for Oriental Research
BATSH	Berichte der Ausgrabung von Tall Šēḫ Ḥamad / Dūr-Katlimmu
CAD	Oppenheim, A.L., *et al.*, eds., *The Assyrian Dictionary of the Oriental Institute of the University of Chicago.*
CDA	Black, J. et al., eds., 2000: *A Concise Dictionary of Akkadian*
DOG	Deutsche Orient Gesellschaft
IFAO	Institut Français d'Archéologie Orientale
IFAPO	Institut Français d'Archéologie du Proche Orient
JCS	Journal of Cuneiform Studies
JESHO	Journal of the Economic and Social History of the Orient
KAJ	Ebeling, E., 1927, *Keilschrifttexte aus Assur juristischen Inhalts*.
KAR	Ebeling, E., 1923, *Keilschrifttexte aus Assur religiösen Inhalts.*
KAV	Schroeder, O., 1920, *Keilschrifttexte aus Assur verschiedenen Inhalts*.
LBA	Late Bronze Age
MA	Middle Assyrian
MAH	Musée d'Art et d'Histoire, Geneva
MARI	Mari Annales de Recherches Interdisciplinaires
MARV	Mittelassyrische Rechtsurkunden und Verwaltungstexte (H. Freydank, vol. I (1976), II (1982), III (1994), IV (2001); H. Freydank and B. Feller, vol. V (2004), VI (2005) and VII (2006).
MDOG	Mitteilungen der Deutschen Orientgesellschaft
MHEO	Mesopotamian History and Environment, Occasional Publications. Leuven.
NA	Neo-Assyrian
NABU	Nouvelles Assyriologiques Brèves et Utilitaires
NB	Neo-Babylonian
PN	Personal name
SAAB	State Archives of Assyria Bulletin
SSEA	Journal of the Society for the Study of Egyptian Antiquities
TMH	Texte und Materialien der Frau Professor Hilprecht Sammlung, Jena
UCP	University of California Publications in Semitic Philology
WVDOG	Wissenschaftliche Veröffentlichung der Deutschen Orient-Gesellschaft
ZA	Zeitschrift für Assyriologie und Vorderasiatische Archäologie

SAMENVATTING IN HET NEDERLANDS

I. Inleiding en historische achtergronden
De ruïne-heuvel Tell Sabi Abyad is gelegen in Noord-Syrië, in de vallei van de Balikh rivier. Rond 1225 v. Chr., aan het eind van de Late Bronstijd, breidden de Assyriërs hun koninkrijk uit naar deze regio en bouwde de onderkoning, Aššur-Iddin, op deze plek een *dunnu* nederzetting. Een *dunnu* is een versterkt landgoed, dat de exploitatie van het achterland als belangrijkste doel had. Honderden teksten die bij de opgraving van de nederzetting werden gevonden, geven een gedetailleerd beeld van het dagelijkse leven in de *dunnu*. Alle landbouwactiviteiten, maar ook de productie van bier, voedsel en andere benodigdheden, werden georganiseerd door de *abarakku* en zijn staf. De *dunnu* werd bewoond tot in de late 12^{e} eeuw v. Chr., misschien tot ca. 1125 v. Chr.

Sinds 1991 wordt vanuit het Rijksmuseum van Oudheden te Leiden archeologisch veldwerk verricht in deze nederzetting. Dit proefschrift bespreekt het aardewerk wat in de *dunnu* werd gevonden. Daarbij staan drie onderwerpen centraal: 1) de presentatie van het aardewerk en het opstellen van een gedetailleerde chronologische sequentie (hoofdstuk IV), 2) de bespreking van alle beschikbare informatie over hoe het aardewerk werd geproduceerd, om te komen tot een reconstructie van de organisatie van aardwerkproductie op de site (hoofdstuk V), en 3) een poging te identificeren waarvoor het vaatwerk was bedoeld en hoe het is gebruikt (hoofdstuk VI).

II. Methoden van veldwerk en onderzoek
Dit hoofdstuk bespreekt hoe het veldwerk op de opgraving te Tell Sabi Abyad verloopt, en hoe het aardewerk verzameld werd. Het beschrijft alle voor de bestudering van het aardewerk gebruikte variabelen. Bovendien worden de gebruikte statistische testen en computerprogramma's kort beschreven.

