

Archaeological Context of Indus Texts at Mohenjodaro*

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Introduction

This paper describes in brief the Database for the Indus Script (DBIS) compiled by the authors on the CYBER 170/730 computer system at the Tata Institute of Fundamental Research (TIFR), Bombay. The paper also describes the applications of the Database to the study of Indus inscriptions in their archaeological context with reference to a major Harappan site, namely Mohenjodaro.

Database for the Indus Script

One of the objectives of the computer study undertaken is to compile the archaeological data along with the Indus texts and make both available to the scholars to facilitate the study of the inscriptions in the context of their occurrences. A Corpus of Texts in the Indus Script, a computerised Concordance to the Texts and some of the processed background data in the form of Tables based on the data compiled by the authors have been already published (I. Mahadevan, 1977). The algorithm to prepare the Concordance to the Indus Texts has also been described in two papers (Mythili R. Rao and I. Mahadevan 1977, 1983). The Finnish scholars (Koskeniemi and Parpola) engaged in computer studies of the Indus Script have also included similar basic data in the Corpus of Texts and the Concordance published by them (1979, 1980, 1982). More recent statistical studies of the Indus Script, viz. Fairservis (1977), Siromoney and Abdul Huq (1980, 1984), are based on the published data from either of the two sources. The Soviet scholars (Knorozov et. al.) who were the earliest to employ the computer to study the Indus Script have been publishing their results in a series of brief papers which do not include full background data (*Proto-Indica* series, 1965-79).

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The Database for the Indus Script presently consists of 3573 lines of text in the Indus Script found written on 2906 artefacts from 19 Harappan and 5 West Asian sites. The artefacts (designated as 'inscribed objects') have been classified broadly into eight types based on the material from which they were manufactured and the modes of writing on them (reversed in the case of seals, in relief on sealings and directly incised on other objects).

The Corpus of Texts and the available background data relating to each text have been coded in both numerical and literal forms for analytical study and reporting respectively. The Database has been broadly divided into two parts, viz. Background Data and the Texts. The Background Data include Site, Locus, Level, Type, Field Symbol and Direction of Writing. For convenience of quick retrieval a Reference Number, which is uniquely defined, has been assigned to each line of the texts. This Reference Number is also included in the Background Data. The Texts consist of a series of Indus signs appearing in each line. A brief description of the elements of the Database is given in Table I. The authors have also created a Library of Signs in the Indus Script for graphic reproduction on a CALCOMP Drum Plotter (see illustrations in Fig. I).

Archaeological Context of the Indus Texts.

Attempts to decipher the Indus Script have been based mostly on linguistic and cryptanalytical techniques and very little attention has been paid to the archaeological context of the inscriptions. (The most recent review of such attempts is by Zvelebil, 1985). The neglect of archaeological data probably appears to be partly due to the non-availability of such data in a readily accessible form until recently, and also partly due to the problems in understanding the stratigraphic data provided in the earlier excavation reports on Mohenjodaro (Marshall, 1931; Mackay, 1937-38), Harappa (Vats 1940) and Chanjudaro (Mackay, 1943). Excavation reports on the important sites of Lothal and Kalibangan are yet to be published in full.

The 'archaeological context' of an Indus inscription is given by the data on

- (a) *Stratigraphy* (site, locus and level) of the inscribed objects;
- (b) *Typology* of the inscribed objects; and
- (c) Associated *field symbols* (pictorial motifs in the field of the inscribed objects).

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Analysis of the inscriptions with reference to their archaeological context is likely to yield valuable clues to their contents even before the script is deciphered. A stratigraphic study of the inscriptions is essential to follow the development of the script and the language during the course of evolution of the Indus Civilization. A correlation of the inscriptions with the typology of the inscribed objects may reveal the purpose for which the inscriptions were recorded. The associated pictorial motifs tell us something about the religious beliefs of the Harappans which we may expect to be reflected in the writings accompanying the pictures. In our view a context analysis on these lines is essential before linguistic and cryptanalytical studies of the Indus texts are undertaken.

Excavations at Mohenjodaro

Mohenjodaro was accidentally discovered in 1921 by R.D. Banerji during the course of clearance of a Buddhist stupa at the summit of a mound. The site was extensively excavated by Sir John Marshall (1922-27) and later by Ernest Mackay (1927-31). Smaller excavations were subsequently undertaken by the custodians of the site (1932-42?), Mortimer Wheeler (1950) and G.F.Dales (1964-65). However stratigraphic data for the inscribed objects are available only from the excavation reports of Marshall and Mackay.

Archaeological Divisions (Loci) at Mohenjodaro.

The archaeological site at Mohenjodaro consists of two mounds. The smaller and higher mound to the west is designated as the Stupa Mound from the later Buddhist Stupa on the summit. The larger mound to the east is the location of the main city with a large number of blocks of houses separated by grids of streets generally oriented in the cardinal directions. (The two mounds are also more commonly known as the Citadel and the Lower City respectively.) For purposes of excavation, the site was divided into smaller Areas and each Area was generally named after the initials of the archaeologist in charge of the digging (Fig. 2, Site plan and Table 2, list of loci at Mohenjodaro.) Each Area was further subdivided by the excavators into smaller Sections and Sub-sections. For purposes of coding, a Section (or Sub-section) has been taken as a unit. Data on smaller subdivisions (like blocks, houses, rooms, court-yards, streets, trenches etc.) have also been compiled, but not presently included in the computerised database.

Marshall's Stratification of the Site.

Marshall determined that there were seven strata of remains between the level of the subsoil water and the summits of the mounds at Mohenjodaro (Marshall, pp. 9-10). On the basis of a study of the structural remains he grouped the strata into three major periods. The lowermost stratum was assigned to the Early Period and the next two strata each to the Intermediate and the Late Periods. Marshall numbered the strata and the phases (sub-periods) in the reverse order, that is, in the order of excavation from the top and not in the chronological order. The levels of the structural remains were measured from arbitrary datum lines with reference to mean sea level, but the levels of artefacts were measured from the surface of the mounds. There is no easy way by which the two sets of measurements can be correlated since the surface of the mounds was not level. In Mackay's later excavations (1927-31) all measurements were made from datum lines fixed for each Area and not from the surface.

Mackay' Modifications.

Mackay found, on the basis of new evidence from more extensive and deeper excavation, that the chronological divisions proposed by Marshall had to be modified. Thus the Late III Period of Marshall was in fact the last or uppermost stratum of the Intermediate Period, and likewise, the Intermediate III Period of Marshall was the last or uppermost stratum of the Early Period. The Early and the Intermediate Periods were terminated by two successive floods resulting each time in the temporary evacuation of the city followed subsequently by re-occupation and re-building at higher levels (Mackay, *Intr.* pp. xiv-xvi). Mackay also found evidence of a still earlier flood at a much lower level (35 ft. below datum) reached only in a restricted area of deep digging (DK Area, G Sec., Block 3) towards the end of the excavation (Mackay, pp. 43-44). Even though Mackay modified the chronological divisions of Marshall, he retained Marshall's nomenclature of the phases and their reversed numbering in the interest of consistency, but at the cost of clarity. A comparative statement of Marshall's stratification and Mackay's modification is given in Table 3.

