



ARKEOLOGISKE UNDERSØKELSER I
TRONDHEIM NR. 2



ARNE ESPELUND, CHRIS McLEES,
MONICA PAGOLDH OG PAULA U. SANDVIK

SMEDENE PÅ ØRENE. METALLVERKSTEDER I MIDDELALDER-TRONDHEIM

-RAPPORT FRA UTGRAVNINGENE
I MELLAGER-KVARTALET 1987

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AV

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FORORD - PREFACE

Etterhvert som Folkebibliotekstomten blir publisert i serien "Meddelelser" øker behovet for rapporter fra andre arkeologiske undersøkelser i Trondheim. Den foreliggende Mellager-rapporten viser verdien av å kunne sammenligne ulike områder innenfor byen: En tilsynelatende rutinemessig sjaktovervåking av et perifert område utviklet seg til å bli en av de mest interessante undersøkelsene i Trondheim i senere tid. Resultatene viser at det hadde vært et spesialisert industriområde ute på Ørene, nord for den egentlige bybebyggelsen fra midten eller slutten av 1100-tallet. Det var en stasjonær og kontinuerlig virksomhet med jernsmiing som den dominerende aktiviteten. Mellager-materialet vil få stor betydning for forståelsen av middelalder-Trondheim spesielt men også middelalderbyene generelt.

Målsetningen med denne rapporten er å presentere materialet først og fremst gjennom en redegjørelse for stratigrafien. Videre blir en første metallurgisk analyse presentert, likeså en pollenanalyse. Tilsammen skulle disse ulike aspektene vise hvilket potensial som ligger i Mellager-materialet.

Det er 4 forfattere til denne rapporten og hver av dem har brukt sin egen språkform. Et eventuelt brokete inntrykk oppveies forhåpentlig av materialets egen tyngde. - Manuskriptene ble avsluttet og avlevert våren 1988, med unntak for pollenanalysen og et mindre tillegg til den metallurgiske analysen.

En stor takk til alle som har vært engasjert i forbindelse med Mellager-gravningen. En særlig takk til Chris McLees som ledet gravningene på en for-tjenestefull måte og som viste stort pågangsmot i såvel utgravnings- som rapportfasen. Også takk til Anne Gaarden for et omfattende arbeid med ren-skriving og redigering av manus.

* * * * *

The Mellager excavations took place under special circumstances. On the basis of former excavations and other data from the area, only a minor programme of sampling trenches was initiated in tandem with building work. Once started, it became clear that there were surviving medieval deposits here and that the archaeological strategy required drastic revision. This resulted in a more comprehensive excavation, though it should be described as an emergency excavation in the real sense of the term. Unfortunately some material was lost initially, though it can be claimed that a significant amount of evidence was recovered which shows that, from the later 12th century, a specialized industrial area was sited here, to the north of the medieval town. This comprised regulated metalworking with iron-smithing as the major technological component. The Mellager material will have a profound impact on our understanding of medieval Trondheim in particular, and medieval towns in general.

This report presents the material primarily via stratigraphical and metallurgical analyses. The various authors have, of necessity, each written in their own language, though it is hoped that this presentational shortcoming is counteracted by the material's innate and self-evident strengths.

A big thankyou to all involved with the Mellager excavation. Special thanks go to Chris McLees who led the excavations commendably and who demonstrated resourcefulness during the excavation and report phases. Thanks also to Anne Gaarden for her exhaustive editorial work and production of the finished manuscript.

Trondheim august 1989

Erik Jondell

1. INLEDNING

1.1. Administrativt

I januari 1986 beslutades i Trondheims bystyre, att ett kombinerat kulturhus/affärscentra skulle få uppföras på den så kallade Mellagertomten av K/S Mellagerkvartalet A/S och Nordenfjeldske Management A/S.

Mellagerkvartalet (Fig. 1) har haft bostadsbebyggelse sedan åtminstone 1600-tallet. De nyligen rivna husen var av relativt sent datum och försedda med källare. Stora delar av området var dermed redan utschaktat och endast gårdsplanerna kunde tänkas dölja ostörda kulturlager. 1985 genomfördes en mindre provundersökning på två av dessa. Förutom moderna störningar framkom smärre efterreformatoriska avlagringar. Då förväntningarna att finna intakta medeltida lager var ringa, ansågs ej behov finnas för en större utgrävning 1987. I stället planerades en undersökning med betäckning TA 1987/3 med fem mindre schakt, tio till femton meter långa och minst två meter breda, vilka betecknades A - E, se vidare kap. 2.1 och Fig. 2. Under 31 dagar skulle två arkeologer dokumentera eventuella lämningar, övervaka schaktningen på områdets övriga delar samt ta mått på steril där detta var möjligt. Kostnaden beräknades till kr 155.600,- för grävperioden 29/4 - 15/6 och efterföljande rapportarbete.

När det första schaktet B öppnats (Fig. 2) upptäcktes ett tjockt, kolrikt lager innehållande stora mängder slagg. Om slaggen härstammat från järnsmide eller någon form av gjuteriverksamhet, hade den inte väckt något större uppseende. De talrika bottenskällorna var emellertid av fayalit-typ och hade uppenbarligen något att göra med kopparsmältning. Då ingen sådan verksamhet var tänkbar bland bostadsbebyggelse, borde lagret rimligen vara medeltida. Detta bekräftades vid fortsatt undersökning. En benkam och några keramikskärvor gav en relativ datering till 1200-1300-tal. Därmed blev det aktuellt att omvärdera Mellagertomten och ändra utgrävningens uppläggning. Vikten lades hädanefter på områdets södra del. Delfält F tillkom norr om schakt B och omfattade en yta av 364 m². Schakt C försvann som en eftergift åt byggnadsarbetet.

Det stod snabbt klart, att varken personal eller tid skulle räcka till för att undersöka de upp till två meter tjocka kulturlagren inom F-området. Så småningom togs därför beslut om förlängning till 21 augusti. Arbetsstyrkan ökade efterhand tills den under den sista veckan omfattade 8 personer. Den nya budgeten löd på kr 870.000,-. I skrivande stund beräknas den överskridas med cirka kr 110.000,-.

Grävningen genomfördes trots förlängning under stark tidspress. Att den förvånansvärt nog blev klar till utsatt datum, berodde till stor del på extra insatser från personalen i form av kvälls- och helgarbete. Grävledare var Christopher McLees och assistent Monika Pagoldh. Resten av arbetsstyrkan utgjordes av Torben Andersen, Ulla Bergquist, Kenan Fulks, Karin Hasselgren, Olof Petterson och Kristin Prestvold.

1.2. Tidigare arkeologiska undersökningar på och invid Mellagerkvartalet.

1985 genomfördes en mindre provgrävning, TA 1985/4, under Krambugata 11 och Kjøpmannsgata 46 B. Områdena (Fig. 2) var ytterst störda och få stratifierade lager kom i dagen. Keramiken gav en datering till 1600-1700-tal (Flodin 1985).

1980 grävde Televerket ett kabelschakt längs södra kanten av Olav

Tryggvasons gate, TA 1980/2. Även här var de ostörda lämningarna efter-reformatoriska (Page 1980).

Under trottoaren utanför Royal Garden Hotel, mitt emot Kjøpmannsgt. 50, har vid rörnedläggning hittats rester av bålverk, TA 1983/12. Fynden var från 1600-talet (Reed 1983).



Mellageret, vy mot nordöst.

1.3. Historisk och topografisk bakgrund

Mellagertomten är belägen på nordöstra delen av en ursprunglig sandbank uppbyggd vid Nidelvens mynning (Fig. 3). Då Trondheim grundlades var denna sandbank sannolikt helt omfluten av vatten. Fortsatt landhöjning och accumulation vidgade alltmer dess omfång och ganska snart bör en förbindelse ha uppnåtts med fastlandet i syd där den dåtida stadsbebyggelsen låg (Fig. 4). Under 1100- och 1200-talen formade området antagligen ett näs (Lunde 1977).

Sandbanksområdet går i äldre skrifter under benämningen öret, ören. Beteckningen påträffas ett flertal gånger i sagalitteraturen, oftast i samband med hållande av ting men också vid andra aktiviteter som skeppsbygge, avrättningar, tillfälliga möten och ansamling av härskaror då fientliga skepp samlats vid Munkholmen. Den första antydning på metallbearbetning görs i Sverres Saga, skriven i mitten och slutet av 1100-talet, då smidesbodarna nämns i förbindelse med ören. Detsamma sker i Nidarosvarianten av Magnus Lagabøters bylov från 1276. Under en utförlig beskrivning av nattvakternas bestämda turer genom staden omtalas, att rundvandringen började på ören och slutade "på ören vid smidesbodarna".

Först 1600-talet (Fig. 5) har lämnat mer konkreta upplysningar om det dåtida utnyttjandet av dagens kulturhustomt. Enligt skattematriklar och kartor hade området blivit en del av stadskärnan och bebyggt med bostadshus. Då som nu begränsades kvarteret av Krabugata samt föregångarna till Brattørveita och Olav Tryggvasons gate. Den sistnämnda kallades Nedre almenning och hade breddats avsevärt efter bybranden 1598. I slutet av 1600-talet utgjorde

den stadens marknadsgata med permanenta bodar byggda intill husväggarna (Berg 1951).

Före branden 1681 delades Mellagerkvarteret i NO-SV riktning av Adelsgata. Gårdarna utmed dess östra sida tycks ha sträckt sig helt ned till älven och var förmodligen bebyggda med ett flertal hus av olika funktion; bostäder, stall, ladugård, loge, förrådshus m m. Kjøpmannsgata anlades i och med Cicignons regulering 1682. Dess tomter tilldelades halva Adelsgatan vilken därmed blev inbygd och försvann. Söder om kulturhustomten finns den dock kvar under namnet Hornemannsveita (Berg 1951). Egendommarna motsvarande nuvarande Kjøpmannsgata 44 och 50 var 38 respektive 30 alnar långa i östvästlig riktning. Måttuppgifterna gör det möjligt, att någorlunda exakt placera Adelsgata på dagens karta. 1987 års grävning berörde inte dess utsträckning.

Hur långt tillbaka bostadsbebyggelsen går på Mellagret är oklart. Kring 1550 lär åtminstone en gård ha funnits på området. 1602 drevs ett världshus i Kjøpmannsgata 46 till stor förtret för grannarna som stördes av bråk och oljud (Berg 1951).

1.4. Frågeställningar

Vid Mellagerundersökningens inledningsskede bestod huvuduppgiften i, att utröna när området först tagits i bruk och för vilket ändamål. Hade de skriftligt dokumenterade 1600-tals-gårdarna föregåtts av annan bebyggelse eller verksamhet? Fanns växthorisoner eller plogspår som tecken på tidigare odling? Kunde rentav sagalitteraturens omnämnande av öret förknippas med just den här delen av sandbanksområdet?

Uppmätandet av steril var vidare en viktig angelägenhet. I första hand för att få reda på när marken blivit torrlagd, men också för att få en klarare bild av äldre strandlinjer och topografisk formationer.

När så de medeltida slaglagren upptäckts ökade antalet frågeställningar lavinartat ock fick ytterligare dimensioner. Både bebyggelse och specialiserat hantverk hade tydligen funnits före den efterreformatöriska eran. När hade den uppkommit, hur länge hade den varat, hade förändringar skett under tiden och viktigast av allt, vad hade de egentligen haft för sig?

Den rikligt förekommande fayalislagen kunde bara ha uppkommit under starkt reducerande förhållanden. Den borde därmed vara en avfallsprodukt från en av de smältprocesser malmen genomgår på sin väg mot ren metall. Hade vi hittat Skandinavians äldsta kopparverk? Det verkade besynnerligt. I Trøndelag finns visserligen rikligt med lätt brytbara sulfidmalmsförekomster (referans: Gunnar Juve, NGU), men när dessa bearbetas avgår giftiga gaser vilka lätt tar livet av mindre djur och knappast heller är nyttiga för människor. Sådan verksamhet borde inte förekomma i utkanten av stadsbebyggelse. Hade malmen genomrostats eller delvis reducerats innan den nådde verkstäderna i Trondheim? Hade råvaran kanske varit skärsten, vitriol eller råkoppar (svartkobber)? Skärstensliknande slaggbitar fanns och en av dem gick till analys.

Utgångsmaterialet för metallaktiviteterna på kulturhustomten är viktigt att fastställa. Det ger en antydning om produktionens storlek, vilket i sin tur gör det möjligt att spekulera i verksamhetens betydelse. Har den tillfredsställt en lokal, regional eller nationell marknad. Har den till och med kunnat exporteras? Ju mindre slag som funnits kvar i råvaran, desto större kvantiteter ren koppar har blivit slutresultatet.

Vilken teknik var känd och använd under den aktuella perioden? Masugnsmetoden slog troligen igenom på 1300-talet. Följdaktligen borde det handla om sena varianter av förhistoriska processer vilket också slaggen angav. Vilken typ av ugnar hade i så fall använts och fanns rester av dessa på utgrävningsområdet?

Var koppar den enda metall som bearbetats? Några blyfynd, silverglimrande korn och gult pulver utvidgade möjligheterna. Blymalm finns på så nära håll som Bymarka och kunde lätt ha reducerats till metall i de befintliga anläggningarna. Bly var den billigaste och mest förekommande metall under medeltiden. Fanns slagg även från denna framställningsprocess?

Med blyförekomster följer också silver då bly har en förmåga att gripa tag i minsta silverkorn. Dessa metaller separerades till för inte så länge sedan genom den 4000 år gamla cupellations-metoden. Hade inte ett myntverk runnits i Nidaros?

Var blyet i stället ett legeringsämne? Vilka legeringar hade i så fall gjorts och vad hade gjutits? Fanns över huvud taget spår av liknande verksamhet?

Hade koppar bearbetats på något annat sätt? Hade den utan att blandas med andra ämnen hamrats till plåtar, nitar, grytor?

Hur raffinerad och omfattande var egentlig tekniken och vilken betydelse hade verkstäderna socialt och ekonomiskt för det dåtida Trondheim? Vilken ställning hade utövarna? Var de egenföretagare med hög status och skattebefriade som bergsfrälset i Sverige? Var de underställda ärkebiskopen, kungen eller någon annan potentat?

Av järn fås vapen. Koppar var sex gånger dyrare än järn. Två viktiga metaller ur flera aspekter. Trönderskt järn var länge ett känt begrepp. Att det framställdes i avsevärda mängder under lång tid med lokal utveckling visar Arne Espelunds och Lars Stenviks gemensamma undersökningar. Var avancerad och utbredd metallurgi en av fylkets viktigaste resurser? Så viktig att makthavare funnit det önskvärt eller nödvändigt att behärska den här delen av Norge? Har framställning och bearbetning av koppar och järn bidragit till områdets starka ställning och maktkoncentration under vikingatid och medeltid?

Ovanstående var några av de otaliga frågor vilka fanns i medvetandet under utgrävningens gång. Huvudparten kommer inte att kunna besvaras och knappast ens beröras i denna rapport. För att komma i närheten av sanningen och få en acceptabel tolkning av verksamheten på Mellagret behövs ett stort mått tvärvetenskaplig forskning och vidare tekniska analyser. Men då skulle också resultatet kunna bli av avgörande betydelse.

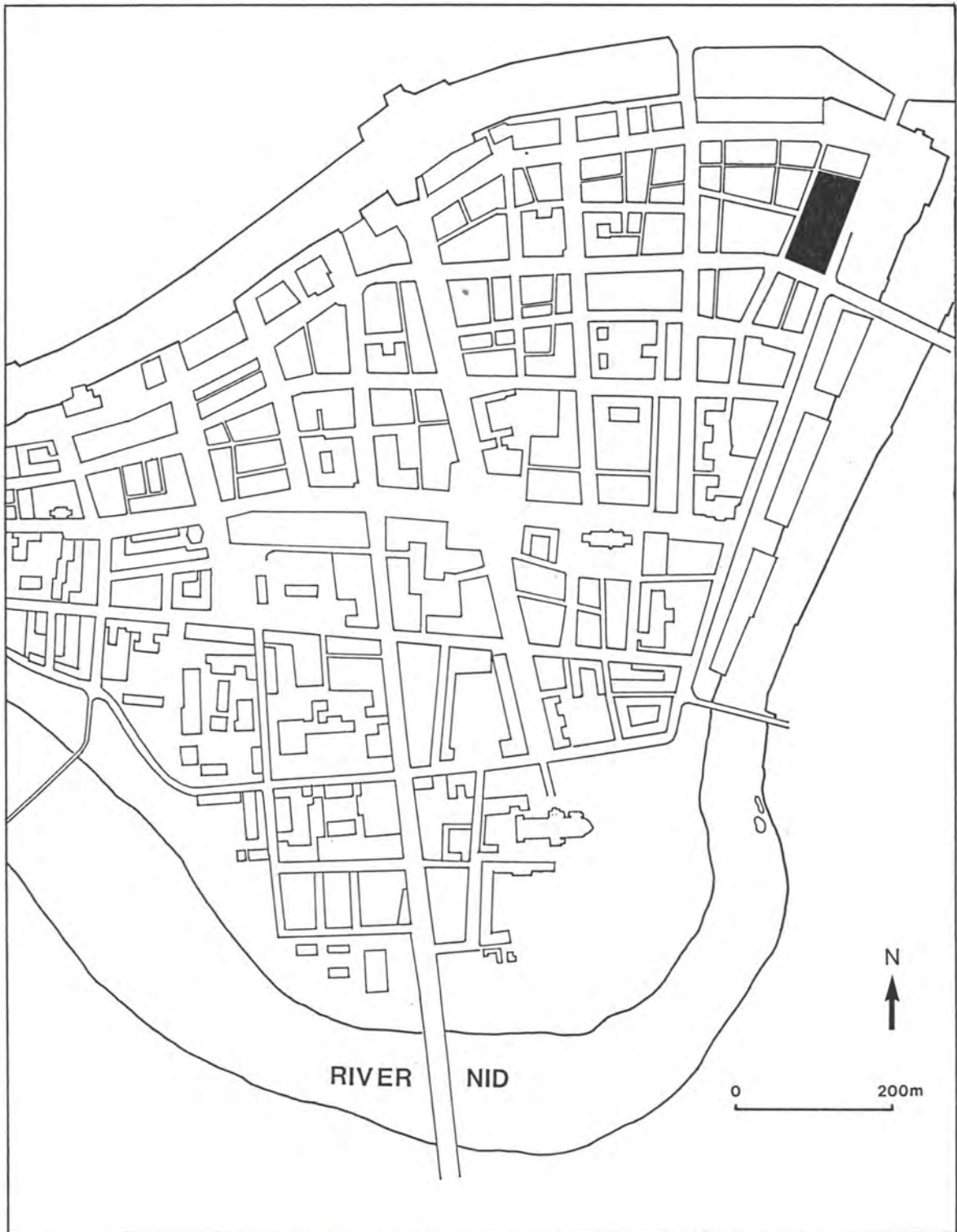


Fig. 1. Plan showing location of Mellager Quarter at the NE corner of the Nidarnes peninsula.

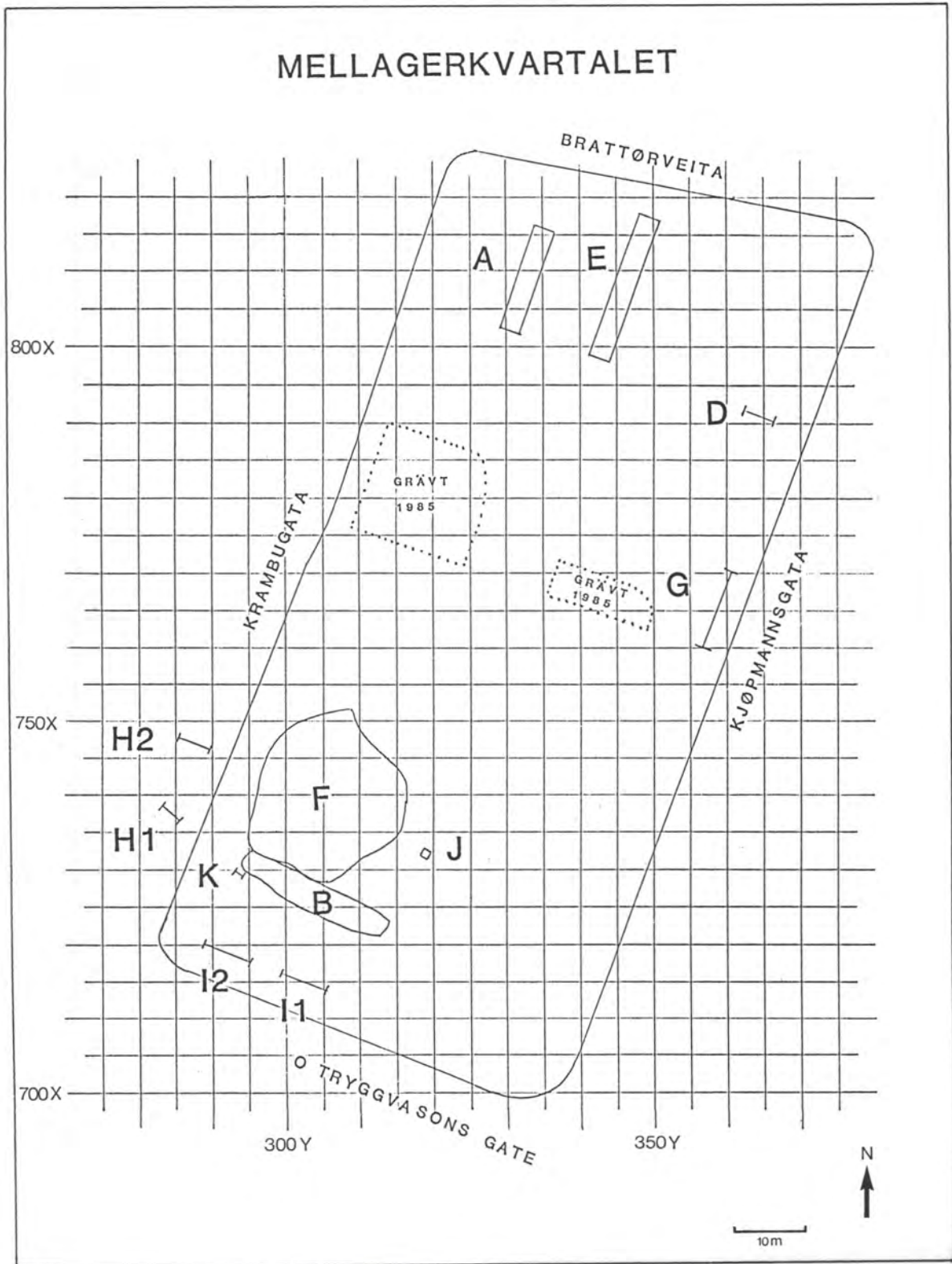
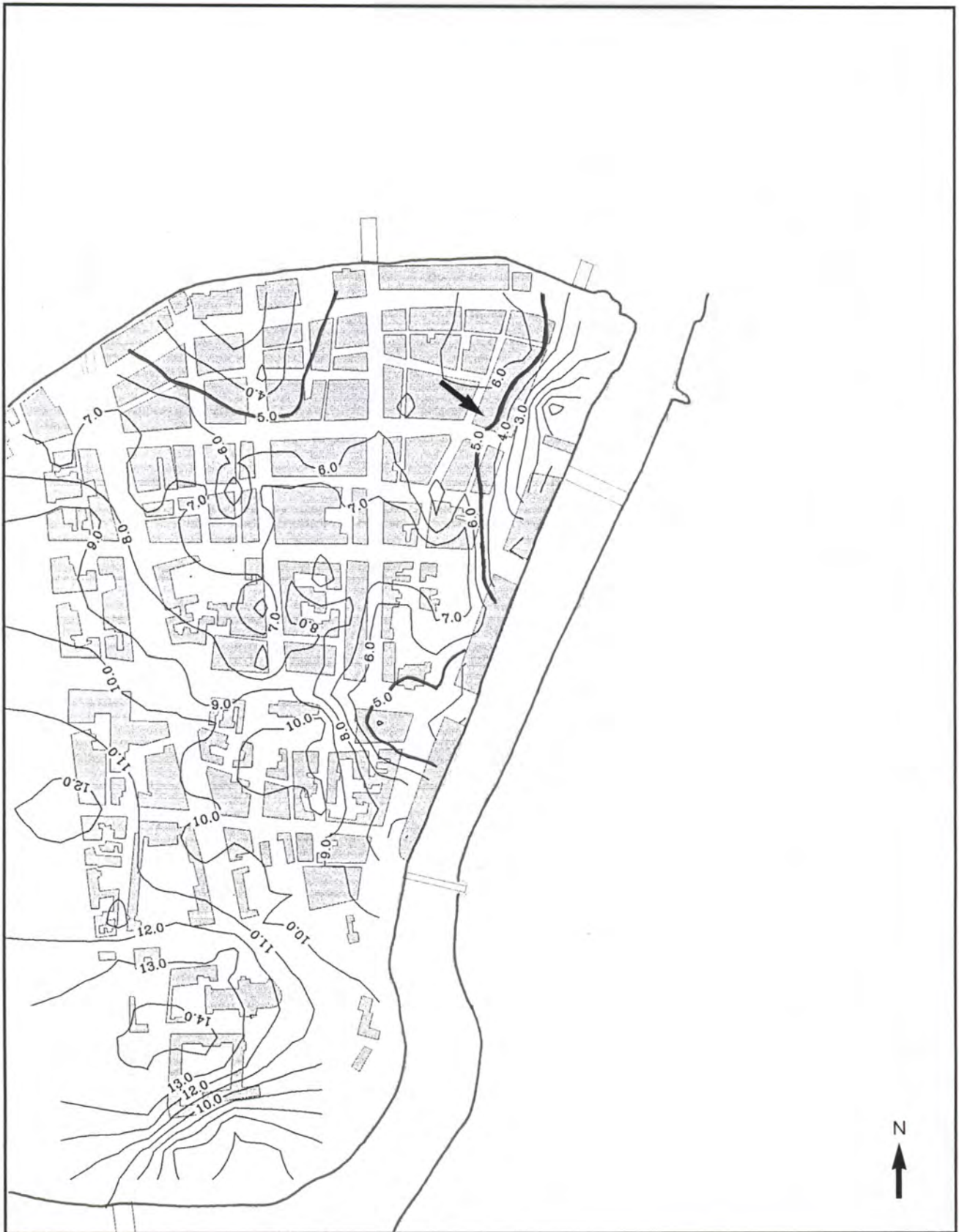


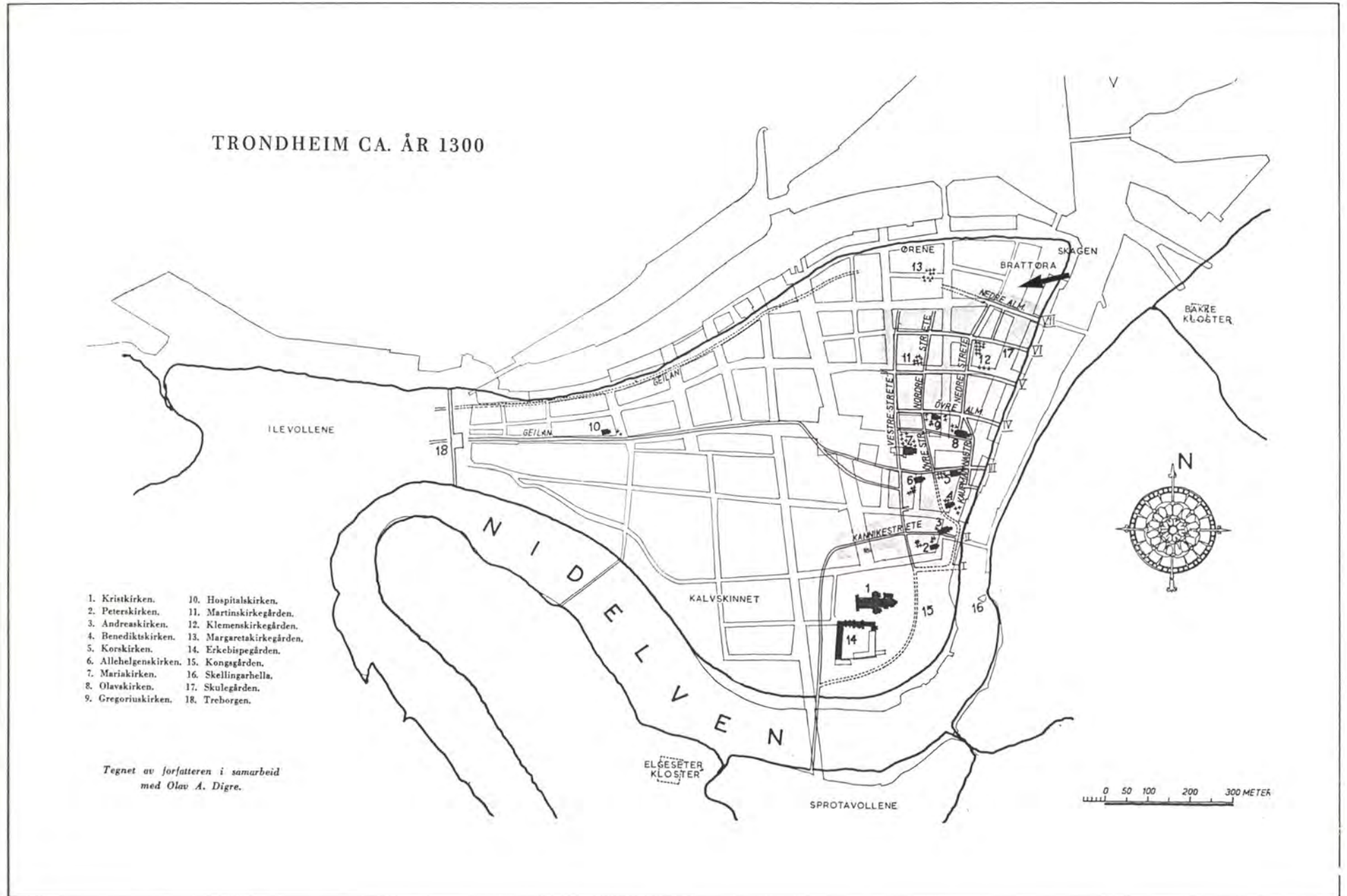
Fig. 2. Plan of Mellager Quarter showing coordinates and the individual investigated areas.



1:7000

Fig. 3. Provisional contour map of the surface of natural ground on the Nidarnes peninsula. Mellager excavations arrowed. The bold line in the 5 metre contour denotes probable high-water mark ca. A.D. 1150. (Based on a map produced by Geografisk Institutt, UNIT, in cooperation with Riksantikvaren.)

Fig. 4. G.A.Blom's reconstruction of the area of the medieval town ca. 1300
 (published in Lunde 1977). Mellager Quarter arrowed.



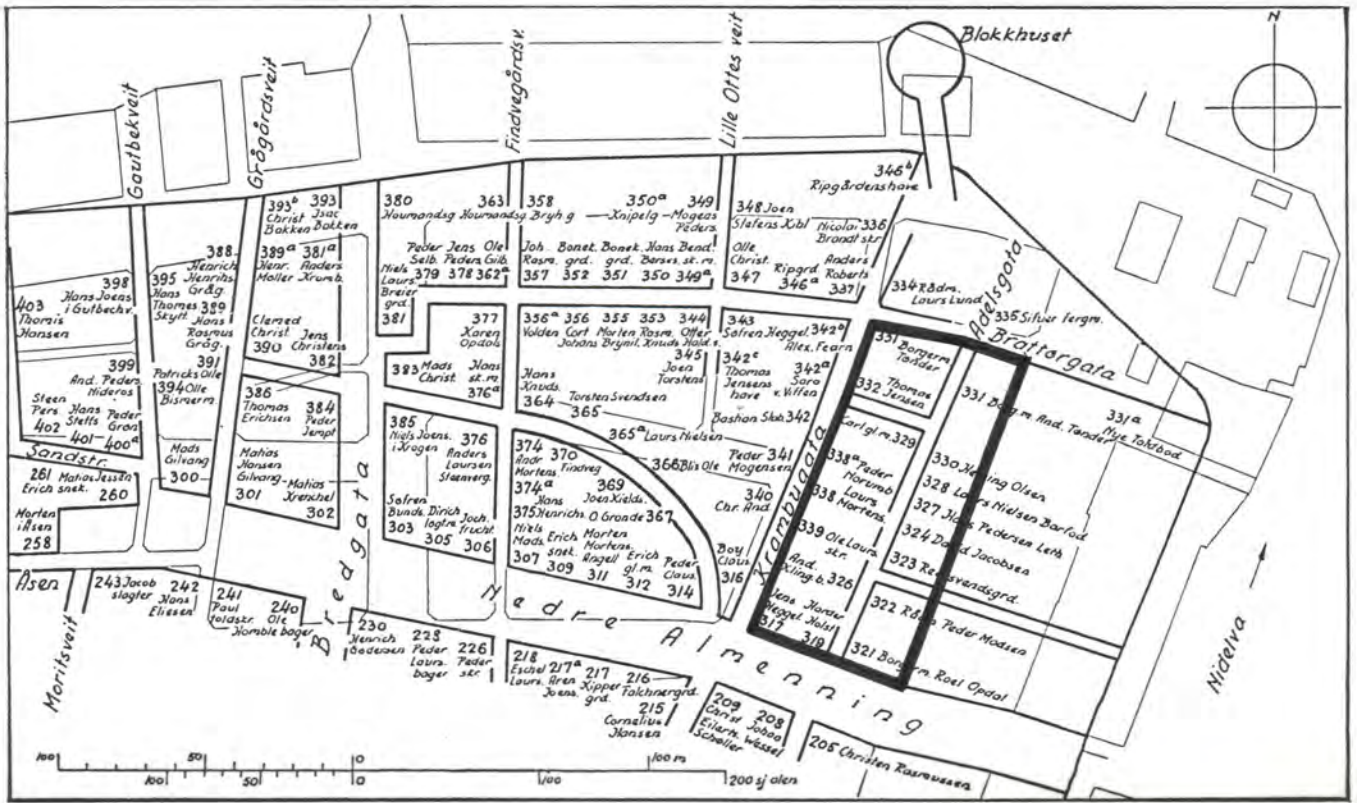


Fig. 5. Mellager Quarter (framed) in the 1600's (extracted from Berg, 1951).

2. METHODS OF EXCAVATION AND DOCUMENTATION

2.1. Site method: machine-use, coordinate system, excavation methods

There were in all 12 separate locations which were investigated archaeologically within the Mellager quarter (see Fig. 2). Machines were used on all areas to a greater or lesser degree. Profiles D, G, H, I and K were exposed during the course of the normal building operations around the perimeter of the quarter where a deep piling trench was dug well down into the natural sands and gravels. The profiles thus exposed were cleaned and documented as and when they were revealed. Likewise, an 18th century cess pit J was exposed and its contents salvaged.

The trenches A, B and E were dug according to the original investigation strategy, though with some additional time-pressure to accommodate the builders' plans. In trenches A and E a mechanical excavator was used to remove material to the archeologists' specifications ie. the cutting of a primary trench removing all overburden to natural ground followed by a secondary cut immediately adjacent to this, removing deposits to a few centimeters above natural to allow closer examination, using "krafser" and trowel. Plans and profiles were drawn recording extant features, and levels taken on natural (for closer detail of all these outlying trenches and profiles see 3.14.).

Trench B, the first to be investigated on Mellager quarter, was laid out according to the original area sampling strategy, and the aforementioned method of machine-use was employed. During the excavation of this trench it became clear that the archaeological potential of the southern half of Mellager quarter had been greatly underestimated and that the courtyard area immediately behind Olav Tryggvasons gate 2A and the ground beneath Krampungata 7 contained the partially disturbed remains of medieval metalworking activity characterized by thick deposits of slag-bearing material. A hurried re-evaluation of the digging strategy ensued whereby a larger area of these deposits could be investigated by conventional excavation. This entailed the demarcation of what was to become known as F-site, an area of some 370 m² (see Fig. 6). A machine was brought on to the area to remove the overburden in preparation for hand excavation. Machine operations took place on the 18th and 19th of May, and at this stage we were still working to the 15th June deadline. Consequently, in the course of levelling the site some 30 cm of slag-bearing deposits were removed to the north-west of the area, while to the south these deposits were left more or less intact. Where possible the machine removed the more substantial post-medieval intrusions (cellars, pits, latrines, ground-walls etc.). This process of machine excavation was employed vigorously throughout the first weeks of excavation on the southern flank of the site, and, most particularly, in the north-eastern quadrant where there was severe disturbance by post-medieval intrusions. During this latter operation a ramp was laid against the north-eastern flank of the "island" of F-site, whereby the machine could be brought up onto the area.

The coordinate system was established on the town grid by Trondheim Kommunes Oppmålingsvesen. A plan is provided showing the investigated areas in relation to the grid (Fig. 2). For closer tying-in of the outlying trenches and profiles see 3.14. The coordinates specific to F-site are shown on Fig. 6. The area as demarcated was sub-circular and as such leant itself to subdivision into quadrants divided by two continuous baulks, one lying N-S on the y 305,00 axis, and one lying E-W on the x 738,00 axis. The quadrant system was thought to be useful in providing a means of breaking the area up into discrete zones which could be treated to some degree independently of each other with a view to fast excavation and the allocation of priorities within the



F-site under excavation; looking East.

site. The quadrants in fact reflected the differing *zones of preservation* of layers on F-site - Quadrant A containing the greatest proportion of intact layers, Quadrant B a slightly more disturbed body of material, Quadrant C a number of isolated patches of medieval deposits, and Quadrant D the most heavily disturbed area. The zoning therefore did not represent too much of an artificially imposed system from this point of view. From the practical viewpoint it was also handy to have discrete areas in order to break up the large amount of documentation needed on the site, and for the focusing of resources in relation to priority. For example, Quadrant D was excavated mainly by machine with some manual investigation where patches of medieval material appeared, whereas Quadrant A was excavated totally by hand after the removal of overburden. The complexity of layers required the provision of complementary information in the profiles provided by the baulk system. As set out originally the baulks did not provide full coverage of intact layers; in fact the baulk lying between quadrants A and B was the only one to provide useful information in this respect, the others recording post-medieval intrusions in the main. This was recognized during excavation, and a supplementary baulk was established in the area of best preservation, Quadrant A, running N-S on the y 300,00 axis. This in effect split Quadrant A into two. However, a number of subdivisions occurred over the whole of F-site, within the quadrant system (see Fig. 6). These related to discrete excavated areas of preserved medieval deposits within the quadrants, and, in Quadrant A, to separate areas allotted

to individual excavators to either side of the supplementary baulk, and to the north and south of the x 743,00 coordinate line. Quadrant A might well have been better treated as an open area excavation if there had been more time. However, the dictates of time, differing degrees of experience in the workforce, and the complexity of the stratigraphy required that Quadrant A could not be dug synchronously, the four internal areas (FA 1 - 4, see Fig. 6) being dug at differing rates and levels, with hope that correlations could be made in post-excavation with the help of the surrounding profiles. This was not a satisfactory form of excavation; however, despite the inevitable problems arising from this disarticulated process (both within Quadrant A and over the whole site) in terms of post-excavation trauma, the information so retrieved was analysable.

Another factor relating to the baulks is the fact that none was excavated due to pressure of time, and consequently a substantial amount of information locked within them has been lost (this pertains primarily to the supplementary baulk in Quadrant A and that between Quadrants A and B.)

F-site and the neighbouring Trench B represent the most extensive relatively intact medieval deposits on Mellager quarter. However, the *scale of loss* of similar deposits, through post-medieval and modern building disturbance is difficult to accurately determine, and hence the full areal extent of medieval occupation here is impossible to estimate (though see 7.2.7. below).

Nevertheless, no medieval deposits were located in the northern half of the quarter in 1985 or 1987. The profiles H and I indicate the presence of medieval deposits extending into Krambugata and immediately to the N of Olav Tryggvasons gate. At the beginning of May 1987 the builders drove a deep ten metre broad piling trench NE-SW between the F-site area and Kjølmannsgata 42, 44 and 46. Although cellar disturbance was quite extensive here slag-bearing and organic layers, similar to those observed to the SW, were exposed in the process of this operation. Slag-bearing layers were hastily documented at a point immediately to the N of where the latrine J was later discovered (see Daybook I entry under 7th May). Otherwise this area, which clearly bore some fragmentary medieval deposits, was lost to the machines. Likewise the area of F was occasionally slightly reduced due to the spasmodic encroachments by the builders. Some 30 cm depth of deposits were lost along the length of Trench B due to time-pressure.

Other areas of loss of medieval deposits within F-site are as follows: in Quadrant A, area FA 5 - here a proportion of the medieval deposits in the quadrant had to be sacrificed in the interests of time, the long N-S trench's eastern edge being straightened and providing a profile; Quadrant C, area FC 1 - this was one of the first areas to be investigated, though it was temporarily abandoned in order to bring the neighbouring area to the same excavation level; however, there proved to be no time to return to this at the end of the digging period; Quadrant D, area FD 2 - here an island of material of high potential was lost with only brief investigation (see 3.11.).

Apart from these areas all medieval deposits on F-site were investigated. Excavation herein was conducted by hand and by normal stratigraphic procedure. The complexity of the deposits and the fragmentary structural remains were such that trowelling was the safest method of maintaining "contact" with the layer sequence, the "krafser" being used sparingly and where thicker deposits and fills could be quickly and safely removed without too severe consequences. As it was the site was excavated very quickly and procedure suffered as a result (see individual area descriptions below).

Layer sampling strategy: In view of the great amount of metalworking debris contained within this highly stratified site it was decided that a series of 8 sample squares of 50 x 50 cm should be placed over the hand-excavated area at a ratio of one square to every 5 metres squared on the site grid (see

Fig. 7). These would ideally provide a securely located serial sample for future analysis, where specific finds might be closely located vertically and horizontally within the stratigraphic sequence.

Although theoretically a sound system, the practical problems of retrieving samples under pressure of time and the difficulty in processing (ie. wet-sieving) these samples on site gave rise to a rather less complete retrieval of material per square than one might have achieved under ideal conditions. However, it is hoped that any future work on these samples should not encounter too much deviation from the site record as the bulk of layers within the squares were sampled. The material herefrom, as with the rest of the soil samples taken from these points and others throughout the site, are stored in UNIT Vitenskapsmuseet.

There were also a number of pollen sampling points ranged across the site. These were taken from specific points within the standing profiles (see Fig. 7). Cand. real. Paula Sandvik took these samples in consultation with the field archeologists. The results of this sample series are detailed below (see Ch. 5).

2.2. Site documentation

There are three daybooks relating to the whole excavation season on Mellager quarter. Daybook I covers the period 27.4.87 to 1.7.87 inclusive and contains entries relating to all the trenches and profiles as well as F-site. Daybook II covers the period 2.7.87 to 31.7.87 inclusive and contains entries relating to F-site as does Daybook III which covers the period 1.8.87 to 24.8.87 inclusive. C.J. McLees had responsibility for writing these entries.

Each investigated area on Mellager quarter was treated independently in terms of documentation and numbering of layers etc. Context cards were used only on F-site and Trench B where there was a greater degree of preserved remains (the profiles and trenches over the rest of Mellager quarter utilized appropriate amounts of documentation material and method).

Trench B had its own *running sequence* of context numbers and corresponding layer cards. F-site, being the most complex, has a corresponding complexity of documentation material. A *running sequence* of context numbers was used for the whole site. Each excavator was responsible for filling in context cards relating to his or her area. A large number of planning levels arose during the course of excavation resulting in a flood of plans. Not all profiles were drawn. Those drawn are marked on Fig. 7. N.B All plans were drawn at 1:20; profiles were drawn at 1:10 except for those in Quadrant B.

A large number of colour and black-and-white exposures was taken. The corpus is of variable quality due to varying degrees of photographic competence in the workforce (there being no site photographer each excavator was given responsibility for his/her own photography) and mechanical problems with the black-and-white camera. Also, there being no photographic tower available there is a resulting poverty of suitable vertical shots covering the site as a whole as well as individual areas.

Exposures relating to the 1987/3 season can be found on films 1-29 (colour) inclusive and films 1-47 (black-and-white) inclusive.

All documentary material relating to the 1987/3 season is stored in Riksantikvarens utgravningskontor in Trondheim.

2.3. Finds

Finds were recovered from each of the investigated areas on Mellager quarter. From the peripheral profiles and trenches these comprise mainly sherds of pottery (post-medieval). From latrine J a large assemblage of potsherds, glass and some leather was recovered, dating to the mid-eighteenth century.

The medieval finds derive from Trench B and F-site. These consist predominantly of items relating to metalworking activities ie. slags, furnace-bottoms, burnt clay fragments, possible clay mould fragments, occasional finished metal objects, etc. Also some organic materials, notably shaped sticks, a turned wooden lid, textile fragments and leather-work, including shoes. A comparatively small amount of medieval pot-sherds was found. A number of coins were also retrieved.

Trench B and F-site also produced a large amount of post-medieval finds, predominantly potsherds, derived from the numerous intrusions herein.






A number of charcoal samples were taken for carbon-14 analysis and for analysis of wood types. Some fragments of unburnt wood were taken for the latter purpose also. No wood suitable for dendrochronological purposes was found.