III. De archeologische context
Het aardewerk is afkomstig uit vijf opeenvolgende fases van bewoning. De oudste fase (7) dateert uit een periode voorafgaand aan de komst van de Assyriërs. De nederzetting bestond uit een versterkte toren, en hoorde bij het Mitanni rijk dat zich uitstrekte over noord-Syrië. Niet zo heel lang nadat deze toren door brand werd verwoest, bouwden de Assyriërs in fase 6 hun eerste *dunnu*. Binnen een droge gracht bouwden zij een goed geplande versterking, bestaande uit een toren, een paleis, kantoorruimtes en werkplaatsjes, omgeven door een muur. In fase 5 werd de nederzetting sterk verbouwd. De bebouwing trok zich terug binnen de muren van het fort, maar de meeste ruimtes behielden hun oorspronkelijke functie. Uit deze fase zijn de meeste spijkerschrift teksten bewaard gebleven. In fase 4 lijkt de *dunnu* zijn bloeitijd achter zich te laten. Alleen de gebouwen in het noorden van de nederzetting werden nog bewoond. In de laatste fase van bewoning uit de Late Bronstijd (3) restten er slechts nog een paar eenvoudige huisjes.

IV. De aardewerk-sequentie
Een van de doelstellingen van het proefschrift is het op Sabi Abyad gevonden Midden Assyrische aardewerk in detail te presenteren, en te tonen hoe het aardewerk door de tijd heen verandert. Er zijn duidelijke verschillen aan te wijzen tussen het aardewerk uit de Mitanni fase 7 en dat uit de latere Midden Assyrische fases. In fase 7 kwamen wat meer potten voor, vooral kookpotten waren populair. Kenmerkend waren de half-ronde schalen, vaak met rood beschilderde randen. Ook de cylindrische potten, die "*grain measure*" genoemd worden, kwamen voor. De meeste kruiken in fase 7 hadden korte nekken. Een relatief groot deel van het aardewerk was gepolijst of beschilderd, onder andere met de bekende "Nuzi" motieven. Er zijn echter ook veel overeenkomsten met het aardewerk uit de volgende (Midden Assyrische) fase en de culturele continuïteit is groot. Het aardewerk uit de fases 6 tot 3 is goed herkenbaar als "Midden Assyrisch". Net als op andere vindplaatsen uit deze regio en periode, werd de assemblage gedomineerd door een aantal karakteristieke maar simpele vormen. De belangrijkste waren open schaaltjes met een geknikte wand, grotere schalen met een rechte wijd uitlopende wand, kleine V-vormige of S-vormige drinkbekers met een puntige bodem, kleine ovale kruikjes, grote langwerpige ovale kruiken met een omgeslagen rand en cylindrische ringen die dienden als standvoet. Gedurende de tijd, van fase 6 tot 3, waren er vele kleine maar duidelijke veranderingen te zien in het aardewerk. Sommige vormen van randen of bodems verdwenen of verschenen terwijl weer andere vormen populair werden, en de versiering veranderde. Voor elke fase zijn er op deze

manier typische vormen en details aan te wijzen. Door deze te vergelijken met het gepubliceerde aardewerk van andere vindplaatsen was het mogelijk de aardewerk-sequentie van Sabi Abyad te plaatsen in het grotere chronologische schema. De met behulp van spijkerschrift teksten goed gedateerde sequentie van Sabi Abyad bestrijkt ten dele een periode waarvan het aardewerk niet eerder op eenzelfde gedetailleerde manier werd gepubliceerd. Omdat aardewerk vaak de belangrijkste methode van dateren is op opgravingen in het Nabije Oosten, biedt dit hoofdstuk een waardevolle bijdrage aan de chronologie van noord-Syrië. Appendix A biedt een lijst van het in dit proefschrift verwerkte materiaal. Appendix B presenteert de vormtypologie die gebruikt is bij de beschrijving van het aardewerk.