Critiques of Stratigraphy.

Mortimer Wheeler who introduced modern techniques of stratigraphy to Indian Archaeology described the bench-level system of measurements at Mohenjodaro,

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which did not depend on local observation but on the sea level at Karachi as 'the very parody of scientific method' (Wheeler 1947). He pointed out that archaeological mounds are never level and that buildings at the summit and on the slope at different levels could nevertheless be contemporary. He also agreed with Piggott's criticism that objects and buildings cannot be assigned to a relative period without reference to their context in made up soil, rubbish pit etc. According to Piggott (1948), "the whole account of the Mohenjodaro stratigraphy is so complex and sometimes inconsistent that any discussion of its features must be prefaced by an explanation and a disclaimer to have extracted no more than an approximation from the published data".

Utilizing the Available Stratigraphic Data.

While there can hardly be any doubt about the validity of these criticisms, we feel that the stratigraphic data can still be used profitably if one takes the precaution of correlating levels within relatively small areas of excavation which may then be considered to be approximately flat. Further so far as DK Area (G Section) excavated by Mackay is concerned, he has specifically recorded that the ground levels of the houses in any one phase are 'strikingly uniform' and that even in the Late Period, this portion of the mound was 'fairly flat' (Mackay, Intr. p.xv). The objection that datumline measurements would obliterate distinctions between normal layers and rubbish pits etc. can also be overcome to some extent if one deals with relatively large number of objects on a statistical basis. Here again it can be observed from the Excavation Reports that a large proportion of the inscribed objects was found *in situ* within houses or in court-yards etc. It is of course necessary that one should not lay undue emphasis on the levels of individual items and that random or extreme variations from the normal distribution are ignored.

'Reconstruction' of the Stratigraphy at Mohenjodaro by Piggott and Lambrick.

Piggott (1948) and Lambrick (1971) attempted to re-interpret Mackay's stratigraphic data through sectional diagrams of the DK Area (G section) which Mackay himself failed to provide in his report. In our view, neither interpretation is wholly satisfactory. As Lambrick pointed out, Piggott does not include the low-level flood (at 35 ft. below datum) in his diagram and incorrectly extrapolates Mackay's data on floods in the surrounding plains to the mound itself. Lambrick, however, failed to notice that Piggott's measurements were in fact made from Mackay's datum line and the term 'surface' in

Piggott's diagram was a mere slip. This led Lambrick to misunderstand the levels of building phases and floods marked in Piggott's sectional diagram. Lambrick's own reconstruction is also not free from difficulties. In his diagram the commencement of the Intermediate and the Late Periods are each shown inexplicably one phase *lower* than those indicated by Mackay. Thus the beginning of the Intermediate Period is marked at 20.4 ft. instead of 15.9 ft., and of the Late Period at 9.9 ft. instead of 7 ft. below datum. (cf. Table 3 and Fig. 3).

New Interpretation of Mackay's Stratification.

In view of the problems with the 'reconstructions' of Piggott and Lambrick, it is preferable to fall back on Mackay's own report in explaining the stratigraphy of the site. The enclosed schematic sectional drawing (Fig. 3) is based on Mackay's data and findings, but the Marshall - Mackay nomenclature is discarded in favour of a simpler and more rational system. The major periods are divided, as Mackay did, on the basis of the intervening flood-levels. The same principle has been extended to include the lowest-level flood (at 35 ft. below datum) and the earliest known period below this level and above the lowest subsoil water reached by Mackay (42 ft. below datum) is designated as the 'Very Early Period'. The numbering of the phases (based on Mackay's average floor levels) has been done in the chronological order from the earliest (bottom-most) level to the latest (top-most) level. In order to distinguish the proposed nomenclature from the earlier ones, Arabic numerals have been used for the phases, and 'Intermediate' has been changed to 'Middle' Period. The highest (2 ft. above datum) levels at which inscribed objects were found (respectively seals 2 and 686 of Mackay) are also marked in the drawing

and lowest)

Analysis of Inscribed Objects and Inscriptions with respect to the Archaeological Context at Mohenjodaro.

Presented here, in a summarised form, are the preliminary results of the study of the inscribed objects and inscriptions with respect to the archaeological context at Mohenjodaro (statements 1-12). The study is not exhaustive, but the objective is to illustrate the potential of the Database for further research on the Indus Script along these lines.

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The parameters selected for the study are listed below with brief comments:

(1) SITE : Mohenjodaro as excavated by Marshall and Mackay (Plan in Fig. 2 and stratigraphy in Fig. 3).

(2) LOCI : The smaller archaeological areas coded in the database have been summarised in this study under seven broad areas (loci) covering the whole of the excavations by Marshall and Mackay. See Table 2 for the list of the loci.

(3) LEVELS : For the present stratigraphic study the authors have selected DK area (G Section) excavated by Mackay as it has the largest concentration of inscribed objects and the most copious stratigraphic data. Levels were recorded by Mackay in ft. above (+) or below (—) the datum line for the Area fixed at 178.7 ft. above the mean sea level (Mackay, tabulations of seals etc. pp.369-391). In this study, the measurements have been rounded off to the nearest foot and the data on levels have been grouped as under

Period	Levels (+/- datum in ft.)
Late	+2 to -7
Middle	-8 to -16
Early	-17 to -35

Note : No inscribed objects were found in the very Early Period (-35 ft. to -42 ft. below datum line). Objects found on the surface or for which the data on levels are not available are classified as UNK. (Unknown levels).

(4) TYPES OF INSCRIBED OBJECTS : See Table 4 for the list of Types.

(5) FREQUENT FIELD SYMBOLS : For the present study the most frequent field symbols occurring ten or more times in the whole Corpus (Mahadevan, 1977) have been selected. See Table 5 for the list of frequent Field Symbols.

(6) FREQUENT SIGN PAIRS : For the present study the most frequent sign pairs occurring fifty or more times in the Corpus have been considered. Segmentation analysis has shown that these are not random pairs but are

likely to be meaningful linguistic units like words or phrases (Mahadevan 1980, 1983). See Table 6 for the list of frequent sign pairs.

(7) **DIRECTION OF WRITING** The study has also explored the possibility of changes in the direction of writing in different environments. The determination of direction of writing has been discussed by Mahadevan (1977, 1980). The data on the direction of writing have been grouped as under :

RL : Right to Left

LR : Left to Right

OTHERS : Top to bottom, symmetrical lines, single signs and doubtful cases.