All finds have been conserved and stored in UNIT Vitenskapsmuseet.

2.4. Terminology: Key to symbols

Matrix symbols

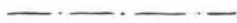

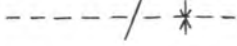
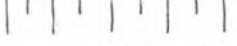


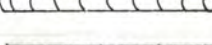
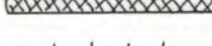
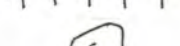



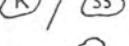
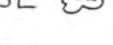

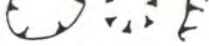

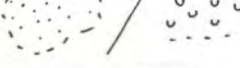

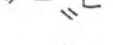

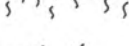

A. Symbols used only in matrices for FA

-  Layer
-  Construction element(s)
(Stone or wood)
-  Fill
-  Major cut feature not
classed as post-hole
-  Post-hole and stake-hole

B. Teckenförklaring - matrix till FB osv.

-  Lager
-  Konstruktion
-  Stenkonstruktion
-  Stolphål
-  Pinnhål

Symbols used on plans and profiles

	Limit of excavated area
	Sub-area boundaries / limits of intrusions
	Limit of layer / abutting layers
	Sluttning
	Sluttning vid nedgrävning - direction of slope
	Wood (plank)
	Wood (log/stock)
	Wood (burnt - consolidated charcoal)
	Förmultnat trä (plankor)
	Stone
	Worked stone
	Vertically-set stone
	Chalk / Sandstone
	Slag
	Speciellt rikligt med koppar utfällningar
	Pits, post-holes or major intrusions (in phase)
	Stake-hole / Stake-hole with in-situ remains of stake
	Sand-gravel / gravel
	Clay (unburnt) / clay (burnt)
	"Trälera", rödbrun
	Charcoal (unconsolidated)
	Organic material admixed
	Burnt sand

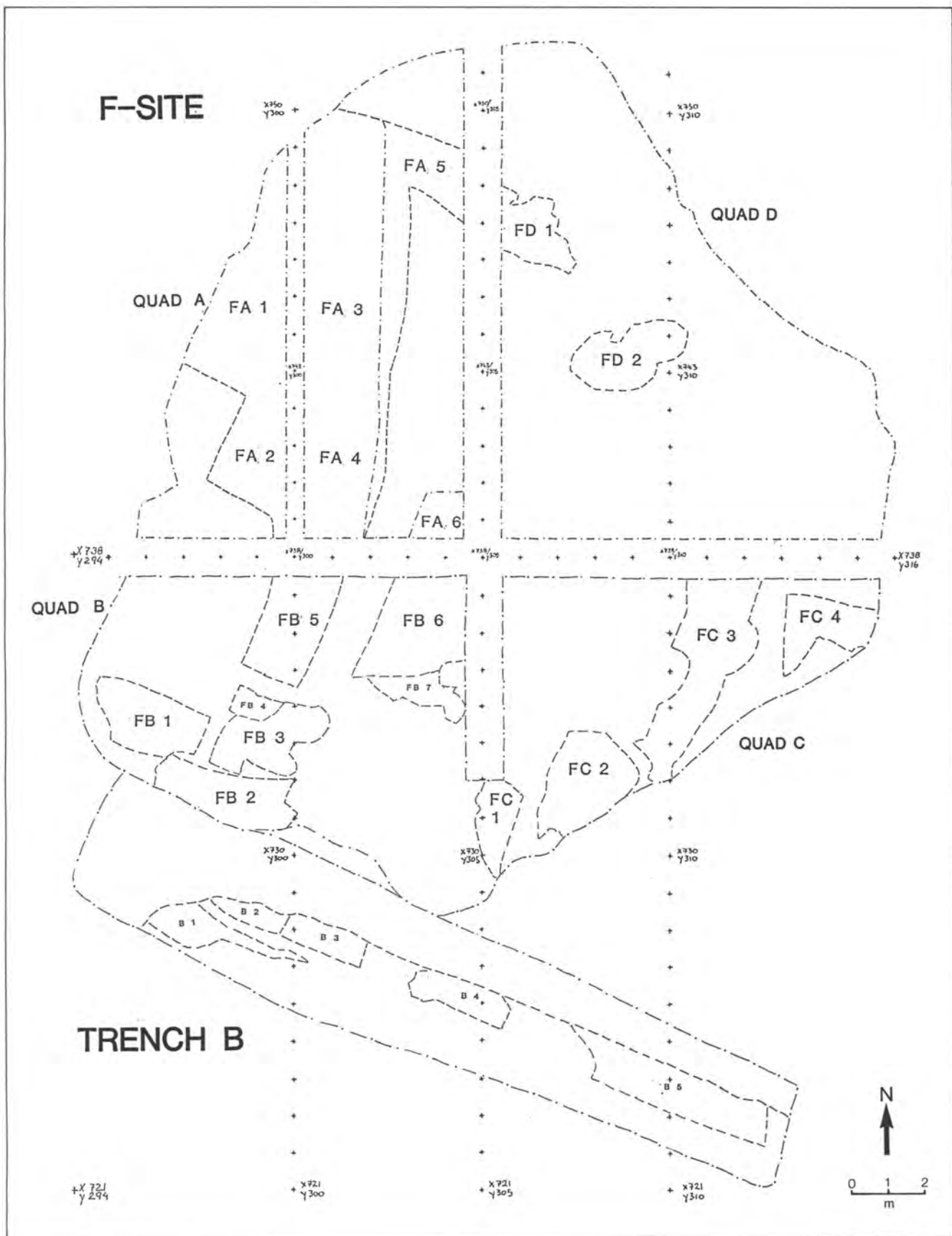


Fig. 6. Plan showing the major excavated sites F-SITE and TRENCH B. The quadrants and various individual excavation areas are marked.

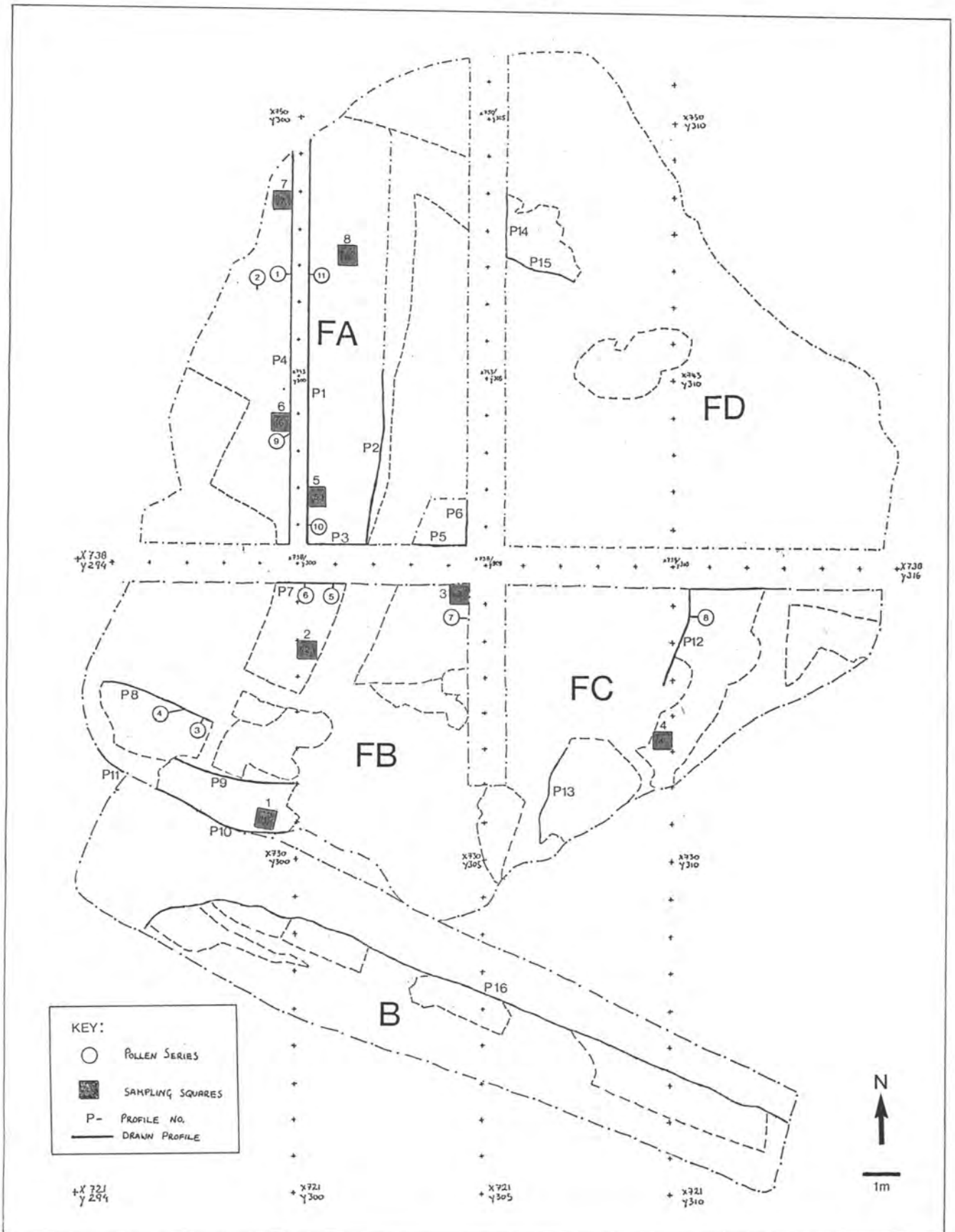


Fig. 7. Plan of F-SITE and TRENCH B showing points at which pollen and metallurgical samples were taken, and the locations of the drawn profiles.

3. STRATIGRAFI OCH FASINDELNING/STRATIGRAPHY AND PHASING (M. Pagoldh / C. McLees)

3.1. Undersökta områden och införda beteckningar

Mellagerundersökningen (Fig. 2) var ursprungligen avsedd att innefatta 5 mindre schakt betecknade A - E. A, B och E utfördes enligt planen, D blev till en avritad profilvägg och C bortschaktades utan föregående dokumentation. I stället tillkom fält F som täckte en 364 m² stor yta. Det blev grävningens huvudområde varpå alla resurser satsades.

Ytterligare lageravsättningar hittades vid schaktövervakning i kvarterets övriga delar. Deras profiler avritades och kallades G, H, I och K. Bokstaven J användes till en avträdesgrop innehållande stora mängder 1700-talskeramik och glas. Föremålen togs tillvara och fyndplatsen markerades på karta (se Fig. 2).

Vid utgrävning av huvudfältet användes en korsprofil och de olika kvadranterna benämndes FA, FB, FC och FD. För att lättare kunna omtalas, har områdena inom dessa fått egna beteckningar och kallats FA 1, FA 2 FB 1, FB 2 FC 1, FC 2 o s v (se Fig. 6).

3.2. Redovisningens uppbyggnad

På grund av tidsbrist och svåra stratigrafiska förhållanden redovisas de olika kvadranterna inom F-området var för sig för att sedan på olika sätt sammenlänkas, se kap. 3.13. De mindre schakten A, B och E samt profilerna D, G, H, I, K får egna självständiga beskrivningar. B kommer dock att i görligaste mån knytas till kvadrant FB. Det är att märka, att all svensk text skrivits innan den engelska påbörjats, varför vissa slutsatser dragna till följd av omständigheter inom ett område kan komma att motsägas i ett annat.

3.3. Kulturlager och bevaringsförhållanden

Här berörs endast förhållandena på huvudfältet. Vad som sägs om lagerinnehåll gäller emellertid också schakt B där lämningarna var av samma art.

Cirka 70% av F-områdets 364 m² stora yta upptogs av efterreformatoriska och recenta anläggningar. De återstående 30 procenten med medeltida kulturlager var huvudsakligen uppsplittrade i mindre lokalteter mellan murar och källare. Endast i kvadrant FA fanns en större sammanhängande grävbar yta. Lämningarna var tunnast i norr, ca 30 cm, och växte sedan mot söder för att i FB 2 som mest uppgå till 2 meter.

Kulturlagren kan delas upp i två kategorier. Dels avlagringar från metallhantering i verkstäder, dels dumpat slaggavfall. Verkstadslämningarna dominerade kvantitativt och dess lager karakteriserades av ett mycket varierat, blandat och omrört inne-håll. Förutom jordmatrixen som normalt var i kornstorlek mo, fanns stora mängder kolstybb, sand, större och mindre fläckar och klumpar med bränd och obränd lera, förslaggad lera, en del skör-bränd sten och hällrester, metallspill, gröna och klarblå koppar-utfällningar samt slagg. Slaggen var av olika typer och mestadels i mindre bitar. Stora bottensköllor förekom, men mera spritt. Övervägde gjorde emellertid slagger med stort kiselinnehåll (dvs sand). De var ofta något förglasade och glänsande, antingen i svart, grönt, blått, rosa, laxrosa eller rödorange. De kunde också vara matt grå, gråsvarta eller skifta i flera ovannämnda färger. Frekventa var dessutom rostfärgade, matta klumpar vilka antagligen var delar av slaggkakor. Intill härdar och ugnrester hittades degelfragment och områden med silverglimrande

korn, förmodligen bly eller koppar-järn-spinell. Vid ett par tillfällen iaktogs även gödselsklumpar i blandlagren. Skikt med mer enhetlig material förekom sparsamt och oftast i samband med någon konstruktion. De bestod av sand, lera eller kol.

Lagren i avfallsområdena utgjordes av stora mängder ihopsintrad och hårt packad, rostfärgad slagg av fayalit-typ i form av runda slaggkakor med närmast plan översida och konvex botten, 10 - 30 cm i diameter och upp till 10 cm tjocka. En hel del kol fanns. Opåverkad sand var mindre vanligt liksom kornstorlekar mellan sand och lera. Vid sållning och närmare betraktande visade sig även de minsta partiklarna vara slagg eller annan avfallsprodukt från metallhantering. Förslaggad och bränd lera förekom i riklig mängd. I de fall icke eldpåverkad lera fanns, var den i allmänhet prickig av klarblå utfällningar (kopparazurit), vilka var så små att de sällan gick att ta vara på. Inslaget organiskt material var förhållandevis stort och bestod övervägande av pinnar, grenar, träflis och annat mindre träavfall, ibland med synliga spår av bearbetning. Även näver, bark, mer eller mindre grönfärgade obrända ben, enstaka horn, hasselnötskal, tygrester vävda i tu- eller fyrskaft, garnstumpar, läderbiter, remmar och pälsfibrer förekom. En gång påträffades också senor eller sen-tråd. Järn- koppar- och blyoxider var närvarande i form av rött och gult pulver. Metallisk koppar fanns som små plåtbitar, nitar, korroderade klumpar och obestämbar spill. Järn uppträdde som rostklumpar mycket lika slagg. I övrigt hittades brynen, eldslagningsflinta och degelfragment.

Sammanfattningsvis utmärktes avfallsområdena av slagg, träflis, metallspill och inslag av läder och textilier medan huvudbestånd-delarna i verkstadslagren utgjordes av kolstybb, sand och lera.

Konstruktioner fanns endast i verkstadsområdet och bestod av olika typer gropar och groprester samt diverse byggnadsindikatorer.

Groparna hade grävts i sekvenser ovanpå och intill varandra på ett sätt som kraftigt försvårade utläsandet av lagerföljderna. Ett mindre antal nedgrävningar var fyllda med kol. Flera gropar hade rester av en inre konstruktion av kantställda hällar och spår av sten- eller lerinfördring. Antydning till ett överbyggt lerschakt fanns åtminstone för anläggning 151, K 3. Pinnhål förekom generellt runt ugnarna och har en teknisk förklaring.

Byggnadsresterna utgjordes av mer eller mindre säkra stolphål, lergolv och fragmentariska plankrester utvisande golvläggning eller väggar.

Påfallande var den dåliga bevaringsgraden av samtliga konstruktioner vilket till stor del kan skyllas på arten av verksamhet. Metallhantering har gett rikligt med avfall och spill som höjt golvnivån om det inte städats ut ordentligt. Av tekniska orsaker som igenslaggning av blästerhål och liknande, har det varit nödvändigt att helt eller delvis rasera ugnarna med jämna mellanrum för att sedan återställa dem eller bygga upp nya. En tillfällig process kan också ha krävt en egen speciell konstruktion.

Bevaringsförhållandena i övrigt har påverkats av åtskilliga faktorer. Ph-värdet tycks ha legat nära det neutrala, att döma av de två analyser som utförts av Elisabeth Peacock, Vitenskaps-museet. Ett grått, humöst sandlager nära steril gav ett genomsnittligt värde på 6,7 medan ett kolrikt verkstadslager gav 8,07. Den senare, något basiska omgivningen har varit relativt gynnsam för metallernas bevarande. Kolet i lagren kan också ha hjälpt till att skydda metallernas yta från rostangrep (muntlig uppgift Jørgen Fastner, Vitenskaps-museet). Närvaron av koppar förbättrar förhållandet för organiskt material, då den verkar som ett gift på de nedbrytande bakterierna (muntlig uppgift som ovan). I fält iaktogs den tämligen goda bevaringen av just organiskt material i slaggförande, metallrika lager. Träplankorna i verkstadsområdet var omgivna av påförd sand och dåligt bibehållna. De skulle möjligen ha trivts bättre i en blötare och surare miljö.

3.4. Arbetsmiljöfaktorer

Upptäckten av de medeltida slagkakorna i det först öppnade schaktet och den ökade insikten om lämningarnas unika karaktär och ovärderlighet för framtida forskning blev början till en stor omvälvningsprocess. Uppdraget växte från schaktövervakning till vittomfattande arkeologisk undersökning. Vid flera tillfällen förlängdes grävperioden och inom denna fanns bestämda datum då delområden skulle vara avklarade. Tidspress och förändringar gjorde, att grävteknik och planering ständigt måste ifrågasättas och revideras. Detta ställde stora krav på personalen inte minst kunskapsmässigt. Ett visst inhämtande av arkeo-metallurgiska fakta blev nödvändigt och övertidsarbete oundvikligt.

Mellagerundersökningen utfördes i det regnigaste, blåsigaste och kallaste sommarvädret någon av oss upplevt. Först i slutet av juni kom en härlig vecka med strålende sol. Det oupphörliga strilandet från ovan underlättade på inga vis arbetet. Lagren var i allmänhet mycket mörka och vätan gjorde det än svårare att bedöma begränsningar. Andra vanskligheter av grävteknisk art var den komplicerade stratigrafien och problemen att sammanlänka lösryckta områden.

Miljön var mycket bullrig och stressande. Hela tiden pågick intensiv byggverksamhet runt omkring. En armada av moderna maskiner arbetade från sju på morgonen till tio på kvällen och grävskoporna formligen flåsade oss i nacken. Vi hade naturligtvis svårt att hänga med i deras uppdrivna tempo och pressades att forcera grävningen. Samarbetet med byggfirman A/S Anlegg gick i det stora hela bra. Alla arbetare var ytterst vänliga och hjälp-samma och gärna lite skojfriska. Små missöden som nedkörda koordinatpinnar och liknande var det därför aldrig någon som fäste sig vid. En mindre konflikt uppstod emellertid den gången vi hindrades dokumentera en viktig profil.

På grund av byggnationen var arbetsplatsen inte den bästa ur säkerhets-synpunkt. När bortschaktningen kommit så långt att F-området stod kvar som en ö, fick flera av oss balansera på snäva schaktkanter med ett 10 meter högt stup invid fötterna. De mindre jordskalv spuntmaskinen orsakade fick omgivande hus att rämna och det var också nära att sandgrunden rämnade under kulturlagren.

Mellagerundersökningen ägde således rum i en bullrande och stressig miljö. Personalstyrkan var dessutom knapp och då grävningen innehållsmässigt skiljde sig från andra stadsgrävningar, saknade de flesta erfarenhet från liknande problematik. Det allt överskuggande var ändå tidsbristen. Lämningarna krävde helst användande av mindre redskap men krafsan var periodvis flitigt i bruk. För att undersökningen skulle bli klar i tid fick också andra eftergifter göras. Den stora korsformade profilbanken togs inte ned och ett par profiler hann inte ritas. Verkstadsområde FD 2 krafsades ned sista dagen, tråkigt nog, ty det innehöll intressanta konstruktioner som hade förtjänat en bättre dokumentation.

Då mycket jobb som normalt utförs under fältsäsongen lämnats till efterarbetet, har stressen levt kvar under rapportperioden.

3.5. Principles employed in the stratigraphic analysis

3.5.1. Introduction

The sections 3.5. - 3.12. relate to the excavated areas F-site and Trench B, and the reconstruction of the stratigraphic sequences derived from their complex deposits.

For practical purposes the post-excavation work was divided between C. McLees and M. Pagoldh roughly on the lines of responsibility established in the excavation period ie. C. McLees for F-site's quadrants A and C, M. Pagoldh for F-site's quadrants B and D. M. Pagoldh also assumed responsibility for the analysis of Trench B and its correlation to F-site. The correlation of Trench B and F-site's quadrants A and B is dealt with in section 3.13. Prior to this the stratigraphy and phasing of each of the excavated areas are discussed under their own sections (3.7. to 3.12. below), while a discussion on natural ground as observed in all the areas of 1987/3 is set out in section 3.6. Firstly, however, the principles employed in the post-excavation analysis are discussed below.

3.5.2. Principles and criteria: discussion

The nature of the deposits encountered has been outlined above (see 3.3.). The intensive metalworking activity as represented by highly stratified successive accumulations of waste-bearing deposits, the (poorly-preserved) remains of wooden structures, the numerous pits, hearths/furnaces, post- and stake-holes and the usual problem of extensive post-medieval intrusions, presented the archaeologists with a highly complex body of material to be unravelled in post-excavation.

The first procedure was to construct matrices for each excavated area from information derived from context cards, site notebooks, daybooks, plans and profiles, information which, as a result of time pressure, was occasionally difficult to reassemble and correlate due to unchecked documentation, unresolved relationships and contradictory data. Nonetheless, a series of matrices was constructed and used to establish correlations between excavated areas. Thereafter phasing could begin.

During excavation certain sequential patterns and dispositions were observed within the body of material and these became somewhat clearer during post-excavation. In other words, despite the stratigraphical discontinuities arising from the great amount of intrusive (medieval and post-medieval) activity on the site, a picture composed of distinct horizons and sequences of structured activity arose from the mass of data. However, it must be stated immediately that the interpretation of individual features and collective patterns is often based on very slight and ambiguous evidence and the phasing so reproduced is here presented as open to future reinterpretation and rationalization. Despite this a form of phasing was established, each phase comprising a perceived overt change in the grouping of elements. These elements consist of fragmentary traces of wood (timber and planking) which conform to consistently repeated alignments, possible *burnt* timbers in similar alignments, associated spreads of sands and gravels used as make-up beneath the structural timbers, stratigraphically associated spreads of material (mixed waste-bearing silty sandy deposits; compacted spreads or pads of clean or charcoal-admixed clays, burnt and unburnt; associated negative and positive features, such as hearths/furnaces, pits, post- and stake-holes etc.) All these elements have been assembled in as close correlation as possible, and the phasing "hung" thereon.

A phase, as defined here, represents a distinct horizon of structural elements and associated deposits related to a specific episode of activity, in this case relating to workshops (walling, flooring, hearths/furnaces, pits etc.). The individual phases are separated by traces of destruction. These boundaries were very hard to determine due to the lack of any distinguishable widespread fire-horizons, the difficulty in accurately correlating slight structural elements with probable occupation surfaces, and the probability that successive arrange-

ments followed very quickly upon each other, thereby causing previous flooring/occupation deposits etc. to be re-used in the subsequent episode of activity. The pattern is one of a succession of workshops adopting the same alignments and arrangements over the period of metalworking as represented on F-site. The structuring of a phase is therefore often dependent on the correlation of only a few elements e.g. a new spread of gravel beneath a fragment of aligned timber, a hearth and some spreads of clay. Also, a single phase may be broken up into a number of internal levels where no demonstrable break in the main associated structural elements occurs, the sequence of levels therefore representing possible successive build-ups of debris from activities within a single workshop episode.

It has often been very difficult to tell accurately whether structural elements have been cut down into, or laid directly upon, pre-existing deposits. Pits, hearths and post-/stake-holes posed particularly difficult problems in the determination of their cutting levels. Also, the inherent difficulties represented by established structural boundaries, assessing the extent of clearance/removal of material in antiquity, the close similarities between distinct deposits, and the obscuring of crucial relationships by intrusions, all made the task of interpretation difficult. This is particularly the case in Quadrant B where "islands" of medieval deposits exist between post-medieval intrusions, and within the medieval deposits the key structural elements are more poorly-represented than in Quadrant A and the criteria used for phasing are consequently more fragmented and disarticulated. Nonetheless, although the sequential patterns are less explicit even than in Quadrant A, the stratigraphical arrangements do not diverge greatly and it has been possible to link these two areas (see 3.13.).

The particular stratigraphical problems encountered within each phase are discussed under the relevant sections below.

3.6. Natural ground (steril)

This section deals with the heights and character of natural ground as encountered during the 1987/3 investigations.

Heights on the natural ground as plotted over the 1987/3 area are summarized by means of spot-heights on the general area plan (Fig. 8). For further definition and discussion see 1.3., 3.7.1., 3.13., 7.1.

Discussion

The peripheral profiles and trenches to the north and east of Mellager quarter were heavily disturbed by post-medieval intrusions and consequently only a few heights on undisturbed natural could be obtained. Generally here the natural ground consisted of graded clean deposits of yellow to brown river sands and gravels. To the south-west of the quarter natural was observed in all investigated areas. However, some problems in the precise definition of natural arose here. In all investigated areas to the SW natural proper was initially assumed to be beneath an ubiquitous compacted horizon of grey silty sandy gravelly material (see also discussion of this horizon in 3.7.2. below). However, it became increasingly obvious that the natural sands/gravels here encountered were frequently contaminated with charcoal and other organic material (notably occasional bone fragments). This was particularly the case in F-site's Quadrant A FA 3 area where, on the last day of excavation, an investigative trench immediately along the supplementary baulk's eastern length revealed evidence of human activity within the body of this so-called "half-natural" (see Fig. 9 and 10). The evidence consists of the remains of two campfires. These, and

two right-angled ditches found in FC 2 and 3, are discussed in greater detail below (3.7.1. and 3.10.). However, heights were taken on the surface of this contaminated natural (as well as the cleaner sands/gravels below where exposed) and the former heights have been used for the purpose of composing the spot-height plan, as it is felt that these sands and gravels are river-deposited (flood-levels?) and that the probably small-scale human activity represented therein took place within the context of a natural rather than a man-made environment where the sandbank at the mouth of the Nid was still prone to flooding. The pollen analysis has some bearing on the problem of natural ground (see below, Ch. 5.4.) and this information is incorporated in the Phase 1 discussions below. One of the camp-fires was ¹⁴C-dated to A.D. 900-1027 (calibrated - Stuiver/Pearson) providing a broad date for these presumed flood-levels. The evidence of the heights across the quarter points to the presence of a ridge of river sands and gravels (in the form of a sandbank?) stretching from the north-west part of the quarter (where it is at its highest) to the south-west corner, losing height gradually towards the south and falling away gradually to the south-west and rather more steeply to the east and south-east and the river.

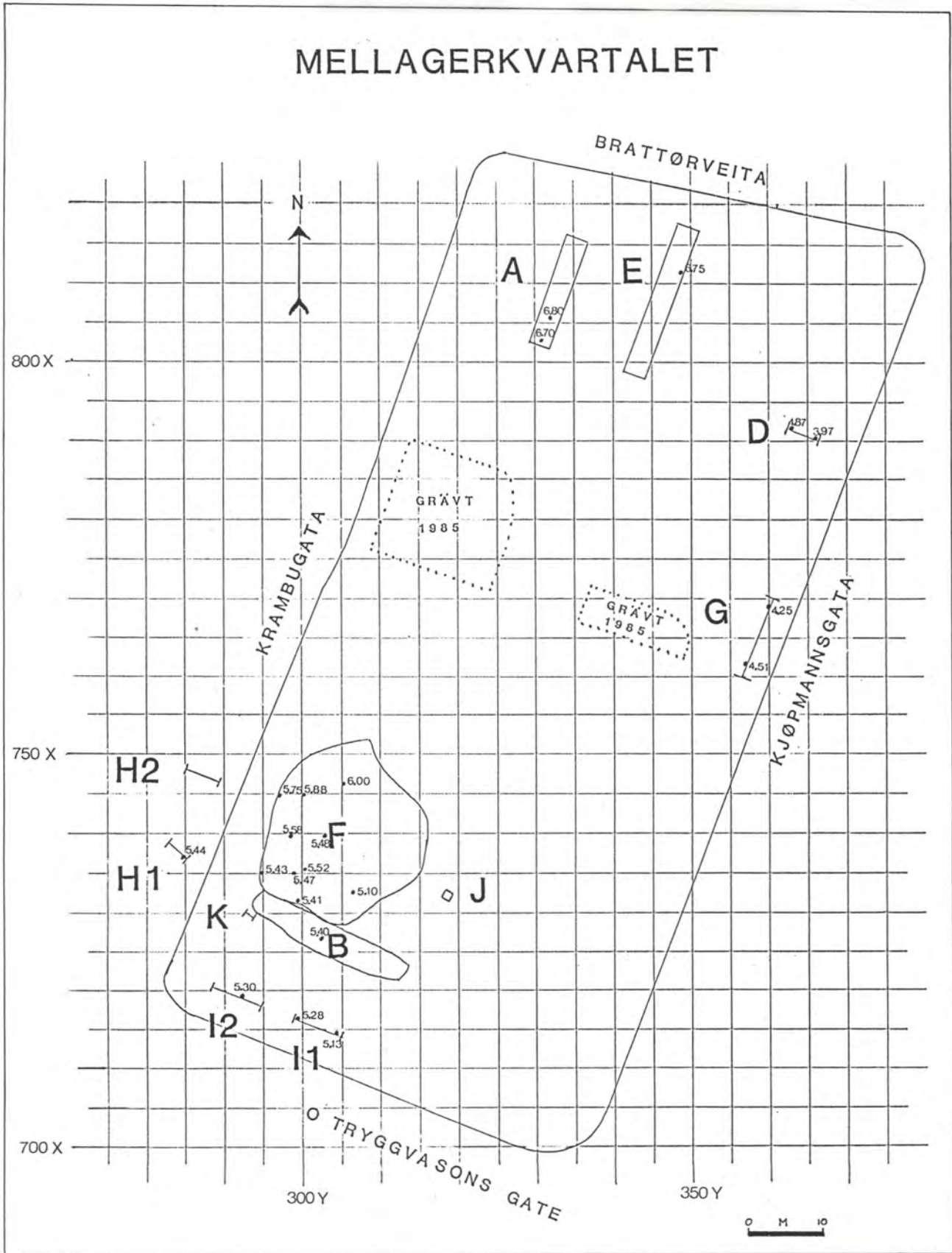
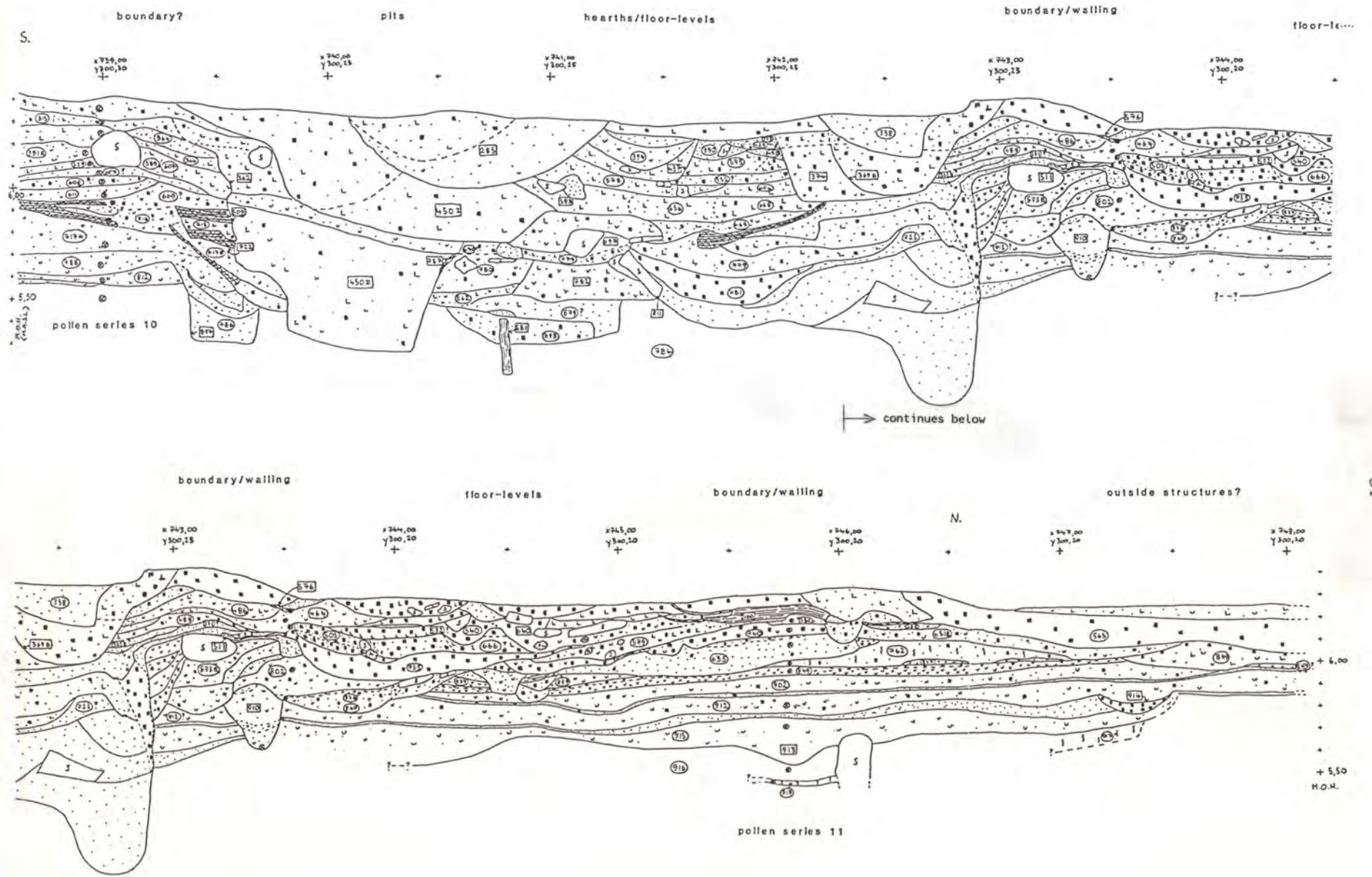


Fig. 8. Plan showing spotheights on natural ground registered in the investigated areas.

Fig. 9. The E-facing profile of the supplementary bank in F-site's Quadrant A. 1:25.



3.7. F-site: Quadrant A (FA)

3.7.1. Phase 1 (see Fig. 10)

General characteristics

This phase incorporates a body of contaminated river-deposited sands and gravels loosely termed "half-natural" (halv-steril). It bears within it some traces of human activity, notably two isolated campfires. A longitudinal ditch may also be within this phase, though its precise stratigraphical position is in some doubt.

Stratigraphic description

FA 3 was the only area on F-site in which these levels were investigated to any degree, and in this area this process comprised only a narrow investigative trench cut along the northern half of the supplementary baulk's eastern side (see Fig. 10). It was in this area that the clearest doubt as to the security of classifying these levels as "natural ground" arose on the last couple of days of excavation. As it appeared in profile here (Fig. 9) this body of charcoal- and bone-contaminated material comprises a series of yellow-white and yellow-brown loose sandy gravels interspersed by two thin bands of grey soft silty sand. These lie between the compacted grey gravelly horizon (849) above and loose graded clean gravels (916) below. The former is a horizon which appears universally (though discontinuously) over the SW group of sites on Mellager quarter (see phase 2, 3.7.2. below), and the latter is *natural proper*. In FA 3's investigative trench, therefore, a number of levels of "half-natural" were encountered. Elsewhere over F-site excavation proper was forced to stop on removal of the compacted gravel surface noted above (though see Quadrant FC 3.10.3 and 3.10.5.); however, it seems that the contamination of natural was rather more explicit in the FA 3 area than elsewhere. Sealed firmly within the "half-natural" levels here, and lying partly within the profile, were two isolated campfires at slightly different stratigraphical levels. The southernmost 913 (K10) lay at the base of 915, possibly cutting 916, while further to the N. 914 (K11) appears to have been cut into the band of soft silty sandy material intervening between 912 and 915 (the latter layer bore some seashell assemblages).

In rather more doubt is the stratigraphical position of the ditch 908 (K12), also hurriedly excavated on the last day when its northern edge was thought to appear on removal of 902 "half-natural" gravel, which also filled it, and to the south on removal of 783 charcoally silty sand (lying just on the compact gravel surface). On this basis it might be placed beneath phase 2 levels. However, the fill and sealing contexts are in doubt: 902 proper has clearly been cut away immediately to the N of this feature, while "783" as described sealing the ditch may in fact be a separate entity altogether and consequently the ditch may well have been cut from the phase 2 or 3 levels (see Figs. 11 and 12-17).

The character of "half-natural" is clearest in FA 3 area. Elsewhere the compacted gravel surface effectively sealing these deposits is rather less complete and therefore a) the secure identification of the surface of "half-natural" is rather more doubtful, and b) the impact of intrusive features (especially in the FA 4 area) obscures the true nature of these deposits, which themselves could not be fully explored. In areas FA 1, 2 and 4, if the evident gradual N-S and E-W slope of these levels is taken into account and allied with later disturbance, the natural ground exposed may well display differential characteristics across the whole site (see concluding discussion).

Layers in Phase 1

FA 1: 920, 773, 778

FA 2: 778

FA 3: 902, 912, 915, 916, 917

FA 4: 784

Description of constructions (Fig. 10)

K 10: campfire (913). Cuts 916? Sealed by 915. Lies at 5,60 m.a.s.l. It appeared as a localized spread of friable charcoal and burnt bone fragments (sampled) lying adjacent to two set water-worn boulders, fire-reddened on their southern sides. The feature was some 50 cm broad N-S. Beneath it lay a soft, brown silty layer of indeterminate extent bearing fragments of fibrous organic material (sampled), 917.

K 11: campfire (914). Sealed by 912. Lies at 5,80 m.a.s.l. A bowl of loose friable charcoal fragments, thickest to centre and base. The grey band of silty sand into which it is cut was burnt reddish-pink in the immediate vicinity. Ca 40 cm broad N-S.

K 12: ditch (908). Uncertain stratigraphic location (placed in phases 1, 2 and 3). Longitudinal, aligned WNW-ESE. Steep-sided, flat-bottomed. Filled with gravel (loose yell.white) on excavation included within 902 context, though may comprise a separate later deposit. Some 3,25 m long by ca. 30-50 cm broad by ca. 15-24 cm deep. Full extension W uncertain. Possible boundary marker or foundation trench.

Dating

The burnt bone sample taken from K 10 yielded a ^{14}C date of A.D. 900-1027 (calibrated Stuiver/Pearson).

Discussion

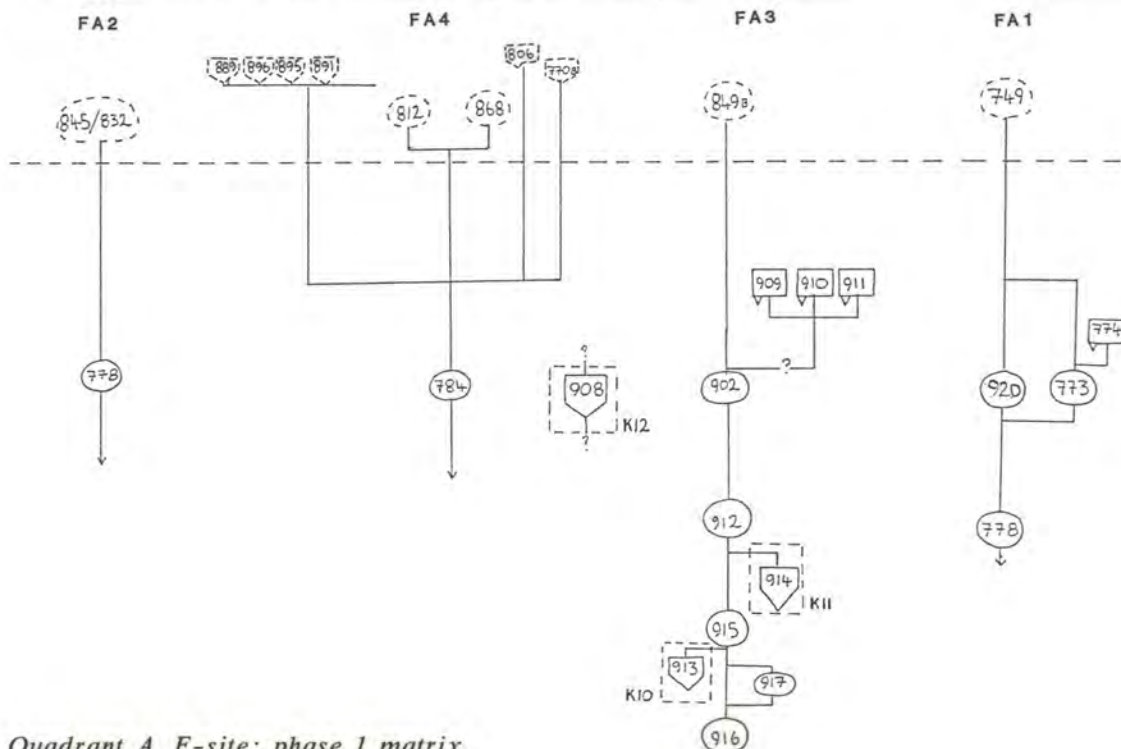
On the basis of the evidence detailed above, it seems reasonable to suggest (while bearing in mind the incompleteness of investigation) that this body of sands and gravels constitutes a series of geological strata (ie. alluvial deposits) and that the human activity within this active riverine environment may be characterized as occasional visits to a flood-prone sandbank, exposed at intervals, at the mouth of the River Nid. The term "half-natural" conveys this interaction of human and natural agencies, the former represented by only a few slight traces. The visitors left their mark in the form of two campfires, one of which bears the remains of a cooked meal. On stratigraphical evidence these campfires relate to *two* separate visits, possibly some years apart. The earliest of the two provided a broad date for its use sometime in the 10th or early 11th centuries A.D. At A.D. 1000 the high-water mark is thought to have lain at the 5,70 m.a.s.l. contour: both of these campfires' positions and the ^{14}C -date appear to complement the hypotheses laid out above (see also 7.2.6. below).

These features lie towards the highest point on natural in the excavated area (ca. 5,60-6,00 m.a.s.l.). From here the deposits shelve gradually to the W, S, and SE where also much of their upper levels appear to have been cut away by later activity. In assessing the character of natural ground (including so-called "half-natural") across the site, the natural slope of the topography and the consequences of subsequent removal of natural deposits by human agency must be borne in mind. In combination these factors may account for the possibly differing characteristics of natural ground. To the N in FA 3 contamination of the alluvial deposits by charcoal and bone was more in

evidence than elsewhere. Also in FA 3 no pollen was found in these levels (see 5.4.). Some tentative suggestions as to the significance of this differentiation are proposed. If the shelving of these layers truly reflects the natural topography, the lower areas to the S might not necessarily exhibit the same structural characteristics as those to the N due to differential deposition relating to a temporarily exposed beach/sand-bank zone and an adjoining shallow-water zone. Therefore to the N of the site a series of beaches were being formed and intermittently visited sometime in the 10th and early 11th centuries, while to the S at this time lay a shallow-water zone subject to different depositional agencies and, of course, inaccessible to man. Subsequently, at a later date, the area of F-site became free of, or at least less prone to, flooding, and it was at this point in history that the intermittent activity of this "campfire" or "pre-metalworking" phase is superseded by evidence of more widespread and intensive human activity across the whole site, as represented by phase 2's compacted gravel surface, which in effect seals the alluvial deposits over much of the SW area of Mellager quarter.

To the N, in the FA 3 area, the alluvial "half-natural" deposits are largely intact. If the natural zoning, as suggested above, implies that the contaminated "half-natural" deposits of FA 3 did *not* formerly extend over the *whole* area prior to phase 2 activity then the natural pattern of deposition and topography has been sealed by the compacted gravel surface. However, to the S much of the upper portion of alluvial deposits has been cut away by later activity, though whether this constitutes a deliberate planing-off and removal of a former extent of "half-natural" deposits here is debatable. Why this should occur on the lowest part of the site, and in such proximity to the river and the consequent danger of flooding, is a curious factor, and it is arguable that for obvious reasons this latter seems an unlikely proposition.

The ditch K 12 is a problematical feature. If it belongs to this phase then its presence is possibly indicative of some attempt at the establishment of rather more permanent human activity at this early stage. It is the first feature to display the WNW-ESE alignment repeated at this point by a succession of later structures. It is comparable to those found in FC (see 3.10.3. below), though here again problems of stratigraphy obscure the true picture. Its function as a boundary ditch or foundation trench for a building seems probable, though on balance its placement in the phase 2 or phase 3 levels seems more favourable in the light of subsequent activities.



Quadrant A, F-site: phase 1 matrix.