V. De technieken en organisatie van de productie van aardewerk
Veel archeologische publicaties van aardewerk beperken zich tot een beschrijving van het aardewerk zoals in hoofdstuk IV van dit proefschrift. Behalve een middel om een vindplaats te dateren, is aardewerk echter een rijke bron van informatie over de samenleving. Dit hoofdstuk concentreert zich op de vraag hoe het aardewerk van Sabi Abyad werd gemaakt, en hoe de productie ervan was georganiseerd. De reconstructie van aardewerk-productie steunt op gegevens over het vaatwerk zelf, maar ook op de informatie over pottenbakkers-ovens, werkplaatsjes, gereedschap, ongebakken aardewerk-fragmenten en misbaksels die op de site zijn gevonden, en op wat we weten over de natuurlijke, sociale, economische en historische achtergronden van de samenleving. Deze multi-dimensionele benadering past in de groeiende aandacht binnen de archeologie voor technologie. Er is recentelijk grote belangstelling voor de mogelijkheden die de gedetailleerde bestudering van technologische processen en de reconstructie van het werk van ambachtslieden archeologen bieden om tot uitspraken over een verleden samenleving te komen. Een dergelijke poging om de productie van aardewerk te reconstrueren is voor de archeologie van het Nabije Oosten niet eerder ondernomen. Het gangbare beeld van het Midden Assyrische aardewerk was dat het massaal werd geproduceerd in grote “manufacturen” of pre-industriële fabrieken. De belangrijkste redenen voor dit denkbeeld zijn het eenvormige, bijna gestandaardiseerde uiterlijk van het aardewerk, en de gehaaste manier waarop het gemaakt is. Massaproductie in grote werkplaatsen werd als verklaring gezien voor deze uniformiteit en op snelheid gerichte vormtechnieken. Het onderzoek in dit proefschrift toont echter aan dat in Sabi Abyad het aardewerk werd vervaardigd in kleine redelijk zelfstandige werkplaatsjes. Het gebruik van efficiënte en op snelle productie gerichtte technieken werd niet veroorzaakt door de uitzonderlijk grote aantallen die geproduceerd moesten worden of door het feit dat men streefde naar standaardisatie, maar eerder door de manier waarop de productie was georganiseerd. Slechts een of een paar pottenbakkers moesten de *dunnu* en de van de nederzetting afhankelijke bevolking van aardewerk voorzien. Daarvoor werden zij betaald in rantsoenen, en moesten zij hun gezin onderhouden door een veld te bebouwen. De administratie van de *dunnu* had slechts behoefte aan bruikbare potten, en extra mooi afgewerkte of versierde potten leverden waarschijnlijk geen extra beloning op.

Na een korte inleiding over gangbare theoretische modellen van de organisatie van productie, bespreekt hoofdstuk V eerst de natuurlijke omgeving van de nederzetting. De klei in de omgeving is zeer kalkrijk, waardoor bepaalde eisen worden gesteld aan vormtechnieken, baktechnieken en gebruikte magerings-materialen. Door de natuurlijke omgeving en het klimaat te bestuderen, werd ook duidelijk welke potten niet in Sabi Abyad gemaakt kunnen zijn en in welke seizoenen de pottenbakker het best kon werken. Contemporaine en vroegere tekstbronnen uit Mesopotamië laten zien dat de pottenbakker zeer waarschijnlijk een man was. Hoewel er weinig informatie uit teksten is over de organisatie van aardewerkproductie, is het te verwachten dat de Midden Assyrische administratie hem behandelde zoals andere ambachtslieden, en dat hij een vergelijkbare status had.

In fase 6 en fase 5 werden pottenbakkers-werkplaatsen gevonden, terwijl in deze fases en in fase 4 grote en kleine pottenbakkers-ovens werden ontdekt. De bestudering van deze werkplaatsen, ovens en de voorwerpen die daarin werden aangetroffen, boden nieuwe informatie over de organisatie van aardewerk-productie. Zo werd duidelijk dat in fase 6, toen de *dunnu* werd gebouwd, werkplaatsen speciaal werden aangelegd aan de oostelijke rand van de nederzetting. Twee grote ovens werden gebruikt om het aardewerk te bakken. In fase 5 veranderde dit beeld. Nu zien we dat de pottenbakkers gebruik maakten van leegstaande ruimtes in of naast gebouwen die andere functies hadden. Zo werd het huis van de schrijver gebruikt als werkplaats, en werden grote en kleine pottenbakkers-ovens aangelegd in het westen en noorden van de *dunnu*. Hoewel wellicht evenveel aardewerk werd geproduceerd als voorheen, lijkt de activiteit meer geïntegreerd te zijn met andere activiteiten. Misschien was de pottenbakker niet meer continue op de site aanwezig. Er zijn geen werkplaatsen gevonden in fase 4, maar een grote oven in het noorden van de nederzetting bewijst dat aardewerk nog wel op de site werd geproduceerd.