Note : The direction of lines on seals is coded as they would be read from impressions.

Summary of Results

(1) Inscribed Objects (Statements 1 - 2) :

(i) Mohenjodaro accounts for more than two-thirds of the seals, all of the copper tablets and all but one of the ivory / bone rods included in the whole of the Corpus. But the miniature tablets made of thin, tiny plates of steatite, faience or terracotta, which are such a characteristic feature of Harappa, are totally absent from Mohenjodaro. The site has also yielded relatively fewer sealings and inscribed pottery.

(ii) Seals are the predominant type of inscribed objects found at Mohenjodaro accounting for 80 percent of the total. The seals have fairly uniform distribution in all areas of the site and in all periods in the DK (G) Area.

(iii) It is somewhat surprising that the Citadel Mound, generally regarded as the seat of authority in the city from the character of the public buildings found there, should have yielded so few inscribed objects, most of them being seals. Perhaps the ancient despoliation of the mound for bricks when the Buddhist Stupa was constructed and the presence of a

massive brick platform just below the Middle (Intermediate) Period sealing off the earlier levels from excavation account for the relative paucity of the inscribed objects in this area.

(2) Field Symbols (Statements 3-5):

(i) Animal motifs are predominant at Mohenjodaro accounting for 12 out of 15 frequent field symbols found at this site.

(ii) The so-called unicorn (one-horned [redacted] animal) is by far the most frequent pictorial motif especially on the seals. It is almost always accompanied by a standard-like special cult object. The cult object never occurs by itself as a pictorial motif on the inscribed objects found at Mohenjodaro, unlike at Harappa. The unicorn is evenly distributed in all areas of Mohenjodaro and in all the Periods in the DK (G) Area.

(iii) Among the other animal motifs, the rhinoceros, the fabulous composite animal (made up from parts of bull, tiger, elephant and serpent), the ox-antelope and the humped bull occur relatively more frequently at Mohenjodaro. The hare occurs only at Mohenjodaro where it is present only on copper tablets. (Harappa has however some examples of hare-shaped miniature tablets). The crocodile (*gharial*) is also relatively less frequent at Mohenjodaro than at Harappa.

(iv) Pictorial Motifs other than the animals (dotted circles and the kino tree) are also much less frequent at Mohenjodaro than at Harappa.

(v) Field Symbols are common only on seals, sealings and copper tablets at Mohenjodaro. The pattern of distribution of the motifs is markedly different for each type of object. While the unicorn dominates the seals, it is seldom found on copper tablets. Ox-antelope and hare occur only on copper tablets. Goat-antelope occurs mostly on copper tablets. Rhinoceros and *gharial* occur relatively more frequently on sealings than on seals.

(3) **Sign-Pairs (Statements 6-9):**

(i) The following sign-pairs occur relatively more often at Mohenjodaro:



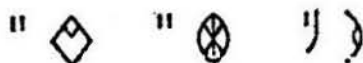
(ii) The following sign-pairs occur with much lower relative frequencies at this site than at Harappa:



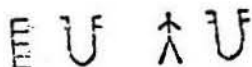
The following pair does not occur at all at Mohenjodaro:



(iii) While the most frequent initial pairs in the Indus Texts, namely



are also frequent at Mohenjodaro, the most frequent terminal pairs in the texts, namely



are among the less frequent pairs at this site. These two [terminal pairs are also relatively less frequent on seals, [and more frequent on sealings and ivory/bone rods. Neither pair is present on copper tablets.

(iv) The following sign-pairs occur with higher relative frequency on copper tablets:



(v) Most of the frequent sign-pairs are commonly associated with the unicorn. The only significant exceptions are the following pairs with minimal or no occurrence at all at Mohenjodaro:



(vi) There are no significant variations in the relative frequencies of the sign-pairs during the three periods in DK (G) area. This confirms the generally accepted view about the stability of the language and the script throughout the history of Mohenjodaro.

(4) Direction of Writing (Statements 10-12)

(i) The most frequent direction of the lines is from right to left (88.68). It is now universally accepted that this is the general direction of writing in the Indus Script.

(ii) 48 lines (2.77%) from Mohenjodaro run in the reverse direction from left to right. This is significantly lower than the average for the whole Corpus (6.58%).

Conclusion


It is necessary to keep in view the pattern of distribution of the signs as well as of the objects on which they are inscribed while attempting to interpret the signs or 'read' the inscriptions. The need for this precaution is illustrated in the following paragraphs with a few examples.


(i) The sign  occurs relatively more often at Harappa than

at Mohenjodaro. However this sign occurs at Harappa mostly on types of objects (miniature tablets and small sealings) not found elsewhere. The fact that the pattern of distribution of this sign is more due to the object types than the sites can be inferred by comparing the seal-texts which show minimal occurrences of this sign on the seals from *both* sites.

(ii) The signs  and  are sometimes regarded as

mere graphic variants of the same sign on the basis of similarity of context in spite of difference in their appearance (Koskeniemi and Parpola 1979).



However the sign  never occurs on copper tablets which *always* feature

the sign.  While the copper tablets have special contents (charac-

teristic field symbols and texts), they use the same scriptas found on other inscribed objects. It is thus concluded on the basis of this evidence that there must be some distinction between the two signs and that it is best to keep them apart and treat them as separate and independent signs.

(iii) Similarly the sign-pairs  and 

have to be kept apart, as the first (a frequent pair) never occurs on the copper tablets while the second (a much less frequent pair) occurs with a very high relative frequency on the copper tablets. Hence

 and  are to be regarded as independent signs even though

they occur in similar (but not identical) contexts in the seal-texts.

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(iv) The signs     and 

have often been interpreted as grammatical suffixes indicating Number, Gender or Case-endings. But the pattern of distribution of these signs does not seem to lend support to such interpretations. It is proposed to deal with this aspect more completely in a separate paper.

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TABLE 1

DATA DESCRIPTION OF THE FIELDS IN THE DATA BASE FOR THE
INDUS SCRIPT

Attributes	Description
Reference Number	Each line of text has a unique Ref. No. in 6 digits comprising the Site Number (col. 1), the Object Number (cols. 2-4), the Side Number i. e. the number of inscribed faces of the object (col. 5) and the Line Number, i. e. the number of lines of text on each inscribed side of the object (col. 6).
Locus	Area, Section or Sub-section of the site as determined by the excavator.
Level	The Level in ft. at which the object was found above (+) or below (-) the datum (in Mackay's excavations at Mohenjodaro and Chanhudaro), or below (-) the surface in Marshall's excavation of Mohenjodaro and Vats' excavation of Harappa. (The data on levels on other sites are not available.) The levels are rounded off to the nearest foot.
Type	The typology of the inscribed objects. (See Table 4 for list of types)
Field Symbol	The pictorial motif in the field on each side of the inscribed object. (See I. Mahadevan 1977, pp. 793-813 for the list of field symbols and illustrations)
Direction of Writing	Mostly from right, occasionally from the left and rarely from top to bottom. (The direction of writing was determined by criteria discussed in I. Mahadevan 1977, pp. 10-14.)
No. of positions in a line of Text	This number records the total number of signs and text - breaks (or illegible portions) in a line of text for computational processes.
No. of Signs in a line of Text	This number indicates the total of extant and legible signs in a line of text.