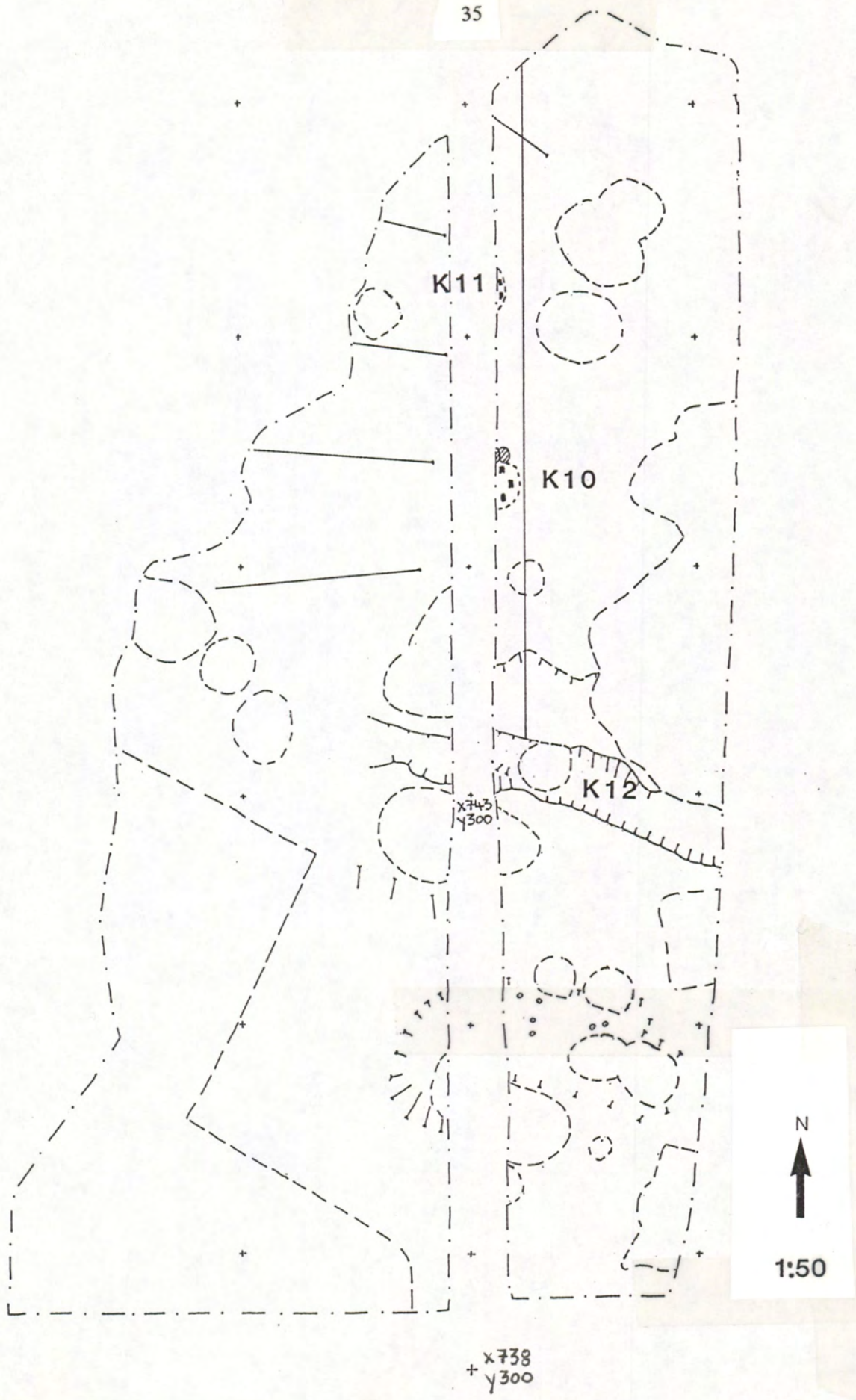


Fig. 10. F-site Quadrant FA: Phase 1.

3.7.2. Phase 2 (Fig. 11).

General characteristics.

This phase consists of a discontinuous layer of compacted grey sandy gravel observed over most of the investigated area to the SW of Mellager quarter. Its extent is broken in areas by later intrusions; however, it formed a very distinctive horizon which, it is suggested, is archaeological rather than geological in nature.

Stratigraphical description.

This horizon lies directly on the alluvial gravels of phase 1, and below the mass of deposits and features resulting from metalworking (see Fig. 9). It is composed of medium- to dark-grey compacted silty sand and gravel, varying in thickness from ca. 1 cm to ca. 5 cm.

In FA 1 and 2 the layer was very thin and discontinuous, its true nature and extent in some doubt - 749 and 845/832. In FA 3 the layer (849) survives more or less intact (Figs. 9 and 11) sloping gently from north to south (from ca. 6,00 m.a.s.l. to ca. 5,90 m.a.s.l.). However, its northermost extent is in doubt due to hurried excavation and later disturbance. It is cut away to the S. In the FA 3 area it is also of a rather more complex composition than elsewhere - its upper third consists of a thin matrix of black greasy (clayey?) charcoal 849a which leaches/grades gradually down into the grey, relatively charcoal-free, gravelly horizon proper, 849b. This is a patchy phenomenon elsewhere. 849a and b should probably be regarded strictly as separate deposits, though they appeared to form a depositional unit and are probably very closely related archaeologically.

In FA 4 783 may well correlate with the charcoally matrix 849a. The compact gravel surface 812 and 868 is otherwise largely cut away, preserved mainly to the S (extending therefrom into Quadrant B). It is ca. 5,60 m.a.s.l. at this point.

Layers in Phase 2.

FA 1: 749

FA 2: 845/832

FA 3: 849 (a+b), 899?

FA 4: 812, 868, 783?

Description of constructions.

There are no constructions in this phase, though depending on the degree of continuity with subsequent activity, the structures cutting this horizon from the phase 3 level may well be related (see discussion below).

Dating.

A charcoal sample from 849a was subjected to ¹⁴C analysis, yielding a calibrated date (Stuiver-Pearson) of A.D. 660-890. Otherwise no dating evidence.

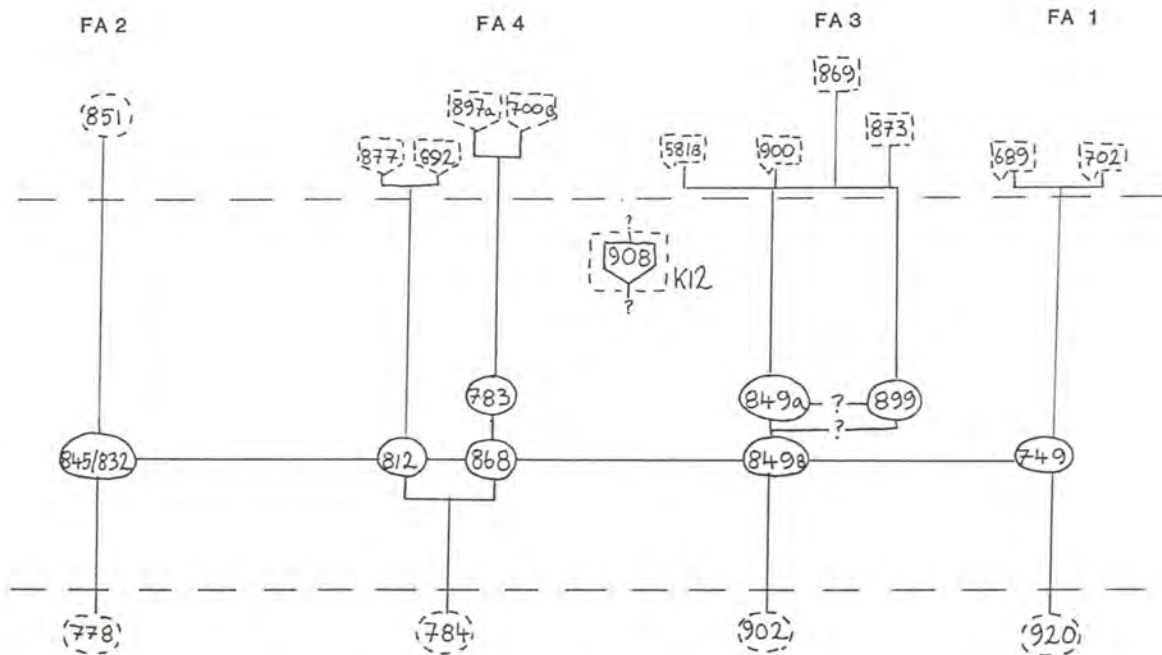
Discussion.

This horizon has been treated as a separate phase in itself as it is difficult to be certain as to a) how exactly this horizon came to be formed b) how long a period of activity it represents c) what kind of activity took place upon it and d) how it stands, in terms of dating and function, in relation to the preceding and succeeding phases.

Its character is reminiscent of a trampled surface and if so it appears to represent the primary occupation surface. Its formation probably arose from widespread activity taking place directly on the exposed surface of alluvial sands and gravels once the area became free of flooding. The discolouration

and compaction are resultant effects of this activity, while the thin patches of closely-associated silty-greasy charcoally materials (e.g. 849a,783) lying on the compact surface are here classified tentatively as remnant occupation deposits. However, the character and intensity of this activity, and also its dating, are difficult to determine. The ^{14}C sample produced a date which is significantly *earlier* than that produced from the phase 1 campfire although it is from a stratigraphically *later* context. The earliest secure metalworking contexts above this horizon also produced comparably early dates, though, it should be noted, a similarly broad calibrated range to that from the primary occupation surface. It has been difficult to establish this horizon firmly within the metalworking period as it may represent a period of occupation distinctly separate therefrom in terms of time and function. Its formation on an expanse of possibly recently-exposed gravel deposits on the W bank of the river seems a reasonable assumption, though whether it represents the first phase of metalworking here, or an earlier pre-metalworking phase of occupation/use of an open site, is still subject to debate, especially in the light of documentary evidence for the establishment of the late Viking "tinglass" somewhere in the general locality (see 7.1.2.).

On stratigraphical evidence (and extremely tentatively, the ^{14}C dates) however, there are suggestions of direct continuity (or at least no perceptible time-lag) in the demonstrable lack of deposits *other than* those relating to metalworking lying directly above this horizon. Thus, it may be suggested, at some time following on the campfire/pre-metalworking phase 1, tentatively dated to the 10th and 11th centuries A.D., an area of exposed land was taken into use specifically for the establishment of a centre for metalworking, the phase 2 horizon representing the initial episode of establishment.



Quadrant A, F-site: phase 2 matrix.

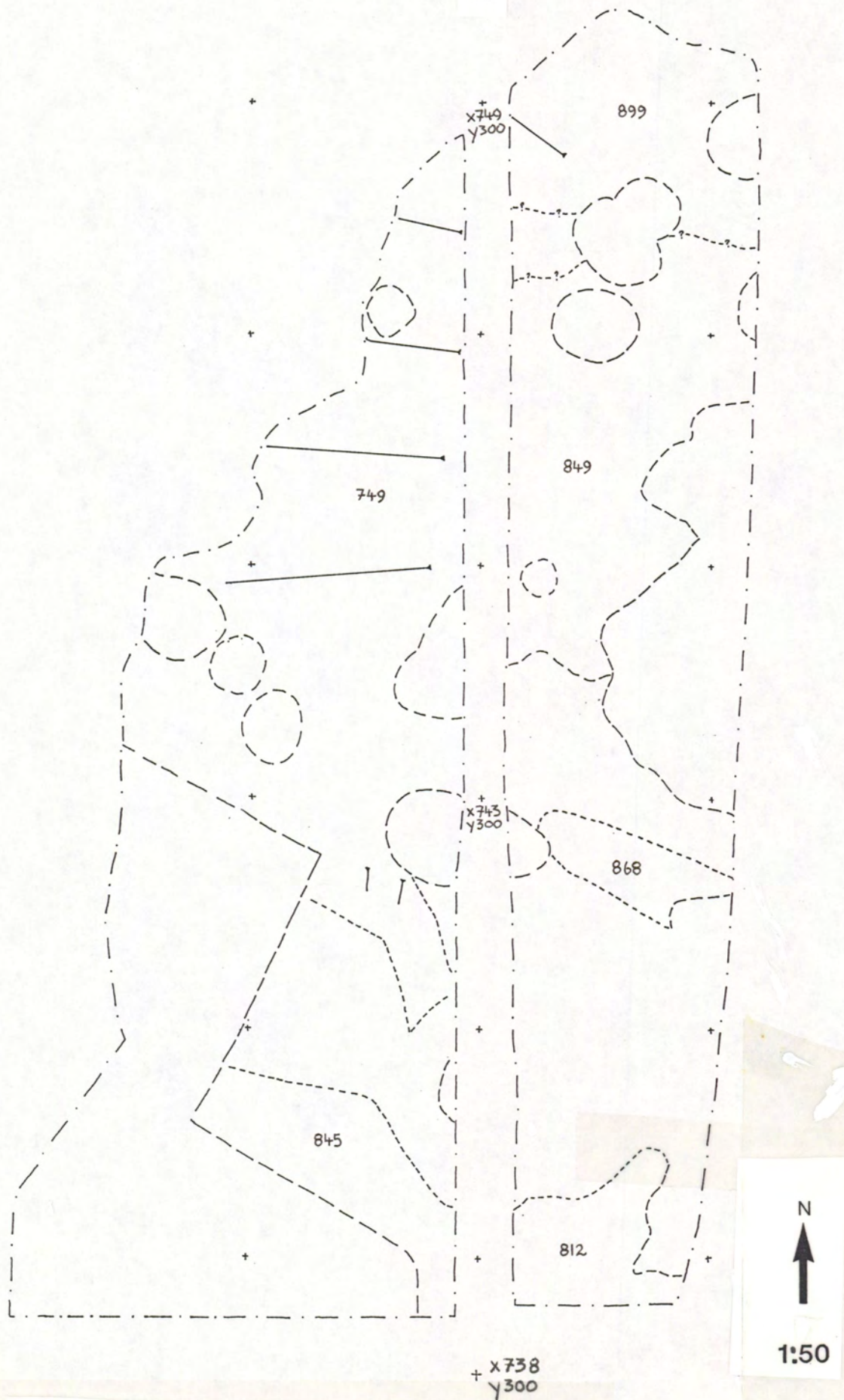


Fig. 11. F-site Quadrant FA: Phase 2.

3.7.3. Phase 3 (see Figs. 12-17)

General characteristics

This phase incorporates a range of structural remains, predominantly negative features, and related deposits. Broad patterns of alignment and concentration can be discerned. The phase is characterized by its substantial increase in surviving features in comparison to the preceding phases, and by the first appearance of forms and arrangements of features which reoccur (often repeated/superimposed) throughout the subsequent phases. The features correspond broadly to probable traces of building activity and an array of probably industrial-related elements. As a whole they may be regarded as the first evidence for metalworking in this area, an activity seemingly taking place within planned or predetermined areas, in this instance within one, or possibly two neighbouring, workshops.

It is a complex phase, in that it has been subdivided into a number of levels (1 to 5) relating to superimposed activities within the broadly-defined episode. Although these elements form a broad stratigraphical unit, their precise interrelationships were very hard to assess.

Stratigraphical discussion

Numerous stratigraphical problems arose in constructing this phase. These included:

- 1) defining the lower and upper limits of the phase;
- 2) correlating features and layers a) within localized groupings and b) across the quadrant as a whole, and arising from this;
- 3) portraying a representative picture of internal sequences of contemporary activity, each with its own set of components.

The first problem arises when assessing the relationship of the range of cut features and related deposits to the phase 2 horizon of compacted gravel and patchy occupation layer. In the majority of cases, the recorded features could not be related securely thereto due to the broken extent of the phase 2 horizon. However, it was assumed that the compacted gravel surface formerly covered the entire area and that it has been subsequently disturbed, most probably by the sequence of features here recorded. How closely related in time the formation of the phase 2 horizon and the phase 3 intrusive activity are is debatable, though in stratigraphical terms there seems to be no great interval.

The series of levels here presented arose from the observable sequence of intercut features and superimposed deposits lying within a notably closely-delimited area in the FA 4 area to the SE. This stratigraphical complexity is not generally repeated to the same degree elsewhere in the quadrant. The upper limit to the phase was very hard to establish due mainly to the lack of any single sealing deposit common to the quadrant, and the ambiguous relationships of the broken array of deposits demonstrably sealing this complex of features. For the purposes of clarifying the phase I have had to make a number of guesses and assumptions:

a) I have assumed that the FA 4 complex of features and deposits, lying as they do within a tightly delimited area, forms a "unit" of activity cutting (though not clearly *cut from*) the phase 2 horizon, and "growing" within the horizontal limits as defined by the WNW-ESE lying features and deposits immediately to the N and S thereof (ie. essentially K12 and layer 788/851). The vertical limit is layer 780, which, although it may underlie, abut or cut the boundary deposits 783 and 785/788, is demonstrably the final deposit *within* this delimited area, it and the neighbouring deposits sealed by layers portraying new structural characteristics in phase 4. In other words, it seems likely that the intensive sequence of elements in this particular area occurred at

least *after* the formation of the phase 2 ground surface and activity immediately thereon (possibly following very quickly thereafter ?) and comprises a number of closely confined activities of structural and industrial nature prior to restructuring in the phase 4 episode. This applies to the rest of the quadrant, though the close correlation of the FA 4 elements thereto, in precise terms, has proved impossible i.e. it has not been possible to correlate the more dispersed elements to the N with particular levels of FA 4 activity, and therefore the former reoccur on each level plan.

b) Having grouped these more dispersed elements lying in FA 1 and 3 within the broad limits of the phase (i.e. they are cut from above the phase 2 horizon and sealed by the general restructuring deposits of phase 4), it has, however, not been possible to demonstrate accurately which particular elements were in active use at the same time. They are each essentially "floating" in relation to each other within the phase limits. Some possible correlations are suggested in the discussion below.



*F-site, Quadrant A (FA 3 and 4), looking N.
Features at FA phase 3-4. Level: see Figs. 12-19.*

With particular regard to the layers and spreads of material: These comprise essentially a number of sand/gravel deposits ranging from clean to highly mixed with coarse elements (charcoal, slag etc.). In FA 3 the cleanish sandy gravel spread 837 lies directly on phase 2's 849a. In nature it resembles natural sandy gravel, with slight charcoal contamination, and I have interpreted it as redeposited natural, up-cast from the digging of the post-pits K14 and K15 (for example), which themselves have been back-filled at the primary

stage with 837 sandy gravel. On this evidence the deposition of the layer and the establishment of the post-holes here may be regarded as closely related in time ie. post-pit dug (837 up-cast), post established, pit back-filled with 837. 837 therefore represents a construction level, and its relatively clean nature would rule out the possibility of any occupation activity directly on its surface, though it may represent a levelling-up process prior to the establishment/formation of a floor. Identifying occupation deposits hereon has been problematical though it seems reasonable to suggest that phase 5 activity has obscured the picture somewhat ie. the occupation deposits over 837 have been partly cut away and possibly raked up to form a fresh foundation for the perimeter of the phase 5 structure here (see 762 in phase 5 discussion). Consequently, although 837 sandy gravel was deposited in phase 3, it appears as a component in phase 4 activity due to the removal or redistribution of the occupation deposits thereon during the course of restructuring in phase 5, while to the S a range of intervening structural elements survives (see phase 4).

The fill of K12 ditch, 773, is a sandy gravel very similar to 837. There was no silting in K12 ditch, perhaps suggesting no great time-lapse between its digging and its subsequent filling, a process reminiscent of the digging and filling of the post-holes K14 and K15. On this basis these features may be related, though no physical link was traced. The post-holes K23 appear to have cut 773 fill in K12 ditch and are themselves filled with gravelly material and sealed by phase 4's 725 and 835. They are consequently difficult to place in relation to other post-holes in the phase, though if the sequence - ditch cut, filled, post-holes cut - is quite rapid they may be in some functional relationship to K14 for example, or even K13 to the W. Their gravel fill may result from the removal of the posts in antiquity (as there was no evidence of rotting) and in-filling in the phase 4 restructuring, where a post-supported wall-line has been replaced by one supported by stones (?).

The pair of post-holes K13 have a potentially long life-span, their fills appearing under 681 of phase 5. They have been placed in phase 3 as being the lowest stratigraphical position from which they may have been cut, though of course they may also relate to phase 4 activity.

To the S of FA 4 there is a further sandy gravel area, capped with a spread of compacted clay-with-charcoal (785 over 788). However, 788 is rather more mixed with charcoal than 837 for example, and it seems more reasonable to interpret it as occupation debris rather than a construction stage related to phase 3 establishment. It seals K18, K19 and K20 features and has a similar composition to 780 immediately to the N. I have therefore placed it together with 780 (though 780 may cut it, their relationship being uncertain) as comprising the final deposits, maybe related to destruction, in phase 3. As such it and 780 occupy an ambivalent "functional" slot in that there is evidence that the final occupation deposits of a structure are re-used by the following activity as basis therefor. This is evident particularly in the case of 780 which seems to have been used as primary flooring/activity surface in the phase 4 episode. 785, however, is clearly covered by the sandy gravel dump (?) 717a and b of phase 4 restructuring.

These layers 780, 785 and 788 have been placed on the level 5 plans, as representing the final stage of FA 4 activity prior to phase 4. In the FA 2 area immediately to the W there are corresponding alignments and dispositions of layers and features, though little corresponding in complexity to FA 4.

N.B. Although the extent of 837 gravel and the filling (and cutting by K23) of K12 ditch have been drawn only on the level 5 plans these elements may well have been in existence at the levels 1 to 4 episodes as well, so their extrapolation back through the sequence should be seen as the most probable picture, the gravel 837 in particular being deposited at an early stage in the

phase and its persistence though this phase and into phase 4 the product of subsequent planing-off and disturbance (see discussion). The possibility that 773 fill of K12 ditch and K23 post-holes comprise a separate, and later, development in relation to 837 gravel is reproduced by means of two separate plans for level 5 ie. level 5a (Fig. 16) and level 5b (Fig. 17).

Layers in Phase 3.

FA2: 827, 851

FA3: 837, 903, 904, 905

FA4: 780, 781b, 785, 788, 862, 870, 876, 879, 893

Description of constructions (Figs. 12-17).

K12: ditch (908). As described under phase 1. Its inclusion in phase 3, as a possible foundation trench/boundary ditch, seems more viable when compared to the range of features of possibly related function and areal disposition herein. At level 5 it has been planned as containing gravelly fill, 773, cut by K23. N.B. No sign of silting in the feature, so it may have been dug and then back-filled quite rapidly.

K13: two post-holes (689 and 702). Appeared on removal, by "krafser", of 681 in FA1. Ovoid-subcircular, ca. 40 cm deep. Diameters: 60 cm x 50 cm (689) and 40 cm x 40 cm (702). Post-pipe fill of each comprised dark-grey coarse charcoally sand, possibly appearing under 681. Edges packed with large lumps of slag and stone set against the primary post-pit fill of yellow-brown gravel with some charcoal, sealed under 681. In form and content and stratigraphical position these seem to form a pair and may constitute contemporary elements, possibly containing posts bearing a sill-beam aligned NNE-SSW here ?

K14: post-hole (900). Part of a subcircular (?) post-hole (cut away to E by 630 and 871 post-holes). Cuts 899-849a and filled with a loose yellow-brown sandy gravel, probably same deposit as layer 837. No post-pipe observed. Post-pit is ca. 60 cm diam. N-S and ca. 65 cm deep. Filled and sealed by 837. Here, as in most of these post-pits, the primary fill was almost indistinguishable from natural gravels, the difference lying in its less graded nature. N.B. See also K25.

K15: post-hole (581). Subcircular post-pit with post-pipe. A feature with a possibly long active life. The post-pipe appeared initially in a later context (phase 6), with wood from 566 collapsed into the post-pipe fill (soft grey sandy, with some slag). At base of fill a large piece of a square-sectioned wooden post remained in situ. The post-pit was seen to cut 849a, and filled with loose yellow-brown gravel, 837 (?). The post-pit was ca. 60 cm x 70 cm in diam. by 86 cm deep.

K16: post-hole (700b). Very uncertain feature. Assigned to this phase on evidence of profile, where steep-sided round-based feature is sealed by gravelly sandy material under 725. It was filled with grey-brown sand and capped by a large slab of stone. Ca. 60 cm diam. by ca. 50 cm deep; only the E half of the feature was dug.

K17: pit ? (897a). Subsquares shallow hollow, filled with 813a, sealed by 780, cuts 868. 813a may be same as 783. Max. breadth ca. 80 cm by ca. 15 cm deep. Truncated feature? Reasonably clear relationship to phase 2 horizon.

- K18: pit ? (892). Irregular hollow, steep-sided, flattish-bottomed, filled with 863, sealed by 785 and 788, cuts 812. Probably a composite and truncated feature ie. a number of intercut features. Max. breadth 115 cm by ca. 25 cm max. depth. Reasonably clear relationship to phase 2 horizon. Stake-hole (part of 806a group) adjoins on SW corner.
- K19: pit/post-hole ? (877). Half a rounded, steep-sided flat-bottomed pit, filled with 786, sealed by 788, cuts 812. Max. diam. ca. 30 cm by ca. 35 cm deep. Reasonably clear relationship to phase 2 horizon.
- K20: group of structural features (806a, 874, 889, 891, 895, 896). These are concentrated within the FA4 area and relate to the level 1 activity in this phase (see Fig. 12). They all cut alluvial sandy gravel 784, though they have been placed stratigraphically above the phase 2 horizon.
- 895: an ovoid, flat-bottomed hollow/pit (hearth ?), filled with 893 (though possibly different, as excavator remarks that the charcoally sandy fill within the hollow is looser and more porous). Ca. 45 cm x 60 cm diam. by ca. 14 cm deep. This is cut by a similar hollow (hearth ?) 896, with similar form, fill and dimensions. These sit in a localized elongated (WNW-ESE) depression in 784; the orientation of this clearly conforms with similar alignments of other structural elements within the quadrant. To the W of these hollows lies a scatter of stake-holes, 806a.
- 889: an ovoid pit/hollow under 866 pit, possibly cut by/partly under 893. Filled with 883, dark charcoally sand with clay and wood fragments. Uncertain function, though possibly industrial (?), 35 cm diam. by ca. 13 cm deep.
- 891: a similar ovoid hollow/pit under 893: similar function ?. Ca. 40 cm. diam. by ca. 7 cm deep.
- 874: an ovoid pit (post-pit/hole ?), under 785 and 788, filled with 864 black charcoally sand. Diam. ca. 20 cm by 16 cm by ca. 5 cm deep (possibly truncated). Function uncertain. These latter features lie on the fringes of the localized depression here.
- K21: group of structural features (771, 806b and c, 826, 866, 867, 880a and b, 881, 894). Concentrated within the FA2 and 4 areas; levels 2 and 3 of phase 3 (see Figs. 13 and 14). Consists of superimposed hearths and related features and deposits.
- 880b (Fig. 13): a concentration/spread of stones lying in mixed sands 876/879, on 893, sealed by 862. May be related to primary activity in relation to 880a (see below) or possibly debris from level 1 activity (hearths ? 895/896).
- 880a (Fig. 14): a concentration/spread of stones and small fragments of wood, some shaped, lying on 879, under 862. 879 is a mixed dark grey sandy layer, charcoal- and blue-grey clay admixed. Clearly defined area/limits, forming a subrectangular area, abutting 876, 881, apparently cut down into natural 784, though lying directly on compacted charcoally sand, 893. Extends W into FA2. Collapsed hearth/furnace?
- 881 (Figs. 13, 14): vertically-standing length of unburned wooden planking, cuts 784 natural, abuts/bounds 879, under 862. Aligned approx. WNW-ESE, ca. 90 cm. long by ca. 25 cm high by ca. 2-5 cm thick. Apparently supported on N flank by line of three stakes; three stake-holes, two bearing remains of stakes, unburnt. Structural element of 880a hearth ?. See also 771 below. May also be associated with 880b ?.
- 771 (Figs. 13, 14): up-standing right-angled lengths of wood, unburnt. Uncertain stratigraphical relationships, as found within area disturbed by pit 743. However, appears to cut natural 778. Abuts unnumbered layer

similar to 879 to E. Southern piece is ca. 10 cm long by 2 cm thick, aligned WNW-ESE. Western portion ca. 40 cm long by ca. 4 cm thick, aligned approx. NNW-SSE. Part of 880 hearth (?) structure ?.



Hearth/furnace K21 (880) in FA 4, looking W.

- 806b (Fig. 14): four stake-holes, cutting 876 and 879, two bearing remains of stakes.
- 806c (Fig. 14): two stake-holes, cutting small patch of charcoally sandy clay, with copper (?) fragments and neighbouring vertically-standing stone 870, which stands embedded in natural 784.
- 826 (Fig. 14): two large stake/post-holes, wood-bearing.
- 866 (Fig. 14): shallow pit/hollow with rounded base, filled with 814 charcoally clay-admixed sand. Subrectangular; ca. 22 cm deep by ca. 40 cm x 50 cm broad. Under 781, over 883, cut by 862 ? Uncertain function.
- 867 (Fig. 14): sub-circular/ovoid flat-bottomed pit/hollow, filled with 815 mixed charcoally compact clay. Stratigraphical relationships uncertain, though sealed by 780. Cuts natural 784, and also pit 890. May also cut outlying spread of 862, though uncertain. If so it should belong in level 4. 60 cm x 50 cm diam. by ca. 18 cm deep. Uncertain function (hearth or furnace?).
- 894 (Fig. 14): circular pit, rounded base, under 862 (?), cuts 876 (?) Incompletely dug; ca. 30 cm diam. by ca. 20 cm deep. Uncertain function.

- K22: group of structural features (806d, 865,782).
Level 4 of phase 3 in FA4 area.
- 806d (Fig. 15): six stake-holes scattered over area, cutting 862 charcoally clay admixed sand (clearly delimited area, lying WNW-ESE, under 780), and natural 784. One stake-hole lies under the wooden elements of 782, cutting 862 (?) while another lies within base of 865.
- 865 (Fig. 15): shallow subcircular pit, rounded base, under 780, cutting 862 ?, filled with charcoal/clay admixed sand, 861. Stake-hole in base. Uncertain function. Area of 862 immediately to S. of this feature bears localized concentration of clay elements. Ca. 55 cm x 55 cm diam. by ca. 11 cm deep.
- 782 (Fig. 15): subrectangular area, aligned WNW-ESE, of blackish grey charcoally sand bearing tiny silvery (metallic?) inclusions 781b, under and around a localized scatter of stones and large and small fragments of unburnt wooden planking. These elements appeared to lie over 862 and under 781 charcoal, and 811 and 697 hearths. Relationship of these elements to 780 not fully resolved. Appeared to be contained within 780 though may possibly have been cut down from over 780. However, 781 is a charcoal concentration and it seems more reasonable to associate it with 811 stones, which also lie over the wood of 782, which it should be noted, is unburnt. It is proposed that 782 was out of use by the time 781 was deposited.

The wooden elements, evidently collapsed, were in poor condition (water-impregnated and of a "cheesy" consistency), and could not be salvaged intact. They included two larger pieces of boards/planking, overlapping, the northernmost sloping gently to the south under a long board/plank bearing a large rounded perforation. The lowest level of this feature comprised the first piece of planking together with a scatter of peg-like lengths of wood and some small to medium-sized stones, including one of sandstone (sampled) lying under the plank. This plank measured some 20 cm x 30 cm, evidently broken off at its S end. The next level up comprised the largest length of planking, 20 cm x 70 cm, with its ragged off-centre perforation ca. 12 cm diam. (fortuitous or deliberate ?) and broken off at its SW end. One metal rivet/nail preserved herein. The uppermost level comprised two smaller fragments of planking, each broken off at one end and bearing a number of rivets/nails. Also more "pegs" and stones, two of which were thin flat soapstone/kleberstein slabs, one of squared form. All these elements seem to comprise the collapsed remains of a wood-and-stone-built structure, in all probability some form of hearth or furnace.

- K23: two pits and related stake-holes (909, 910, 911, 774): Fig. 17.
- 909: pit, sub-circular, steep-sided, round-bottomed. Cuts line and fill of K12 ditch. Gravel-filled (almost indistinguishable from fill of K12). Under 834 ?. 46 cm max diam. by ca. 50 cm deep. Possible post-pit ?
- 910: appeared in profile only (see Fig. 9). Probable sub-circular, steep-sided, round-bottomed pit with tapering base. Cuts line and fill (775) of K12 (in profile cuts 912; obscures line of K12 here). Gravel-filled (three distinct fills ?). Under 834, 847 ?. Max measured diam. 25 cm by 30 cm deep. Possible post-pit ? Contemporary with 909 ?
- 911: two stake-holes. Discovered on removal of fill of 909 post-pit. Cut fill of K12 ?. Small, ca. 4 cm diam., charcoal-filled. Opposed to each other on either side of 909 and K12. Depth not measured.
- 774: stake-hole ? Cuts 773 gravel, fill of K12. Under 850b. Rounded, ca. 6 m diam. by 28 cm deep. Contemporary with other features cutting ditch-fill ?

- K24: ditch-/gully-like feature (807): Figs. 16 and 17. Cuts 780, filled with 717b?. WNW-ESE aligned (though curves due E at easternmost extent), slightly irregular curvilinear gully. Variable width (ca. 15 cm to 25+ cm) and ca. 18 cm deep. Steep-sided, flat bottomed. Dubious feature, especially at either end of its length. May be illusory feature, possibly in fact constituting layer boundary between 780 and 785 ?.
- K25: post-hole (871): Figs. 16 and 17. Cuts 837 gravel, under 762 (which is "dished" into top part of feature ie. partially fills it), with primary fill of soft grey charcoally slaggy silty sand (ie. possibly out of use when 762 deposited over it). Large stone ring found in this primary fill. Feature also cuts 900, and is cut by 630, post-holes. Subcircular, deep, steep-sided post-pit: ca. 56 cm by 50 cm diam. by ca. 80 cm deep. N.B. This may in fact be the post-pipe of K14 post-pit. See discussion below.
- K26: pit ? (901): Figs. 16 and 17. Cuts 837 gravel, under 761 (which may be spread of charcoally slag-and burnt day bearing material from neighbouring feature 873 (K88) to N. Very uncertain feature, partly appearing in dug area. Possible ovoid (?) shallow round-bottomed hollow/pit, bearing waste material ?
- K32: stakes/flat stones (726). Stratigraphically, these have been placed in the next phase, though in all likelihood belong in phase 3, associated with clay/charcoal spread 785. Description under phase 4: see Fig. 18.
- K88: hearth/furnace (873 and 907): Figs. 16 and 17. Uncertain stratigraphical position. Possibly cuts 899 (? same as 849a); appeared under 651b. Only half of feature dug: half a subcircular (?) pit ca. 70 cm diam. by ca. 19 cm deep. Gently sloping sides, rounded base - bowl form. Very wellpreserved series of fills: very mixed coarse upper fill, full of slags and blue-grey clay inclusions (similar to 761 which filled 901 to S), also with much charcoal, brown sand and occasional wood frags. admixed. Under this a possible lining of soft, smooth-textured medium brown sandy clay with charcoal. Under this a more apparent lining of light buff brown sandy greasy clay, thick (ca. 2 cm), over thin band of grey silty sandy charcoally material, over a second intact lining of brown sandy clay, greasy. This feature in turn lies over, possibly truncating, a similar, though smaller (ca. 40 cm diam. by ca. 8 cm deep) ovoid (half-dug) hollow, possibly an earlier hearth in same location. This was filled with a greasy black coarse slag/charcoal-bearing silty sand 906. This feature is 907, classified under K88 also.

Dating

No dating evidence derived from these contexts.

Discussion

Despite the particular stratigraphical problems encountered in constructing this phase, it is probable that the broad pattern of elements reflects the first intensive and systematic building and industrial activity in Quadrant A.

The structural remains, relating to probable walling for buildings and their internal arrangements, establish the dispositions and alignments respected and repeated throughout the metalworking period. Particular problems arise in matching individual elements to each other to form a structural context for contemporary activities. Some suggestions, open to future revision, are outlined below: The broad pattern is suggestive of at least one elongated, partitioned

(?) building, or two adjoining buildings, stretching roughly NE-SW across the E half of the quadrant, the W extension only caught by excavation. An outlying structure may also lie to the NW.

We may have a (partial) sample of internal and external activities, and in addition, zones of differential activity. The building pattern is represented here only by a number of post-pits and a longitudinal ditch in the N half of the quadrant, while to the S similar elements are not so clearly observable. The only length of wood lies in 837 gravel. It is 869, a short length of poorly-preserved wood, of which only its WNW-ESE orientation may be noted as possibly significant.

The northern array of surviving building elements may not all have been in use at the same time. Nevertheless, in the N half of the quadrant two or three major lines of probable walling may be reconstructed. The most obvious is the line of K12 ditch, itself cut by two post-pits K23. To the N lies the cluster of post-pits K14, K15 and K25. As stated already K15 may have a long life-span (at least to phase 5), while K14 and K25 may in fact, on analogy with the form/character of K15, be parts of *one* post-hole ie. K14 is the gravel-filled post-pit, while K25 (soft grey charcoally silty sand) comprises the fill of the post-*pipe* therein. Whether treated as either one of two separate features the K14/K25 post-hole(s) can be confined to phase 3 in terms of active use. On analogy with phase 6's clearer structural alignments, it seems reasonable to suggest that the K14/K25 post(s) supported (perhaps in combination with K15 ? though see below) a now removed line of timber-walling stretching NE-SW at least from this point to align with, at right-angles to, the line represented by K12 (and perhaps the K23 post-holes ?). Note also that the topography slopes away immediately to the W. of this line. This, allied with the possible levelling-up with gravel 837, itself clearly limited in extent, may argue for the presence of one, or two quickly successive structures standing on a gravel platform at the highest part of F-site. The case for two structures in quick succession may be made by allying, for example, ditch K12 and K14/K25 post-hole(s) for the first structure, and K23 (K12 filled) and K15 post-hole for the succeeding structure.

Whether the NE-SW structural line can be continued to the very NE corner of the quadrant is not certain. The phase 2 horizon was not confidently traced here, though it does seem to appear in profile. A thin greasy charcoal-laden layer similar to 849a was traced, though under excavation it was thought to display enough discrepancy to warrant its own number (899). Thin laminations of grey-blue clay (903) occurred thereon, a characteristic not noted to the S. of what appeared to be some sort of vague boundary here (as marked on Fig. 11). This was a highly impressionable boundary, and may have been conditioned by the clearer division here in phase 3 where 837 gravel terminates. For the purposes of this report 899 has been correlated with 849a. Concentrations of waste material occurred here (slags, charcoal, burnt clay) and these spreads, 904, 905, 906, may well relate to activity connected with the wellpreserved hearth(s) K88 which seemed to cut 899/849a. These spreads, notably the blue-grey clay 903, seemed to lie also to the W. of a presumed extension of the NE-SW structural line here, so this activity could possibly have taken place outside the limits of a structure, whose NW corner is marked by K14/K25 post-hole. Certainly, in phase 6, the preserved length of timber terminated at this point.

The pair of post-holes (K13) lying to the NW of the quadrant may be reasonably correlated on basis of form and content. They also conform, in alignment, to the NE-SW orientation noted to the E. They have a different fill (packed with stones and slag) and are cut to a greater absolute depth than those to the E. However, they do have a gravelly primary fill within their post-pits. In addition, they may have been established and in use in either

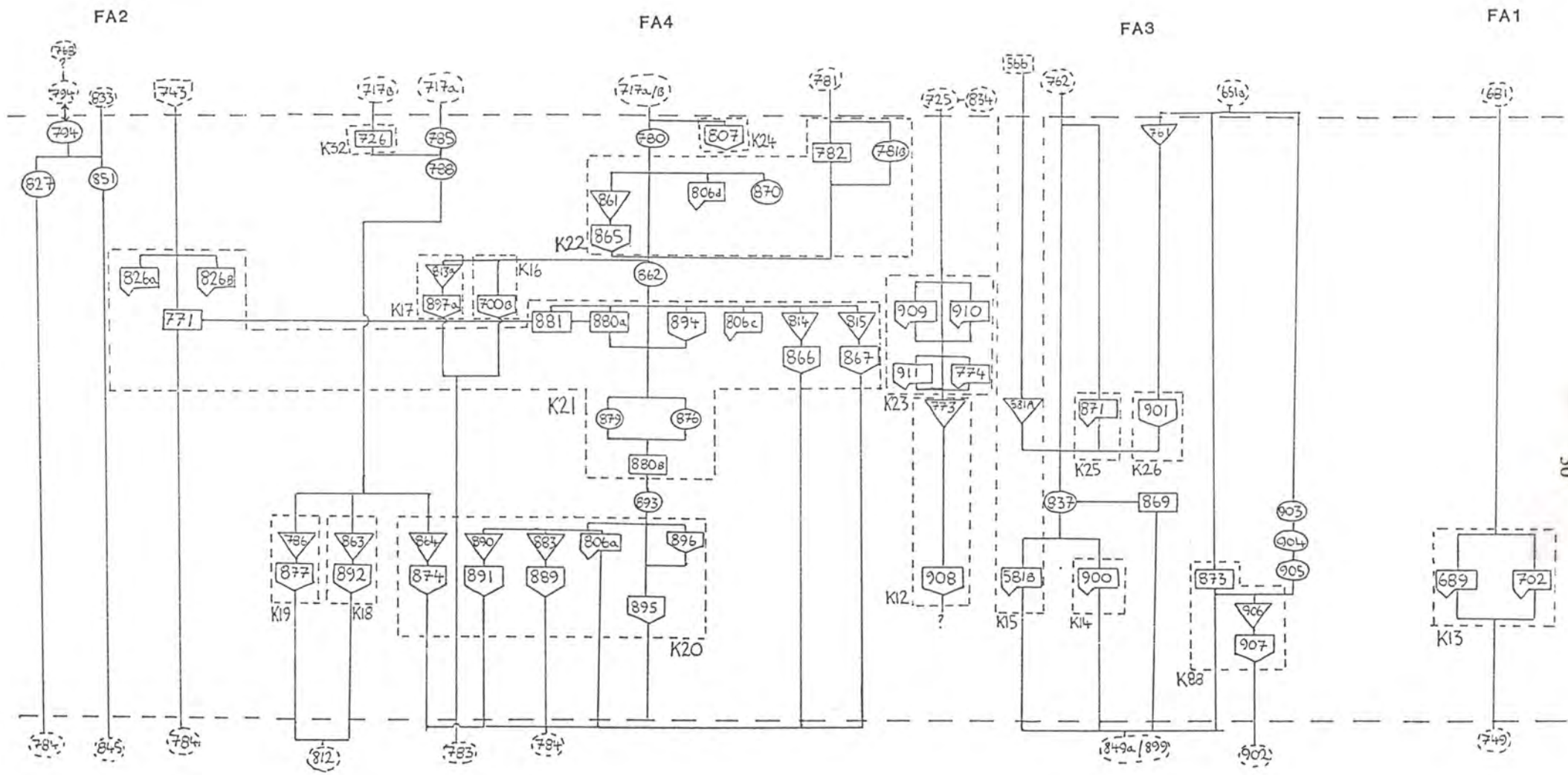
phase 3 or phase 4, or alternatively had a life-span covering the two. They are sealed by what appeared on excavation to be thick dumped deposits heavily-laden with coarse waste materials, and it was thought that this NW area comprised an open area to the W of the structures to the E. However, it may be that these post-holes may relate to either a separate, free-standing structure to the W neighbouring the E structures at this early stage and subsequently destroyed in some wider reorganization of the area, or perhaps an annexe to the main structures to the E, in the form of a covered "lean-to" or shed ? The former seems the more reasonable explanation, though it should also perhaps be noted that the southernmost post-hole in K13 does seem to align quite well with the line of K12 ditch, so perhaps some direct or indirect pattern or connection exists therein.

There has been severe disturbance, in antiquity, in the N half of the quadrant. Disturbance in the SE corner of FA1 where the proposed junction of the right-angled structural lines lies caused major problems, though in itself indicates intensive localized activity associated with the probable cutting and re-cutting of post-pits for successive structures. Likewise, pit disturbance has removed much "internal" evidence in the SE corner of FA3, so the lack of surviving hearths etc. should not be too surprising. Also, in contrast to FA4 to the SE of the quadrant, there is relatively little build-up of occupation/industrial debris, particularly in this phase. It has already been postulated that this results from subsequent disturbance and rearrangement of material, probably in the phase 5 restructuring, where phase 3's (and phase 4's ?) occupation debris has been largely removed or redeposited. The greater surviving build-up to the S of the quadrant can reasonably be explained by reference to the natural slope to the S whereby, in the process of levelling-up in subsequent phases, the deposits on the higher part of the site have been planed off, while to the S these have naturally been left more intact to achieve a better balance in height across the area. The early activity in the FA4 area caused a greater proportion of natural ground to be removed than to the N resulting in a lower "flooring" level than to the N, for which it must surely have become necessary to compensate at some stage. Also, this difference in scale and intensity of cut features between the N and S "interiors" may in some way relate to differential activity between discrete areas, though this is, as yet, a highly tentative observation.