Op basis van de misbaksels en het ongebakken aardewerk, en de archeometrische onderzoeken die gepresenteerd worden in Appendix D, was het mogelijk een overzicht te maken van de vormen die locaal zijn gemaakt, en van de potten die van elders kwamen. Een dergelijk overzicht is nodig voordat de technieken die door de pottenbakkers op Sabi Abyad gebruikt werden beschreven kunnen worden. Een nauwkeurige studie van de sporen die op de oppervlakte van de scherven en potten werden aangetroffen, in samenwerking met het Department for Pottery Technology van de Universiteit Leiden, toonde aan dat er vier basistechnieken gebruikt zijn, in verschillende varianten. Een techniek werd niet op Sabi Abyad gebruikt, en werd alleen aangetroffen bij geïmporteerde kruiken. Drie van de vier technieken maken gebruik van de snelle draaischijf, waarvan twee exemplaren in fase 6 werden teruggevonden. De reconstructie van gebruikte vormtechnieken liet zien dat efficiëntie en tijdsbesparing belangrijk waren. Ook is het waarschijnlijk dat de pottenbakker werd geassisteerd door een of meerdere helpers, en dat er in serie werd gewerkt. Elke vormgroep (drinkbekers, kleine schalen, grote schalen en kleine kruiken, grote kruiken, reusachtige opslagvaten) vereiste andere vaardigheden. Ook voor het bakken in de ovens (en het bouwen daarvan) was deskundigheid vereist, en het is duidelijk dat de pottenbakkers het bakproces goed onder controle hadden. De kleine beschadigingen die voor een deel veroorzaakt werden door de snelle vormtechnieken werden soms oppervlakkig gerepareerd en stonden het gebruik van het aardewerk niet in de weg.

In een meer interpretatief gedeelte van de studie wordt aangetoond dat het vaatwerk van voldoende kwaliteit was voor de eisen die de administratie eraan stelde. Het ging om no-nonsense gebruiksaardewerk, en perfectie of versiering waren niet van belang. Een belangrijk oordeel over Midden Assyrisch aardewerk, dat het “gestandaardiseerd” zou zijn, wordt in deze studie weerlegd. Het blijkt dat het Midden Assyrische aardewerk inderdaad minder divers is dan het voorafgaande Mitanni aardewerk. Ook bestaan er binnen een aantal vormgroepen grootteklasses. De pottenbakkers streefden echter niet naar standaardisatie van de vorm, afmetingen of inhoud van de potten. In Appendix C zijn alle gegevens over de pottenbakkers-ovens samengebracht. Appendix E behandelt de tekens die soms op het aardewerk werden aangebracht, en die mogelijk verband houden met de organisatie van het werk in een werkplaats.