Line of Text Each line of text is coded as a series of 3-digit numbers each uniquely defining a sign. (For the Sign List of the Indus Script, see I. Mahadevan 1977, pp. 32-35). Doubtful signs are marked by asterisks. Breaks and illegible portions are also indicated by a special symbol.

Note : The Corpus of Texts published by I. Mahadevan (1977) is based on this Input Data; but the format in the book has been slightly re-arranged. Data on Locus, Level, the number of 'positions' and signs have been omitted and the Field Symbol codes have been abridged for want of space.

TABLE 2
LIST OF LOCI AT MOHENJODARO

Abbr.	Archaeological Areas	Ref.
SD (ML)	SD Area in the Citadel excavated by Marshall	Marshall, pl. xviii, xxii, xxvii
SD (MY)	SD Area in the Citadel excavated by Mackay	Mackay, pl. vi-viii
L	L Area in the Citadel excavated by Marshall	Marshall, pl. xxx
HR	HR Area in the Lower City excavated by Marshall	Marshall, pl. xxxix
VS	VS Area in the Lower City excavated by Marshall	Marshall, pl. Liii, Lvii
DK (ML)	DK Area in the Lower City excavated by Marshall (Section A - F)	Marshall, pl. Lxi - Lxiv
DK (MY)	DK Area in the Lower City excavated by Mackay (Sections G & H)	Mackay, pl. xiii-xiv, xvi-xxi
OTH./UNK.	Other Areas excavated by R.D. Banerji, Custodians of the Site, Wheeler and Dales. (Also stray objects from Mohenjodaro without details of locus/level.)	No stratigraphic data (on locus or level) available.

Note : (1) See plan of the site in Fig. 2
(2) See Statement 1, 3, 6 and 10 for analysis.

TABLE 3
STRATIFICATION OF MOHENJODARO BY MARSHALL AND MACKAY

STRATA (Acc. to Marshall)	PERIODS AND PHASES (Acc. to Marshall)	PERIODS AND PHASES (Acc. to Mackay*)	AV. FLOOR LEVELS OF STRATA (Acc. to Mackay : in ft. below datum) (Datum : 178.7 ft. above mean sea level)
I	LATE I	LATE I (a)	—3.2
		LATE I (b)	—5.0
II	LATE II	LATE II	—7.0
		----- LATE FLOOD -----	
III	LATE III	INTERMEDIATE I	—9.9
IV	INTERMEDIATE I	INTERMEDIATE II	—13.0
V	INTERMEDIATE II	INTERMEDIATE III	—15.9
		----- MIDDLE FLOOD -----	
VI	INTERMEDIATE III	EARLY I	—20.4
VII	EARLY	EARLY II	—24.0
		EARLY III	Not ascertained (by Mackay), but provisionally above the lowest flood level at —35 ft.
----- EARLY FLOOD -----			
		EARLY IV	Not ascertained (by Mackay), but provisionally extends upto the lowest subsoil water level reached by Mackay a —42 ft.

Note : *Nomenclature in this col. is based on Mackay's modifications proposed in his Report (pp. xiv-xvi), through he himself retained Marshall's nomenclature. See also Fig. 3 for proposed changes in nomenclature.

TABLE 4

DISTRIBUTION OF INSCRIBED OBJECTS ACCORDING TO TYPES AND SITES

Sl. No.	Types of inscribed Objects	No. of Occurrences at Sites							CORP. TOTAL
		MD	HP	CD	LL	KB	OS	WA	
1.	Seals	1232	350	58	89	56	13	16	1814
2.	Sealings	119	288	3	75	21	4	1	511
3.	Min. Tablets	—	272	—	—	—	—	—	272
4.	Pottery	13	64	4	1	20	17	—	119
5.	Copper Tablets	135	—	—	—	—	—	—	135
6.	Bronze implements	5	3	1	—	2	—	—	11
7.	Ivory/bone rods	28	1	—	—	—	—	—	29
8.	Misc. Obj.	8	7	—	—	—	—	—	15
Total		1540	985	66	165	99	34	17	2906

Note :

MD : Mohenjodaro, HP : Harappa, CD : Chanhudaro, LL : Lothal, KB : Kalibangan
 OS : Other sites, WA : West Asian Finds, CORP. : Corpus of Texts, Min. Tablets : Miniature
 Tablets, Misc. Obj. : Miscellaneous Inscribed objects.
 See statements 1 and 2 for analysis.

TABLE 5

LIST OF FREQUENT FIELD SYMBOLS
(with 10 or more occurrences in the Corpus.)

Sl. No.	Description	Total Frequency (in the Corpus)
1.	Unicorn	1159
2.	Short-horned bull	97
3.	Dotted Circles	67
4.	Elephant	56
5.	Humped bull	54
6.	Crocodile (Gharial)	49
7.	Rhinoceros	40
8.	Goat antelope	36
9.	Kino tree	34
10.	Ox antelope	26
11.	Tiger	21
12.	Fabulous composite animal*	20
13.	Standard cult object (occurring alone without Unicorn)	19
14.	Buffalo	14
15.	Hare	10
Total		1702 occurrences (85.4% of the Corpus)

Notes : (1) The Field Symbols are catalogued and illustrated in Mahadevan (pp. 793-813)

(2) See Statements 3, 4 and 5 for analysis.

(3). *Field Symbol No. 25 in Mahadevan's list.

TABLE 6
LIST OF FREQUENT SIGN PAIRS
(With so or more occurrences in the Corpus)

SIGN PAIR (FROM R TO L)	CODE No. (FROM L TO R)	TOTAL FREQUENCY (IN THE CORPUS)	
" ◊	267 099	291	
E U	342 176	184	
♀ III U	336 089	126	44
U III	089 328	124	
E U 𐀀	048 342	114	46
U U	347 342	110	
U 𐀀 ^{uu}	008 342	93	36
𐀀 U	342 001	87	
" ◉	391 099	83	
U	087 328	78	
♀ 𐀀 𐀁	171 059	76	21
𐀂 𐀂 ²¹	245 245	70	25
𐀀	087 059	67	
𐀃 𐀄	051 130	58	
U	095 328	58	
↑ 𐀀	059 211	55	
♀ 𐀅 𐀆	249 162	54	39
')	293 123	54	
TOTAL	18 PAIRS	1782	
		(18. 19% OF TOTAL IN CORPUS)	

Notes: (1) This list is abridged from Mahadevan (pp 724 - 745). The Sign pair

𐀇"

(099 067) with a frequency of 65 is omitted here as segmentation analysis shows that it is not a linguistic unit but 'RANDOM' pair.