It is somewhat difficult to tell exactly what kind of division the K12 line represents: a partition between rooms in one elongated structure, or the southern wall of a free-standing structure with its floor area to the N immediately juxtaposed to a neighbouring southern structure with its own separate floor area ? That the concentration of activity in FA4 to the SW appears to be taking place within the confines of a building, rather than in an open space, is possibly suggested by the consistent and repeated location of elements within a closely-delimited zone ie. superimposition argues for confinement. This sharply-defined area conforms, in its orientation, to the WNW-ESE alignment of K12 and the sandy/gravelly and clay deposits (788, 785) to the S (K16, K17 and K19 may represent post-hole remains). However, the substantial nature of K12 ditch resembles more a firm structural boundary than a slim partition. The question cannot be fully resolved at this stage, and will be further discussed in relation to subsequent evidence. Nevertheless, clear structural activity and zonation occurs to the E half of Quadrant A, and the activity in question is clearly of intensive industrial nature as shown, particularly in FA4, by the concentration of what can readily be interpreted as a succession of superimposed hearths and associated pits, post-/stake-holes and waste deposits. As stated the possible pattern of differential activity across the workshop area must be tempered with caution, especially in the light of comparative sizes of sampled area and the effect of removal of deposits in

antiquity. The "active" area in FA4 bears a tight succession of elements: in level 1 two intercut simple bowl-like hearths (?) truncated; levels 2 and 3 a timber-bounded (hearth ?) structure; level 4 the collapsed remains of a possibly partly timber-constructed hearth (?). Slags, clay, charcoal and metal fragments were found in association with all of these, which represent collectively a cluster of sequential metalworking levels ie. construction of hearth, use/production of waste, destruction, construction of new hearth etc.

Phase 3 therefore represents the first workshop activity in Quadrant A, the greatest proportion of which has survived in the SE area.



Quadrant A, F-site: phase 3 matrix.

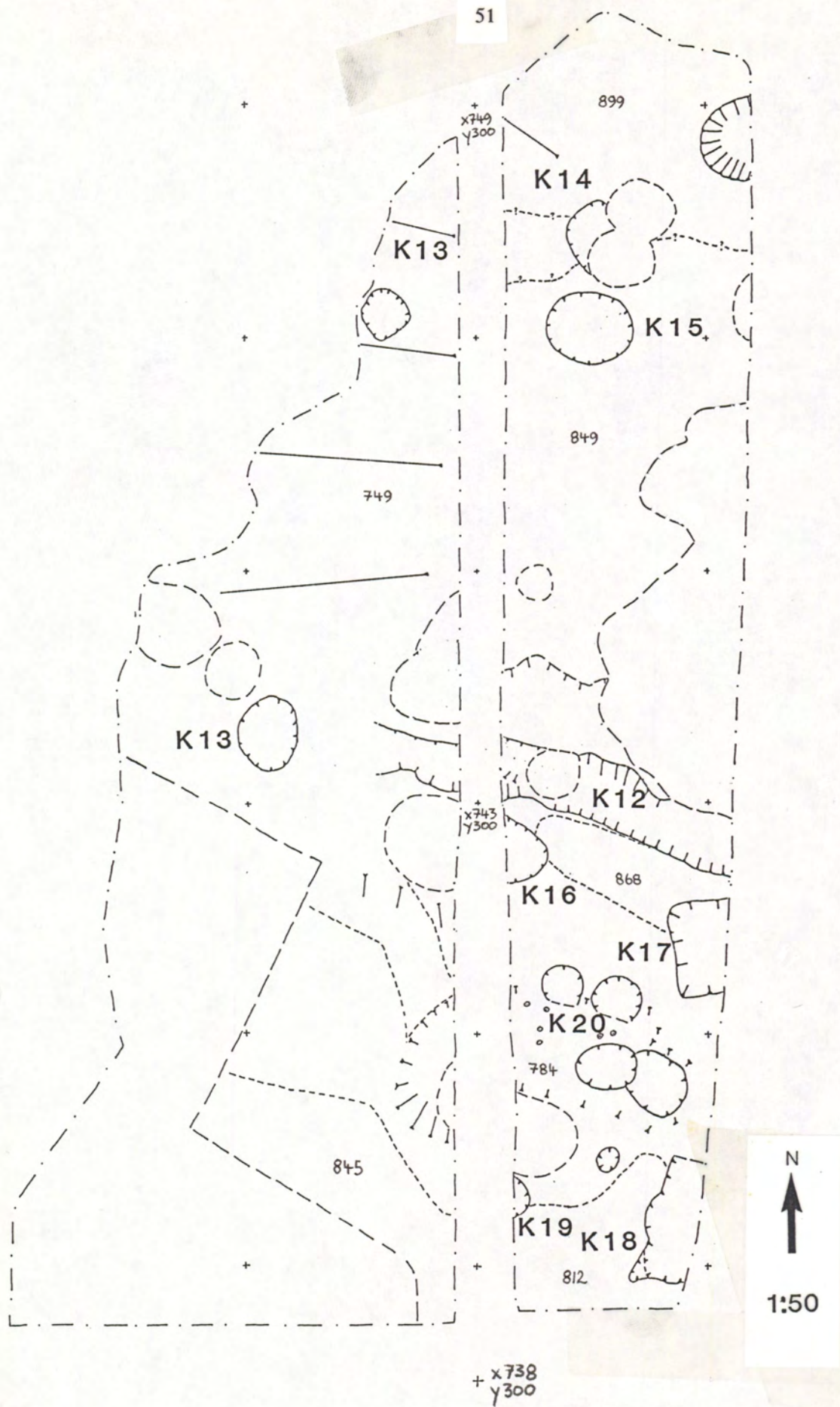


Fig. 12. F-site Quadrant FA: Phase 3; Level 1.

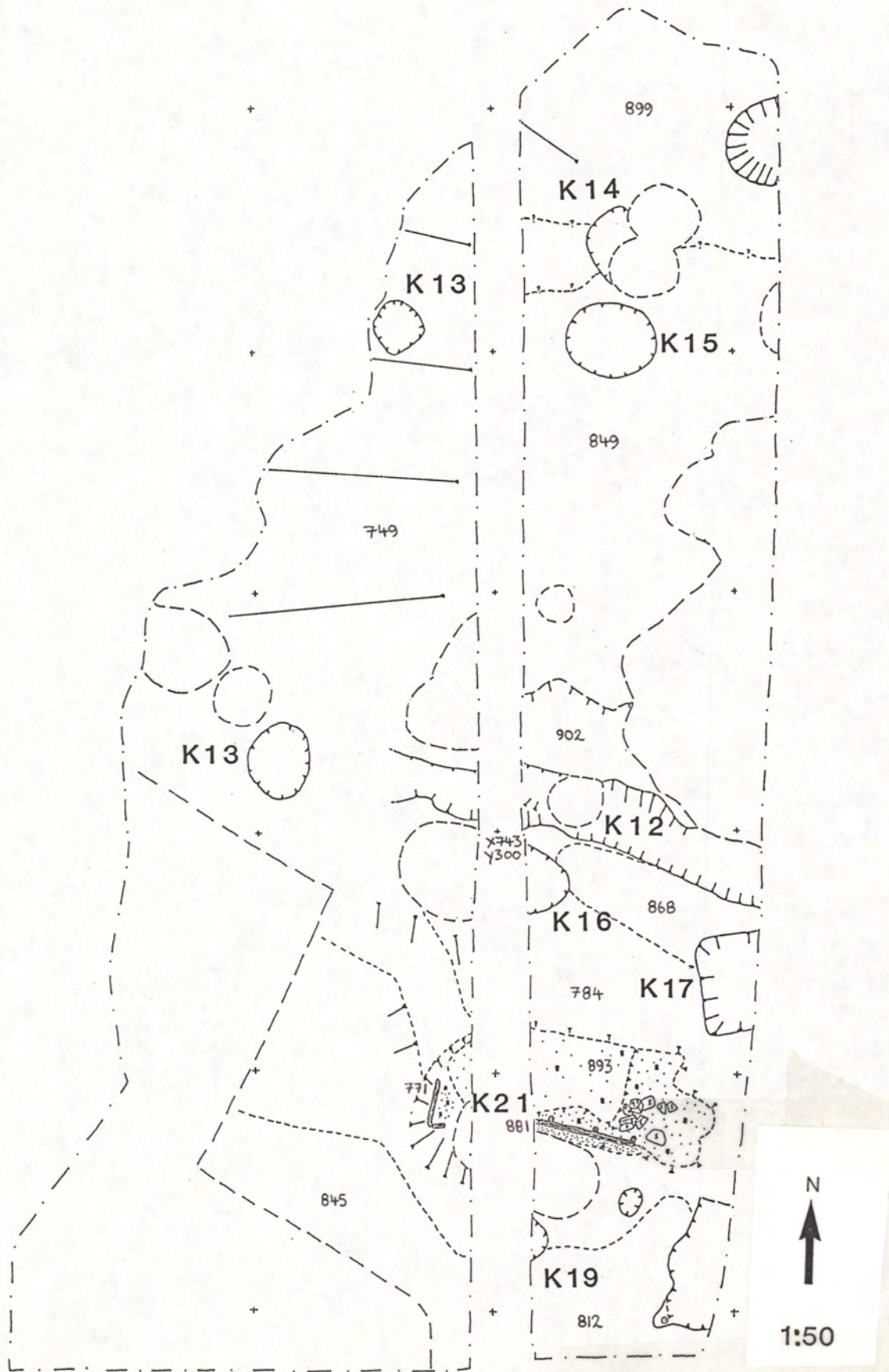


Fig. 13. F-site Quadrant FA: Phase 3; Level 2.

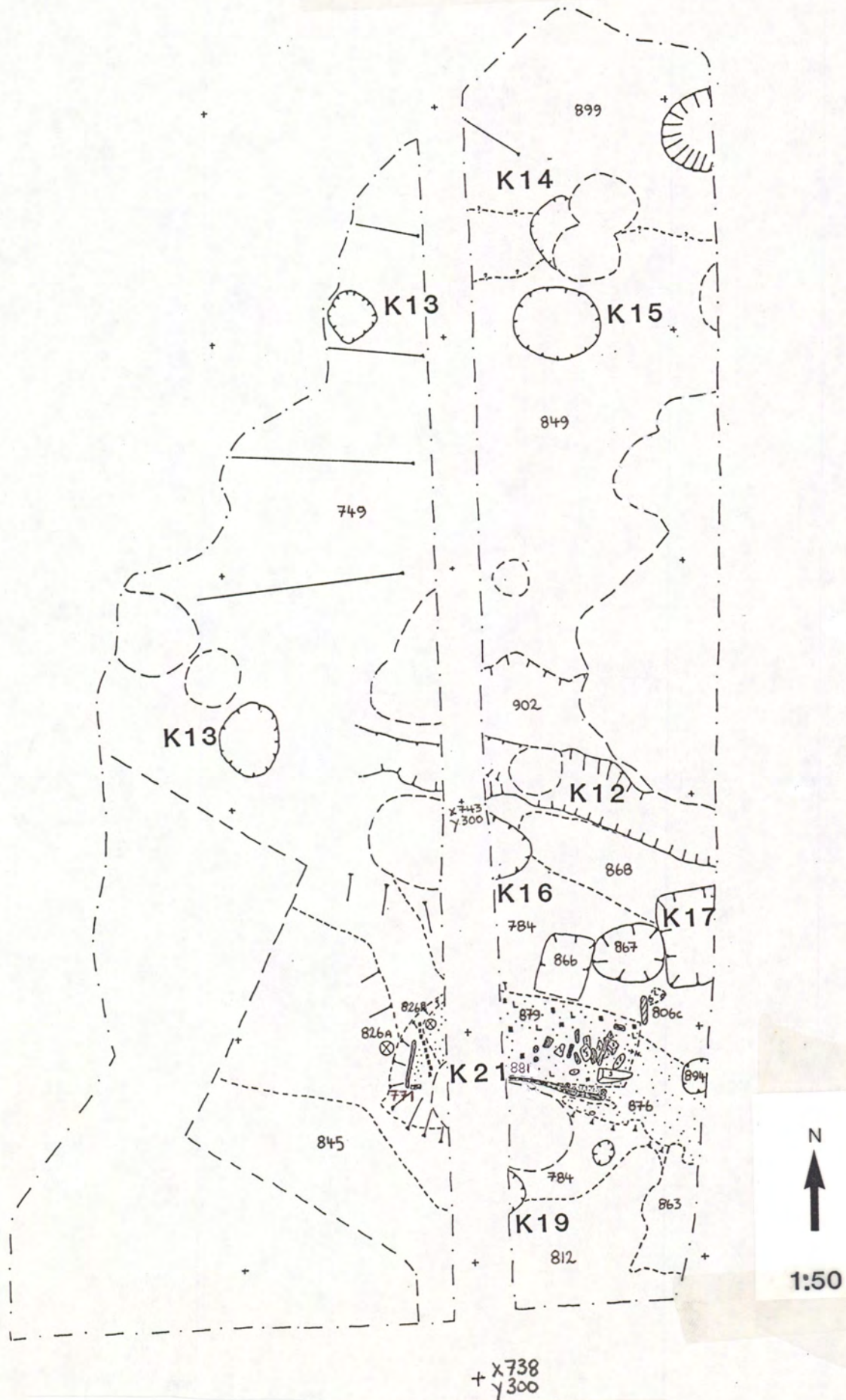


Fig. 14. F-site Quadrant FA: Phase 3; Level 3.

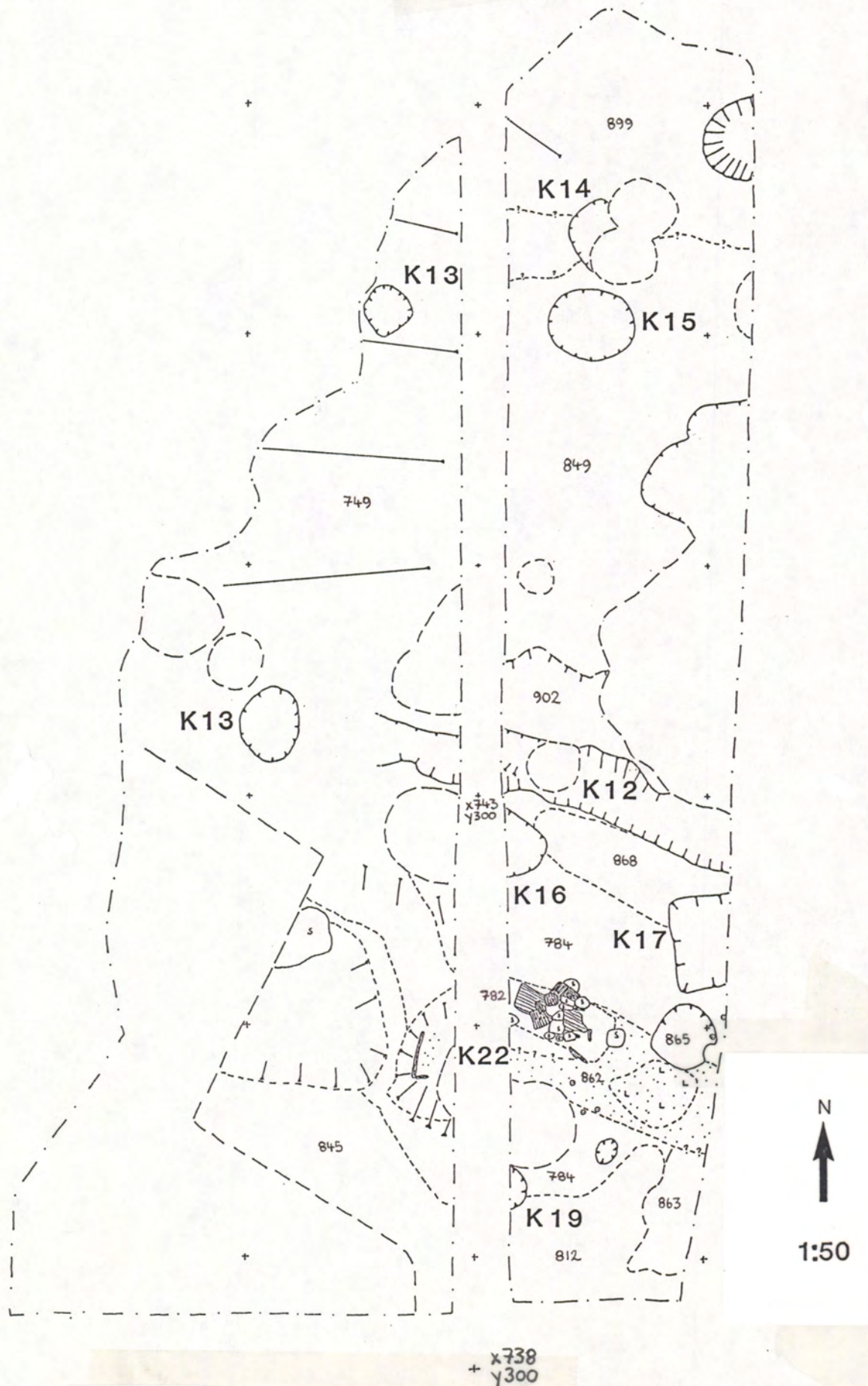


Fig. 15. F-site Quadrant FA: Phase 3; Level 4.

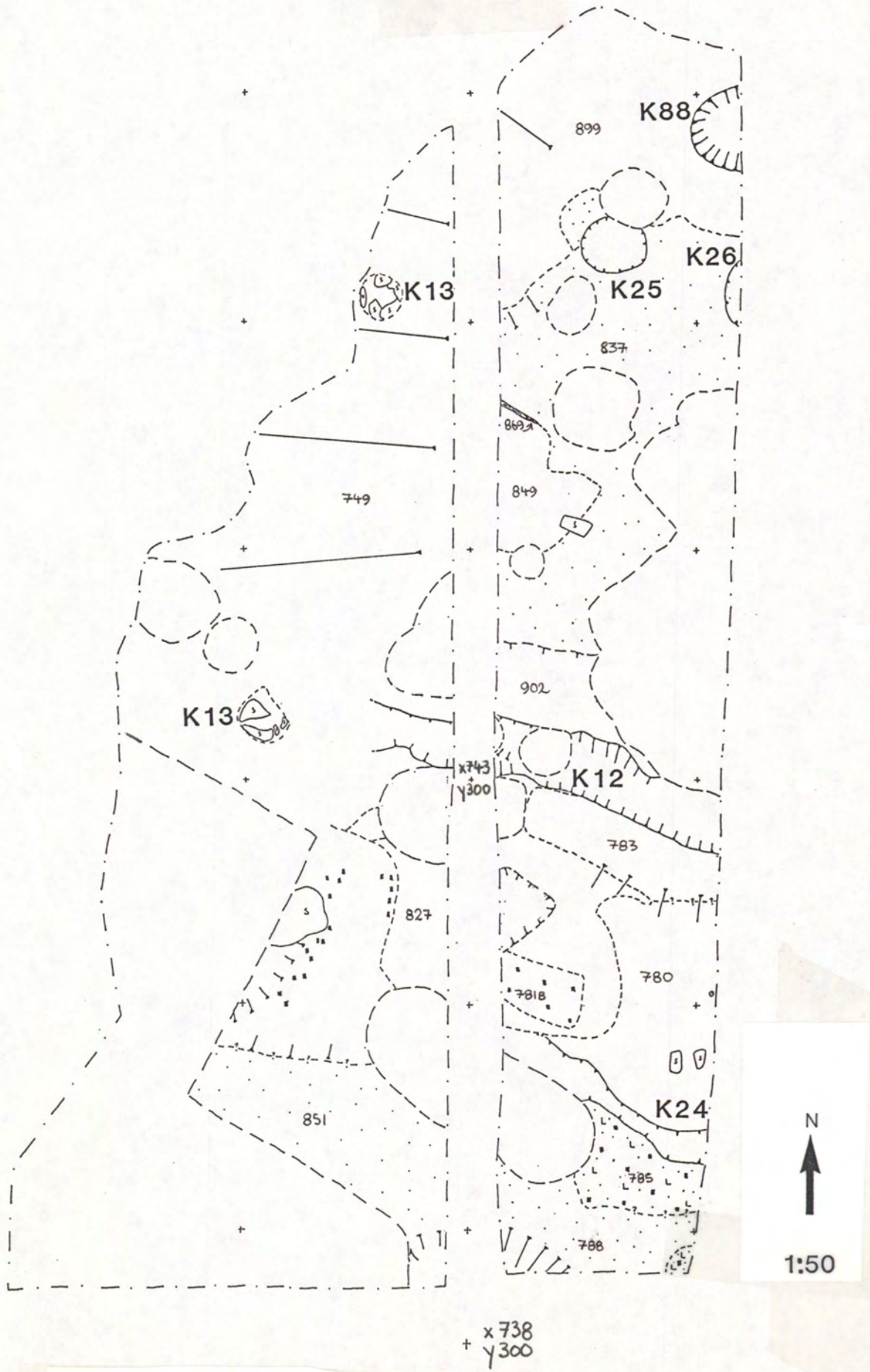


Fig. 16. F-site Quadrant FA: Phase 3; Level 5a.

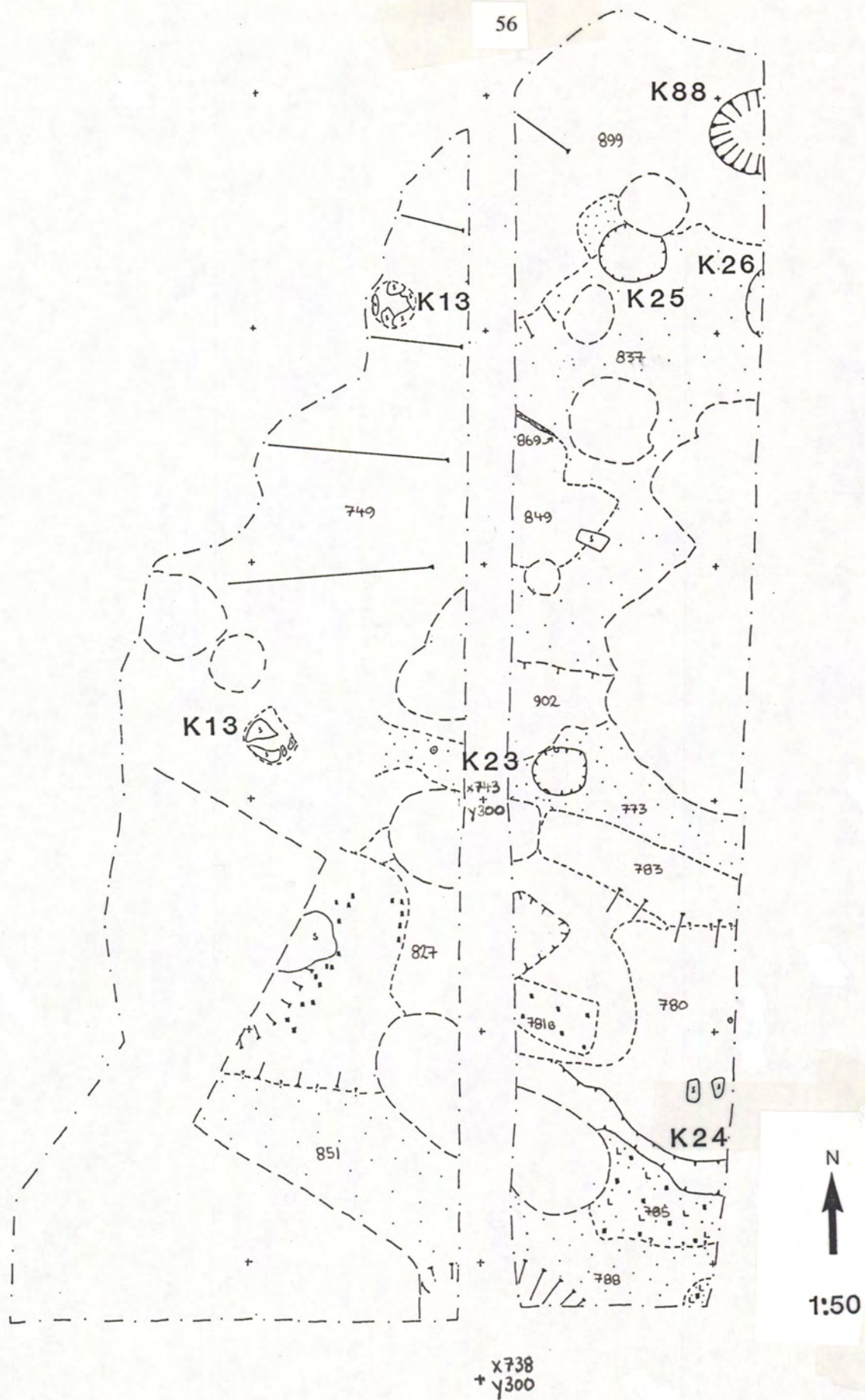


Fig. 17. F-site Quadrant FA: Phase 3; Level 5b.

3.7.4. Phase 4 (Figs. 18 and 19)

General characteristics.

Patterns of alignment and arrangement seen in the previous phase are repeated here, with new structural elements superimposed on some of the pre-existing lines. Again the greatest complexity occurs in the southern half of the quadrant, particularly in the FA4 area, and it is in relation to developments here that a new phase of workshop activity can be perceived. To the N of the quadrant the impact of differential clearance of deposits in antiquity might explain the persistence of certain elements established in phase 3. Two levels have been defined on plan: the first is essentially a construction level with related occupation, the second includes elements relating to destruction.

Stratigraphic discussion.

The range of elements in the FA4 area will be discussed first. Here, in level 1, two discrete areas of relatively clean gravelly sand occur (725, 834 to the N of FA4, and 717a to the S), separated by an area of mixed grey slag-/charcoal-/metal-bearing sandy material 780, which, although deposited in phase 3 seems to be re-used as a working-level in this phase. The gravel/sand areas 725 and 717a slope gently to S and N respectively, while 834 slopes to the N, and they clearly seal the phase 3 elements at these points. 725 seems to lie over 780 at one point at the SE edge of its extent. 725 and 834 may be the same layer essentially, although 834 was possibly of a slightly different composition, having perhaps a noticeably higher fine sand content and a lighter colouring. They are at least contemporary abutting deposits, on both of which lie the pair of large stone blocks 835b and a thin strip of wood 835a. These elements are all orientated in the characteristic WNW-ESE alignment. To the S 717a and 717b are sandy gravels, apparently abutting each other. However, 717b is a grey sandy gravel admixed with charcoal and perhaps should be regarded as part-and-parcel of activity on 780 towards the centre of this area. 717a, however, is another yellowish gravelly sand generally free of coarse inclusions (ie. charcoal, slag etc.), comparable to 725 to the N in composition and, notably, in orientation. These gravels have been laid directly over the layers and features assigned to phase 3. In level 2 725 is overlain by a sand/charcoal layer 723 which abuts a burnt plank (?) 724 which also lies on 725. A directly comparable pattern occurs to the S where 717a and 717b are overlain by a sand/charcoal spread 719 abutting/containing three separate fragments of burnt planking (?). To the centre of the area 780 (and 781b), in level 1, can be seen to be cut by a stone-filled hollow, which in level 2, is filled by a spread of dense charcoal 781 which may have some relationship to 723, though this is very uncertain. 717b may be associated with this also, though it lies under 719. Three distinct zones can be discerned within the arrangement of layers - the sandy gravels and structural elements to the N, mixed deposits and cut features to the middle, sandy gravel and possible structural elements to the S. Cross-correlation was, as usual, difficult to construct, but the pattern and tenuous relationships established seem to hold.

To the SW of the quadrant, in FA2, it was particularly hard to correlate confidently layers with the neighbouring arrangements. 833 was a thick deposit of gravelly sand clearly correlatable to 717a, though its E extension is not wholly clear. 795 here, a sand/charcoal deposit may readily correlate with 717b, abutting (?) 833. 768, lying over these deposits, seems to correspond to the charcoal/sand deposit 719 in FA4, though its extent to the N in FA2 and relationships with layers in FA1 are in doubt, and 827 and 794 may still survive here (cf. 780 to E).

In FA1 and FA3 the elements defined in phase 3 persist into this phase, the lack of any firmly identifiable widespread new deposits resulting either

from the relative longevity of the arrangements to the N, or the removal/re-disposition of pre-existing occupation deposits in phase 5 (as postulated in phase 3 discussion).

In level 2 a curving arc of material, 762/715-739 stretches over FA1 and FA3. This was a thickish deposit (though thinning rapidly to edges) of soft, grey, slightly greasy sandy gravelly material. It had a slight humus content, and had a fair content of waste elements (slag, charcoal, burnt clay fragments, angular stones). Its most notable characteristic was the inclusion of a fair proportion of small flakes/strips of birch bark, which tended to lie to the top of the layer. Stratigraphically it is hard to place, as it can be interpreted as comprising redeposited, or disturbed, occupation debris from phase 3-4 activity, which forms a component of construction relating to phase 5. It is not an *in situ* occupation deposit, but consists of a body of debris etc. reconstituted as possible make-up for the phase 5 structure here, perhaps raked up into a slight bank on the perimeter thereof and/or cut away by subsequent activity to the middle of the structure. The birch bark inclusion may result either from the destruction / collapse of some phase 3-4 element (walling or roofing ?), or may be debris from construction activity in phase 5 (trimming of wood etc.?). Two short parallel strips of unburnt wood and an overlying patch of charred wood, 872, lie to the top of the layer in a NE-SW orientation on the line followed by later timbers. 762 is dished into the top of K25 post-hole, so it is out of use by this stage. 762 is very similar in content to 802 to the S. (though 802 lacks birch-bark) which can be more readily interpreted as make-up for phase 5, so stratigraphically these two layers can probably be equated, and 762 belongs strictly in level 1 of phase 5, though I have also placed it, for the purposes of illustrating the derivation of the material, on the phase 4 level 2 plan (Fig. 19).

In the SW corner of FA3 lies a patch of blue-grey clay with a concentration of slags 836, sealed under 802 and lying on material 847, similar to 762. This area may constitute intrusive activity associated with the occupation of the structure here - perhaps an area of debris in the proximity of a former hearth ? This area provided some dating evidence (see below).

To the NW in FA1 the pair of post-holes K13 may still be in use. In FA3 K25 is sealed by 762, while K15 post-pipe is still present.

Layers in Phase 4.

FA1: 715/739 ?

FA2: 768 ?, 794 ?, 795, 827 ?, 833

FA3: 762 ?, 834, 836, 847

FA4: 717a, 717b, 719, 723, 725

Description of constructions (Figs. 18 and 19).

K27: aligned fragmentary wood and stones - walling elements (835a, 835b). At the FA3/FA4 boundary occurred two large unworked blocks of stone, roughly rectangular, spaced some 1,25 m apart. They lie on 725 and 834 sandy gravel deposits. To the NW in FA1 lies another stone of similar proportions, lying on 749 and surrounded by 739. When viewed collectively these stones conform to the WNW-ESE alignment noted in the previous phase's K12 orientation, are quite regularly spaced (ca. 1,25 m intervals), and, in the case of the two easternmost stones, are of similar relative height (that to the W is some 15 cm below the top height of those to the E, though there has clearly been greater disturbance in the vicinity of the former, and it may be noted that a smaller stone lies next to this, which may formerly have been placed on the larger stone to compensate for the discrepancy). It is suggested that the sizes and spatial arrangement of this row of stones are such as to allow their

interpretation as supports, possibly for a sill-beam, which is probably represented by the very fragmentary length of wood (unburnt), orientated WNW-ESE, lying at the base of 802 in 834. This group of elements clearly seals the K12 ditch in phase 3, and the K23 elements therein, and are in turn sealed by the dump/make-up deposits of phase 5, and represent remnant walling. N.B. See also K30.

- K28: pit (853). In FA2, sealed by 678, cuts 827? Fill, 854, grey soft sandy, charcoal etc.. Large steep-sided ovoid round-bottomed pit, disappears into profile. Ca. 85 cm diam. by ca. 40 cm deep. Uncertain function, hurriedly excavated.
- K29: hearth/furnace (897b). E half of shallow-sided hollow or "bowl" cutting (?) 780. Max diam. ca. 80 cm by ca. 30 cm deep. Lower fill of greyish yellow sand containing 5 large stones, evidently collapsed. Above these a lens of charcoal, 781, thickest to centre and bottom of feature, thinning to edges. Remnant collapsed hearth and ultimate filling: ie. charcoal from final process, or, from burnt planking associated therewith ? cf. 782 (K22) for example. Feature clearly post-dated phase 3 hearth 782 (K22); implies 780 re-used as work surface/flooring in association with this probable hearth/furnace.
- K30: burnt planking ? (724). Isolated patch of charcoal which displayed integrity of structure and has been interpreted as remains of burnt timber/planking. Disappears into profile in FA4. Lies on 725 sand/gravel, abuts 723 sand/charcoal spread. In closely comparable stratigraphical position to K27. Collapsed element thereof ? ie. burnt walling ? Ca. 70 cm by 40 cm broad by 3-8 cm thick. Cf. K31.
- K31: burnt planking ? (722). 3 separate patches of charcoal with integrity of structure - possible strewn fragments of burnt timber/planking. Lie to S of FA4, disappearing into profile. Lie on sand /gravel 717a, 717b. Remnant structural elements - burnt walling ? Largest piece ca. 90 cm long by ca. 2-8 cm thick. Stratigraphic correlation with K30 to N.
- K32: 7 stake-holes, one vertically-set stone, one flat-lying stone (726). To the S of FA4, in 717a and 717b sand/gravel. These diverse elements appear to form a unit, stratigraphically and possibly functionally. Each stake-hole (ca. 4 cm diam., round-ovoid) bore the rotted broken-off remains of a stake, unburnt. The flat angular stones (one set upright on edge, orientated WNW-ESE at junction of 717a and 717b), were neither soapstone/kleberstein or sandstone and were not obviously burnt. Although these features appeared in 717a/b they may in fact be elements surviving from activity prior to the deposition of the sand/gravel layers here ie. they may derive from phase 3 activity on 788, 785 being clay/-charcoal material deposited therefrom ? Certainly, the flat-lying stone rests on 778, and the lower parts of the wooden stakes may have been present/up-standing when 717a/b were deposited. These possibly collectively represent (collapsed) remains of some form of hearth activity.
- K33: arc of 3 stake-holes (720). Appeared in 719 sand/charcoal layer. Round-ovoid, ca. 4 cm. diam. by ca. 5 cm deep. Form an obvious half-circle/arc and may relate to a former structure lying adjacent to the N, cut away by a later pit here ?.

- K34: 3 stake-holes (721). Appeared in 719. Traces of wood up-standing in holes. Round-ovoid, ca. 4-6 cm diam.
- K35: pit/hearth ? (840). Portion of irregular hollow, flat-bottomed; possibly two inter-cut features. Cutting level very uncertain, as feature cut by 759b above. Possibly cuts 837 gravel (or maybe even 849a below ?). Ca. 30 cm deep. Flat angular stones at top of surviving fill which was full of usual waste debris - a mixed deposit of charcoal, sand, slag, lens of compact burnt sand/clay, with a basal layer of slag and charcoal and flat stones. Fill yielded an object of copper/bronze (?) - a double-ring form. Possible remains of hearth/furnace with destruction debris ?

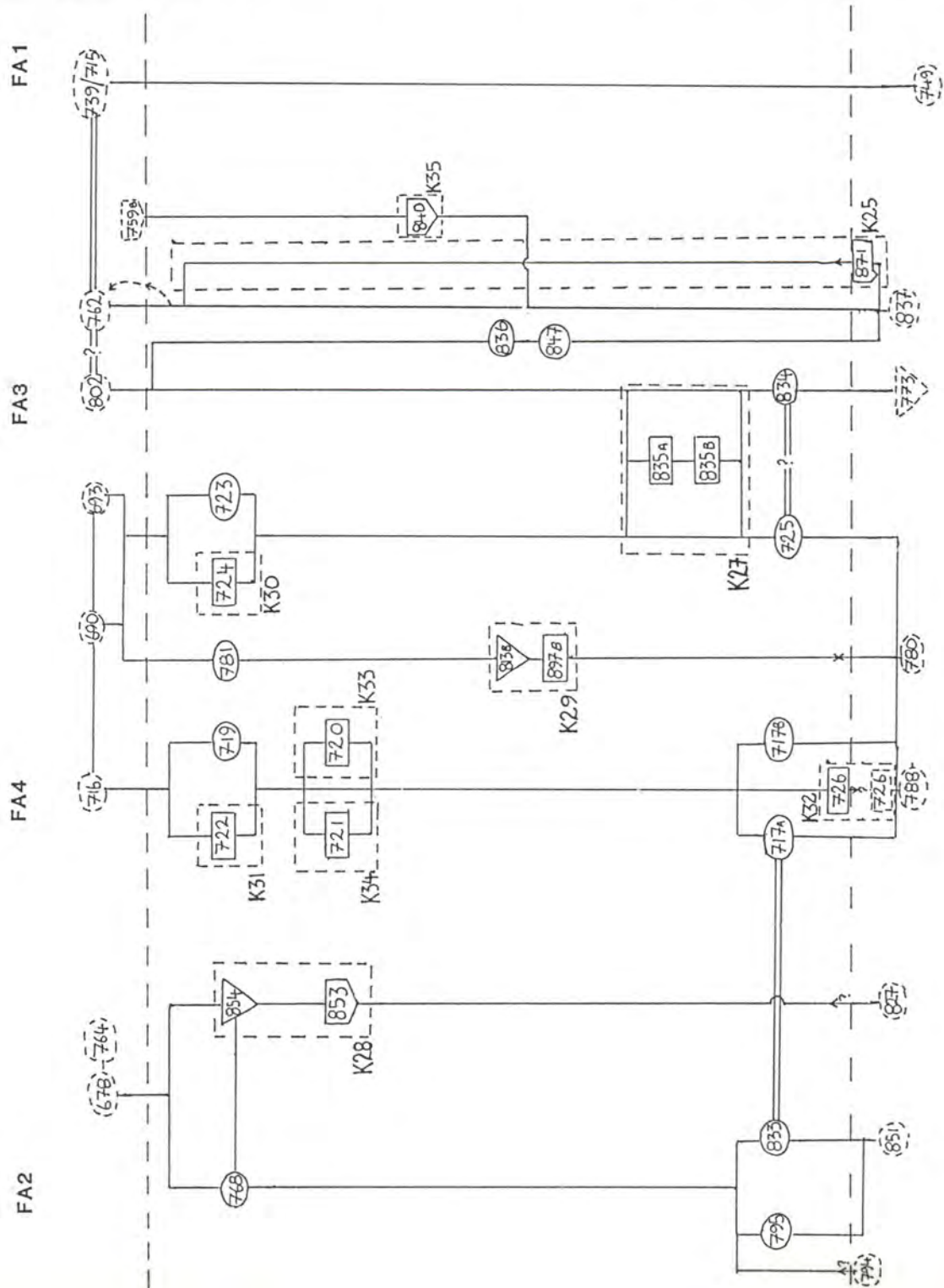
Dating

In the SW corner of FA3 lay a patch of thin blue-grey clay with a concentration of slags 836 sealed beneath 802 (phase 5) and 847, material similar in character to 762, though without birch bark. Although sealed by 802, this is not a firm context as the profile (Fig. 9) suggests that this area constitutes an intrusion cut from above 837 gravel, and perhaps higher. However, on the basis of its sealing by phase 5's 802 this has been placed within phase 4. 836 contained a single sherd of Scandinavian Blackware, dated broadly to the 12th and 13th centuries. This is the first such find from an early metalworking context in Quadrant A, though its wide date-range offers only a broad insight into the time of deposition, probably within the active life of the phase 4 structure, the context probably deriving from its occupation.

Discussion.

This phase sees the establishment of the second workshop in the metalworking period. Continuity of alignment of structural elements on pre-existing lines is striking, though some new forms of structural activity occur. Whereas in phase 3 the WNW-ESE structural line/division between FA3 and FA4 is characterized by a ditch and subsequent post-holes, in phase 4 a spread of thickish (ca. 10 cm) clean gravelly sand has been deposited as make-up for a probable wall-line comprising three evenly-spaced pad-stones supporting a fragmentarily preserved possible sill-beam. Part of a similarly orientated thick spread/body of clean gravelly sand lies to the S of FA4 (and FA2). Intervening is a body of waste-bearing material, cut by the remains of a probable hearth/furnace, and this area constitutes the slightly sunken (in relation to the slightly higher-standing gently sloping spreads of gravel to N and S) work surface/flooring area, activity taking place on pre-existing deposits (ie. no attempt appears to have been made to establish a new body of material as flooring). These elements form the level 1 construction/occupation elements. Level 2 shows occupation/destruction elements. The clean gravels are sealed by grey sands heavily mixed with charcoal, which may comprise spreads of waste/occupation debris, or layers resulting from the destruction of structural/walling elements. To the S of FA4, immediately to the N of the clean gravel spread, a number of features relating to possible hearth/furnace activity occur. In close stratigraphical relation to the charcoally sand spreads occur, to N and S of FA4, two isolated areas of burnt timber. It is tempting to equate these with collapsed portions of burnt walling, as they lie on the gravel make-up within the charcoally sands, and can be tied into the characteristic general structural orientation. Whether these constitute portions of walling collapsed inward from the (in the case of the northernmost) wall-line represented by the pad-stones and sill-beam, and to the S. from a wall-line on the gravel spread here, thereby forming part of a single structure stretching from N to S of the quad, or alternatively, elements of a separate self-contained structure lying only in the FA4 area, is a difficult question to unravel clearly. Although, in

this phase, no clear in-situ occupation deposits or features survive to the N and NW of the quadrant, post-hole K25 may form a structural element of a NE-SW structural line, while 762 comprises phase 3-4 occupation debris deposited within a structure in FA3, though redeposited/raked up in phase 5 and therefrom sealing the post held in K25. Heavy disturbance at the probable junction of the NNE-SWW and WNW-ESE structural lines has obscured events here (just to N of K28).



Quadrant A, F-site: phase 4 matrix.

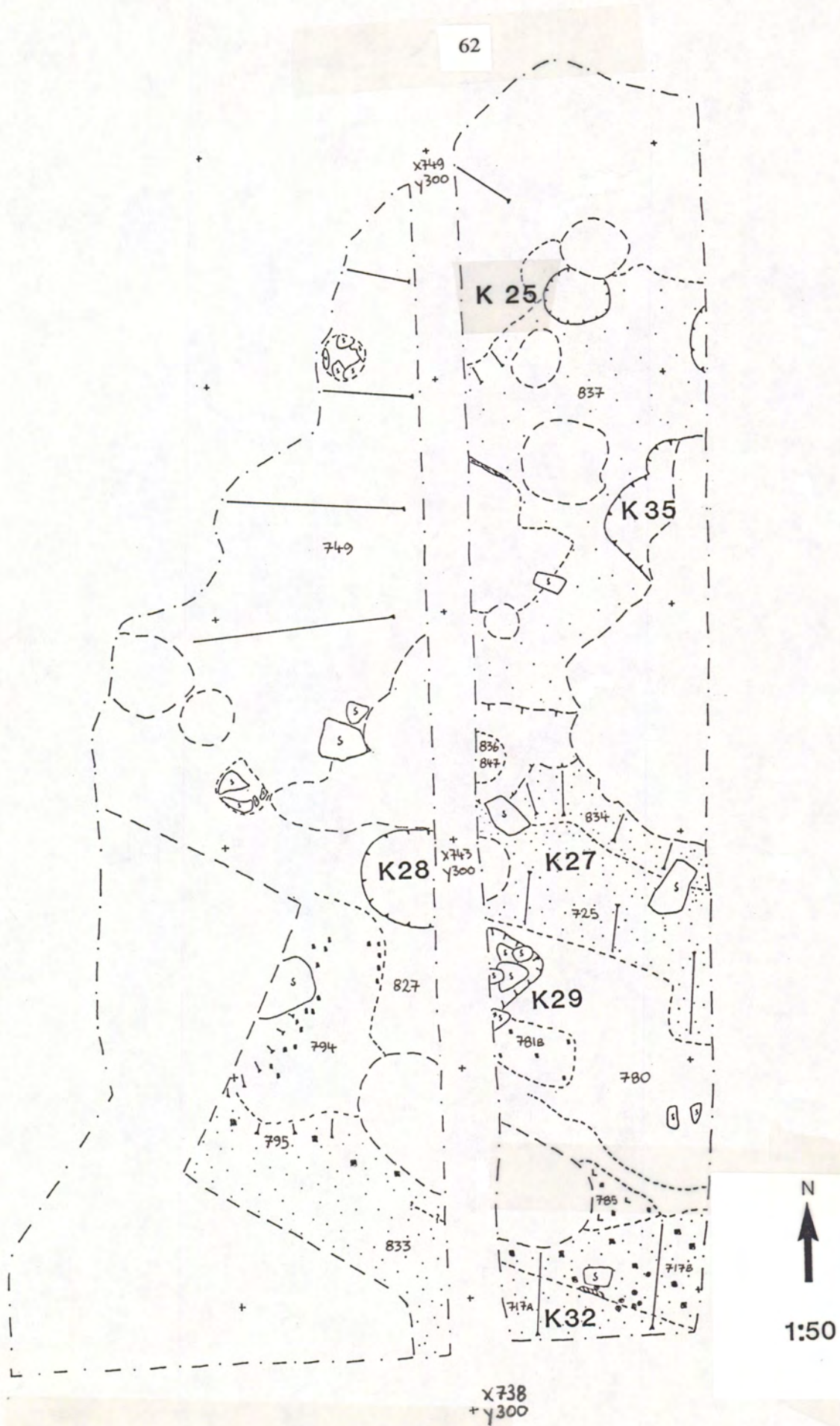


Fig. 18. F-site Quadrant FA: Phase 4; Level 1.