VI. Functie en gebruik van Midden Assyrisch aardewerk

Het uiteindelijke doel van de pottenbakkers was om bruikbaar vaatwerk te produceren. Een integraal onderdeel van de studie is daarom de reconstructie van de functie en het gebruik van het aardewerk. Die kan soms gereconstrueerd worden door te kijken naar de vondstcontext. Enkele vormen werden vooral in het officiële staf-gedeelte van de nederzetting gevonden. Sommige potten bevatten nog resten van de oorspronkelijke inhoud, zoals graankorrels, knoflook en zaden. Kruiken en kleine schaaltjes werden gebruikt voor kindergraven en crematiegraven. Een gedetailleerde analyse van de vorm en de gebruikssporen op het aardewerk, gepresenteerd in Appendix G, leidde tot een voorlopige indeling van het aardewerk in twaalf functionele groepen: kookpotten, vaatwerk voor eten en drinken, vaatwerk gebruikt voor de productie van voedsel en andere zaken, opslagpotten en kruiken, opslag in zeer grote hoeveelheden, transport, standvoeten voor andere potten, zeven, lampjes, deksels, vaatwerk gebruikt in graven, en vaatwerk gebruikt als maat-vat. Op Sabi Abyad zijn twee spijkerschrift teksten gevonden waarin een pottenbakker en aardewerk voorkomen. Deze teksten werden door F.A.M. Wiggermann in dit proefschrift voor het eerst gepubliceerd in Appendix F. Maar ook in andere Midden Assyrische teksten komt aardewerk voor. In samenwerking met dr. Wiggermann bevat dit hoofdstuk een lijst van Assyrische namen voor aardewerk. Vaak is de vertaling van deze namen niet precies bekend. Voor deze periode is dit de eerste keer dat er geprobeerd wordt deze namen naast de bestaande aardewerkvormen te plaatsen. Natuurlijk is het niet mogelijk elke vorm precies te identificeren, maar de lijst levert een interessant beeld op van het gebruik van aardewerk in de Midden Assyrische tijd. Een bespreking van de eetgewoontes en methoden van koken, bierbrouwen en andere voedselbereiding geeft de nodige context aan deze informatie. Iconografische bronnen waarop aardewerk wordt afgebeeld zijn voor deze periode zeer schaars. Een overzicht van de gepubliceerde rolzegels en enkele andere bronnen laat het aardewerk vooral zien terwijl het gebruikt wordt bij het uitvoeren van rituelen.

Curriculum Vitae

Kim Duistermaat was born in Utrecht on 7 April 1971. Upon finishing grammar school (Rijksscholengemeenschap Schoonoord at Zeist, "gymnasium α") in 1988, she went on to study Archaeology at Leiden University. She specialized in the Archaeology of Anatolia and Mesopotamia with D.J.W. Meijer, and graduated in 1994 with an MA thesis on Neolithic seals and seal impressions from Tell Sabi Abyad in Syria (Duistermaat 1996).

Her interest in seals and sealings resulted in an archaeometric research project together with G. Schneider in Berlin, concerning the composition and provenance of the clays used for sealing in Neolithic Sabi Abyad (Duistermaat and Schneider 1998). She has been and still is responsible for the publication of the Neolithic glyptic material from Sabi Abyad (Duistermaat 2000b, Akkermans and Duistermaat 1997, 2004) and she has now also started work on the Middle Assyrian seal impressions from the same site.

During and after her studies, Kim has been an active member of student committees, a board member of the "Ex Oriente Lux" society, and a member of the board of editors of the student magazine "Profiel" of the Faculty of Archaeology. She worked in different part-time and volunteer jobs with the Netherlands Institute for the Near East in Leiden (NINO) as an office assistant, and with the National Museum of Antiquities in Leiden (RMO) as a guide, registrar, and staff member of the archaeological research project at Tell Sabi Abyad. She first joined the archaeological expedition to Tell Sabi Abyad (with P.M.M.G. Akkermans) in 1991, and has been involved in the project ever since. In addition she has worked on excavation projects in the Netherlands and Syria, including the sites of Geleen, Khirbet esh-Shenef, and Tell Brak (with R. Matthews).

In 1997 she moved to Damascus, Syria, where she set up and managed the Netherlands Institute for Academic Studies (www.niasd.org) on behalf of the NINO. Apart from her work for the institute she taught Syrian archaeology students in courses on "Introduction to Pottery in Archaeology", together with O. Nieuwenhuyse and A. van As (Leiden University). She organized archaeological tours around Syria for a non-specialist audience, and presented classes on archaeology to preparatory-school students of the al-Kafila school in Damascus. She has also published several articles on Syrian and Mesopotamian archaeology for a non-specialist audience.

From 1994 until 1999 Kim was responsible for the processing of the Middle Assyrian pottery during the excavations at Sabi Abyad. This ultimately led to the work for this thesis. The research was for the largest part self-funded and was carried out in the spare hours next to her job as director of the NIASD. In 2005 a sabbatical year and two travel grants enabled her to finish the study. In 2006 she was appointed director of the Netherlands-Flemish Institute in Cairo, Egypt (www.nvic.leidenuniv.nl).

Her main research interests are seals and sealings, pottery studies, technology and technological choices, and the history of Archaeology in the Middle East. Recently, her move to Egypt has provided her with the opportunity to broaden her scope to Egyptian archaeology and its relations with Syria and the Levant.

Kim is married to the geologist I.A. Nijenhuis and lives in Cairo, Egypt.