(2) See Statements 6 to 9 for analysis.

STATEMENT 1

DISTRIBUTION OF INSCRIBED OBJECTS ACCORDING TO LOCI AT
MOHENJODARO

Obj. Types	Citadel			Lower City				Oth.	Total		
	SD (ML)	SD (MY)	L	HR	VS (ML)	DK (MY)	DK		MD		CORP. %
Seals	21	14	14	171	75	194	686	57	1232	1814	67.92
Sealings	2	2	1	12	6	12	73	11	119	511	23.29
Min. Tablets	0	0	0	0	0	0	0	0	0	272	0.00
Pottery	0	1	0	0	1	0	7	4	13	119	10.92
Copper Tablets	4	2	4	14	20	16	61	14	135	135	100.00
Bronze Implements	0	0	0	0	0	0	5	0	5	11	45.45
Ivory/ Bone Rods	0	0	0	2	2	1	18	5	28	29	96.55
Misc.Obj.	0	0	1	1	0	2	4	0	8	15	53.33
Total	27	19	20	200	104	225	854	91	1540	2906	52.99

STATEMENT 2

DISTRIBUTION OF INSCRIBED OBJECTS ACCORDING TO LEVELS (IN FT.)
IN DK (G) AREA AT MOHENJODARO

Object Types	Early	Middle	Late	Unk.	Total		%
	-35 TO -17	-16 TO -8	-7 TO +2	DK (G)	MD		
Seals	130	357	143	49	679	1232	55.11
Sealings	16	24	10	23	73	119	61.34
Min. Tablets	0	0	0	0	0	0	0
Pottery	3	3	1	0	7	13	53.85
Copper Tablets	3	12	7	39	61	135	45.19
Bronze Implements	5	0	0	0	5	5	100.00
Ivory/ Bone Rods	3	4	0	11	18	28	64.29
Misc. Obj.	0	1	0	3	4	8	50.00
Total	160	401	161	125	847	1540	55.00

STATEMENT 3

DISTRIBUTION OF FREQUENT FIELD SYMBOLS ACCORDING
TO LOCI AT MOHENJODARO

Field Symbols	Citadel			Lower City				Oth.	Total		%
	SD (ML)	SD (MY)	L	HR	VS	DK (ML)	DK (MY)	MD	CORP.		
Unicorn	14	9	6	106	46	115	411	40	747	1159	64.45
Short-horned Bull	0	1	2	13	5	6	40	2	69	97	71.13
Dotted Circles	0	0	0	0	0	0	8	0	8	67	11.94
Elephant	0	0	0	6	4	5	21	1	37	56	66.07
Humped Bull	0	0	0	4	2	7	30	3	46	54	85.19
Crocodile	0	0	0	0	0	3	7	1	11	49	22.45
Rhinoceros	0	0	1	9	5	4	15	3	37	40	92.50
Goat Antelope	2	0	0	3	1	6	13	2	27	36	75.00
Kino Tree	0	0	0	0	0	2	4	0	6	34	17.65
Ox Antelope	0	1	1	6	3	1	8	3	23	26	88.46
Tiger	0	0	1	2	0	2	12	1	18	21	85.71
Fabulous Composite Animal	2	1	0	2	1	0	12	0	18	20	90.00
Standard Cult Object	0	0	0	0	0	0	0	0	0	19	0.00
Buffalo	0	1	1	2	0	0	5	1	10	14	71.43
Hare	1	0	1	0	1	2	5	0	10	10	100.00
Total	19	13	13	153	68	153	591	57	1067	1702	62.69

STATEMENT 4

DISTRIBUTION OF FREQUENT FIELD SYMBOLS ACCORDING TO LEVELS
(IN FT.) IN DK(G) AREA AT MOHENJODARO

Field Symbols	Early —35 TO —17	Middle —16 TO —8	Late —7 TO +2	Unk. DK(G)	Total MD	%
Unicorn	82	209	88	28	407	747 54.48
Short-horned Bull	7	25	5	2	39	69 56.52
Dotted Circles	0	1	0	7	8	8 100.00
Elephant	4	8	4	5	21	37 56.76
Humped Bull	10	14	4	2	30	46 65.22
Crocodile	2	3	2	0	7	11 63.64
Rhinoceros	4	6	2	3	15	37 40.54
Goat Antelope	7	1	3	2	13	27 48.15
Kino Tree	1	0	1	2	4	6 66.67
Ox Antelope	1	0	1	6	8	23 34.78
Tiger	2	6	3	1	12	18 66.67
Fabulous Composite Animal	3	7	2	0	12	18 66.67
Standard Cult Object	0	0	0	0	0	0 0.00
Buffalo	2	3	0	0	5	10 50.00
Hare	0	0	0	5	5	10 50.00
Total	125	283	115	63	586	1067 54.92

STATEMENT 5

DISTRIBUTION OF FREQUENT FIELD SYMBOLS ACCORDING TO
INSCRIBED OBJECTS AT MOHENJODARO

Field Symbols	← Object Types* →								Total		
	1	2	3	4	5	6	7	8	MD	CORP.	%
Unicorn	726	18	0	0	3	0	0	0	747	1159	64.45
Short-horned Bull	59	7	0	0	3	0	0	0	69	97	71.13
Dotted Circles	0	0	0	0	0	0	7	1	8	67	11.94
Elephant	29	1	0	0	7	0	0	1	37	56	66.07
Humped Bull	45	1	0	0	0	0	0	0	46	54	85.19
Crocodile	5	6	0	0	0	0	0	0	11	49	22.45
Rhinoceros	13	18	0	0	6	0	0	0	37	40	92.50
Goat Antelope	7	3	0	0	17	0	0	0	27	36	75.00
Kino Tree	2	4	0	0	0	0	0	0	6	34	17.65
Ox Antelope	0	0	0	0	23	0	0	0	23	26	88.46
Tiger	12	2	0	0	4	0	0	0	18	21	85.71
Fabulous Composite Animal	9	8	0	0	1	0	0	0	18	20	90.00
Standard Cult Object	0	0	0	0	0	0	0	0	0	19	0.00
Buffalo	9	0	0	0	1	0	0	0	10	14	71.43
Hare	0	0	0	0	10	0	0	0	10	10	100.00
Total	916	68	0	0	75	0	7	1	1067	1702	62.69

[*Note : See Table 4 for list of Object Types.]




