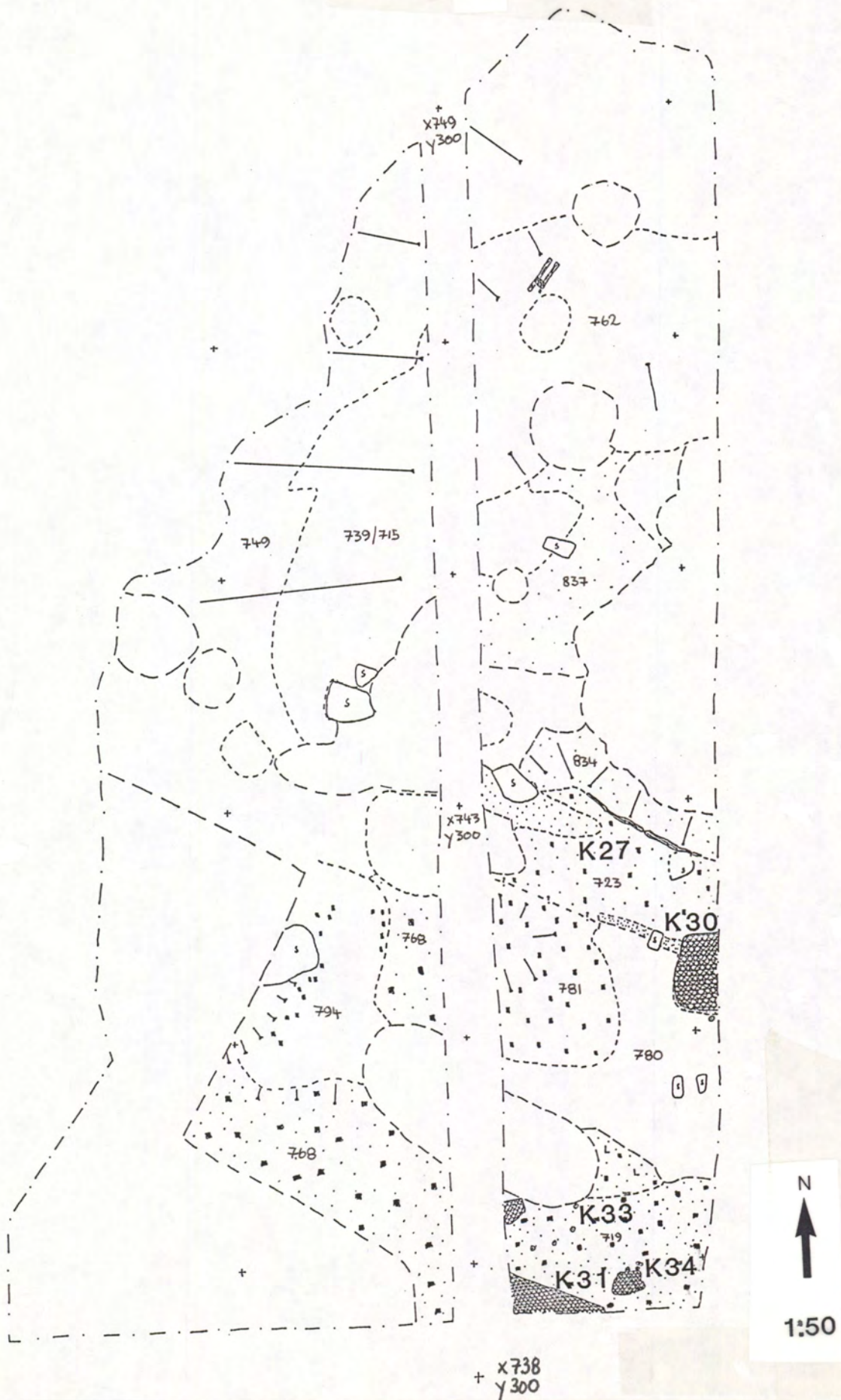


Fig. 19. F-site Quadrant FA: Phase 4; Level 2.

3.7.5. Phase 5 (Figs. 20-22)

General characteristics.

Fresh deposits and structural elements on the established alignments mark a new phase of workshop activity. The right-angled WNW-ESE/NNE-SWW walllines in the N half of the quadrant can be discerned enclosing an area of intensive pit and post-hole activity, while to the S further hearth/furnace activity takes place within rather more ambiguous limits. The phase has been divided into three levels, levels 1 and 2 showing construction/occupation activity, level 3 the related destruction elements.

Stratigraphical discussion.

In FA3 762 (same as 715/739 in FA1) forms a thick spread, thinning to edges, of slag etc. - ridden soft sandy material and with a notable content of birch bark fragments. This has already been discussed under the previous phase; it appears to constitute a spread of redeposited or rearranged occupation debris from previous activity utilized in this phase as possible make-up for the new structural arrangements herein. The birch bark may originate from collapsed walling or roofing, or may be debris from construction activity on this surface (see also K38 below). Laid directly on 762, or cutting it, is a discrete spread of fine, slightly gravelly pebbly sand (redeposited beach-sand ?) with some charcoal, 635: possible make-up/levelling-up material. Traces of a concentration of pits and post-holes herein testify to intensive activity taking place above this surface. This did not extend W into FA1 (although 838 sand in FA1 is the equivalent of 635 in FA3, it did not extend for any recordable extent beyond the profile bank). Neither 762 or the layer above it to the NW, 651b/688 (a compacted grey gravelly sand with slag, charcoal etc.) bore intrusions other than the deep post-hole 630 (K36). Above 635 sand lay a thick body of greasy dark grey-black very charcoally clayey sand 740/754 and above that 637, a grey sandy coarse deposit, and 579, a laminated dark-grey clayey sandy gravelly deposit. All these may be regarded as spreads of material related to occupation/activity taking place above 635 sand (ie. associated with K37 pits etc.) and sealed by the probable destruction layer of dense charcoal 753 to S. and by walling timbers in phase 6, 566.

Charcoal 753 possibly extends into FA1 as 681, though this relationship is far from certain, and the full extent of 681 to N and S was not precisely determined.

To mid-quadrant, orientated WNW-ESE lie a series of deposits probably relating to a wall-line, lying on the previously noted alignment. In FA3 a "bank" of material 802, very similar in character to 762 (though lacking birch bark), slopes to the N. Heavy disturbance in FA1 obscures its possible W extension. This abuts (?) the spread of yellow-brown gravelly sand 693, which extends NNW into FA1 as 850b. This slopes gently both to N and S in FA4, and probably constitutes a spread of make-up established as a foundation for structural elements, the possible burnt remains of which overlie these deposits ie. 753 dense charcoal and 878 (K24) burnt planking in FA1, 692, 808, 775 (K43) burnt planking in FA2 and 4. Similar arrangements occur to the S of the quadrant where 716/764 grey charcoally gravelly sand is overlain by possible collapsed burnt planking 765 and 809 (K44). Between these burnt elements, and lying beneath them stratigraphically, lies, in FA4, a thick deposit of dark grey mixed charcoally sand and gravel, with blue-grey clay inclusions, which is possibly the same as 763 to the W in FA2. 763 appeared to abut 764 in FA2, while 690 abuts the gravelly sand 693, and mixed material 716 in FA4. It therefore seems to represent a near-contemporary deposit, accumulated between these limits. Lying within 690 in FA4 is an area of probable hearth/furnace activity represented by 697 (K39) and associated layers of charcoal, clay, burnt

sand etc. 696 and 779. K39 seems to have been placed directly above the previous phase's hearth structure at this point. 690 bears some stones which may have derived from K39's destruction. Lying over 690 to the NW of FA4 is a spread of compacted clay and charcoal 698. To the N a similar spread 691, though with laminations of yellow sand, lies over 693 gravelly sand and under the burnt timber 692 of K43. To the S of FA4 further spreads of charcoal/clay lie on 716 (which is quite similar in content to 690) - these are 694, 695 and 718, the last two lying under burnt planking 809. 718 and 695 comprise grey/-black clay compacted and heavily contaminated with charcoal, while 694 is less compacted with a greater sand content, some burnt red in patches.

Layers in Phase 5.

FA1: 681, 688, 715/739?, 850b

FA2: 763, 764, 776

FA3: 579, 635, 637, 651b, 740, 753, 754, 762?, 802, 824

FA4: 690, 691, 693, 694, 695, 696, 698, 716, 718, 779

Description of constructions: Figs. 20, 21, 22.

K36: post-hole (630). Subcircular, deep post-hole, filled with 631 soft grey sand admixed with some slag and angular stones, and some wood fragments. Fill appeared below collapsed fragments of 566 (phase 6), though post-pit widened under 580. Uncertain cutting level - greatest dimension appeared in 651b and 762, and may cut either. Max diam. ca. 55 cm by ca. 30 cm deep.

K37: concentration of pits and post-/stake-holes (633, 634, 759a, 759b, 816, 817, 818, 819, 820, 821, 822, 823, 839). These features appeared clearly on exposure of the spread of fine yellow-white gravelly sand 635 in FA3. However, these probably represent the lower portions of features cut from a higher level whose edges appeared obviously only in contrast with 635. The deposits over 635 (740 and 754) comprised a near-black greasy charcoal-laden body of material in which the similar fills and extents of these features could not be readily distinguished from each other.

633: portion of a shallow hollow, subcircular ? Max diam. ca. 60 cm, ca. 5 cm depth surviving. Cut by 667. Filled with greasy concentration of charcoal in sandy/clayey greasy matrix. Uncertain function.

634: portion of shallow hollow, subsquare - subcircular ? Filled with heavy charcoal concentration in sandy/clayey greasy matrix. Uncertain function. Ca. 6 cm surviving depth.

759a: portion of sub-ovoid, bowl-like pit. Filled with much metalworking debris - burnt and unburnt sandstone and kleberstein (soapstone), metal fragments, brown and blue-grey clay pieces, slag, gravel, in a dark grey soft clayey charcoally matrix, similar to 754 and 740. Ca. 20 cm deep. Cut away by 532, cuts 759b. Uncertain function - possible waste pit, or former hearth/furnace filled with debris post-use ?

759b: portion of subsquare hollow/pit, filled with dark grey soft charcoally sandy material, very mixed, with slags, clay, stone etc. Also yielded two sherds of shell-tempered pot (see Dating). Within fill a portion of wooden stake preserved in SW corner, and possible burnt stake in NW corner (see 816). Max. breadth ca. 65 cm. Cut by 759a, cuts and seals 840. Uncertain function - waste pit, or former hearth/furnace filled with destruction debris ?

- 816: two stake-holes, in fill of 759b: lie at opposed corners of 759b pit. To SW a stakehole ca. 5 cm diam. by 23 cm deep, containing decayed surviving portion of wooden stake. To NW a more doubtful feature - a shallow circular area of charcoal ca. 6 cm diam. Burnt stake ?
- 817: post-hole ? 11 cm deep: rounded ca. 18 cm diam. Straight-sided, flattish base. Charcoal-filled.
- 818: post-/stake-hole ? 12 cm deep: rounded, ca. 9 cm diam. Charcoal-filled.
- 819: two stake-holes, in sides of hollow/pit 820, exposed on removal of fill of 820. That to S charcoal-filled, ca. 7 cm deep by 4 cm diam., ovoid. Neighbour to SE charcoal-filled, ca. 4 cm deep by 2 cm diam., ovoid. Fills indistinguishable from that of 820.
- 820: ovoid hollow/pit bearing 819. Shallow-sided, bowl-like base (indented). Filled with charcoal in clayey greasy matrix (754). Large square stone block, resting on 837 gravel abuts to S. Diam. of hollow ca. 60 cm by ca. 45 cm, depth ca. 8 cm. Uncertain function.
- 821: ovoid hollow and stake-hole ? Neighbouring 820 a small ovoid shallow hollow with rounded bowl-like base: diam. 25 cm by 18 cm; depth ca. 5 cm. To W a very shallow ovoid hole, diam. 10 cm by 4 cm; depth ca. 4 cm. Both features filled with greasy clayey charcoal (754). Uncertain function.
- 822: Three stake-holes, in 823 pit/hollow: 6 cm, 4 cm, 2 cm deep respectively; 2-3 cm diam. Charcoal-filled (indistinguishable from fill of 823). Placed round perimeter of 823.
- 823: portion of ovoid shallow pit/hollow. Cut by 667. Filled with greasy clayey charcoal 754. Diam. 40 cm by 45 cm; depth ca. 5 cm. Contains 822, stake-holes. Uncertain function.
- 839: line of three stake-holes. Appeared as voids in 635 and 837. Ovoid, ca. 3-4 cm diam. Depths (from N-S) 55 cm, 7 cm, 8 cm respectively. Sealed by 754.
- K38: large pit with post-holes (770a). A heavily disturbed feature, the lower portion only surviving, though was observed at S to be cut from 802. Composes a subsquare (?) pit, straight-sided, flattish bottomed. Filled with dark grey sand/clay material heavily admixed with charcoal, blue-grey clay inclusions, fragments of worked stone, slag etc. Fill removed as one, though comprised differentiated series of compact and loose variations of dark grey charcoally sand with gravel mixed with clay and usual coarse elements to a depth, where less disturbed, of ca. 60 cm. A number of larger blocks of stones lay towards the base, which sloped gradually from N-S. In the base three medium-sized, and one smaller, ovoid stake-/post-holes, filled with charcoal. The larger holes were ca. 9 cm diam. by 50-60 cm deep, the smaller ca. 4 cm diam. These lay at each corner of the feature, which is orientated NNE-SSW. Immediately to W, at a relatively higher level, though also cutting 802, lie one post-/stake-hole of similar dimensions and alignment to those found in base of pit, and one smaller stake-hole, -7 cm deep. The larger hole is subsquare in plan, ca. 5 cm x 4 cm. The pit is a substantial feature, with a breadth NE-SW of ca. 1 m. The straight edges and the presence of corner posts suggest the possible use of some form of a stabilizing lining (no remnants survived), perhaps wattle or birch bark ? (762 layer to N contains fragments of that material). The contents of the pit suggest use as a waste pit for metalworking debris. Sealed by 753 charcoal spread.
- K39: concentration of stones - hearth/furnace (697). Area of flat angular stones, mostly soapstone (kleberstein), with one sandstone or chalk (?)

example. Most lay flat and overlapping, though to the S edge stood one upright-standing stone. Some examples to N and S also sloped gently to middle. To SW a patch of sand. Tumble of stones lay under a concentration of charcoal, ash and partly red-burnt sand, much grey-blue clay, slag, 696 - the final fill/destruction deposit ? Around the area of stones within the layer 690, a further associated mixed layer, grey-black sandy, with blue-grey clay, sand, burnt sand, charcoal and ash, 779. The feature encompasses an area of ca. 80 cm by 80 cm, and represents the collapsed remains of an industrial hearth/furnace composed of large stones, a collapsed superstructure of clay (?), and a patch of sand at edge for placing moulds or crucibles ??



Collapsed hearth/furnace K39 (697) (in FA 4) looking W.

- K40: subsquare pit (667). By virtue of the character of fill, this feature was located at slightly higher stratigraphical level to other features (K37), and seen to cut 823 and 633 thereof. A characteristic subsquare, flat-bottomed pit (cf. 759b), ca. 70 cm by 70 cm in breadth, by ca. 15 cm deep. Filled with soft brownish grey gravelly sand with large proportion of admixed (and also patchy concentrations) large charcoal pieces. Some blue-grey clay inclusions and metal fragments. Base was a hard compacted gravel (837). SE corner indented/notched. Feature probably cuts clay/charcoal spread 740/754, though clearly sealed under 566 wood of phase 6. Uncertain function.
- K41: post-hole ? (755). Rounded post-pit to top, becoming rectangular lower down. Cuts 754. Filled with grey gravelly sand, 637? Diam. of round portion ca. 30 cm; rectangular portion ca. 20 cm by 15 cm breadth.

Depth: ca. 37 cm. Structural element ? Accommodated rectangular-sectioned post ?

- K42: burnt plank/timber (878). Length of heavily burnt wood, lying flat on 753 charcoal layer under 511 unburnt wood. Orientated WNW-ESE. Ca. 1 m long by 10 cm broad. Collapsed element of walling ? Cf. K43, K44.
- K43: burnt planks/timbers (692, 775, 808). Four separate, though stratigraphically correlated, patches of consolidated charcoal/remnant burnt planking ? All orientated WNW-ESE. 692, 808 lying on sandy gravel 693 and clay spread 691, 775 on 850 sandy gravel. 692 substantial: ca. 1,70 m max. length by 50 cm max. breadth; 808 two portions ca. 30 cm and 25 cm long by ca. 10 cm max. breadth; 775 ca. 65 cm long by ca. 40 cm max. breadth. 692 slopes gently to N, the others gently to S 775 punctured by stake-hole (?) 774. Collapsed portions of timber walling ? Cf. K42, K44.
- K44: burnt timbers/planking (809, 765) - (context 765 also includes stake-hole). Two discrete patches of consolidated charcoal, remnant heavily burnt planking ? 809 lies on 718 clay/charcoal spread to S. of FA4, while 765 burnt plank and neighbouring stake-hole lie on/cut 764 charcoally sand. 809 ca. 40 cm max. length by ca. 16 cm max. width; 765 ca. 26 cm. max. length by ca. 8 cm max. breadth. These are orientated approx. WNW-ESE. 765 stake-hole partly filled with wood to a depth of 7 cm. Rounded, ca. 5 cm. diam. Burnt planking comprising former structural elements - collapsed walling ?
- K45: three, possibly more, intercut pits (770b). These are very ambivalent features, both in form/function and in stratigraphical position. They were dug together with 770a; their fills were so similar, however, that their relationships to each other and to 770a could not be precisely established. However, they are either filled with 579, or sealed thereby, and were seen to cut 802, so they belong to this phase of workshop activity. They contained mixed dark grey clayey sandy material with much waste debris - slag, charcoal, sand, large stone fragments, metal etc. Uncertain function.

Dating

Three sherds of English shell-tempered pottery were found in contexts relating to this phase. Two came from the fill of 759b pit, while the third derived from 579 layer, the topmost in a series of spreads of waste-bearing probable occupation deposits. These sherds provide a broad date range for deposition : C12th to C13th.

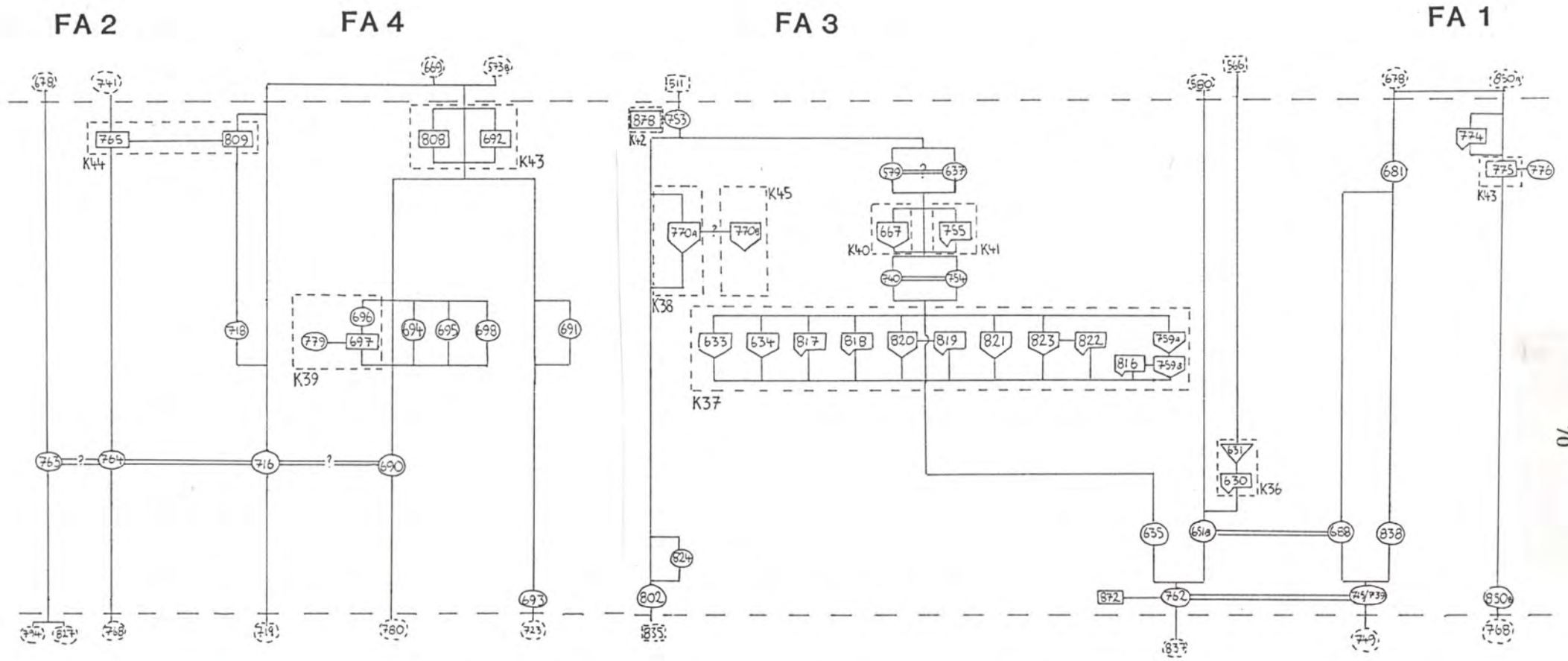
Discussion

The pattern of elements familiar from preceding phases is repeated here, re-emphasizing the impression of continuity in structural lay-out between episodes of activity.

One difference, however, lies in the greater amount of evidence for probable "interior" activity within the structure lying to the N of the quadrant ie. the K37 cluster of pits etc. in FA3. This structure's outline/walling is probably represented by K36 post-hole to the N and the WNW-ESE arrangement of gravels/make-up and collapsed burnt timbers to mid-site, forming a structure lying roughly along the NNW-ESE axis. 762 possibly represents the construction level thereof, the sweeping arc perhaps constituting a platform of redeposited make-up, and 635 sand the levelling-up for the new flooring/acti-

vity levels thereon, rather less extensive in extent and probably contained within re-established timber walling, the only traces of which occur in their destruction and collapse. The survival of the "interior" may result from a decreased necessity, in phase 6, for clearance/levelling-up of the N half of the site, broad cross-quadrant parity in levels (at least between FA3 and 4) having been achieved by the clearance in FA3 at the beginning of this phase. The features in K37 are less obviously hearth/furnace structures than the series of hearths/furnaces found to the S in FA4. They are filled with waste debris, or exclusively charcoal, and may have served different functions, though they may have been more thoroughly dismantled in antiquity. Also only their lower portions have survived in most cases. The two subsquare pits 667 and 759b constitute a form exclusive to this area and phase. The deep waste-filled, probably formerly timber-lined, pit 770a is a substantial structure, and, in its orientation, seems to respect the general pattern of alignment, and its presence within the up-standing limits of a workshop seems a reasonable assumption.

To the S in FA4 a single hearth/furnace structure (K39) occurs, apparently laid almost directly over the previous phase's hearth. It should be noted, as possible support for the impression of differential clearance in antiquity to achieve cross-site levelling-up, that K39 hearth and associated waste deposits (690 etc.) have not been laid on fresh levelling-up deposits such as that represented to the N by 635 sand, but rather laid directly on pre-existing deposits. 690, and the patches/pads of compacted clay charcoal may represent spreads of material from activity relating to hearth/furnace K39, spread out within the possible structural limits represented by the burnt timbers to N and S thereof. Again, it is very difficult to establish whether the K39 hearth/furnace and associated deposits lie within a separate S room within one elongated structure, or within a separate free-standing structure. That rearrangement of elements seems to occur synchronously across the site may argue for a partitioned elongated workshop lying across the quadrant from NE to SW. To the N and NW where the layer 651b/688 lies, there is less evidence for intensive structural activity, and this layer, a compacted gravelly waste-debris bearing deposit may constitute a trampled area lying open outside the structure, which represents the third workshop phase in the metalworking period.



Quadrant A, F-site: phase 5 matrix.

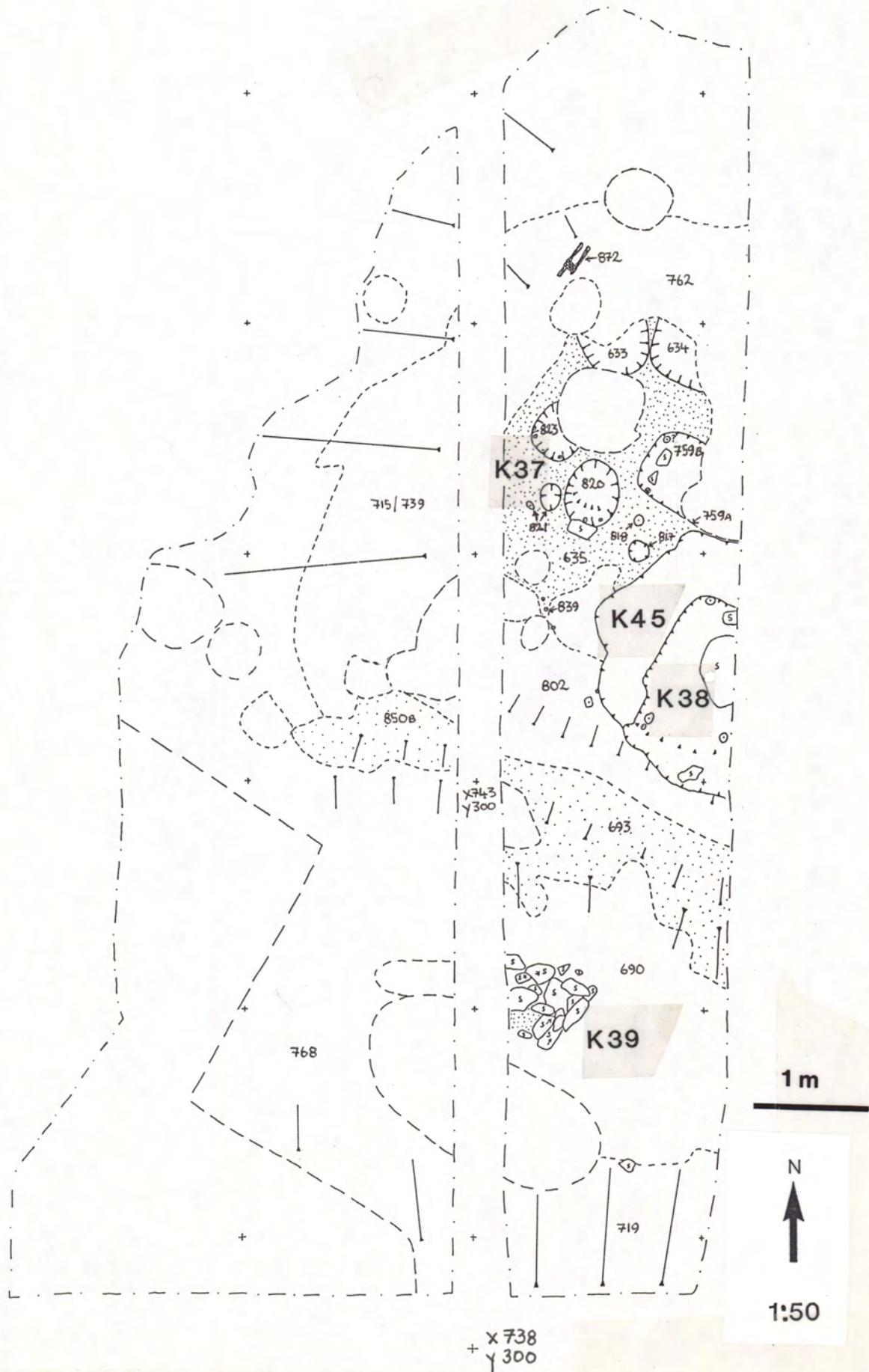


Fig. 20. F-site Quadrant FA: Phase 5; Level 1.

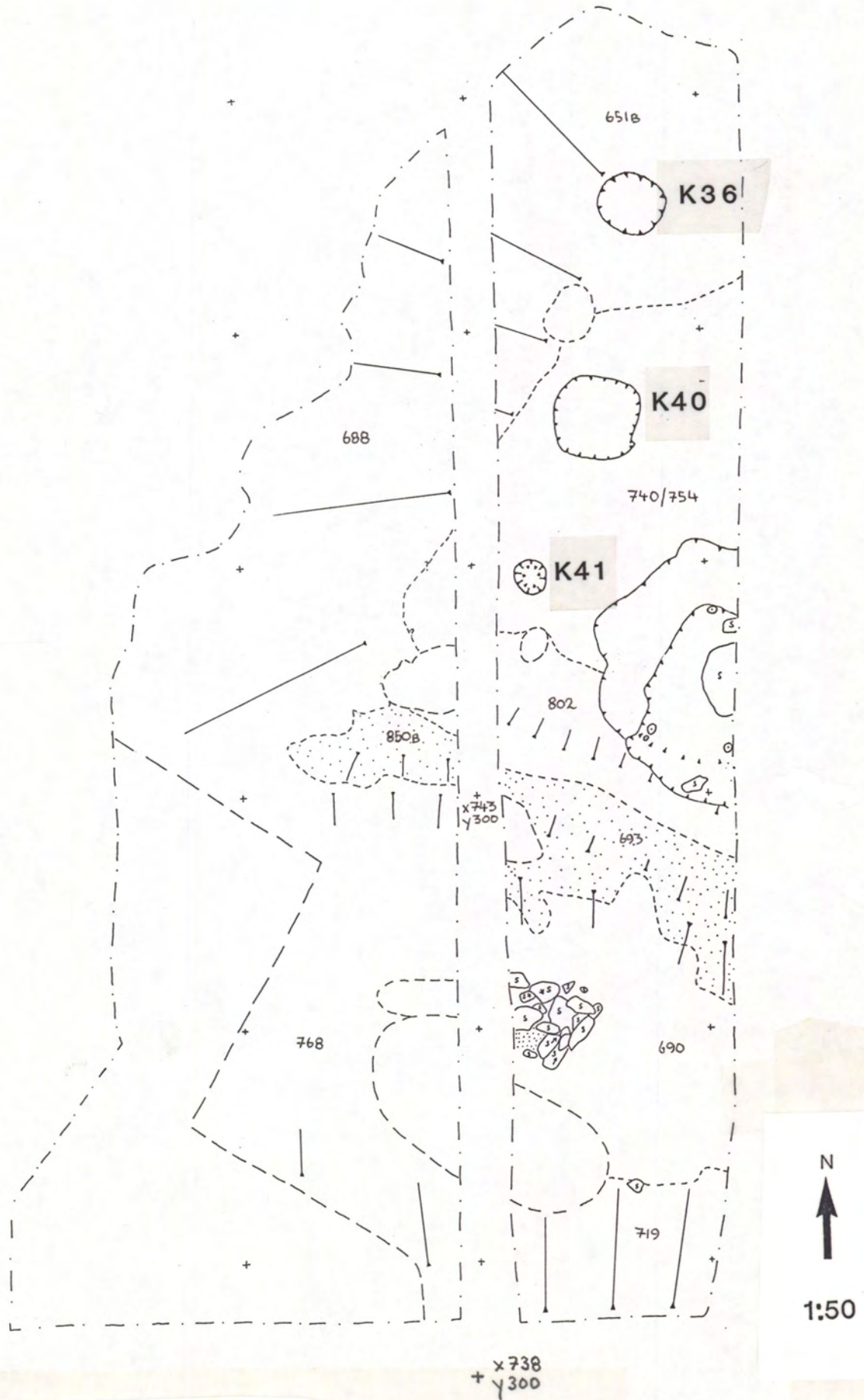


Fig. 21. F-site Quadrant FA: Phase 5; Level 2.

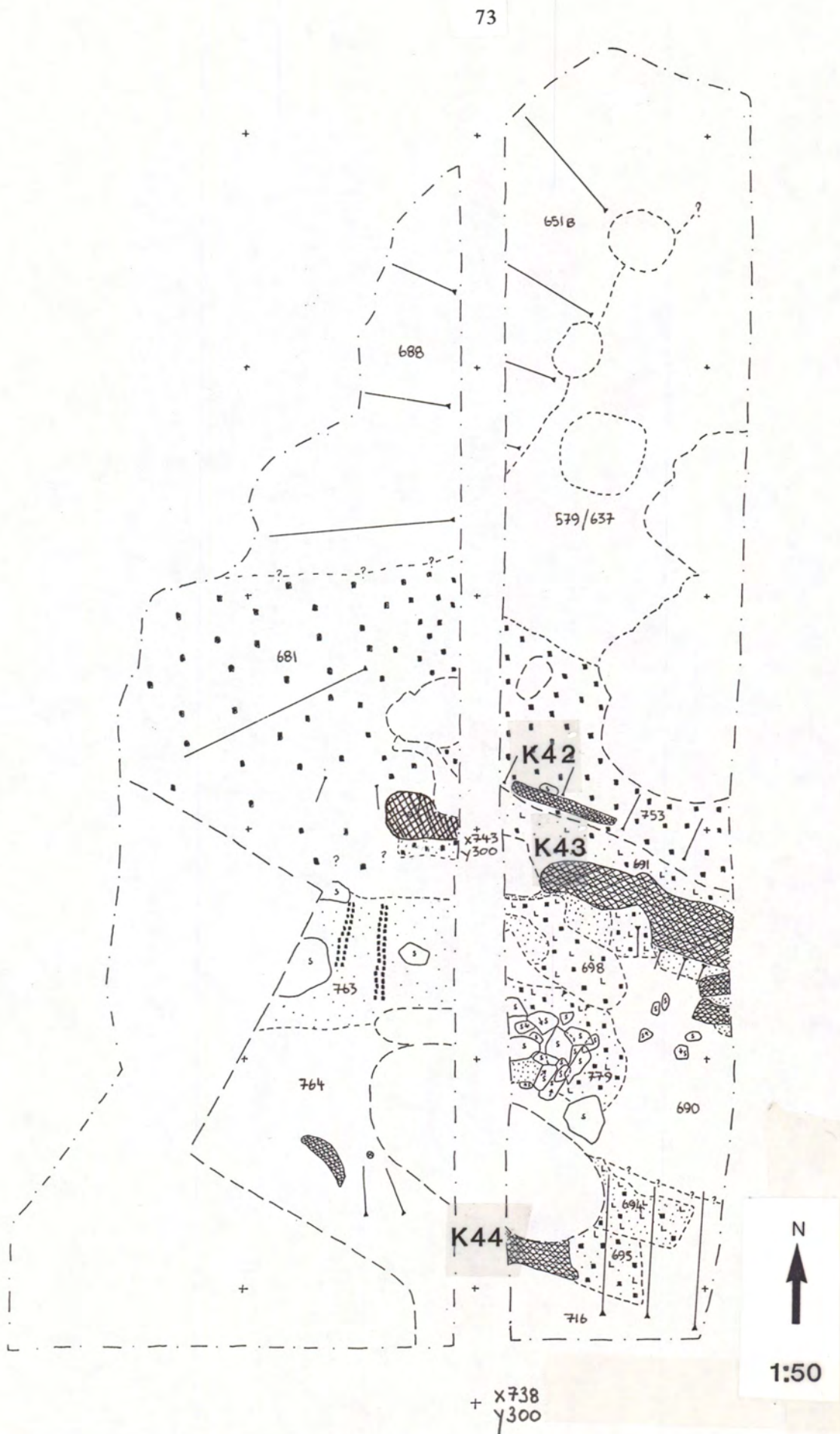


Fig. 22. F-site Quadrant FA: Phase 5; Level 3.

3.7.6. Phase 6 (Figs. 23-29).

General characteristics.

New structural elements appear on the pre-existing patterns of alignment. The phase is characterized by rather more emphatic evidence for walling, particularly in the NE part of the quadrant, where a number of regularly aligned timbers survive. Some evidence for internal arrangements occurs to the NE, though again the most complex surviving arrangements lie to the S., where there is continued hearth/furnace activity. Also, for the first time, a significant complex of superimposed elements, notably thick spreads of clay, appear in the SW part of the quadrant. Some slight evidence for aligned walling elements also occurs here.

The phase is highly complex and has been subdivided into 7 levels representing superimposed episodes of activity within the broad limits of the structural pattern.



Phase 6 workshop structure, southern half (in FA 3) looking W.

Stratigraphical discussion.

Level 1 (Fig. 23): a level showing elements relating to the construction of a new building, or buildings, on the pre-existing pattern. To N and W in FA1 and 3 a spread of gravel, relatively clean, 580/653 seals the compacted grey gravel 651b/688. It is of limited extent, thinning and sloping to W and NW, though forms a thicker bank of material, flat-topped, immediately beneath two (or possibly three) parallel timbers (K46). All these elements are orientated NNE-SSW. The fills of two post-holes cut from lower levels appear in the gravel and under the wood. The E length of wood lay partly on greasy

charcoal 740 and 579, while that to the W lay wholly on gravel 580. As these elements were the first to appear after machine clearance and the hurriedly excavated first trial trench across the area, corresponding problems in understanding relationships occurred. It has not been easy, for example, to decide whether the E timber has been laid deliberately on the 579-740 layers or has collapsed thereon, perhaps from an upright position. The wood is unburnt, sealing layers heavily contaminated with charcoal.

Due to heavy disturbance in the SE corner of FA1 in the area of post-hole K48 it was always difficult to correlate layers and features. However it seems reasonable to suggest that K46, K48 (wood-filled post-hole) and the fragmentary line of parallel timbers K47 lying on gravel 573b/850a comprise a unit of contemporary structural components, K47 and K48 having common sealing contexts. However, 573b/850a gravel appears to have been cut down into pre-existing contexts, while 580/653 seems to have been banked up on previous layers. As with K46, an element belonging to K47 appears to lie on a heavily burnt layer, in this case 753, and the same problem of whether this has collapsed or not occurs. This has implications for the interpretation/assignment of possible occupation levels within the interior of the building represented by the timbers.

To the S in FA2 and 4 a number of new deposits and features occur. 669 is a debris-filled layer whose N extent and relationship to 573b is uncertain though I have interpreted it as a new occupation deposit abutting 573b which cuts the previous phase's 692 and 693. There is no obvious hearth relating to this level here, though some slight evidence of activity occurs, in the form of up-standing stones 860 and the spreads of clay/charcoal 677 and 668 in particular. A line of stones and charcoal/burnt timber K51, and a spread of charcoally sand 611, may denote collapsed remains of a wall-line (from the previous phase ?) to the S, though this is very tenuous. Correlation between FA2 and 4 at this point was very difficult, the deep disturbance to the SW having caused localized sinkage in FA2 layers. Further to the N 678 is a layer, full of debris, similar to 669, with a localized area of charcoal etc. 743, cut by a deep long-ovoid intrusion 701 (K65). Although I have placed this level in phase 6, it may in fact also relate to the destruction of the previous phase, notably the deposits in FA2 and FA4.

Level 2 (Fig. 24): Same general arrangements to N. In house "interior" two new layers to S thereof, 505 and 666. 505 is another layer of dense friable charcoal (cf. 753) in a greasy clayey matrix, 666 a more mixed debris deposit. 505 appeared to abut the wood K47, though at a higher level, and may have been cut away by 512, the "trench" containing K47. 512 may not, however, actually constitute a cut, but represent a subsequently filled "gap" where timbers stood and have been removed or destroyed, perhaps after the formation of all the abutting neighbouring layers to N and S thereof. To the S of this line 657 (also called 573a and 551 under excavation), a spread of sand and gravel encroaches, thinly, over the K47 timbers' southernmost edges. This layer extends into FA1 as 621 and into FA2 as 682 (whose W extension is very uncertain). Cutting 682 is a possible post-hole or pit K54, and lying on 657 to E a burnt timber K52. Abutting these gravels in FA4 a thick debris-rich deposit 656 (same as 683 in FA2 ?). In FA4 a scatter of three "pads" of compacted clay and charcoal, and a squarish hearth/furnace structure K53 and a more dubious neighbour K50 (though see previous level).

Level 3 (Fig. 25): Same general pattern, though with new occupation deposits and cut features. In FA1 591 comprises a thick debris-laden deposit (or deposits) "krafsered", and same as 565 in FA3. Seals gravels of previous levels and appears to abut line of wood K46. FA3 "interior" with new spread of

greasy charcoally material 540 and gravel 560, cut by a number of pits and possible hearths. A very large deep pit cuts 505 to SE of FA3, K55 - lies over previous phase's deep pit K38.

In FA2 and 4 to S 621/682/657 still "open" against K47 line. In FA4 K52 burnt plank partly overlain by new series of deposits above 656 ie. 604 etc. To W herein a localized spread of thick blue-grey charcoally clay with a number of large stones embedded, 578. This is the same as 643 in FA2, where it covers 682, and K52 post-hole pit (though this is not absolutely certain, and this feature may well have cut 643, though the presence of a large stone within 643 partially covering K52 may rule against this). 643 contains three stake-holes K67, though these may well have been cut from the layer above, 642 ? 658 is another thick debris-ridden clayey sandy material, same as 607 to E ? 607 and 605 are abutting layers (with stake-hole and aligned wood fragment K57) at junction. This establishes a pattern seen through the next levels also and spanning FA2 and 4, whereby slight evidence for a division (K57), running approx. WNW-ESE across the middle of these areas, can be discerned in a series of abutting layers and fragmentary possible structural remains. Certainly the succession of clays and sands, possibly from the level of 682 (see level 2), in the N half of FA2, seems to be near-regularly limited at its S edge.

To the S of FA4 a further deposit of charcoally sand 608, possibly abutting 607.

Level 4 (Fig. 26): To the N in FA1 and 3, the same arrangements as the previous level. To the S in FA2 and 4 the previous clay deposits etc. are overlain by more sandy debris-filled layers (642/574) to the N of the possible division line mid-way in area where the layers abut while the previous more clayey deposits persist to the S of that line (K57). 657/682/621 persists along K47 line.

Level 5 (Fig. 27): same arrangements to N in FA1 and 3. To S in FA2 and 4 new clay spreads appear mixed with charcoal (562 same as 575). 562 bounded to W and S by lines of burnt wood (K59) - thick (planking ?) line orientated NNE-SSW at right-angles to thinner line of charcoal (consolidated) aligned WNW-ESE. These may be remnant walling timbers, possibly laid on 682, though this was not fully established. Related to pattern in previous levels, and the possible division line K57. K58 hearth possibly cut from this level. New spreads of sandy clayey mixed material, quite compact, to S of K57 line, abutting (509 same as 589). 657/682/621 persists.

Level 6 (Fig. 28): To N same arrangements as before. To S in FA 2 and 4 a new series of abutting layers. K59 burnt wood still present, bounding/retaining 508 debris-laden sandy deposit. To S of K59 line 509 abuts, possibly overlain now by 480. In FA4 552 (same as 508) abuts 411/391b slag concentration on 589; division line K57 still present ? To S of K47 line 657/682/621 still present (called 551 in FA4 at this stage). Charcoally sand area 490 to mid-area cut by two pits - K63 in turn cuts K62, former filled with burnt sand (orange), latter with charcoally loose gravel. Much of NE portion of FA4 cut away, so full picture not discernible.

Level 7 (Fig. 29): Fills and new spreads of material within "interior" in FA3, southern half. K64 here in fact wrongly placed, as it is cut by pit/hearth 521 (part of K56 complex) rather than vice versa. Spreads comprise charcoal fills of pits and blue-grey clays. These are of uncertain relation to each other and to the building here. May comprise later features ?

To S in FA2 and 4 new spreads of thick blue-grey clay (474) and dark grey charcoal-ridden clay (427) - compacted and with associated scatters of

stake-holes. K62 and K63 may have been cut from this level. K59 possibly still present though more vague to S, and W length of burnt wood possibly overlain by large stone contained in 474 clay. 657 etc. sand sealed by 618/489 dark grey clayey sand, its full extension in FA4 uncertain, though overlapped line of timbers K47 at S edge. In FA4 489 and 367 may be same layer, though sinkage of layers in relation to intrusions caused problems of correlation. Similar clay-laden layers, mixed with sand. In FA2 416 may be same as 367 in FA4. Layers slope sharply to SW in FA2 where a post-med. intrusion has disturbed the deposits.

Layers in Phase 6.

FA1: 565, 580, 591, 619, 621, 651a, 653, 850a

FA2: 352 ?, 416, 474, 480, 508, 509, 562, 618, 642, 643, 658, 678, 682, 683, 687, 711, 741

FA3: 505, 510, 513, 514, 538, 539, 540, 560, 561, 564, 666

FA4: 367, 391a, 391b, 397, 411, 417, 427, 487, 490, 544, 551, 552, 573a, 573b, 574, 575, 578, 589, 604, 605, 607, 608, 609a, 609b, 610, 611, 656, 657, 668, 669, 677

Description of constructions (Figs. 23-29).