STATEMENT 6

DISTRIBUTION OF SIGN-PAIRS ACCORDING TO LOCI
AT MOHENJODARO

FREQ. PAIRS		CITADEL		L	LOWER CITY			DK (MY)	OTH MD	TOTAL CORP	%	
		SD (ML)	SD (MY)		HR	VS	DK (ML)					
"	◇	4	0	1	21	15	28	101	7	177	291	60.82
E	U	1	0	0	4	0	2	17	2	26	184	14.13
III	U	4	0	2	9	11	15	46	7	94	126	74.60
U	III	0	0	0	0	0	1	3	0	4	124	3.23
U	𐑁	1	0	0	4	4	6	25	2	42	114	36.84
U	U	2	0	0	6	1	9	43	4	65	110	59.09
U	𐑁	1	0	0	12	4	9	34	2	62	93	66.67
𐑁	U	0	1	1	3	1	7	34	4	51	87	58.62
"	⊗	1	0	1	8	2	8	29	3	52	83	62.65
U	II	0	0	0	0	0	0	0	0	0	78	0.00
𐑁	𐑁	1	1	0	5	1	10	20	3	41	76	53.95
𐑁	𐑁	0	1	1	4	4	6	23	8	47	70	67.14
𐑁	II	0	1	0	8	1	5	26	5	46	67	68.66
√	𐑁	0	1	1	3	2	4	12	3	26	58	44.83
U	III	0	0	0	0	1	0	3	0	4	58	6.90
𐑁	𐑁	0	1	0	5	5	6	14	1	32	55	58.18
Y	𐑁	0	0	0	4	1	6	14	0	25	54	46.30
𐑁	𐑁	0	0	1	4	4	6	19	2	36	54	66.67
TOTAL		15	6	8	100	57	128	463	53	830	1782	46.58



















STATEMENT 7

DISTRIBUTION OF FREQUENT SIGN-PAIRS ACCORDING
TO LEVELS (IN FT.) IN DK (G) AREA AT MOHENJODARO

FREQ. PAIRS	EARLY (-35 TO -17)	MIDDLE (-16 TO -08)	LATE (-07 TO +02)	UNK.	TOTAL		
					DK (G)	MD	%
" 	24	48	22	7	101	177	57.06
E 	3	9	0	5	17	26	65.38
III 	8	19	6	13	46	94	48.94
U 	1	2	0	0	3	4	75.00
U 	2	14	5	4	25	42	59.52
U 	7	20	11	4	42	65	64.62
U 	5	21	2	6	34	62	54.84
人 	8	11	7	8	34	51	66.67
" 	5	15	5	2	27	52	51.92
U 	0	0	0	0	0	0	0.00
人 	3	11	2	4	20	41	48.78
 	1	12	5	5	23	47	48.94
人 	4	13	7	2	26	46	56.52
√ 	3	4	4	0	11	26	42.31
U 	0	0	1	2	3	4	75.00
人 	3	7	1	3	14	32	43.75
Y 	4	9	0	1	14	25	56.00
U 	6	7	5	1	19	36	52.78
TOTAL	87	222	83	67	459	830	55.30



















STATEMENT 8

DISTRIBUTION OF FREQUENT SIGN-PAIRS ACCORDING TO INSCRIBED
OBJECTS AT MOHENJODARO

FREQ. PAIRS	OBJECT TYPES								TOTAL		
	1	2	3	4	5	6	7	8	MD	CORP.	%
" 	165	8	0	1	0	0	2	1	177	291	60.82
E 	3	12	0	0	0	0	11	0	26	184	14.13
III 	60	7	0	0	27	0	0	0	94	126	74.60
U 	2	0	0	0	2	0	0	0	4	124	3.23
U 	26	5	0	1	8	0	2	0	42	114	36.84
U 	56	6	0	0	0	0	3	0	65	110	59.09
U 	45	9	0	0	7	0	0	1	62	93	66.67
人 	37	13	0	0	0	1	0	0	51	87	58.62
" 	51	1	0	0	0	0	0	0	52	83	62.65
U 	0	0	0	0	0	0	0	0	0	78	0.00
人 	33	3	0	0	4	0	1	0	41	76	53.95
田 	31	4	0	0	12	0	0	0	47	70	67.14
人 	41	2	0	0	3	0	0	0	46	67	68.66
人 	20	4	0	0	2	0	0	0	26	58	44.83
U 	0	3	0	0	0	0	1	0	4	58	6.90
人 	32	0	0	0	0	0	0	0	32	55	58.18
Y 	22	3	0	0	0	0	0	0	25	54	46.30
人 	34	1	0	1	0	0	0	0	36	54	66.67
TOTAL	658	81	0	3	65	1	20	2	830	1782	46.58

STATEMENT 9

DISTRIBUTION OF FREQUENT SIGN-PAIRS ACCORDING TO FREQUENT FIELD SYMBOLS AT MOHENJODARO

FREQ. PAIRS	← FIELD SYMBOLS* →															TOTAL OCC.	MD	%
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15			
" 	116	6	0	8	6	0	0	0	0	0	2	2	0	1	0	141	177	79.66
E 	2	1	0	0	0	1	0	0	1	0	0	0	0	0	0	5	26	19.23
III 	36	4	0	2	0	0	2	0	0	0	1	1	0	0	0	46	94	48.94
U 	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0.00
U 	20	1	0	0	0	0	0	0	0	0	2	1	0	0	0	24	42	57.14
U 	35	3	0	2	0	0	2	1	0	0	2	1	0	0	0	46	65	70.77
U 	23	6	0	0	1	2	0	0	0	0	0	0	0	0	0	32	62	51.61
人 	25	2	0	0	3	0	1	0	0	0	4	0	0	0	0	35	51	68.63
" 	26	2	0	0	4	0	3	0	0	0	0	0	0	0	0	35	52	67.31
U 	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
人 	19	0	0	1	0	0	0	0	0	0	0	0	0	0	0	20	41	48.78
田 	20	3	0	0	0	0	0	0	0	0	0	0	0	0	0	23	47	48.94
人 	28	1	0	1	0	0	0	0	0	0	1	0	0	0	0	31	46	67.39
人 	16	1	0	1	0	0	0	0	0	0	0	0	0	0	0	18	26	69.23
U 	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	3	4	75.00
人 	20	4	0	3	0	0	0	0	0	0	0	0	0	0	0	27	32	84.38
人 	17	1	0	0	2	0	0	0	0	0	0	1	0	0	0	21	25	84.00
人 	23	1	0	0	3	1	0	0	0	0	0	0	0	0	0	28	36	77.78
TOTAL	426	36	0	18	19	4	8	1	4	0	12	6	0	1	0	535	830	64.46

[*Note : See Table 5 for list of field Symbols]

STATEMENT 10

DISTRIBUTION OF LINES OF TEXT BY DIRECTION OF WRITING
ACCORDING TO LOCI AT MOHENJODARO

Direction	Citadel		L	HR	Lower City		Oth.	Total		
	SD (ML)	SD (MY)			VS	DK (ML)		DK (MY)	MD	CORP.
Right to Left	27	20	19	206	102	219	852	88	1533	2974
Left to Right	0	0	0	4	1	7	30	6	48	235
Others	1	1	4	17	7	17	94	8	149	364
Total	28	21	23	227	110	243	976	102	1730	3573

STATEMENT 11

DISTRIBUTION OF LINES OF TEXT BY DIRECTION OF WRITING
ACCORDING TO LEVELS (IN FT.) IN DK(G) AREA AT MOHENJODARO

Direction	Early	Middle	Late	Unk.	DK(G)	Total	
	—35 TO —17	—16 TO —8	—7 TO +2			MD	%
Right to Left	167	403	161	112	843	1533	54.99
Left to Right	7	17	2	4	30	48	62.50
Others	19	37	15	22	93	149	62.42
Total	193	457	178	138	966	1730	55.84

STATEMENT 12

DISTRIBUTION OF LINES OF TEXT BY DIRECTION OF WRITING
ACCORDING TO OBJECT TYPES AT MOHENJODARO

Obj. Types	RL	LR	Others	MD	Corp.
Seals	1214	31	94	1339	1968
Sealings	130	6	26	162	746
Min. Tablets	0	0	0	0	503
Pottery	13	3	3	19	128
Copper Tablets	139	6	17	162	162
Bronze Implements	1	1	5	7	17
Ivory/Bone Rods	25	1	2	28	29
Misc. Obj.	11	0	2	13	20
Total	1533	48	149	1730	3573

FIG 1

SPECIMENS FROM THE LIBRARY OF INDUS SIGNS
PRODUCED ON CALCOMP PLOTTER

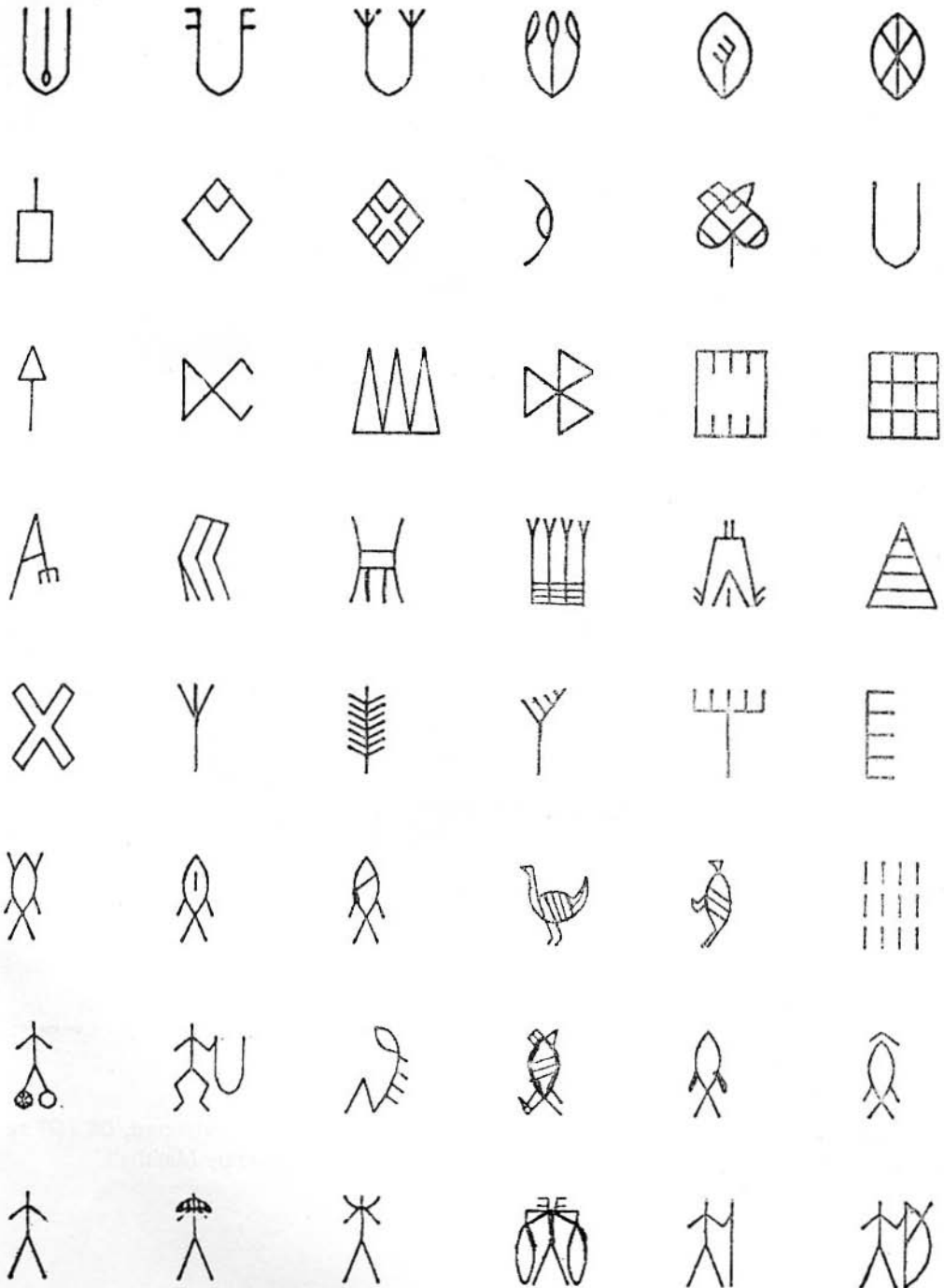
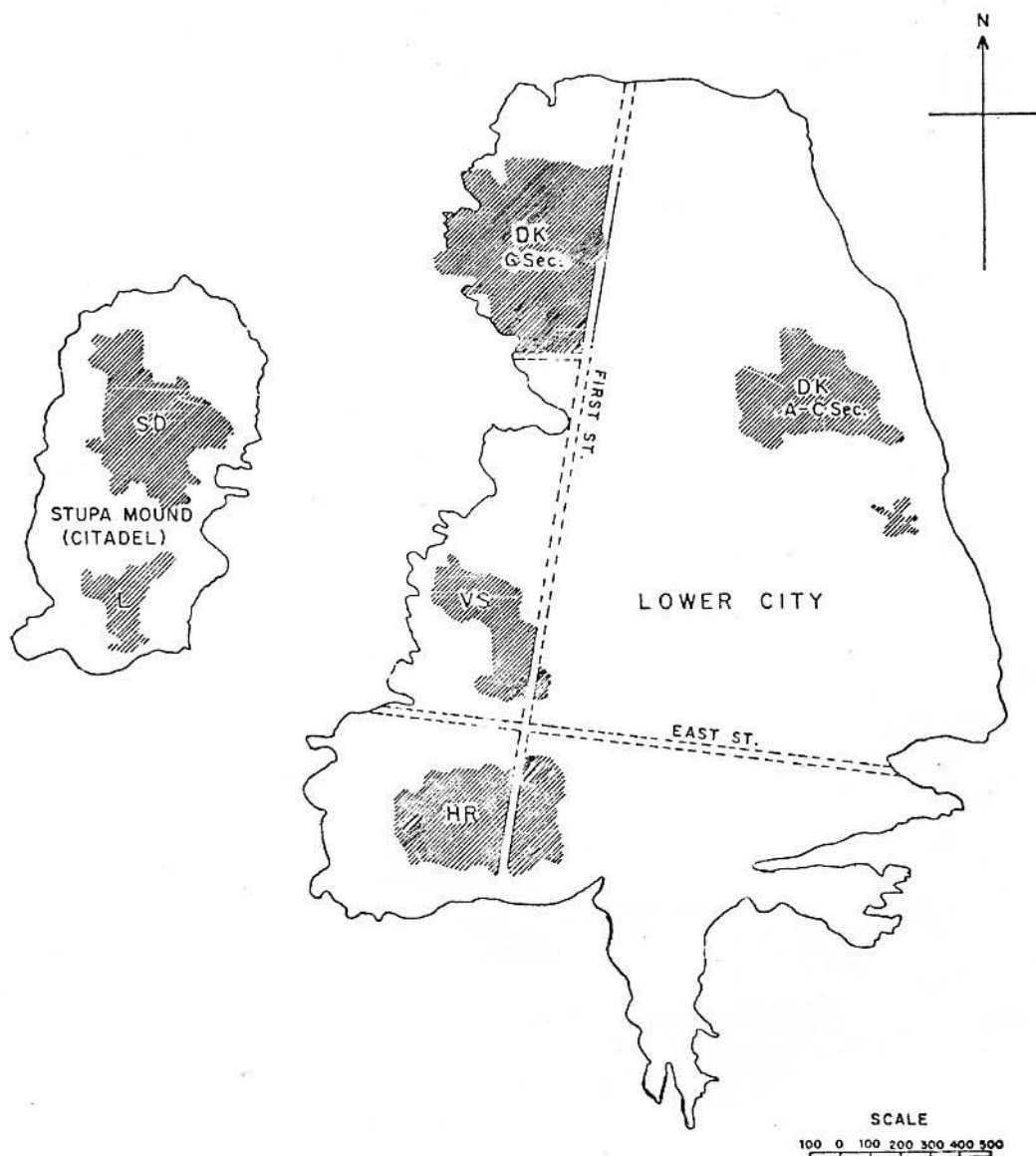