K46: timber walling ? (566/652). Five individual portions of timber constituting the remains of two, or possibly three, parallel-lying lengths of timber/planking ? These were reasonably well preserved, though had softened considerably and were prone to easy damage. All orientated NNE-SSW. The easternmost length lay flat on 580 gravel, a clear "bank" of foundation material. Its line was broken over fill of 581b post-hole, though on analogy with neighbouring length, it probably formerly extended over this fill. This piece was ca. 2 m 10 cm in length by ca. 12 cm broad by ca. 2 cm max. thickness and rectangular in section. Bore occasional shallow saw-notches. 580 gravel began sloping NW immediately to the W of this timber which rested on a level extent of that gravel. Its neighbour(s) to the E also lay partly on 580 though also appeared to lie on the charcoally clay/sand mixed layers 740 and 579 of phase 5. Its length is broken over 581b post-hole fill where collapsed portions thereof lay on the top of 581b fill. This length may constitute a possible rebated timber (the collapsed remains of a slotted sill-beam ?) as, to the S of its length, it seemed to widen out and was notched longitudinally. However, this may be a false impression - instead there may have been originally two closely abutting parallel timbers which could not be confidently separated under excavation due to the state of preservation. Taken as two separate entities, the westernmost is some 3,50 m in length (adding 652 portion in FA1) by ca. 20 cm broad by ca. 5 cm max thickness: the shorter abutting eastern length is ca. 1,50 m long by ca. 18 cm broad by ca. 2 cm thick. Again this wood bore occasional traces of saw notches. None were burnt.

These elements represent the surviving lower portions of the W wall of a building with its flooring to the E. Whether one or other comprises a flat-lying sill-beam or collapsed timbers which formerly stood on edge is difficult to ascertain, though the possible notched timber may provide some indication of the nature of construction (?).

Cf. K47 and K48. (See 7.2.3. and Discussion, below.)

K47: timber walling ? (511, 884). A number of wood fragments constituting the remains of possibly three parallel flat-lying timbers/planking. Very fragmentary preservation, though enough present to demonstrate clearly their alignment on the WNW-ESE orientation and close abuttal. Most lay

within a narrow longitudinal depression, 512, on sandy gravel 573b, which clearly forms a foundation for these elements. One timber, to the NW lies on 753 charcoal, beneath 505 charcoal. In general these fragments were not severely burnt, though some slight charring was in evidence. The total length of the projected line, from the SE end to the NW end (including 884 in FA1) is ca. 2,80 m, while the max. combined breadth is ca. 30 cm. These were very thin fragments, generally no thicker than ca. 2 cm, frequently less. Collectively these represent probable collapsed walling elements, contemporary with K46, and forming a S wall division. The same problems of defining construction form as relate to K46 occur here.

Cf. K46 and K48. (See 7.2.3. and Discussion, below.)

- K48: post-hole (594). The cutting level for this feature is uncertain, though fill seems to be sealed by 590. Hole is roughly ovoid, ca. 70 cm by 50 cm diam. and bears the remains, very fragmentary, of a rotted post. Fill comprised a soft sandy mixed material, with charcoal, wood fragments and some slags. Post-hole ca. 30 cm deep. Corner post supporting walling elements K46 and K47 ?
- K49: hollow and stake-hole (756 and 757). Small ovoid hollow, straight-sided; 40 cm by 20 cm diam. by 10 cm deep. Filled with coarse material, 666 ?, with sloping angular stone to one side therein. Neighbouring stake-hole appeared as a void in 753. Ovoid; ca. 5 cm diam. by 30 cm deep.
- K50: up-standing stones and length of wood (921). This is a composite context for two separate elements: three vertically set stones in a cluster on/in 669 and a short length of unburnt wood ca. 18 cm long by ca. 5 cm broad. Former possible remnants of destroyed hearth/furnace (?) and possibly related to spread of clay/charcoal material abutting to N (677), though latter, while in characteristic orientation WNW-ESE, is a dubious remnant structural element.
- K51: wall-line ? (810, 882). Dubious feature, though conforms to earlier patterns. In FA2 a line of charcoal fragments in 741 running WNW-ESE for ca. 1,40 m; at W limit a fragment of burnt planking 20 cm by 15 cm. Collapsed walling ? To E in FA4 a line of three flat stones lying on 669; possibly correlate with charcoal line to W. Possible remnant support/pad-stones for a sill-beam ? Again orientation approx. WNW-ESE, though deviation to more E-W line. Alternatively 810 may be debris from destroyed hearth/furnace ?
- K52: burnt timber (898). Patch of consolidated charcoal on 657, sloping to S. Ca. 50 cm long by 40 cm max. breadth; disappears into profile. Possible collapsed (?) burnt timber/plank.
- K53: hearth/furnace (585). Lowest level lies on 656, main body of debris in 574, under 578. Probable collapsed stone-built hearth or furnace, consisting of a large concentration of angular flat stones, overlapping in three distinct levels/layers: lowest has surviving (4) up-standing vertically-set stones; above those a consolidated mass of flat stones covering an area, roughly square, of ca. 60 cm by 60 cm. Upper level a spread of flat stones within blue-grey clay 578. Under the stones a concentration of red-burnt sand, black-coloured sand and slag.



Collapsed hearth/furnace K53 (585) in FA 4, looking W.

- K54: pit/post-hole ? (639). Under 618, cuts layer 682 (?). Ovoid, irregular. Filled with brown soft sand with wood fragments, some charcoal and slag. Notable find herein: a rectangular block of stone with ingot moulds cut into three sides. Unfortunately depth of feature not recorded, though some evidence to suggest ca. 15 cm.
- K55: large pit (478). Cuts 505, under 464. Heavily disturbed to N, so full extent and form uncertain. Surviving portion ca. 1,20 m broad E-W and N-S. Formed a deep (ca. 50 cm) steep-sided basin. The primary fill was a grey gravelly silty material with some large stones (10-15 cm wide) clustering in two groups to SE and N, as well as scattered at base of next fill. The main body of deposits within the pit consisted of a series of thin deposits of buff-brown soft fine clay with charcoal interspersed with thin bands of bluish-grey soft gravelly silts and dark grey charcoally silts, excavated *en masse* as 466. Top fill comprised a thicker spread of buff-brown soft clay 510, which spread out slightly over lip of pit.
- This feature lies directly over the earlier pit K38. Its function is uncertain, though the laminated series of clays must derive from a repetitively productive source and the pit must relate to a specific activity other than the casual dumping of debris and waste fragments.

The brown colouration of the clay may infer that it has been burnt, and there was a fair proportion of charcoal in the series of fills.

- K56: four pits/hearths ? (491, 521, 559, 640). A loose grouping of features whose cutting levels were uncertain, but which lie above layers 505 and 540. Group comprises two charcoal-filled hollows and two deeper stone- and waste-debris filled pits.
- 491: is an ovoid hollow ca. 70 cm by 55 cm diam. by ca. 20 cm deep. Fill 493 comprised concentration of charcoal in greasy clay matrix. Originally thought that this was a blue-grey clay lined pit, but the clay found round most of perimeter may in fact be a spread deposit from neighbouring 640. Large stone lies to W. Uncertain function.
- 521: is half a round (?) pit, ca. 70 cm diam. by ca. 20 cm deep. Filled with 520, mixed grey/brown soft sand/clay, with slags, charcoal, burnt clay, blue-grey clay inclusions etc. Also one large stone resting in fill to NW of feature. Destroyed hearth/furnace ?
- 559: is a shallow ovoid hollow, ca. 50 cm by 45 cm diam. by ca. 9 cm deep. Filled with greasy charcoal and some slag. Uncertain function. Cuts gravel 560.
- 640: was rather more diffuse than represented on plan, though in profile clearly represents a hollow or pit filled with slags, charcoal, blue-grey clay and a cluster of stones. Ca. 75 cm diam. by ca. 12 cm deep. Capped by blue-grey clay spread 513. Possible destroyed hearth/furnace ?
- K57: wall-line ? (606). Very tenuous feature, which is a composite context including small stake-hole with wood intact, a short length of unburnt wood ca. 15 cm long, aligned WNW-ESE, and the abutting layers 605 and 607 which conform again to a WNW-ESE orientation ie. differential deposition to either side of intervening wall-line/division ?
- K58: hearth/furnace (395). Cuts 574 ? Disappears into profile. Excavated portion suggests round pit, ca. 70 cm diam. by ca. 30 cm deep. Steep-sided, rounded base. Number of later layers dished into top (367). Under 367 in pit appeared a thin spread of soft clayey orange-brown burnt sand/clay. This was spread over a number of flat angular stones, lying horizontally and of variable dimensions. One large stone burnt on underside. These sat loosely in very dark grey soft silty sand with charcoal and pieces of brown burnt clay and unburnt blue-grey clay inclusions. Only a few slags, but these were large. Some flat stones at base. Standing to one side and surrounded by fills a large slab of stone, set on edge. A spread of material to S of the pit, over these internal deposits, 411, comprised a possible dense body of slags raked out from this feature, which is probably a hearth/furnace.
- K59: burnt timber (479). Comprises two right-angled lengths of burnt wood in FA4. To W a NNE-SSW orientated fragmentary portion of planking (?) 80 cm in length by ca. 6 cm breadth, forming right-angle with thin line of charcoal ca. 2-3 cm broad. These seemed to bound a series of clays and sands in NW of FA4. Appeared under 380 in relation to 474 (abutting ?) at height of 6,13-6,14 m.a.s.l. This height corresponds very closely to that of 511 (K47) wood and to the highest portion of sloping 898 (K52). Wood may have rested on 682 (though uncertain), though whether it has been cut down from above 474 for example or whether these series of clays/sands have accumulated within some form of structure/walling represented by these burnt lines of wood, is open to debate. However, the differences in layers to either side hereof argues for differential

deposition to either side of an intervening boundary (see also 606, K57, possible corresponding wall-line in FA4).

- K60: stake-holes (492). Collectively numbered scatter of 11 stake-holes under 473, cutting 474. Average diam. ca. 5 cm by 3-6 cm deep. Filled with 473, brown-black clayey silty sand. No obvious pattern/formation.
- K61: stake-holes (428). Arc of 5 stake-holes under 396, cutting 427 compacted clay/charcoal. Filled with charcoally sand. Ca. 4 cm diam., ovoid. Variable depth - from W: 26 cm, 4 cm, 8 cm, 9 cm, 5 cm.
- K62: pit (390). Pit appearing in FA2 and FA4. Possibly ovoid, ca. 80 cm broad E-W by ca. 25 cm deep. Filled with loose gravel with some charcoal. Uncertain function: associated with casting ? ie. for the placing of crucibles or moulds ?
- K63: pit/hearth ? (437). Half an ovoid (?) pit; steep-sided, rounded base. Ca. 50 cm diam. by 20 cm deep. Cuts K62. Primary fill dark grey sand admixed with clay; main fill compacted orange-burnt sand (394), top fill dark grey sand, cut by stake-hole, 4 cm. diam. by 8 cm deep, and containing large flat-lying slab of stone and two smaller stones. Collapsed hearth ?
- K64: pit/hearth ? (532). Half a rounded (?) pit/hearth, steep-sided, rounded base. Ca. 1 m diam. A number of fills; upper of brown clay/silt admixed, over pure charcoal in rounded depression, over burnt flat stones (stea.). Charcoal hollow cuts grey mixed spread of clayey soft sand with blue-grey clay, gravelly, over charcoal (under flat stones), over gravelly silty sand, with large N-sloping stone and piece of heavily burnt sandstone. Hearth/furnace (?) with reasonably intact fills.
- K65: pit ? (701). A deep, long-ovoid (?) steep-sided pit, under 682, cutting 687. Ca. 75 cm long by ca. 20 cm broad by ca. 35 cm deep. Filled with dark brown clayey gravelly sand, slag and some copper/bronze fragments. Uncertain function.
- K66: post-hole(s)/pit(s) ? (571, 700). Feature(s) with uncertain cutting level, though sealed by 573a/657/551. Filled with gravelly dark grey sand, with charcoal, slag and clay, 572. Rounded ca. 55 cm diam. Uncertain depth, as lies directly over similar feature, filled yellow-grey gravelly sand, 699. May be portions of same feature or two superimposed features, corresponding to those in profile at this point. Uncertain function(s), though possible post-holes ? Upper portion is 571, lower 700.
- K67: stake-holes (659). Three large ovoid stake-/post-holes, in a line approx. E-W. In 643 under 642. From W: 13 cm diam. by 8 cm deep; 16 cm diam. by 7 cm deep (wood remnant); 5 cm diam. by 30 cm deep.
- K68: wood-lined pit ? (450b). Lowest of two (or more ?) superimposed pits; cutting level uncertain, though possibly cut from 669 level, under 450a. Base squarish and flat. Widens and gets rounder to top, though may be result of collapse of layers. Extends across baulk between FA2 and 4. Base ca. 1 m by ca. 70 cm. Remains of up-standing board/plank to N 787, collapsed board/planking to W, 772. Max. depth ca. 70 cm. Filled with coarse mixed debris-laden material: dark grey soft gravelly sand with much slag, charcoal, clay etc. Waste pit ?

K69: pit ? (450a). Uncertain cutting level, though it is cut by hearth K53 to N in FA4, so possibly cut from level of 656. Extends into FA2, where it appears to cut 683. Here it is filled with 714, a soft dark grey clayey sand with charcoal and slags - produced a sherd of pottery (see Dating). Waste pit ?

Dating

This phase produced 4 sherds of medieval pot: from layer 505 in possible house interior in FA3 immediately N of K47 line of wood, a sherd of Andenne or possible German whiteware, 12th century; from layer 604 in possible house interior in FA4 a sherd of Saintonge, ca. 1300 (possibly insecure context, as found very near trench disturbance for modern wall); from layer 711 in house interior in FA2 a sherd of Scandinavian blackware, 12th-13th centuries; from 714, fill of 450a pit, a sherd of French pot, 13th-14th centuries.

This provides a broad potential date range of some 200 years for the phase:

Level 1: (711) - 12th - 13th centuries.

Level 2: (505, 714) - 12th century and 13th/14th centuries.

Level 3: (604) - ca. 1300.

However, only two sherds derived from reasonably secure contexts - 505 and 711, and these are broadly compatible (ca. 12th century). (The presence of a sherd of Saintonge ware, presumably a luxury product, presents an interesting aspect for future thoughts).

Discussion.

A number of particular problems in this complex phase deserve closer scrutiny:

The correlation of the major surviving timbers K46 and K47, and the gravels they rest on to form a structural unit, is relatively secure. If the correlation of these to the post-hole K48 (somewhat less secure) holds, then these elements represent the fourth building in the N half of the quadrant. As yet, no firm conclusions as to the form of construction (whether lafted, slepvegg etc.) can be offered, though the form of the timbers (planks rather than logs) may be suggestive of their having been set on edge, their ends set into notches in supporting corner posts. If so, then the E timber of K46 is a collapsed element, and this raises a number of problems in identifying the layers and features associated with these timbers' functional life within the building's interior - for example, the features cutting the layers this rests on may derive from later activity, etc.

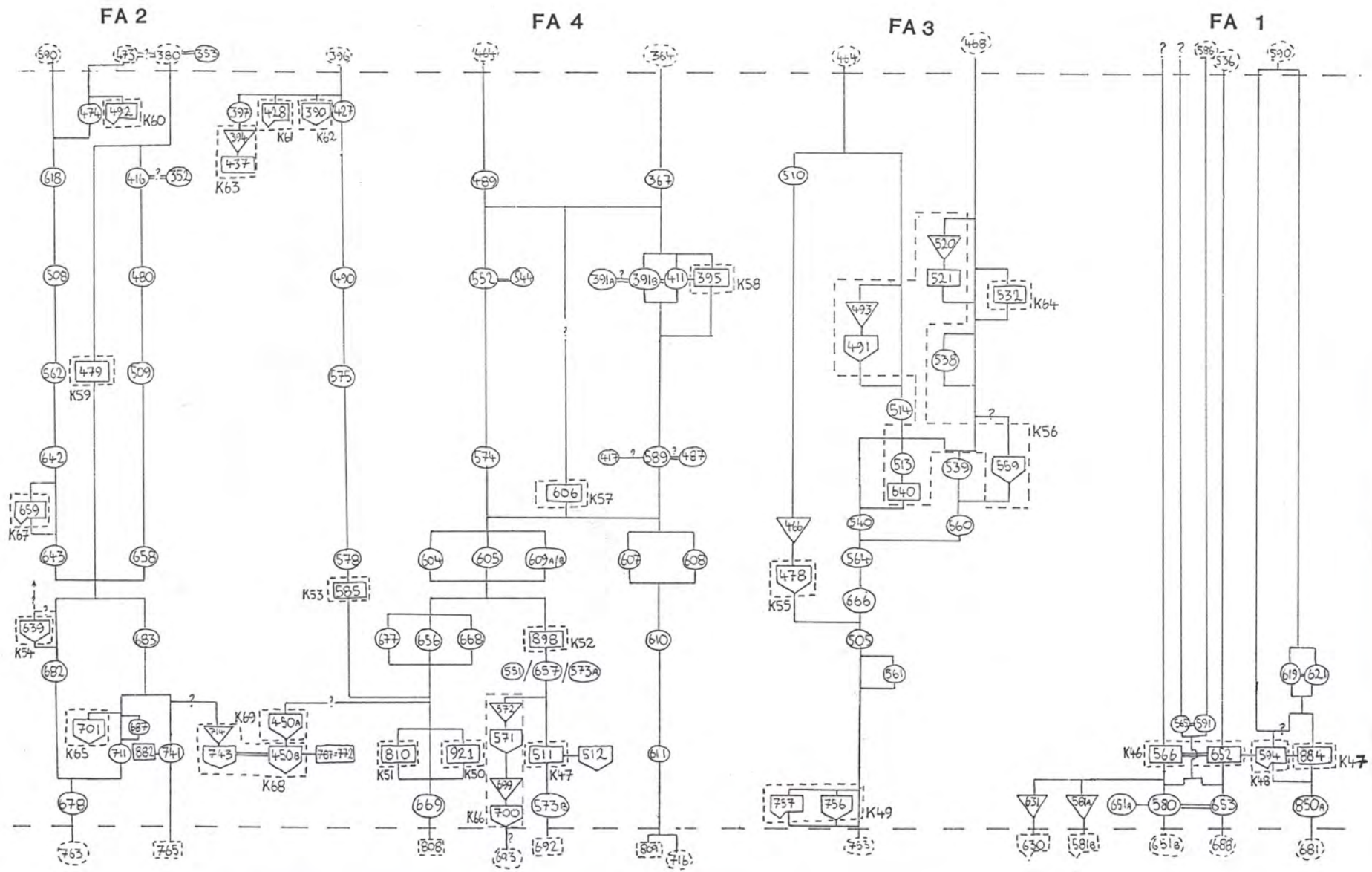
The K47 line and associated layers to N and S is a difficult group to disentangle. It is hard to decide on the longevity of K47's use. In level 2 there is some evidence to suggest that the structure represented by K47 (and K46) has gone out of use, as it is partly covered to the S by 657, and less certainly, to the N by 505. 657 persists through to level 6, while to the S thereof a large sequence of layers has been deposited. To the N 505 persists through to level 7, with some superimposed activity to the N thereof. However the wood lies in a narrow depression 512, into which these layers have partially slipped, and the wood was largely exposed on removal of the sealing deposit in phase 7, 565, again falling into this elongated hollow, which also seals 489 (level 7) to the S as well as 505 and its superimposed deposits to the N. Consequently, the possibility exists that the deposits to N and S of K47 have accumulated while some dividing structural component stood within 512, and on its subsequent removal the layers have slumped and slipped into the gap, and all were sealed by the phase 7 deposits. This said, it may also be possible that, for example, 505 charcoal and 898 burnt plank represent the destruction of the

K47-K48-K49 structure, though this destruction, due to the longevity of 657, may have taken place at any time from level 2 to level 6. Alternatively these may represent the remains of yet another walling-line placed over the K47 line, in which case the layers and features above these elements are from later activity. A further complicating factor may be an imbalance in surviving deposits to the N and S of K47, whereby planing-off or clearance to the N in phase 7, while leaving the S area relatively intact, has produced disproportionate survival of phase 6 deposits across the quadrant. Modern planing-off, by archaeologists and machine, may also add to the imbalance.

The layers and features to the S form a generally harmonized sequence of repetitive deposits, which may reflect a stable, long-lived structural context for the activities which produced them. Most striking is the alternation, in the N half of FA2 and the NW portion of FA4, of a correlated series of thick blue-grey clays mixed with charcoal (often with embedded stones and bearing arrays of stake-holes) and intervening charcoally debris-rich sandy layers. This build-up seems to have been limited in extent, and there is evidence for possible timber-walling at least from level 5, though in all likelihood, from level 2 and through to level 6, though, again, possibly into level 7 also. The burnt timber to the NW is orientated NNW-SSW and conforms to the line represented by K46. This is at right-angles to a thinner line of consolidated charcoal, orientated WNW-ESE, which may align with even slighter evidence (abutting layers, stake-hole etc. given loose construction status, K57) to the E in FA4. These elements may suggest some form of compartmentalization of a room. In the N half of this possible WNW-ESE division a specific activity has been repeated, involving the use of a fair proportion of clay and producing much charcoal, slags, burnt clay, metal off-cuts etc. It was thought, during excavation, that these localized spreads of clay may represent laid floors on which the debris-laden deposits have accumulated. At the time of writing this seems to be the most reasonable suggestion; certainly, an array of activities, represented by the stakeholes herein, seem to have taken place on or above these spreads. However, an alternative possibility is that this clay originated from neighbouring hearth/furnace activity, and perhaps results from the dismantling of clay domes thereover. However, the unburnt nature, and the consolidation in thick deposits, of this material may rule this out in favour of the first suggestion, or some other possibility.

The differential sequential deposition of differing layers to either side of this possible partition is a clear characteristic with hearth/furnace activity and thick blue-grey clay spreads confined to the N half, though the presence of, for example, K58 hearth so close to this possible division line may suggest either a structural change in arrangements, or too much wishful thinking on the archaeologist's part.

The perennial problem of trying to decide whether we have the remains of one partitioned building, or two juxtaposed workshops, is still present and not fully resolved. However, in the case of the latter, one might expect to find a parallel wall-line immediately to the S of that most emphatically preserved. In this phase some very slight evidence for this occurs in the possible post-pits K54 (FA2 - level 2) and K66 (FA4 - level 1), as well as the gravelly sand 657/682/621 and burnt plank K52. This evidence is very tenuous though, and the pattern of deposits suggests no more than differential build-up within areas to either side of one intervening wall-line, therefore inferring the presence of a two-roomed structure stretching across the quadrant NE-SW, which in this phase shows possible signs of subdivision in the S room. From the slight (and inconclusive) dating evidence, this phase may lie within the 12th to 13th centuries.



Quadrant FA, F-site: phase 6 matrix.

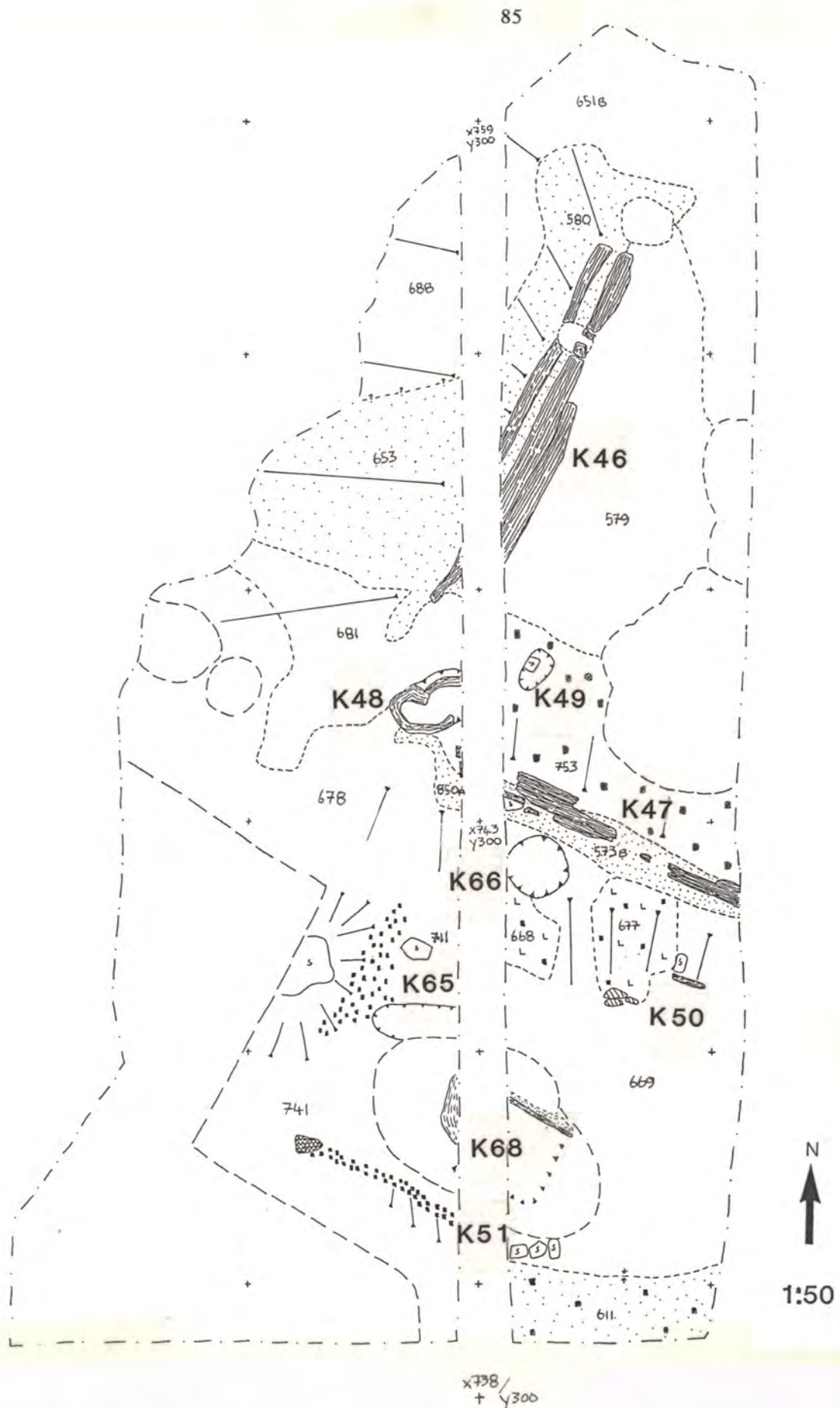


Fig. 23. F-site Quadrant FA: Phase 6; Level 1.

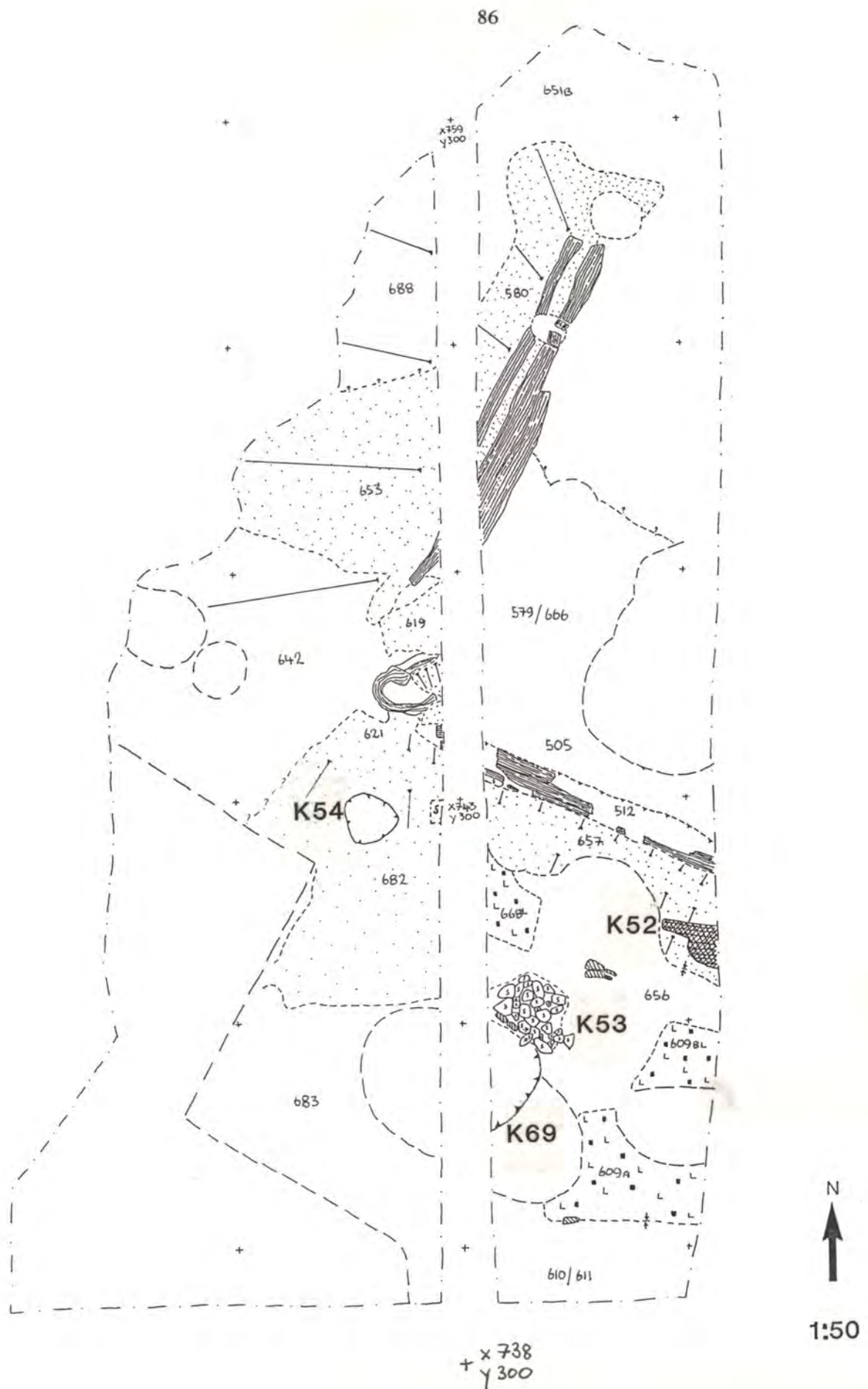


Fig. 24. F-site Quadrant FA: Phase 6; Level 2.

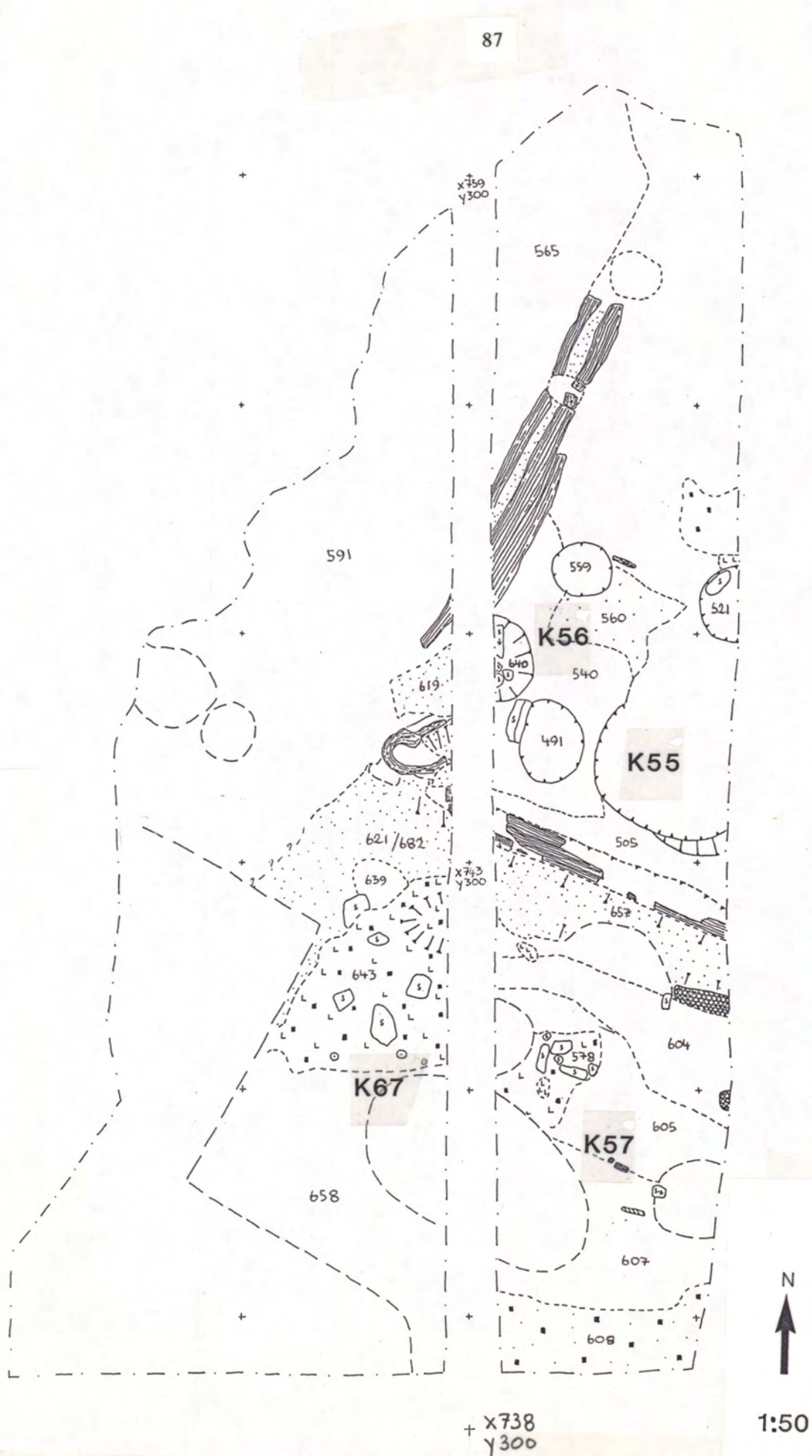


Fig. 25. F-site Quadrant FA: Phase 6; Level 3.

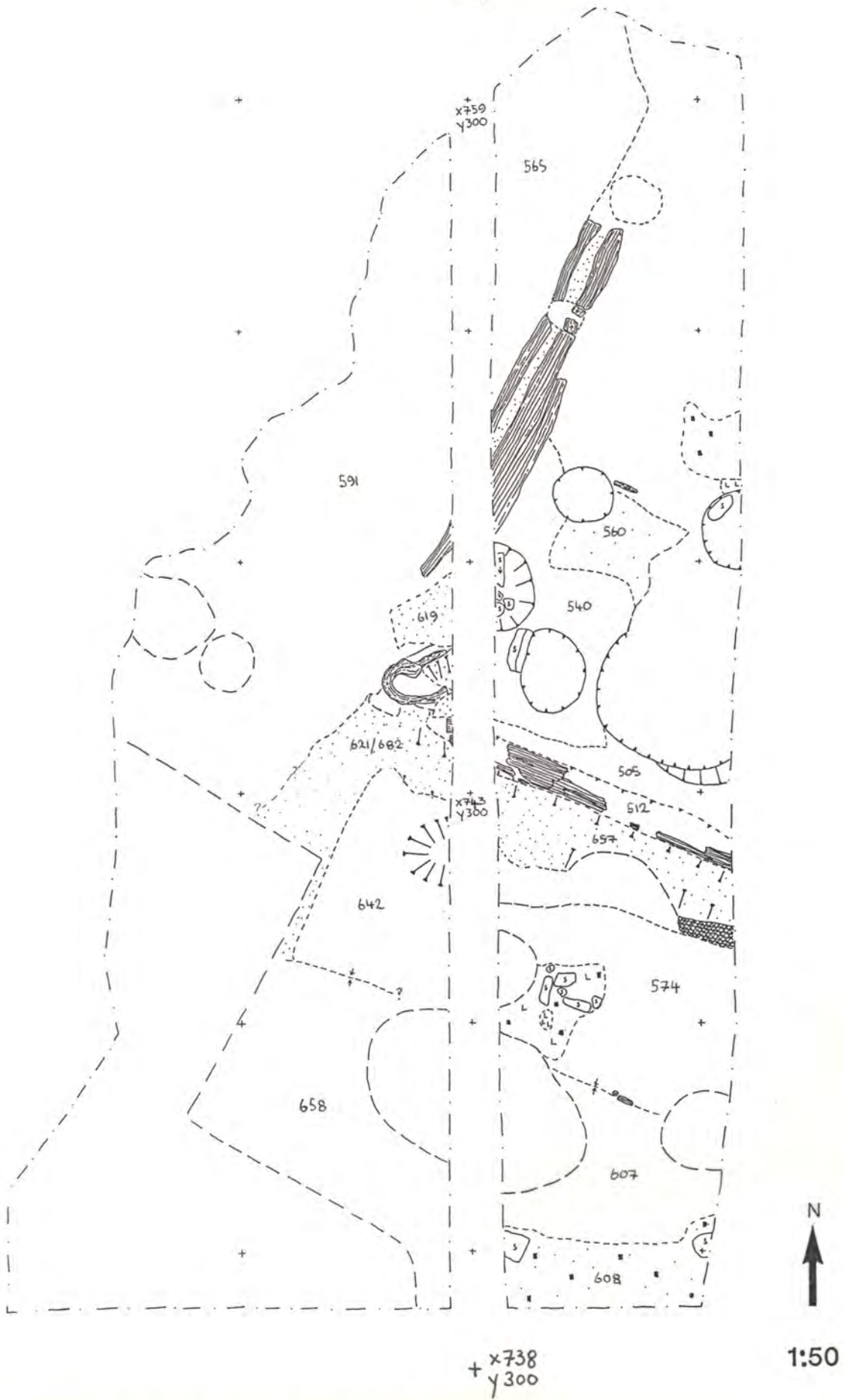


Fig. 26. F-site Quadrant FA: Phase 6; Level 4.

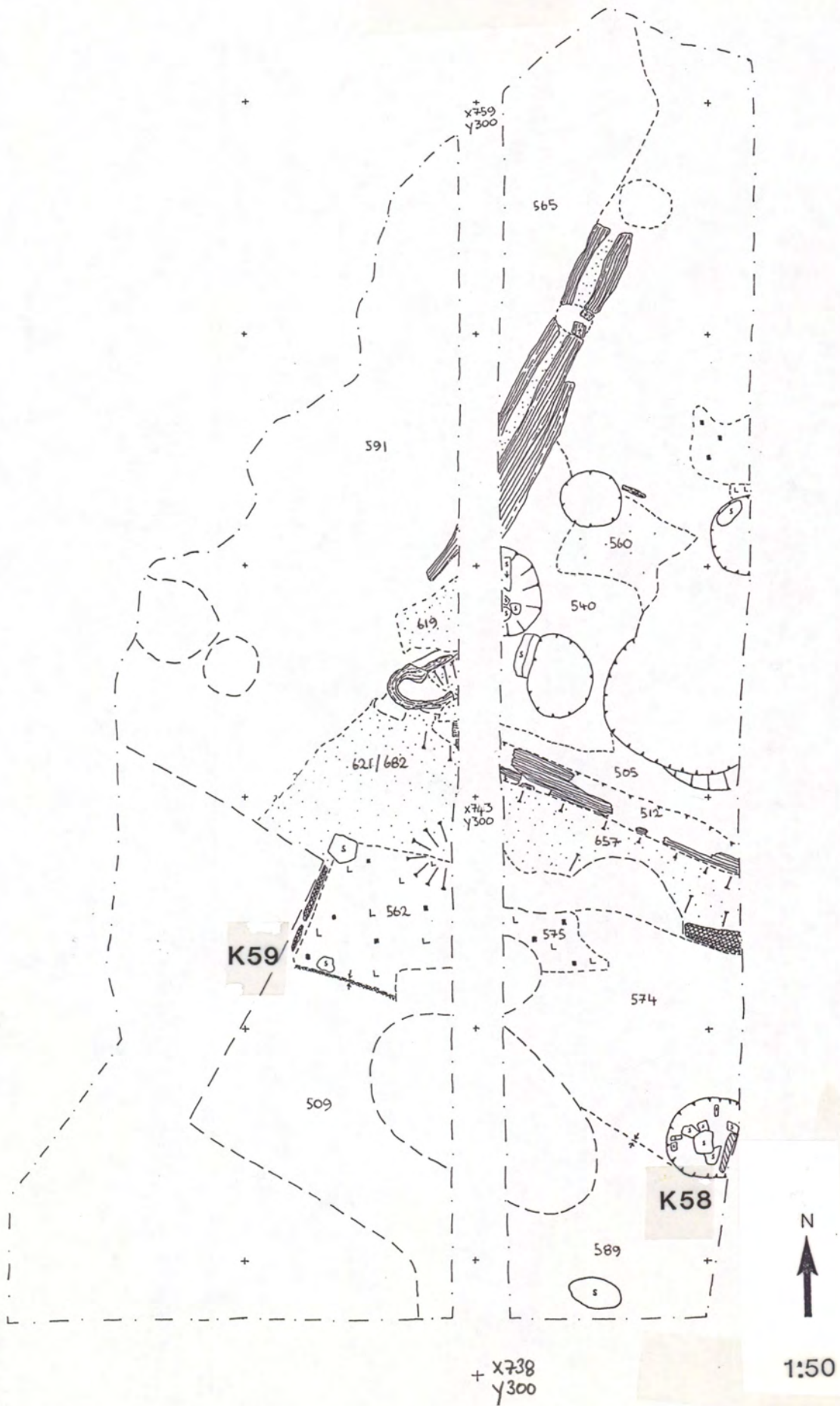


Fig. 27. F-site Quadrant FA: Phase 6; Level 5.

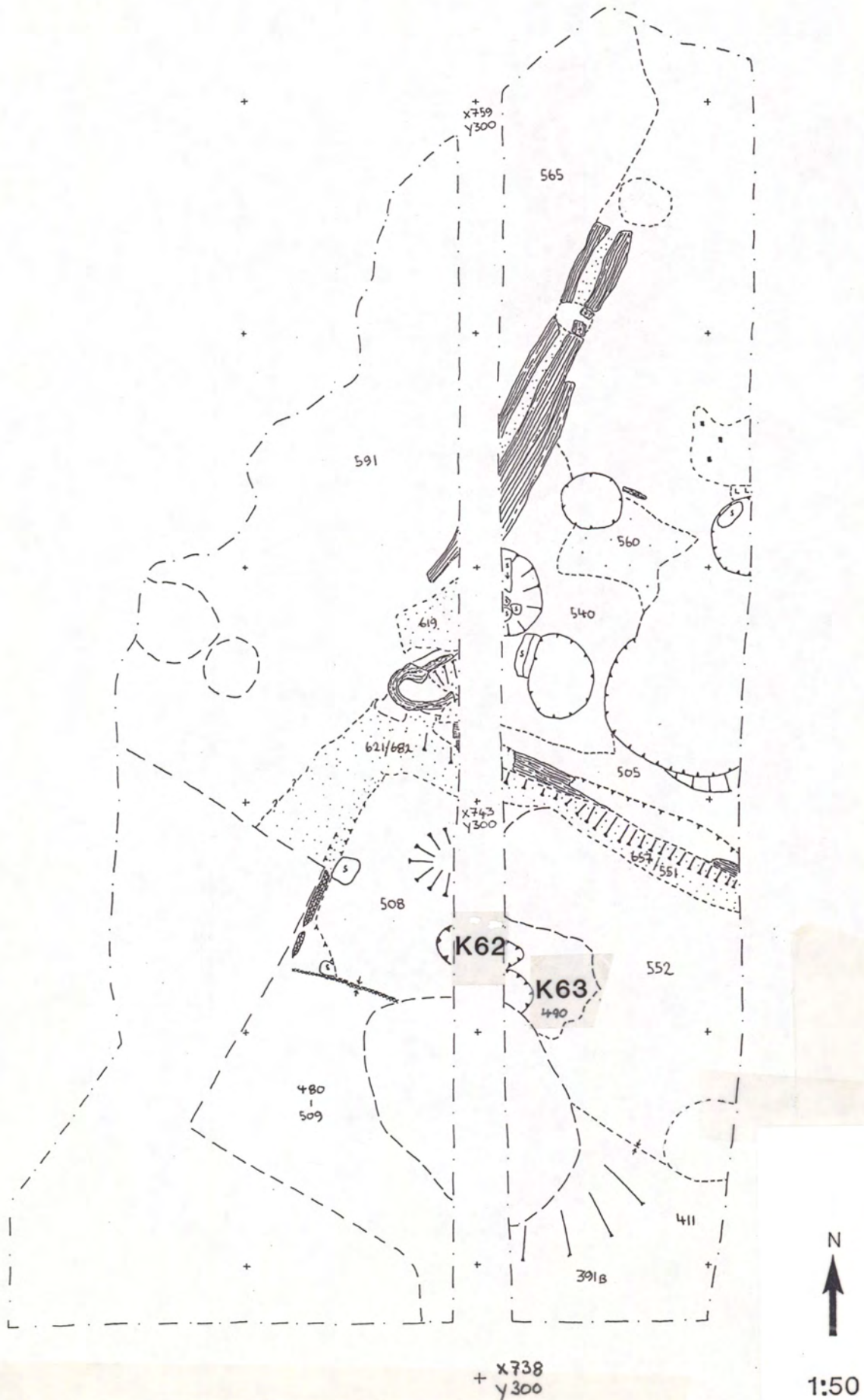


Fig. 28. F-site Quadrant FA: Phase 6; Level 6.