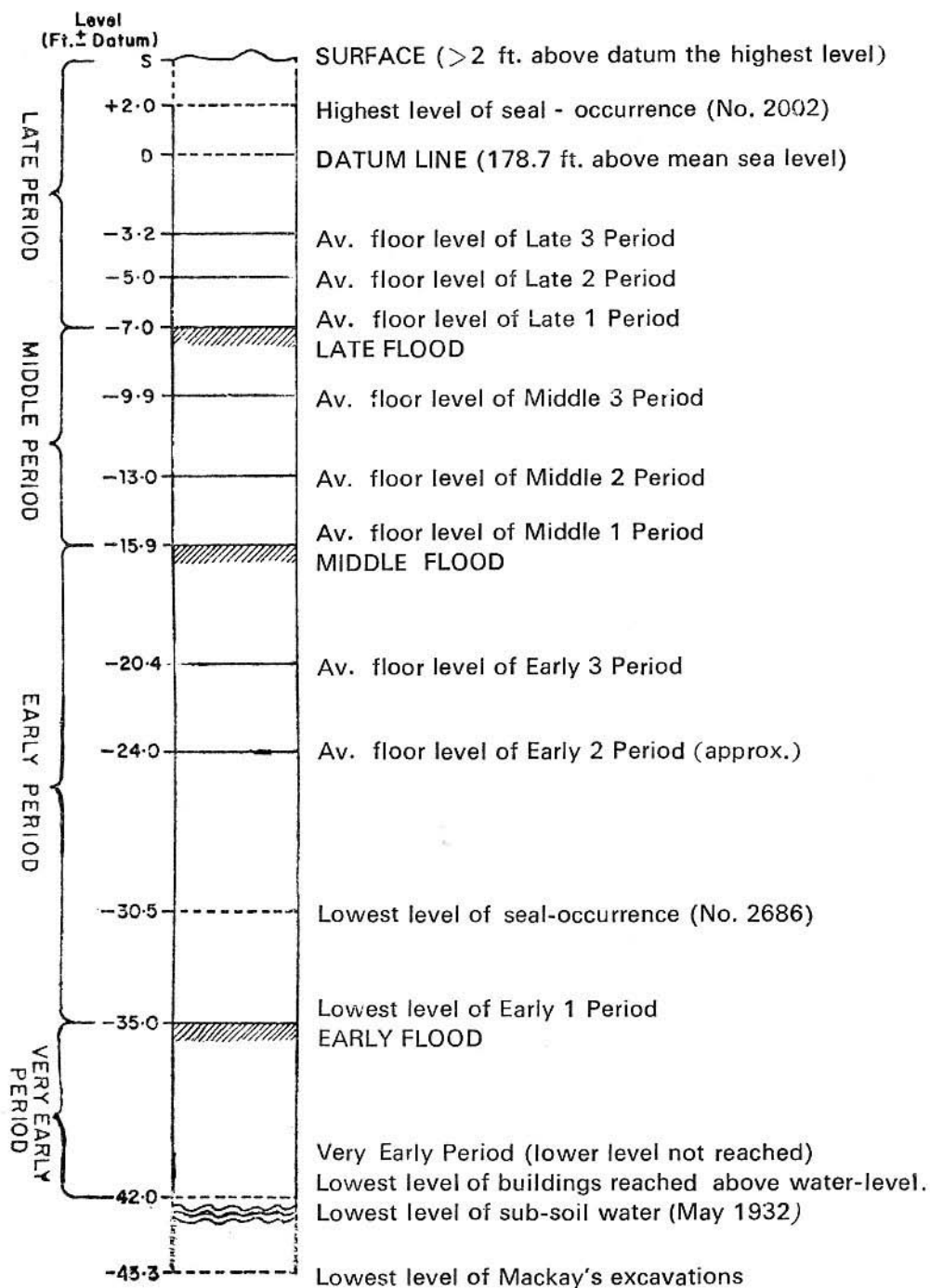
FIG. 2



SITE PLAN OF MOHENJODARO

Boundaries 160 ft. above MSL. Trenches outside main loci not indicated. DK (G) sec. and parts of SD were excavated by Mackay and all other areas by Marshall.

FIG. 3



SCHEMATIC SECTION OF DK MOUND, G Section.

(Data acc. to Mackay with revised nomenclature)