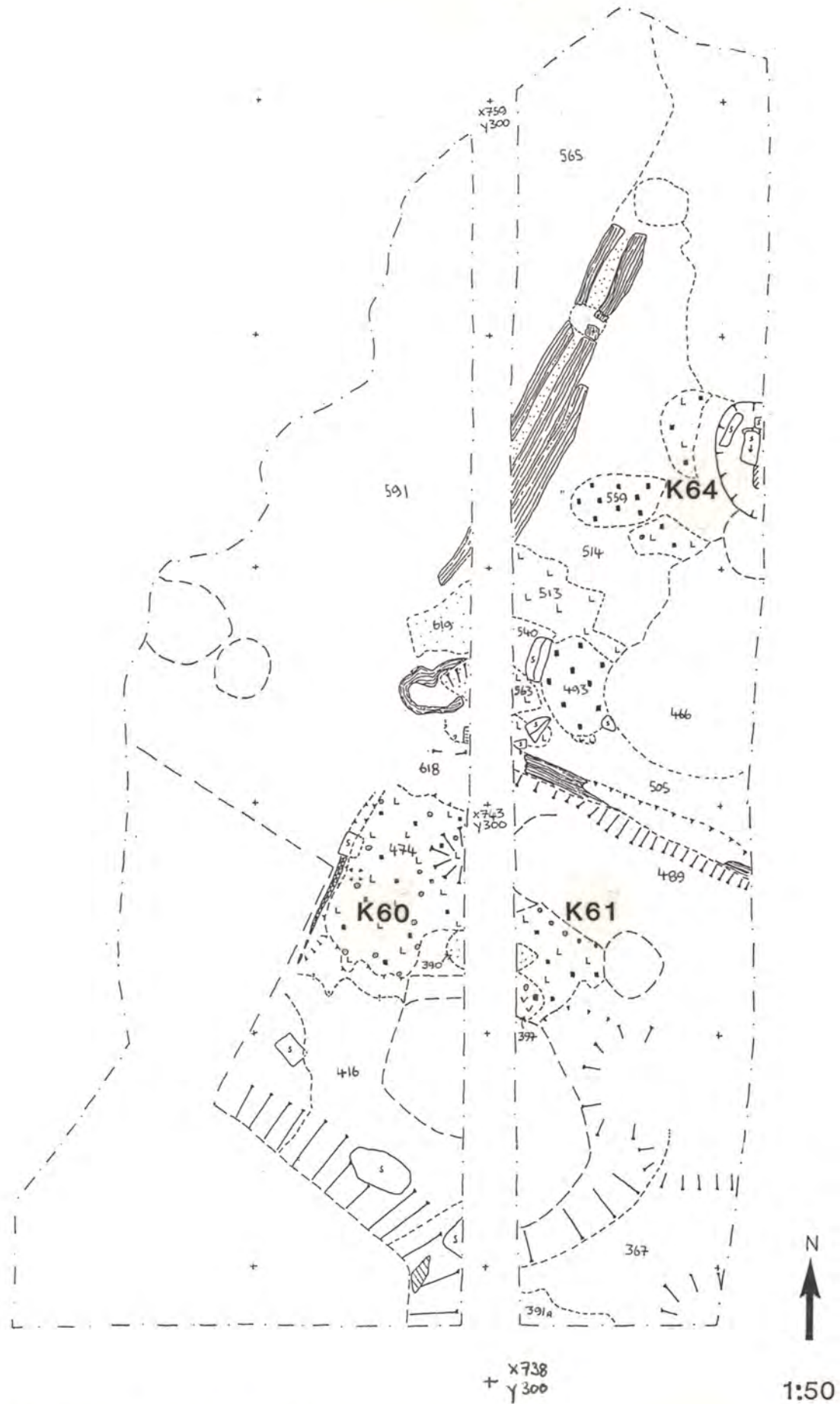


Fig. 29. F-site Quadrant FA: Phase 6; Level 7.

3.7.7. Phase 7 (Figs. 30 and 31)

General characteristics.

A phase bearing more diffuse arrangements than before, though the WNW-ESE mid-area structural line is still quite apparent with fresh accumulations of gravelly deposits, stones and aligned fragments of wood.

To N and S thereof a range of features whose cutting levels were generally very uncertain, though characteristic pits and possible hearths testify to continued intensive activity clustering in the familiar pattern ie. to S and NE of the area with little evidence to the NW.

These are some slight indications of a possible extension of the WNW-ESE mid-area alignment further W, a development rather more perceptible in the next phase.

Generally, structural arrangements are even more confused at this stage due to disturbances.

Stratigraphical discussion.

The details relating to the WNW-ESE alignment of deposits are discussed below under K70. The compacted gravel deposits 464 and 486 fill an elongated depression 512, over the previous phase's timber-line 511. They also spread out to either side, though their full extension to N and S was never fully ascertained. To the N the area stands at the height to which machine clearance reached, while to the S confusion resulted from the hurriedly (and poorly) excavated first investigative trial trench cut across the area (see next phase plans for extent).

Consequently a number of features and layers have been shaved off, their cutting levels and extents not fully recognized. In FA4 a number of charcoal and slag-bearing deposits, often dished into lower features, were excavated as separate spreads, though on later examination these can generally be correlated as a common mass of material - ie. 364, 366, 365, 396. These spreads, judging from the relationship of 396 to 486 and 380 (in FA2) to 567, lie above or abut the central WNW-ESE division line. To the N in FA3 the features must be regarded as floating between phases 6,7 and 8, their cutting levels uncertain. In FA1 the pattern of spread of the compacted gravelly sands 590, 593 and 567 possibly indicate a) the continuity of the NNW-SSW line (590 covering the previous timber-line 652 in FA1 and possibly 566 wood too, as some sand remnants survived on these timbers), and b) a possible elongation of the structural line to the W, perhaps terminating in a post-hole K71 (though this may also be the remains of a hearth). 583 comprises a body of soft, slaggy, charcoal and wood-fragment laden sandy material, lying over wood in K48 post-hole. Looked very much like post-pipe fill ie. rotted fragmented organic material. Abuts 567. May indicate that former post here out of use at this stage ?

In FA4 the flat-lying stones to the NW belong to the previous phase's hearth activity, K63.

The concentration of intercut pits between FA2 and 4 continues, K73 possibly cut from this level.

A stratigraphically insecure concentration of large stones and waste debris lies to the SE of FA2, K74, slumping of layers caused locally by a large deep post-medieval pit.

To N in FA1, a slight bank of mixed sandy clayey material with heavy scatter of steatite and sandstone fragments and slag and charcoal lies isolated to N of scatter of pits. Dumped material.

N.B. Pressure of time forced a contraction of the excavated area at this stage. Area to very NE never investigated.

Layers in Phase 7.

FA1: 550, 567, 583, 586, 587

FA2: 353/291, 380/473

FA3: 364, 365, 366, 396/22, 465, 486

FA4: 464, 468, 469

Description of constructions (Figs. 30 and 31).

K70: wall-line ? (21a, 21b, 464, 486, 494, 567, 590, 593). A composite grouping of deposits and elements which together may comprise orientated remains of a timber wall-line and its foundation. Consists of a distinct line of deposits lying WNW-ESE across the middle of the quadrant - two compacted sandy clayey gravelly deposits overlying each other in FA4 slumping into elongated trench/hollow 512, covering previous phases timbers. Lowest level, 464 (level 1), bears a number of flat steatite slabs 21b, one "pecked" on underside, and a larger block, also "pecked". Slabs slope to S into 512 hollow. Above these 486 bearing large blocks and slabs of steatite, some burnt, 21a (none worked) and two parallel short strips of slightly charred wood (not burnt through) 494 (southernmost dips to S), aligned WNW-ESE and possibly same as fragmentary strips of wood 576. There are corresponding deposits to W in FA1.

The role of the stones in this context is debatable. They form a loose line, with a notable concentration to SE. They clearly relate to a specific function (N.B. the worked and burnt slabs) perhaps deriving from furnaces. However, it is proposed that their position here results from their redeposition and secondary use as part of the make-up/consolidation for a structural line, forming a foundation bank for timbers. Traces of a similar mass, 590, stretching NE-SW, occurs in FA1.

K71: pit/post-hole ? (577). Subcircular steep-sided pit, ca. 50 cm by 55 cm diam. by ca. 28 cm deep. Cuts 567 under 550. Filled with grey-brown soft sand with content of steatite and sandstone fragments (some larger pieces concentrated to NE part, together with large pieces of slag), slags, metal, charcoal etc. All the characteristics of a destroyed hearth/furnace, though may also perhaps be a formerly stone-packed post-hole ?

K72: complex of pits/hearth (407, 410, 410g, 448, 452). All of uncertain cutting level, especially in relation to 464 etc.

407: sub-ovoid, rounded base. Ca. 64 cm by 50 cm diam. by ca. 10 cm deep. Filled with 408, laminated series of deposits 1-2 cm thick ie. greyish sand over black charcoally/sooty sand (some large fragments), metal and "porous" slags. Also a yellow sand layer over another slag-laden charcoal deposit at base. Cuts 452. 487 stake-hole with rotted wood revealed in base. Hearth/furnace ?

410: irregular form, ca. 70 cm by 70 cm diam. Contained a number of fills of charcoally sand, burnt sand, silvery metallic flakes, slag, metal etc. Seals 410g, a lower hollow. Hearth/furnace ?

410g: part of ovoid/rounded hollow sealed under basal fill of 410. Hearth/furnace ?

448: ovoid pit, steep-sided, rounded base. Ca. 65 cm by 50 cm diam. by 7 cm deep. Filled with 449 dark brown greasy clayey charcoally sand with slag - at base lay three stones. Hearth/furnace ?

452: sub-ovoid steep-sided pit with flattish base, ca. 75 cm by 80 cm diam. by 8 cm deep. Cut by 407. Filled with 453 dark brown greasy clayey charcoally sand with slag and some small green metal clumps. Hearth/furnace ?

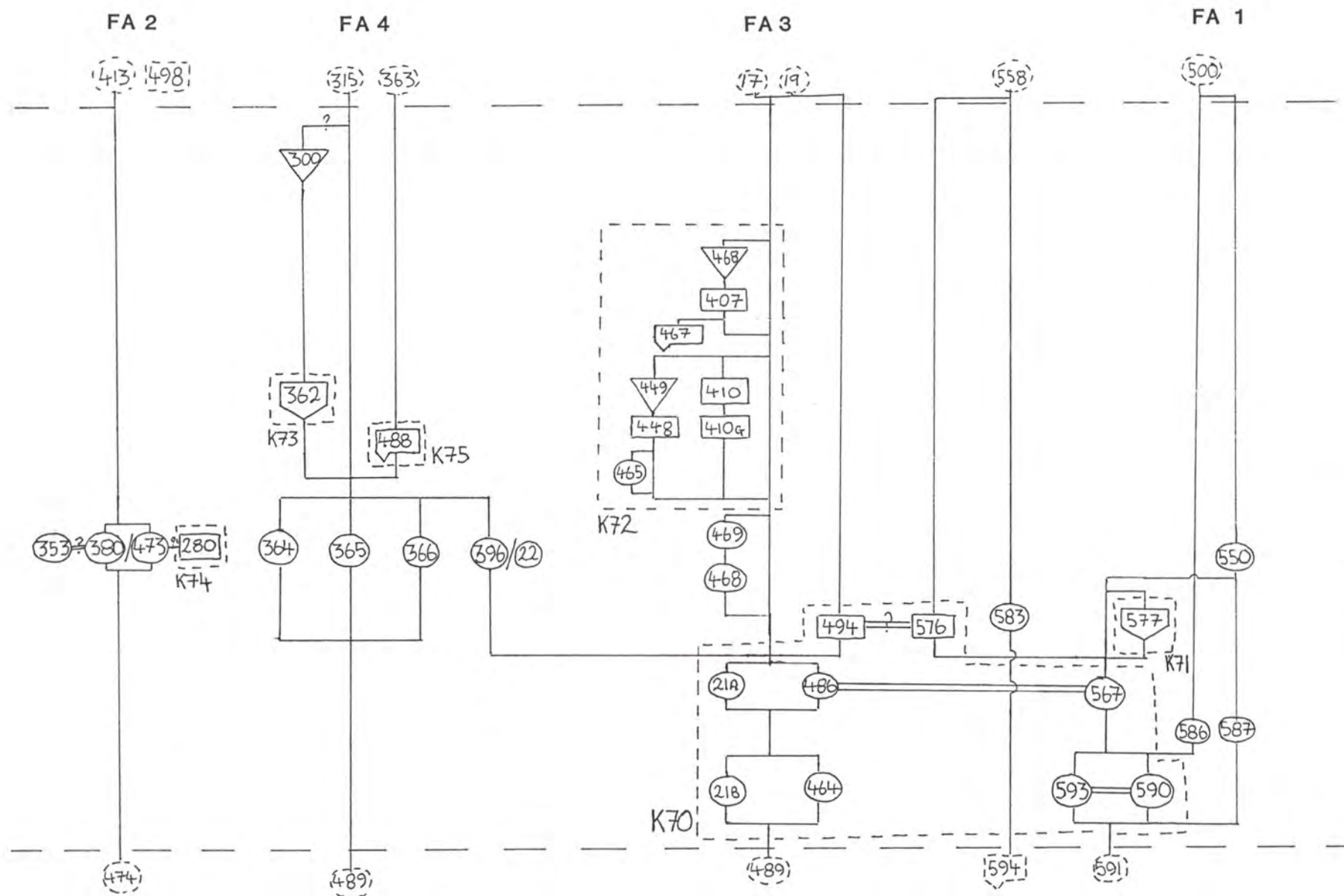
- K73: pit (362). Part of an ovoid (?) pit, gently sloping sides. Ca. 1,45 m diam. E-W. Cut away by 285. Cut from 315 or 364? Filled with 300, dense greasy charcoally sand with slags, copper fragments. The profile suggests that 362 in fact comprises two intercut pits - the later filled with 300, the earlier with dark grey sand mixed with clay and charcoal. Upper fill also contains silvery grey metallic flakes. Waste pit ?
- K74: collapsed hearth/furnace elements ? (280). Context is composite, comprising a number of deposits and a concentration of stones in SE corner of FA2. Slope to SW, of insecure correlation; slumped layers due to neighbouring post-med. pit. Comprises a number of laminated charcoally, slaggy soft sandy deposits, burnt steatite and sandstone, some large blocks, one standing vertically. Work area/hearth ?
- K75: two stake-holes (488). Under 363. Ovoid; E-W 6 cm diam. and 6 cm deep and 5 cm diam. by 8 cm deep (contained stone packing ?).

Dating.

One sherd of pottery from this phase derived from layer 473 (same as 380), sealed between clay spreads 413 above and 474 below. Sherd of York ? whiteware: 13th century.

Discussion.

The range of features and deposits in this phase are only loosely tied together. The firmest stratigraphical succession relates to the evident line of deposits in mid-area, which testify to continued structural activity, and which may constitute evidence for the fifth successive structure in the area, placed directly on the pre-existing alignment. Other structural evidence is either missing or is of a very tentative nature, and the tying-in of contemporary metalworking structures (pits, hearths etc.) is equally uncertain. The slight dating evidence for this phase may place it within the 13th century.



Quadrant FA, F-site: phase 7 matrix.

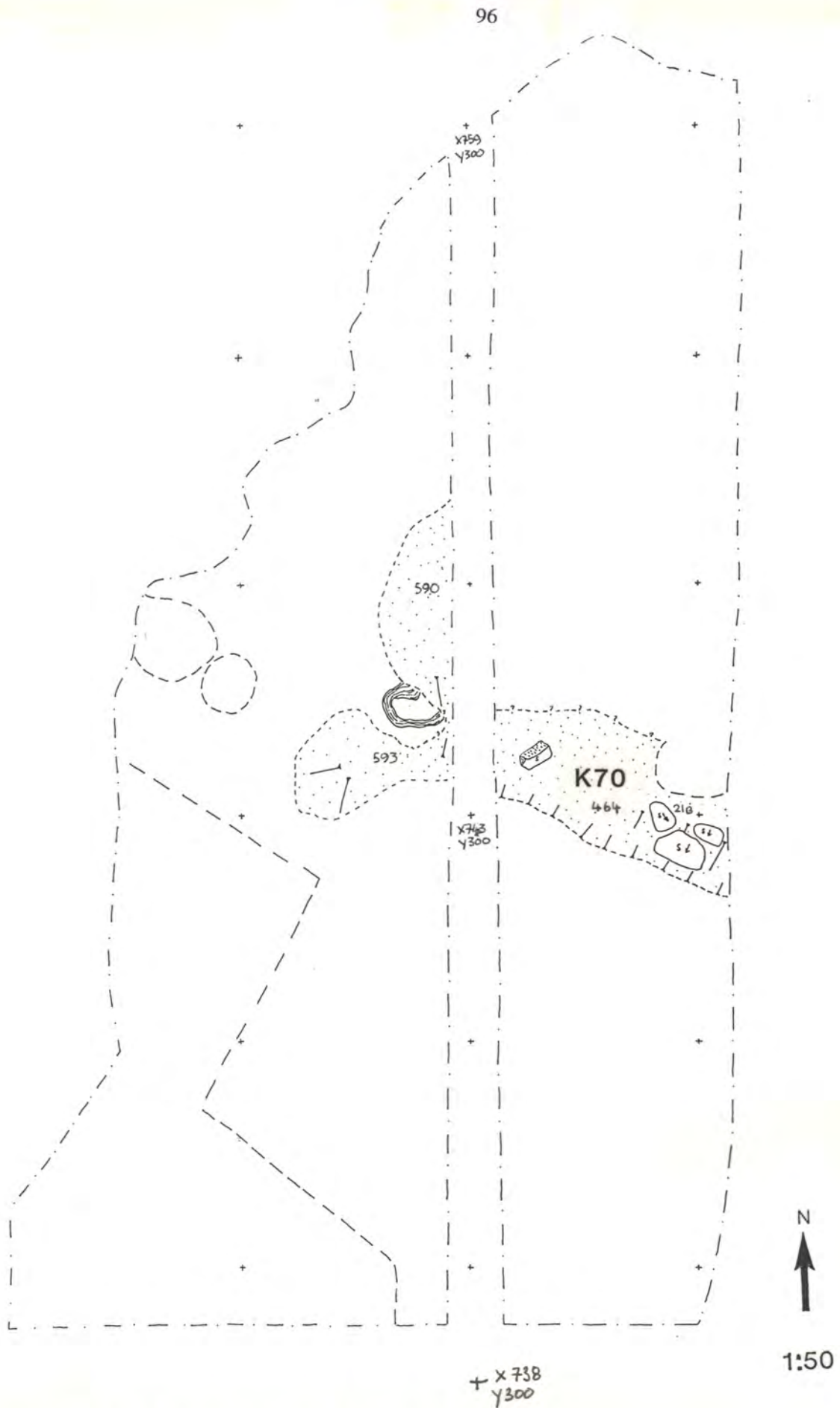


Fig. 30. F-site Quadrant FA: Phase 7; Level 1.

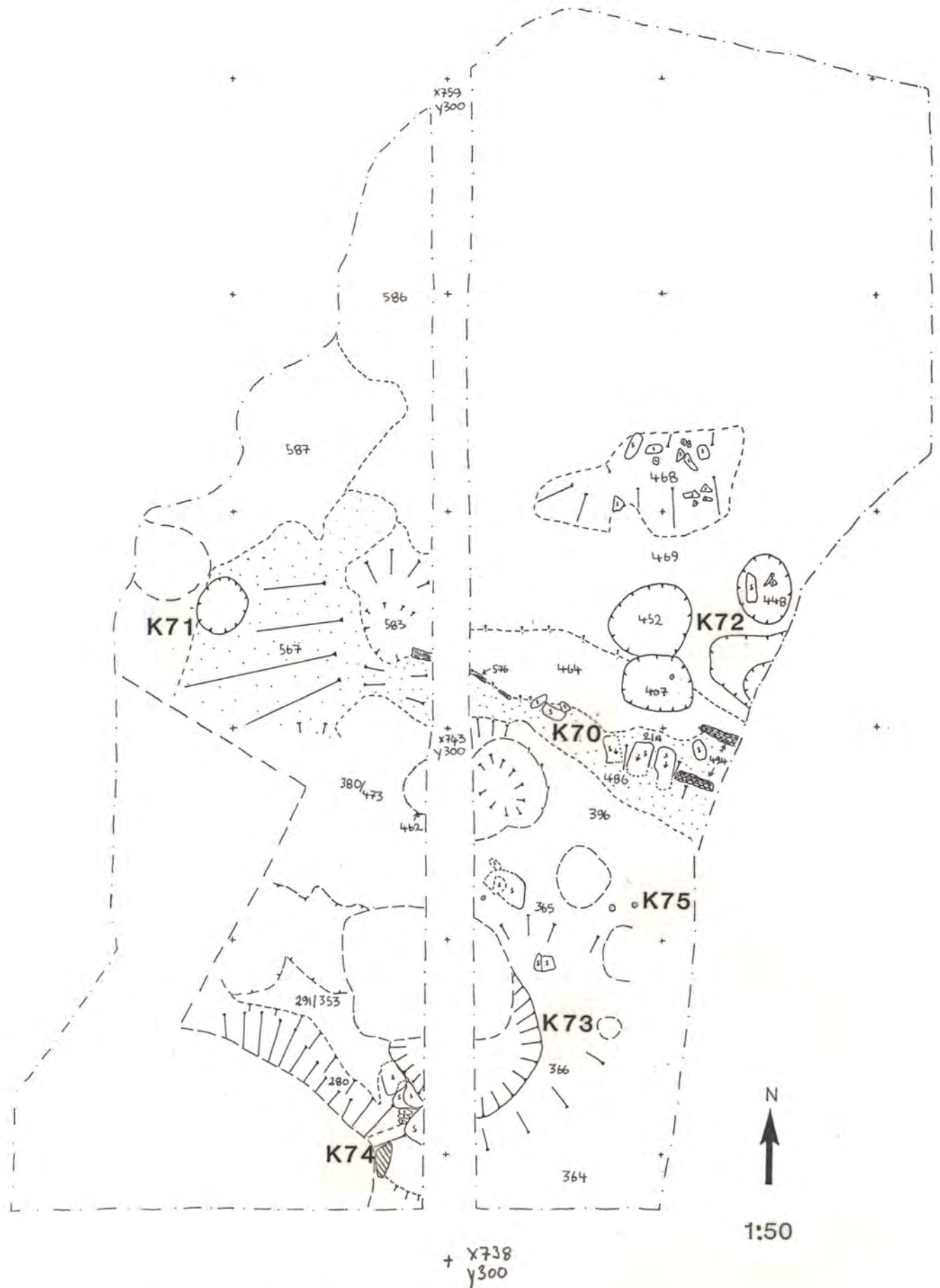


Fig. 31. F-site Quadrant FA: Phase 7; Level 2.

3.7.8. Phase 8 (Figs. 32-34).

General characteristics.

A fragmented and confused pattern. Some indications of continuity of structural arrangements may be inferred from the line of stones K76 aligned WNW-ESE, though this extends further W than previous structural indicators on this line.

To the NW a highly complex interleaved and intercut series of spreads of charcoals, sands, clayey concentrations and pits and hollows testify to intensive activity. Machine clearance obscures the picture to the NE. To the S fragmentary traces of compacted clay pads and some cut features are suggestive of previously noted forms of activity.

Stratigraphical discussion.

Level 1: K76 stones lie on a very slight crest of material, grey clay-mixed sandy deposits 550 and 380, which may be the same layer, or abutting layers. 380 slopes sharply to S and is overlain by compacted dark grey charcoally clay pads/spreads 379 and 413. 379 apparently abuts the K76 line, as does the fill of K77. Both these contexts are sealed, as is K76 line in level 2, by a spread of charcoal 426. 379 may be the same as 413, with scatters of stake-holes. In FA4 a spread of gravel lies beside two neighbouring, but stratigraphically successive, hollows K80. These appeared to cut (or abut ?) two very distinctive overlapping spreads of compacted reddish brown laminated charcoally clays 314 and 363. The bulk of deposits lying over this S half were debris-laden sandy deposits - 315, 353/291, heavily admixed with waste from metalworking (slags, charcoal, metal fragments, burnt clay etc.).

Level 2: K76 sealed by charcoal spread 426, which also covers 412, a clay pad, over 379. 426 charcoal may extend into FA4 as 360, and, more tentatively, as 18. FA4 in fact is at two levels at this point: to the E a higher body of material, cut away to some 4-5 cm to the W in the first investigative trial trench.

In FA1 a discrete spread of charcoally sand 12 under charcoal patch 11 may correspond to 15 and 19 in FA5 to E, a deep hollow fringed by charcoally sand sloping to N. 17 is a band of charcoally compacted sand abutting 19, cutting 18 charcoal spread.

A possible ovoid pit sequence K85 may relate to hearth K86 with well-preserved sequence of fills, in FA2.

Layers 1-5 are layers encountered on initial clearance of the site, 5 corresponding to 18 charcoal spread.

To the NW in FA1 a large complex of spreads were planned which made very little sense. The main layers and features only have been reproduced here.

Layers in Phase 8.

FA1: 11, 12, 383, 384, 385, 386, 406, 409, 419, 425, 446, 451, 463, 476, 495, 499, 500, 501, 502, 516, 517, 518/519, 531, 534, 535, 548, 549, 558.

FA2: 281, 379, 413, 426

FA3: 19, 23

FA4: 5/18, 17, 299, 314, 315, 323, 359, 360, 363

Description of constructions (Figs 32-34).

K76: row of stones/wall-line ? (498). 4 stones, flat-topped, set end-on-end in WNW-ESE alignment in FA1. Lie on 380/499. Padstones for sill-beam?

K77: pit? (436). Dubious feature. Irregular, steep-sided hollow under 426. Cuts 379. Filled with charcoal concentration under mixed soft slaggy sand

with a number of flat angular stones. Fills seal 447 (K78). Abut stones 498. Possible hearth/furnace?

- K78: stake-holes (447). In base of K77 and in 379. Large hole, 10 cm diam. by 3 cm deep, filled with charcoal. S of this a line of 3 stake-holes, ca. 5 cm diam. by 5-7 cm deep.
- K79: stake-holes (414). 4 ovoid stake-holes 5-7 cm diam. cutting 413.
- K80: pair of pits/hearths ? (308, 376). Two neighbouring subcircular, steep-sided, flattish-bottomed hollows of similar character.
- 308: half excavated: ca. 50 cm diam. by ca. 20 cm deep. Cuts 363 clay pad. Cut by 330. Filled with 307, charcoally dk.grey-brown soft sand, fair inclusion of slags, metalwork, sandstone fragments. Hearth/furnace?
- 376: ca. 50 cm by 60 cm diam. by ca. 25 cm deep. Cuts 314 clay pad. Filled with grey soft sand mottled reddish-brown with fair inclusion of slags, charcoal, steatite and sandstone fragments, metalwork. Hearth/furnace? (Stake-hole 361 to W 11 cm deep by 9 cm diam.).
- K81: group of pits/hearths ? (454, 461, 496/506, 530). Array of cut features, not necessarily contemporary. Cutting levels planed off. Lie to N of K76.
- 454: possibly two intercut pits? Ovoid forms ? Cut 500. Filled with slags and charcoal and some bone and large stones.
- 461: ovoid (?) hollow. Cuts 500. Filled with slags, charcoal, blue-grey clay inclusions, grey sand at base.
- 496/506: sub-ovoid hollow filled with large pieces of compacted greasy charcoal. Called 496 in FA1, 506 filled with 507 in FA3.
- 530: a pair (?) of intercut pits. Lie under concentration of charcoal and burnt wood 497 (part of fill ?). Filled with mixed charcoally sand. N.B. E hollow lies directly over former post-pit at this point. Cuts 499 ? Lies directly over 536 in 550. Possible implications for structural/building pattern.
- K82: pit (285/345). A sub-square/sub-ovoid pit, sloping sides, rounded base. Cuts 300, though top shaved off in first trial trench and by machine clearance. Contains a number of similar mixed sandy fills, greyish, interspersed with clay patches and yellow sand lenses; also sandstone and steatite fragments, slag and metalwork, unburnt bone and charcoal. Waste pit ?
- K83: pit/hearth (330). Sub-ovoid (?) hollow. Cuts 315 and 308 and 363. Cut by 312. Filled with 313 greasy clayey charcoal concentration mixed with slags and burnt clay. Hearth/furnace ?
- K84: post-hole (328). Round, deep hole: ca. 20 cm diam. by ca. 50 cm deep. Homogeneous soft grey sandy fill, slag-free. However, lies directly under a localized concentration of slags 311/312, possibly deposited in the top of the hole ?
- K85: hearth(s)/pit(s) ? (369,374). Ovoid pit; cuts 360. Possibly actually two, or three, inter-cut pits: earliest is 374 (under 360) filled with dark grey mottled red-brown soft sand with charcoal, slags, stone fragments; cut by 369b filled with similar compacted fill below 338 grey soft clay-laminated silty sand, in turn cut by pit filled with dark grey soft sand with clay and slags and upright slab of steatite set against 338 sand (see

profile Fig. 9). 338 and 369b may be part of same pit ? Possible hearth activity here, and may be same as K86.

K86: hearth/furnace (462). Half an ovoid/circular hearth in FA2. Cutting level difficult to establish - distorts layers beneath it, and may extend into FA4 (see K85). Due to similarity of layers in the locality, this feature's edges were not identified until sharp contrast against 474 blue-grey clay, though fill was first noted in 380. Profile suggests this is a feature cut from a higher level, though it has confusingly compressed lower layers in its immediate locality. It is of basin form and bore a number of fills, the uppermost (at least as captured in excavation) consisting of grey sand with fragments of wood first thought to be the remains of a bucket. Below this, in sequence: very compacted dark grey sandy clay with metal and much slag and a couple of flat stones, vertically set, and some smaller stones, scattered. Signs that this material lay on a possible lining of blue-grey greasy clay, sand and charcoal: under this; a gravelly sandy fill, burnt at base; a very compact burnt (reddish-brown) clay with metal and slag; another compacted layer of reddish brown burnt clay; a localized patch of charcoal to S of pit. To middle of latter clay was an area of dark brown silty sand in a little hollow. Not much burning to the N of the feature. Lowest sequence: a brown (burnt) clay over grey sand over charcoal, the latter appearing to spread over 474. Stake-hole set at angle herein within the "bowl".

It is difficult to establish the precise character of this feature: there is evidence to suggest that this sequence of fills a) occupy a hollow cut down from a level not encountered in excavation and b) they possibly represent a built-up sequence "growing" on the same spot, and that the layers surrounding the bowl bear some intimate connection with this superimposed sequence of development.

The diam. of the feature is ca. 60 cm and the surviving depth some 25 cm. The K85 activity to the E may be part of this activity, which represents one of the better-preserved hearths/furnaces.

K87: hollow (15). Round-bottomed depression with burnt charcoal and slag-bearing (and silver metallic flakes) sandy clayey deposits. Under 4 (clearance): dubious and poorly understood feature. Cuts 19, charcoally sand.

Dating:

No evidence derived from these contexts.

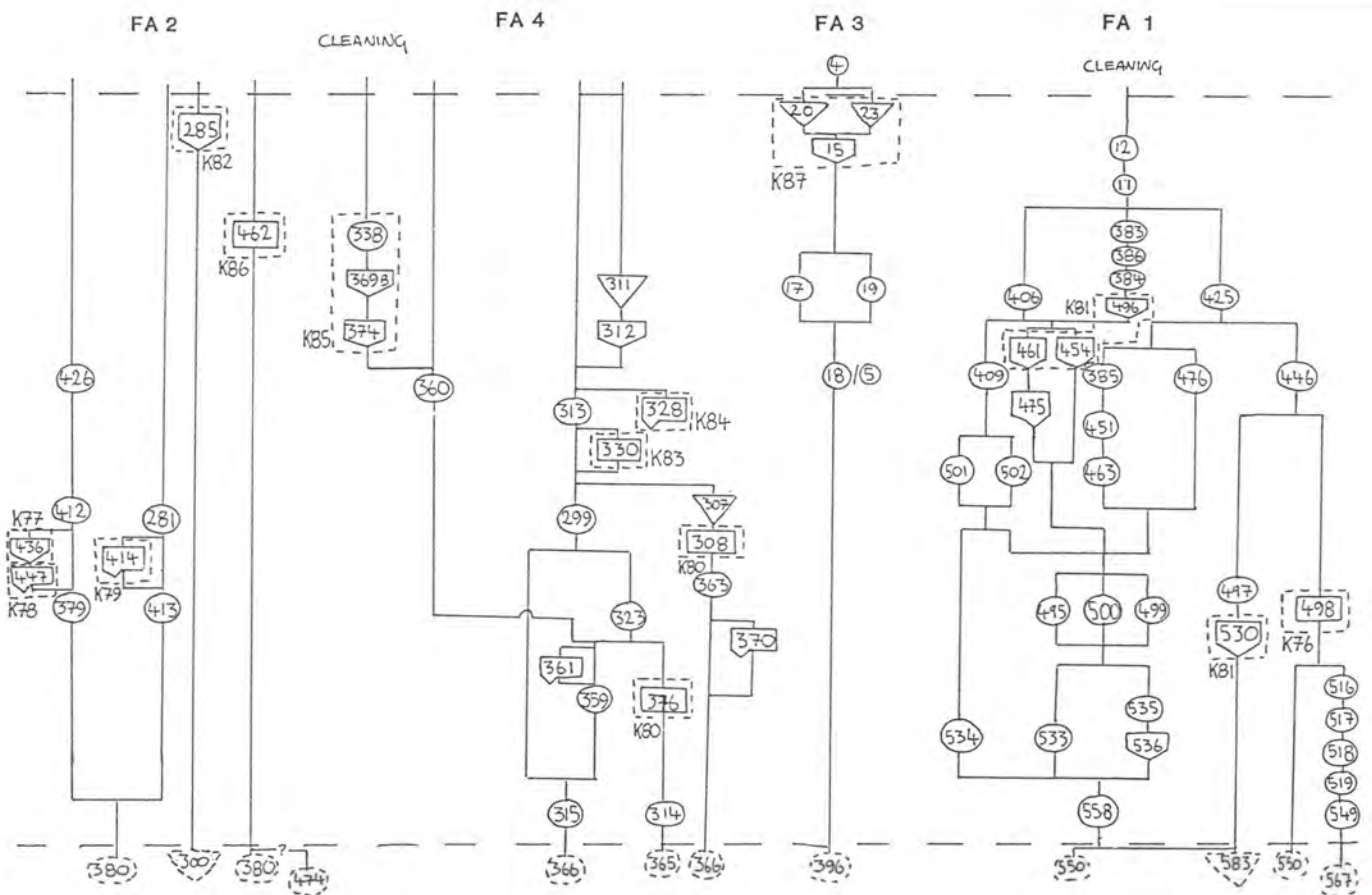
Discussion.

The features and layers here are truncated and incomplete. However, the stone alignment K76 follows previous orientations here, though extends further W. Whether or not these stones constitute evidence for an expansion of a walling-line to the W to encompass an area of flooring to the NW pitted with hearths and spreads of charcoal and slag (not seen here in earlier levels) is a tempting, but inconclusive thought. Such a line of possible pad-stones, at least in such a tight formation, has not been noted before (though three spaced stones occur in phase 4). These may have supported a sill-beam, the burnt remains of which may survive as 426, and, more tenuously, 18.

Compacted clay spreads/pads (remnant flooring ?) occur again to the S of this line. A pair of interesting hearths/furnaces (?) K80 lie in FA4 in close relation to two such pads: these pits appeared to cut them, but it may be possible that this clay (burnt ?) constitutes a surviving integral component of these hearth structures (perhaps the lower portions of domes of clay ?).

Another interesting "bowl" form of hearth K86 lies in FA2, evidently having a long active life-span, though again whether this constitutes a simple cut feature or a composite structure of a built-up nature remains to be seen. The intense pit-digging activity concentrated between FA2 and FA4 continues; these may well constitute waste pits in which debris from hearth activities was dumped, though one must ask the question as to why one should dig a waste-pit inside a building (presuming that one was then standing).

Although fragmented, patterns of continuity can be noted, with tempting hints at possible new developments, both in the spread of structural elements and, perhaps, in their composition.



Quadrant FA, F-site: phase 8 matrix.

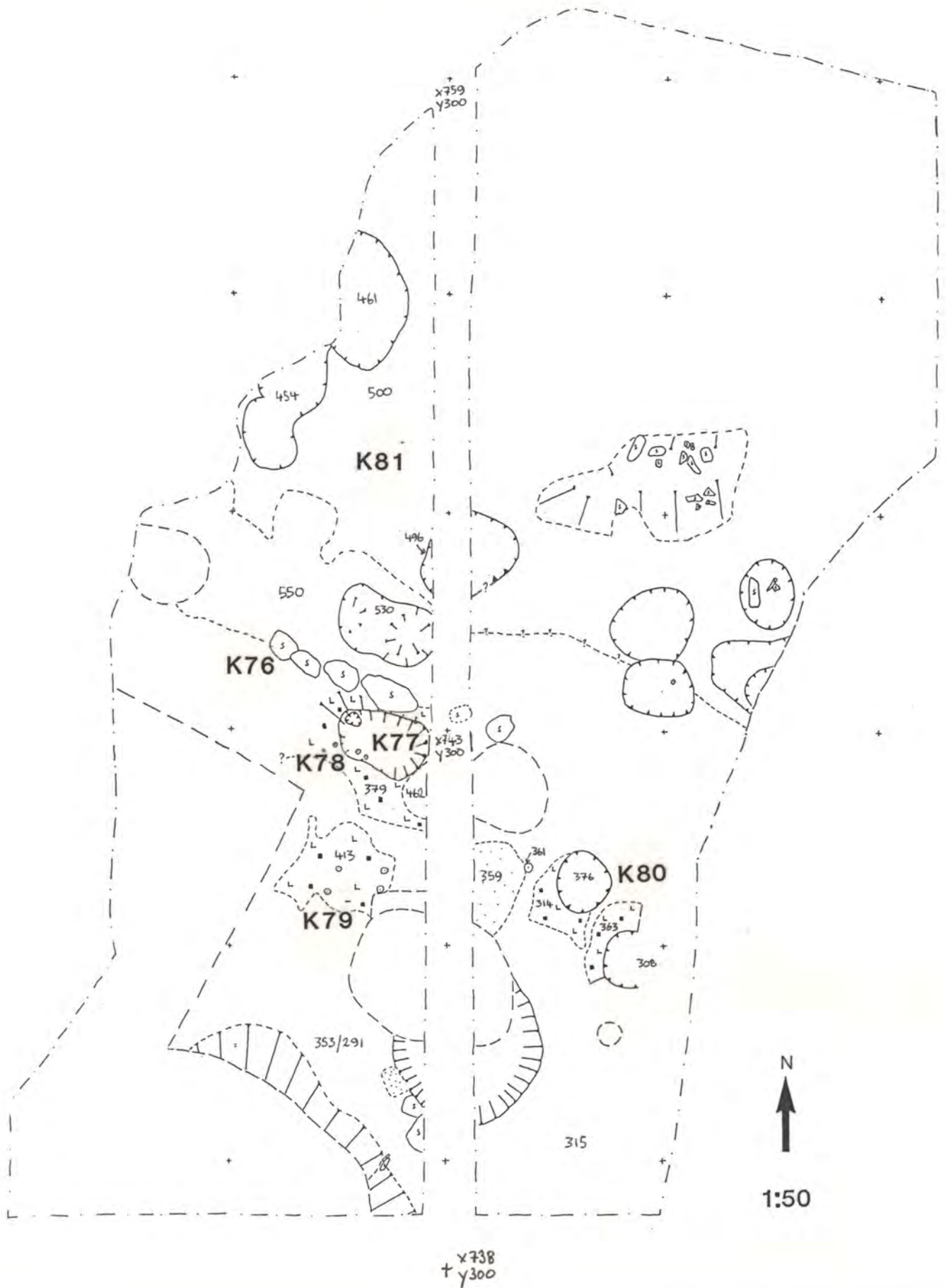


Fig. 32. F-site Quadrant FA: Phase 8; Level 1.

Lager

Konstruktion

Stenkonstruktion

Stolphål

Pinnhål

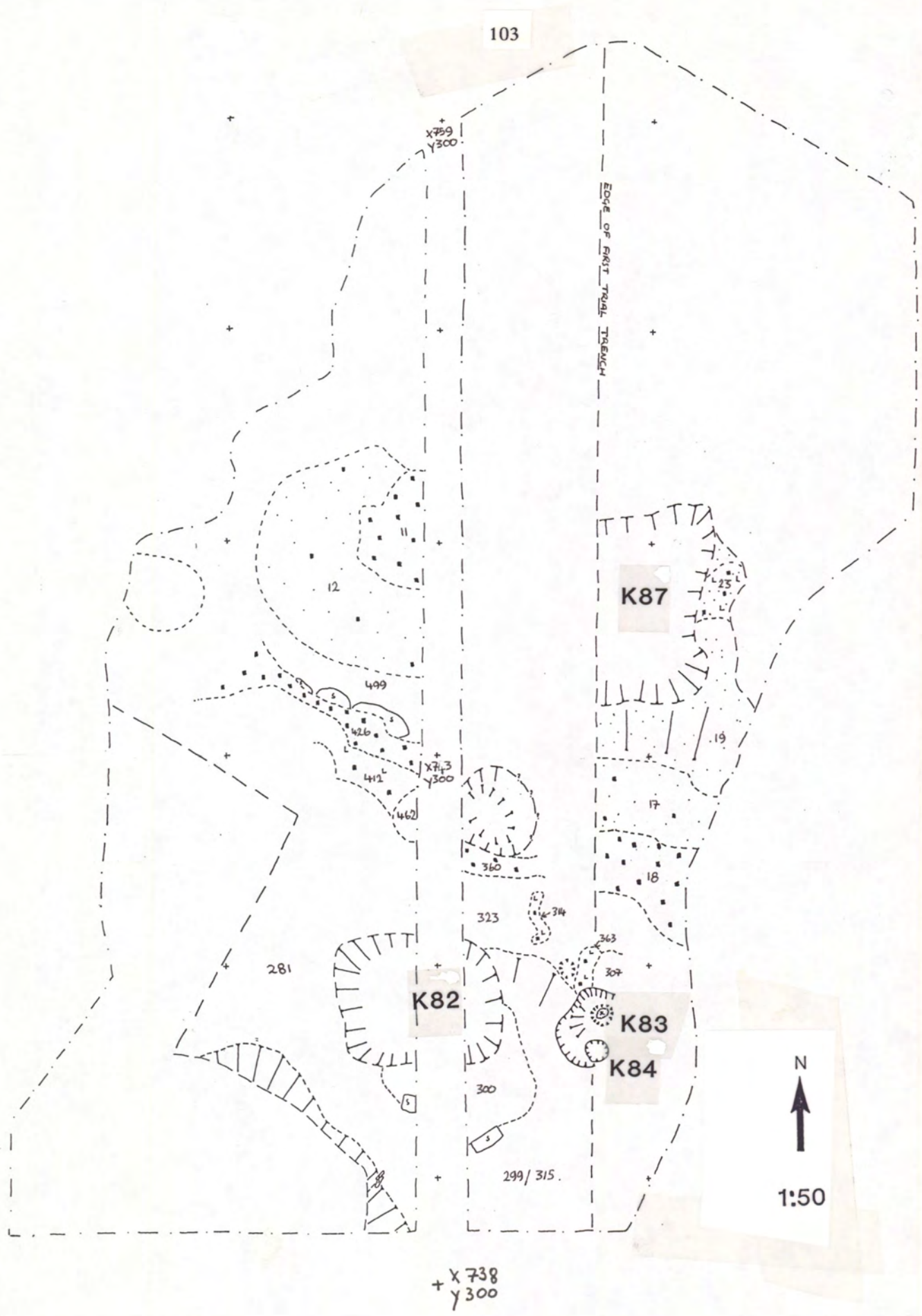


Fig. 33. F-site Quadrant FA: Phase 8; Level 2.

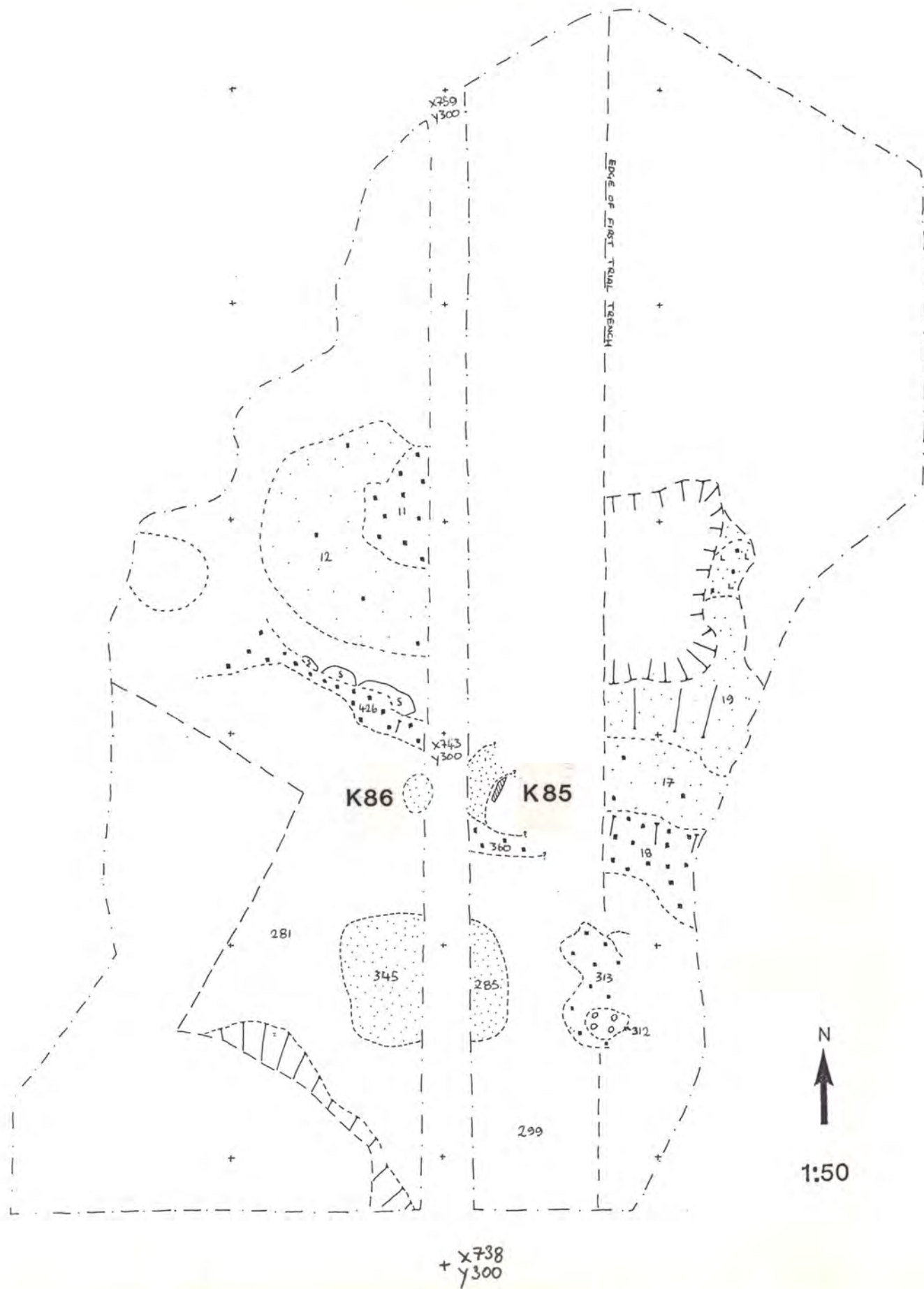


Fig. 34. F-site Quadrant FA: Phase 8; Level 3.

3.7.9. Phase 9 (no Fig. - general plan in archive).

Comprises only a few intrusions of post-medieval origin: the area was planed off, in the excavation's preparatory period, to the slag-bearing deposits, and, especially to the N of the quadrant, some medieval deposits were also removed. Consequently little examination or documentation of the post-medieval features and deposits took place. The major intrusions comprise a NE-SW orientated foundation wall (19th century) to the E of the quadrant, a square wood-lined latrine (?) to the N, a rounded (?) sand-filled pit to the SW, and a tar-container to the SW.

Dating.

17th to 20th century pot sherds etc.

3.8. Fält F: Kvadrant B (FB).

3.8.1. Grävteknik och dokumentation.

Kvadrant FB bestod från början av fyra, små separata områden med stratifierade, medeltida lager, vilka numera betecknas FB 2, 4, 5 och 6. När murar och andra moderna störningar tagits bort, tilkom FB 1, 3, och 7 (Fig. 6).

Fyra arkeologer var kortare eller längre tid involverade i utgrävningen av detta delfält. Därmed fanns också fyra olika sätt att gräva, dokumentera och göra lagerbeskrivningar.

Krav fanns att kvadranten med undantag av FB 6 skulle vara färdigundersökt till den 15. juni. Ytterligare en veckas tidsfrist gavs. När denna gått visade det sig, att spuntmaskinen bara behövde ta FB 2-området i anspråk, varför även de andra ytorna så småningom kunde grävas ned till steril. Den överhängande tidspresen påverkade naturligtvis grävteknik och dokumentation. I FB 2 användes krafsan då detta var möjligt, lämningarna samlades under mer kollektiva lagnummer och gränserna drogs när större förändringar förelåg. Gropars och nedgrävningars innehåll fick sällan egna kort utan beskrevs under konstruktionsnummret. FB 4, vilket under större delen av tiden omfattade en 1 x 0,5 meter stor yta, fingrävdes och minsta avvikelser registrerades och nummerades. Med hänsyn till lämningarnas art har flera lager kunnat likställas i matrixen. FB 3 framkom under en mur och är en utvidgning av B 4. Också B 1 uppenbarades i ett senare skede och fingrävdes. Övre delen av FB 5 borttogs med skärvslev och tesked under stark stress, vilket avspeglat sig i virrig och ofullständig dokumentation. FB 6 bestod i stort sett av ett enda slagglager utan konstruktioner. Detta var mycket hårt packat och fick av nödvändighet hackas bort med krafsa.

I efterhand har det visat sig, att inte alla arkeologer haft grepp om jordarters kornstorlekar. Somliga har endast gjort skillnad mellan sand och lera vilket i någon mån försvårat efterarbetet. Några få har konsekvent använt sig av den norska uppdelningen i sand - silt - lera. I kommande text begagnas omväxlande den norska och den svenska som har kornstorleksföljden sand - mo - mjåla - lera. Kornstorlekarna omtalas i stigande skala med huvudbeståndsdelen sist.

3.8.2. Fasindelningen.

Mellagerundersökningen skiljde sig markant från tidigare stadsgrävningar inom Trondheim. Trots detta har redogörelsens uppläggning och innehåll i görligaste mån, efter hänsyn tagna till tidspress och liknande faktorer, tillpassats Riksantikvarens i Trondheim tidigare utarbetade mall för rapportskrivning.

Kommande fasindelning har utförts med FB-kvadrantens och schakt B karakteristika i tankarna och utan större kännedom om FA-området som inte är färdigarbetat då detta skrivs. Schakt B redovisas i kap. 3.12. Där relateras de båda områdena och paralleller dras. OBS att konstruktionsnummerna (K-nummer) är gemensamma för FB-kvadranten och schakt B.

På grund av lämningarnas art och dåliga bevaringsgrad blir självsagt en fasindelning nog så godtycklig. Avgörande för gränsdragning mellan olika faser och nivåer har varit större förändringar i områdets utnyttjande samt mer eller mindre urskiljbara golv- eller arbetsnivåer.

Struktureringen av FB 5 övre del blev den mest problematiska. Stor möda och förhållandevis lång tid las ned på området men slutresultatet är inte helt tillfredsställande. FB 5 avvek från de mer sammanhängande ytorna i söder och väster. Det avslutades både i norr och söder av sekvenser med nedgrävningar vilket komplicerade gränsdragningarna. Ett stort, närmast olösligt problem utgjorde också slaggdumpningsområde FB 6/7 som inte mer än i stora drag kunnat knytas till kvadrantens övriga områden. Det är här osäkert från vilken verkstad/vilka verkstäder avfallsmaterialet kommit. Fasindelningens bakomliggande syften har framför allt varit:

- att illustrera olika typer av verkstadslämningar
- att påvisa den stora kontinuiteten i metallhanteringen, bland annat genom anläggningarnas placering och likheter i avlagringarnas sammansättning
- att påvisa att byggnader har funnits om än spåren var vaga
- att framhäva fältets kraftiga och tidiga utnyttjande och dess tydliga uppdelning i verkstads- och respektive slaggdumpningsområden.

3.8.3. Fas 1 (Fig. 35).

Ursprunglig markyta.

På flera ställen inom F och schakt B påträffades ovan steril ett vanligen 4 cm tjockt lager med mycket hård, plan och jämn yta (FB lagnummer 69, 206, 340, 341, 342, 525, 800, 800II). De översta två centimetrarna bestod i allmänhet av grå till mörkgrå, ibland något lerig, sandig mo och de understa av ljusgrå humös sand, möjligen ett urlakningsskikt. Ytan var ibland också grusig men ej överallt. Avlagringen kallades i fält för markyta, då den först uppfattades som sådan. Uttrycket har behållits eftersom ingen bättre passande term hittades.

Markytan var alltid helt plan och slät och påverkades inte vid beträdande. Höjdskillnaden mellan de olika delområdena var försumbar, ytan verkade nivellerad och inte naturligt uppkommen. Det kompakta lagret kunde och hade naturligtvis påverkats av ovanliggande lämningar, men dessa kan inte ha varit den enda orsaken till att det bildats. Den kan knappast heller ha tillkommit på något annat naturligt sätt, utan bör ha varit resultatet av en avplaning av området samt eventuellt en förhårdnande preparering av det översta skiktet. Pollenanalysen kan tas som stöd för denna hypotes (kap. 5.4.). I fall lagret formats såsom naturligt markyta i öppen dager, borde pollen ha funnits i densamma samt några centimeter ned i steril grund. Det gjorde det emellertid inte, utom på ett ställe, men där är förklaringen att ytan legat öppen under nästkommande fas. Om ingen avplaning gjorts, måste området ha tagits i bruk innan pollen hunnit avlagras, vilket verkar mindre troligt.

Markytan kan inte tidsfästas då inget daterbart material påträffades. Skiktet innehöll aldrig slagg og inte heller fanns slaggförande lager under detta. Markytan bör därför ha tillkommit innan metallhanteringen tagit sin början. En rimlig tanke är, att en förberedande avplaning och preparering gjorts inför verkstädernas anläggande.

Jordlager:

69, 206, 340, 341, 342, 525, 800, 800II.

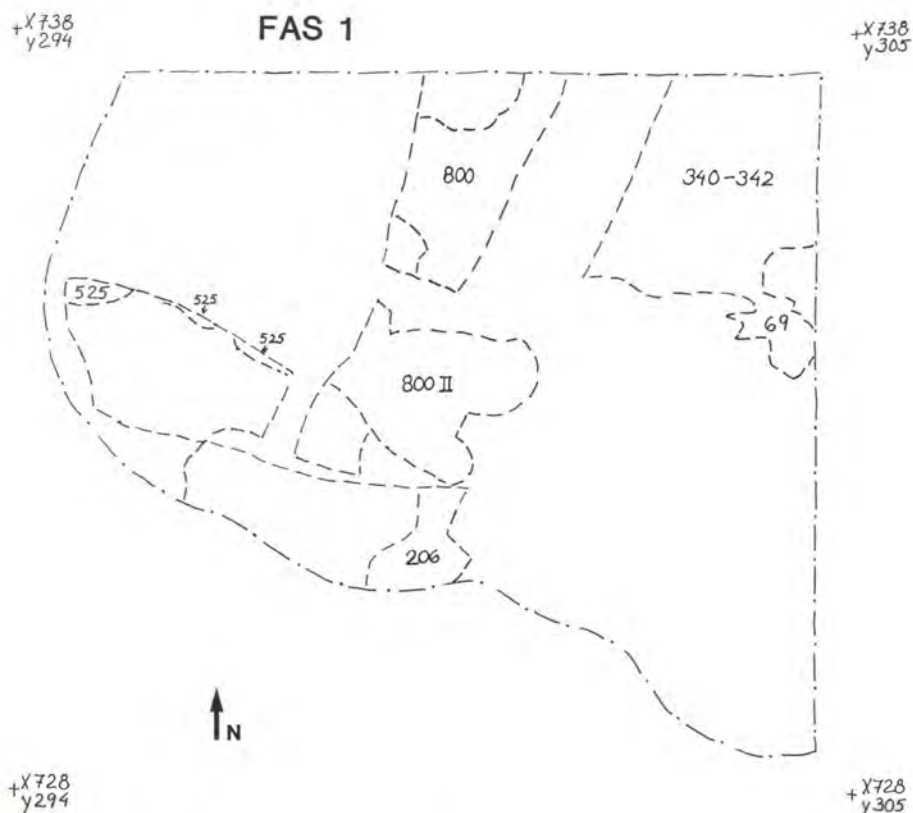
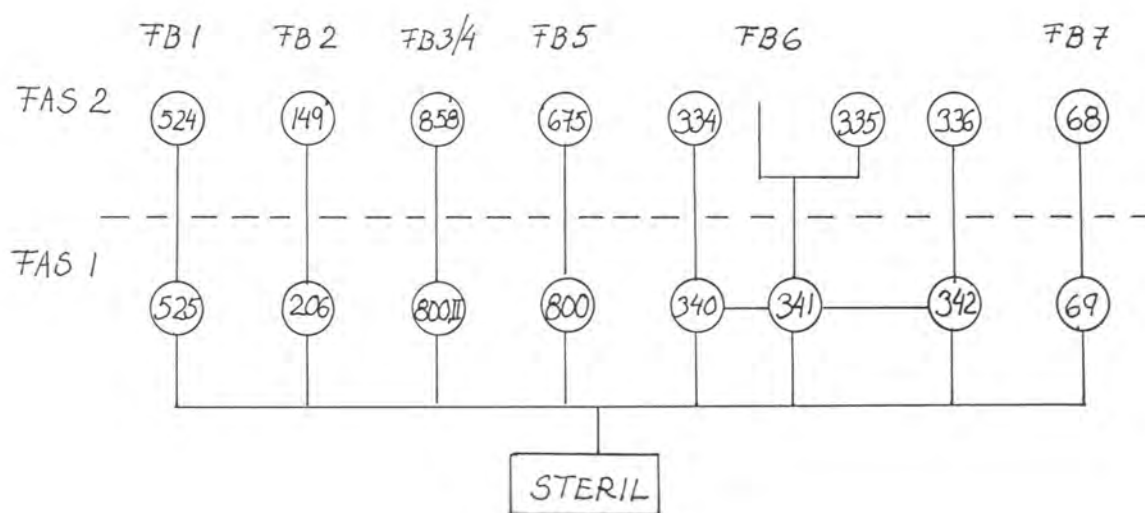


Fig. 35. F-fältet, kvadrant FB: Fas 1. Skala 1:100.

3.8.4. Fas 2 (Fig. 36).

Spår av den första metallhanteringen.

Från markytan hade en större nedgrävning eller urschaktning gjorts i områdets sydvästra del, Fig. 36. Denna hade sedan fyllts igen med dumpat slaggavfall samt sand och lera ditförda av två rännor.

Konstruktionsbeskrivning.

K1: Nedgrävt område i FB 1, FB 2 och FB 3. Den bevarade delen var 5 m bred, 2 m lång och upp till 0,65 m djup. K1 innefattar också rännorna 569 samt igenfyllnadslager 170, 247, 524, 557, 570, 859 och 860.

Avloppsrännorna utmynnade precis vid profilväggen i FB 1. De hade fört med sig material vilket avlagrats i form av tunna lerskikt varvade med ändå tunnare sandskikt (524 - 570). Leran dominerade stort i det djupaste partiet. Ju högre upp mot gropens kant man kom, desto större blev sand- och siltinslaget. En del kopparutfällningar sågs i lagren liksom några mindre slaggbitar, kol- och träfragment, förslaggad och orangebränd lera samt läder och obrända ben. Slaggen fanns företrädesvis i bottenskikten dit den tycktes ha sjunkit av sin egen tyngd.

Material från rännorna hade även hjälpt till att fylla fördjupningen i FB 2, men där hade dessutom en stor mängd slagg - främst bottenskållor- och organiskt avfall i myckenhet (se generell beskrivning av slagglager i kapitel 3.2.) dumpats från den värmepåverkade kanten i FB 3. Detta gavs lagnummer 170 och bestod av minst 5 skiktningar, dock med samma innehåll.

Dumpningslagren i FB 3 utgjordes av 247, 859 och 860. De innehöll gråmörkgrå lerig silt, sand, bränd sand och mycket slagg.

Övrig stratigrafi.

Över igenfyllnadslagren i FB 1 fanns ytterligare några varv med sand och lerig silt, 482, 483, 484, 485, 522, 523. Dessa hade också avsatts på den smala kanten av markytan som stack fram vid profilväggen. 482 hade en slaggkoncentration längst i öster vilken antagligen fortsatte som slaggdumpningslagret i 247 i FB 3.

Markyta 800 i FB 5 har förmodligen legat öppen och oanvänd medan aktiviteter pågick i kvadrantens SV parti. Detta var intrycket vid grävningen vilket nu bekräftas av pollenanalys. Endast här fanns pollen i nämnvärd mängd i och under markytan (pollenserie 5).

Nedgrävning 798 i samma område var dubiös. Den hade markerade gränser men var i övrigt diffus och verkade "fel". Gropen innehöll gul sand och tre lersjok, 797. Under dessa framkom ett modernt vattenledningsrör! Det är därför möjligt, att formationen bildats när röret pressades in i marken.

De understa avfallslagren i FB 6 hade vissa likheter med slagglager 170 som fyllde den urgröpta delen av FB 2. Dessa två områden kan emellertid bara sammanlänkas medelst vaga synsinyck, varför inga bestämda slutsatser vågar dras om samtidigthet.

Datering.

I igenfyllnadslager 522, FB 1, hittades ett mynt av typ brakteat vilket fanns i cirkulation från cirka 1150 till 1200 e Kr. I igenfyllnadslager 557, FB 1, fanns en keramikskärva vilken Ian Reed identifierat som Paffrath blau-grau och daterat till 1100-tal.

En ¹⁴C-analys av organiskt material från 170, FB 2, gav 1220+/-90 BP. Kalibrerat enligt Stuiver och Pearsons skala hamnar åldersbestämningen mellan 677 och 894 e Kr.

Då ^{14}C -provet gett en långt tidigare datering än föremålen, är det troligt att analysmaterialet påverkats och föråldrats av någon företeelse i det slagg- och metallförande lagret.

Kommentar.

Två avloppsrännor utmynnade i en nedgrävning. Om denna varit avskiktlig och funktionsbetingad är oklart men troligt. Rännorna kan ha anlagts för dräneringsändamål. Om så varit fallet, skulle de kunna vara något äldre än de första metallaktiviteterna. Rännorna kan också ha varit tekniskt betingade om t.ex. vitriolframställning (ingått) i verksamheten.

I denna fas finns de första spåren av metallhantering. Slagg har tillsammans med annat avfall dumpats i en nedgrävning och möjligen har en verkstad varit uppförd någonstans på Mellagertomten.

En keramikskärva och ett mynt tidsbestämmer fasen till 1100-tal.

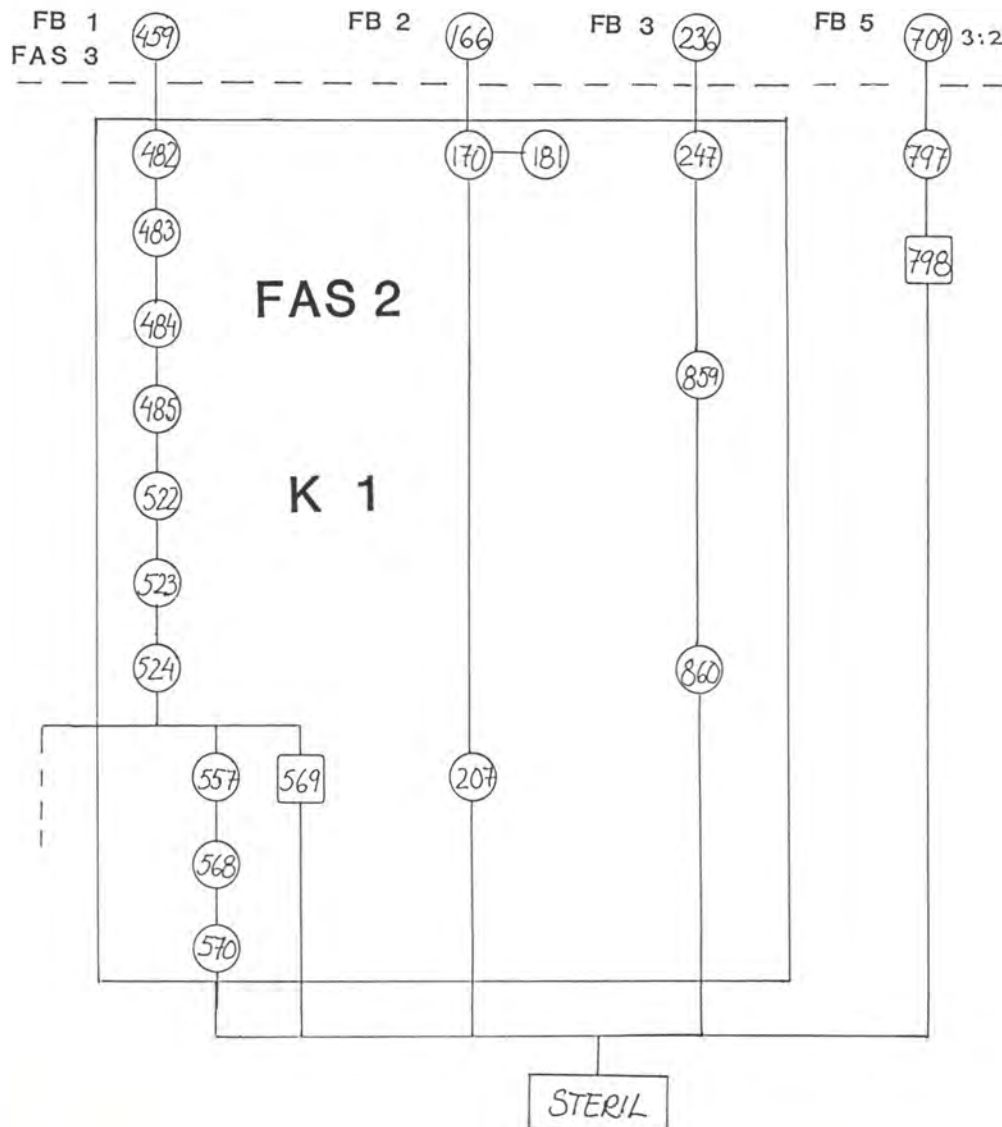
Jordlager.

FB 1: 482, 483, 484, 485, 522, 523, 524, 557, 568, 570

FB 2: 170, 181, 207

FB 3: 247, 859, 860

FB 5: 797



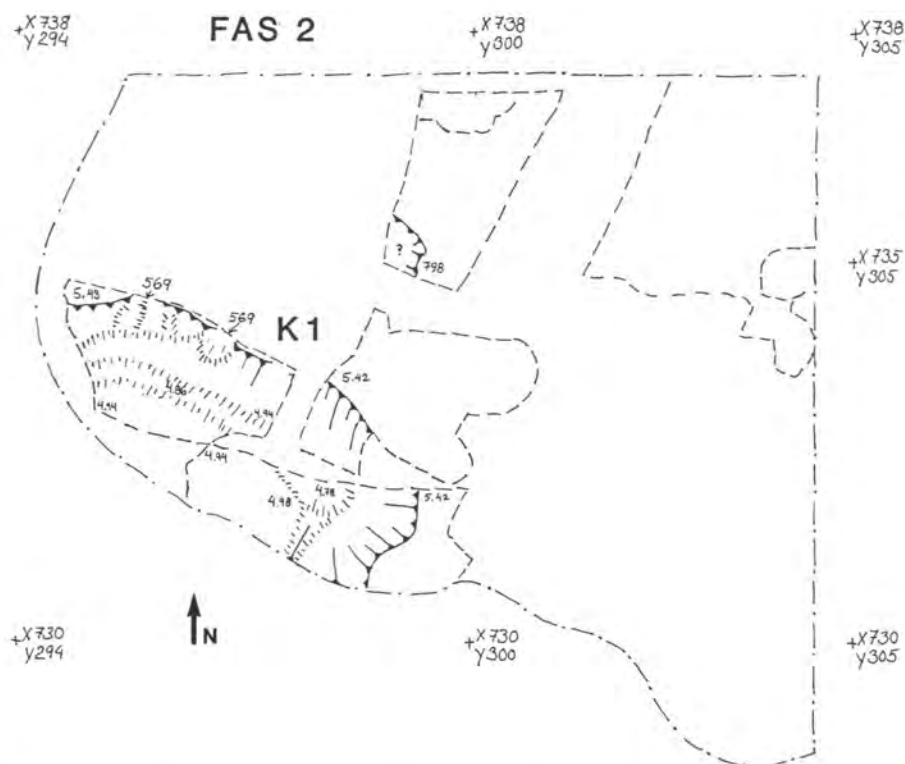


Fig. 36. F-fältet, kvadrant FB: Fas 2. Skala 1:100.

3.8.5. Fas 3:1 (Fig. 37).

Byggnadsindikationer.

Föregående fas dumpnings- och igenfyllnadslager förseglades av någon sorts huskonstruktion. Byggnaden förnams genom diverse plankrester och rödbruna leriga lager innehållande trä- och näverfragment.

Konstruktionsbeskrivning.

K2 är en verkstadsbyggnad som på denna nivå dokumenterats genom träresterna 135, 155, 197, 237, 727 och 799. Även i det blandade trä/lerlagret 857 ingick plank- och träbitar. K2 bestod också av rödbruna siltiga leriga lager med mer eller mindre tydliga trä- och näverfragment. Dessa hade nummer 150, 166, 203, 204, (236), 245, 246, 457, 460, 857 och 858. Gul påförd sand låg alltid över och under träleran och plankresterna (159, 458, 459, 675).

Träet var mycket dåligt bevarat, vilket ibland gjorde det svårt att avgöra, om det rörde sig om en eller flera brädor (ex 799) eller i ett fall om en stock, 135. 135 skulle t o m kunna ha varit plankor liggande över en halvklyvning. Den rödbruna, siltiga leran, "träleran"; hade exakt samma färg som de i hög grad förmultnade och uppsplittrade plankorna och innehöll otvivelaktligen träfragment. Speciellt tydligt var detta i de områden trästrukturer gick att urskilja. I fält uppfattades lerlagren som förmultnade brädor och näver sammanpressade och ihoptryckta med lera.

K2 stratigrafi inom kvadrantens olika områden.

FB 1: På sandunderlag 459 vilade ett ca. 1 cm tjockt, rödbrunt lerlager, 460. Detta täcktes av sandskikt 458 varpå ett nytt rödbrunt lerlager, 457, följde.

FB 2: Samma sorts avlagringar fanns här, men deras utbredning avbröts tvärt i öster av ett slaggdumpningsområde. Det understa lerskiktet 166 hade smärre inslag kolfragment och näver. Därpå följde sand 159 och sedan trälera 150. Olika nedgrävningar, vilka kommer att beskrivas 1 3:2, skar igenom dessa skikt.

I området mellan nedgrävningarna och slagggavfallet fortsatte rödbruna lerlager varvade med sand att förekomma uppåt genom flera nivåer (nivå 3:2 143 sand, 3:3 137 minst fem skikt trälera, 133 sand, 3:4 92B lera, 108 sand). De begränsades i väster av fragmentariskt trä där stockrest 135, plankrest 155 och plankrest 92A (3:4) kunde urskiljas. Även i öster begränsades de vid åtminstone ett tillfälle av trärester, men de har endast dokumenterats på en profilritning. Brådskan var stor och virkesavfallet i slagglagren försvårade bestämningen. Ovanpå lera 137 låg dock en mindre bräda, 134, intill vilken antagligen en stock funnits att döma av lerans form (se 3:3).

FB 3 och 4: Lera-sand-lerskikten upprepades också här men låg nu direkt på ursprunglig markyta. Det understa rödbruna lagret med träfragment och näver hade oftast klibbat ihop med sanden ovanför, varför allt i hastigheten borttogs som 858 samt 245, 246. Det översta lerlagret 857 innehöll rikligt med trä, bland annat ett par nedtryckta, ca. 2 cm tjocka plankor. Den nordvästra delen av FB 3 hade ett märkbart inslag grågrön lera.

FB 5: En eller flera plankor, 799, fanns direkt på markytan. De gav ett visst intryck att vara kantställda.

Lera - sand - lerskikten saknades. I stället noterades ett 25 cm tjockt lager gul sand, 675, vilket täcktes av 2 mm mörkgrå lera. I nordöst var lerskiktet kraftigare och grågrönt till färgen förutom ytan som var gul på grund av inblandning av aska eller någon metalloxid (729). Ovanpå 729 låg en mindre plankrest, 727. Lerlagren har tolkats som golvnivå. Den låg här något högre än väntat i förhållande till övriga områden och med hänsyn taget till markens sluttning. Detta samt skillnaden i uppbyggnad gör det troligt, att FB 5 hört till en annan verkstadsanläggning vilken fortsätter inom FA-kvadranten. Den inbegrips dock här i K2 eftersom den skulle kunna vara en avbalkad del av denna byggnad.

K2 har förmodligen en fortdättning i schakt B allra västligaste del där likadana lager med trälera, sand och plankrester hittades, se schakt B fas 4:1.

Datering.

Inga daterande föremål hittades.

Kommentar.

Det mellanliggande skiktet i sekvensen trälera - sand - trälera utgjordes av gul, övervägande opåverkad, påförd sand. Från det översta lerlagret hade flera nedgrävningar företagits varför nivån uppfattades som golv.

Plankresterna delade FB-kvadranten i SV-NO riktning. Öster om avgränsningen fanns slaggdumpningsytor, väster därom verkstadsanläggningar. Skiljet hus/avfall var mycket klart i FB 2 och fortsatte genom yngre nivåer. En vägg bör sannolikt ha stått där. Hur denna varit konstruerad framgick emellertid inte. Möjligen har sekvensen rödbruna lerlager mellan träresterna varit en del av avbalkningen, men dessa lager kan också ha varit en förhöjning i etapper av golvnivån eller eventuellt en verkstadsbänk (liknande mullbänk i fas 3:3 låg). Den långsmala brädan 134 låg ovanpå lerskikten 137. Öster om plankan var leran skålad och formad som efter en borttagen stock. Ifall en stock legat på detta stället kan den ha utgjort grunden för en stav- eller timmerkonstruk-

tion. 799 i FB 5 gav snarare intryck av skiftesverk eller något annat, enklare byggnadssätt.

I FB 3/4 gick träresterna också i NV-SO riktning och antydde ytterligare en avdelning av området. Den södra byggnadskroppen tycktes fortsätta i schakt B där likadana rödbruna lerlager i kombination med trä påträffats. Storleken på detta hus eller rum har därmed varit minst 6 x 5 meter. FB 5 har antingen varit ett rum i samma hus eller tillhört en annan byggnad. Troligen är det sista alternativet mest sannolikt. Det är möjligt, att FA-områdets kommande redovisning, vilken inte är gjord då detta skrivs, bättre kan avgöra denna fråga.

Jordlager.

FB 1: 457, 458, 459, 460

FB 2: 150, 159, 166

FB 3/4: 203, 204, 205, 235, (236?), 245, 246, 857, 858

FB 5: 675, 729

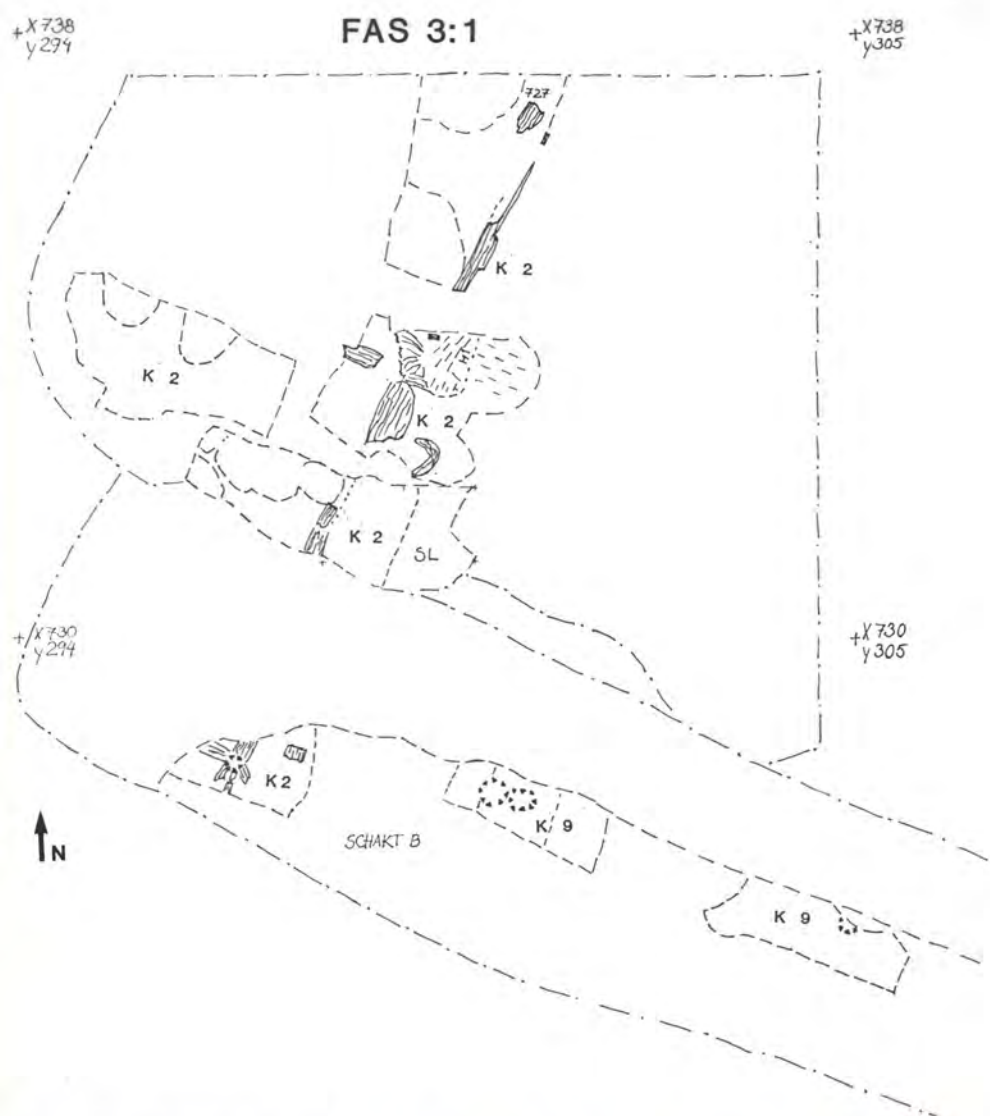


Fig. 37. F-fältet, kvadrant FB och schakt B: Fas 3, nivå 1. Skala 1:100.

FB 1

FB 2

FB 3/4

FB 5

FAS 3:2

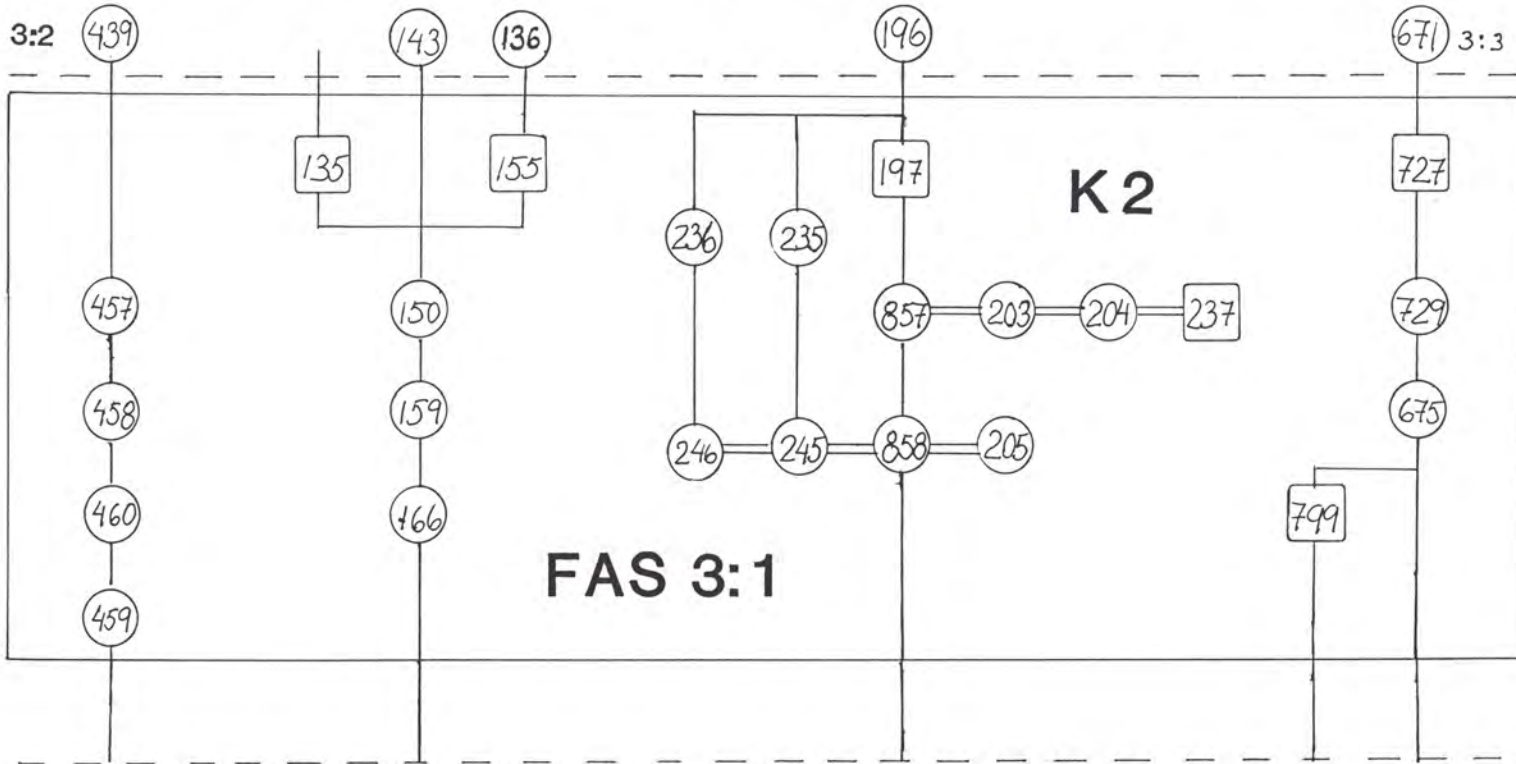
439

143

136

196

671 3:3



K 2

FAS 3:1

3.8.6. Fas 3:2 (Fig. 38).

Verkstadsanläggningar.

Denna nivå representerar den tidigaste verksamhetsfasen inom byggnad K2 vilken beskrivits i föregående avsnitt, 3:1. De första konstruktionerna avsedda för metallhantering hade anlagts i gropar. Av de tolkningsbara nedgrävningarna innehöll minst tre, troligen sex, ugnrester. En var en möjlig bälggrop, övriga hade ingen uppenbar funktion men kan ha använts vid gjutning eller liknande processer. Dessutom registrerades arbetsytor av lera, en eventuell fällsten, slaggavfallslager samt en större mängd pinnhål vars närvaro har en teknisk förklaring.

Konstruktionsbeskrivning.

K2 gäller och följande anläggningar hade anlagts inom denna verkstadsbyggnad.

K3 (Fig. 39) innefattar ugnskonstruktion 151 med framförvarande grop, bälggrop 152 samt en onummererad fällsten. Alla dessa företeelser gav ett intryck att höra samman och utgjorde antagligen en arbetsenhet. Möjligen kan också en eller båda de obestämbara nedgrävningarna 160 och 161 ha varit knutna till K3.

Ungsgrop 151A var närmast rund, ca 65 cm i diameter och 30 cm djup. Den hade en inre, raserad stenkonstruktion av ursprungligen kantställda hållar med en yttre diameter på ca 40 cm (tidigare troligen något mindre) och bevarad höjd 25 cm. Endast en håll stod fortfarande upprest vid utgrävningstillfället, resterande var tydligt nedfallna och söndersplittrade av stark hetta. Kring stenarna fanns en myckenhet bränd lera, vilken kan ha använts att täta konstruktionen. Ugnen har förmodligen haft ett lerschakt som överbyggnad, emedan bränd lera låg utspridd som efter ett nedrasat sådant, då anläggningen började framträda på nivå ca 5,50 M.O.H. Under detta "lersjok" fanns en hel del slagg, speciellt i norr intill den ur profilväggen utstickande kalkstenen. En kalkstensbit låg för övrigt bland hållresterna, vilket är värt att notera eftersom den kan ha placerats där i ett medvet, metallugiskt syfte. Mot ugnsbotten påträffades också en delvis utrakad (?) bottenskälla. Denna har senare analyserats, se N 107266. Slaggkakan låg ungefär där ett blästerhål kan tänkas ha funnits. Här i den östra delen anknöt en annan grop, 152, vilken mätte ca 60 x 60 x 25 cm och vars yta sluttade ned mot stenkonstruktionen. 152 var till hälften fylld med ljust gråbrun, siltig sand och däröver grå sandig mo. Nedgrävningen bör ha varit lämplig som bälggrop. En ytterligare tolkningsmöjlighet är, att den fungerat som avställningsplats för deglar och gjutformar. I väster framför ugnen fanns ännu en grop. Den var ca 60 x 60 x 30 cm och innehöll svart lite fet och sandig, sotig mo, slagg, kopparskrap och rikligt med bränd lera. Gropen har förmodligen behövts för att komma åt att sköta ugnen. Nära ugnsanläggningen låg en flat, något urholkad sten med dimensionerna 30 x 30 x 5 cm. Den verkade stabil, välförankrad och omgavs av en mängd större kolbitar. Den urskålade formen berättade, att hållen antagligen fått tjänstgöra som fällsten. På denna har slagg hamrats ur en metallupp eller också kan slaggkakor ha slagits i bitar för att kvarvarande metallroppar skulle kunna tas tillvara.

K4 707, rest av ugnsgrop, närmast rund, ca 70 cm i diameter och 25-30 cm djup. Arbetsytorna 703 och 705 inkorporeras i samma konstruktion. Två mindre kantställda hållflisor begränsade nedgrävningen i SV. Smärre skörbrända hållrester låg utspridda i anläggningens centrum tillsammans



Hearth complex K3 (151) in FB.

med diverse slaggbitar varav en var en ovanligt vacker bottenskålla. Gropen innehöll i övrigt mörkgrå samt rödbrun sandig lerig mo med visst inslag silverglimrande korn och kopparfragment (710).

I direkt anslutning till nedgrävningens södra del fanns arbetsytor av bränd och obränd lera (703, 705). 703 var en orange närmast cirkulär fläck med spår av något rött, oidentifierbart material. 705 bestod övervägande av avlagringar med ljust grågrön lera. Ytskiktet var mörkt rödbrunt och leran innehöll orangeröda/klarröda utfällningar.

- K5 730, 747, 830, rester av ugsanläggningar. I den norra delen av FB 5 fanns sekvenser av ugsrester över och intill varandra. De skars alla av profilbanken, vilket försvårade utredandet och dokumentationen.

830 innefattade egentligen två gropar. Den undre, något större och vidare, hade raka väggar och plan botten. Enligt profilteckningen var den 80 cm i diameter och 40-45 cm djup. I denna hade en annan nedgrävning gjorts. Ett par hällrester, en av dem kantställd, samt ett

lersjok på gropens botten angav en borttagen inre konstruktion. Bland innehållet i övrigt märktes slagg, kol, kopparspill, bränd och obränd lera. Ugnsgropen skars på mitten av profilbanken men beräknas ha haft en diameter på 60 cm.

Ovanför 830 fanns 10-20 cm avlagringar med gulbrun, rödbrun och gråbrun sandig mo samt vaga spår av ytterligare en ugnsgrop.

Därefter började anläggning 730 som var ovanligt välbevarad för att komma i denna sakvens. I en större grop bildade bl.a. 3 kantställda hållrester en närmast rund formation, drygt 40 cm i diameter. Flera bitar av stenplattor låg spridda i centrum. Den östra på insiden sotiga ugnsgropkanten var fodrad med bränd lera. Väster om stenanhopningen fanns en mindre fläck med silverglimrands korn och något rödockraliknande material. Intill fläcken och under den fanns några lerskikt. Anläggningen var dessutom fylld med mörkgrå och sotig lerig mo, slagg, koppar- degel- och kolfragment. En kopparnål samt en blybit hittades även.

730 skar anläggning 747. Också denna har sannolikt bestått av två gropar, vilka båda antagligen innefattat stenkonstruktioner. Den överst försvann in i profilen. Det parti som var synligt överlagrades till största delen av 730. Två rejäla kantställda hållar, orangebränd lera och lämningens relativt tydliga avteckning på schaktväggen pekade emellertid mot en raserat ugn. Kopparskrap ingick i fyllningen. Den undre anläggningens grop var nedgrävd i steril och därför lättåskådlig. Hällflisor, bränd sand och lera antydde att en inre konstruktion funnits.

Övrig stratigrafi.

Förutom nyss nämnda konstruktioner fanns i denna fas ytterligare rester av fyra nedgrävningar, nämligen 160, 161, 444 och 445. De hade alla oturen att ligga på schaktanten och endast fragmentariska delar av dem fanns inom undersökningsområdet. Ingen har därför heller kunnat ges någon funktionell tolkning.

Lager 442 och 443 hade en skarp nordlig gräns och skar FB 1 övriga skikt. De skulle därför kunna ha utgjort fyllning i ännu en nedgrävning. Innehållet påminde om dumpningsmaterial och utöver gråsvart sotig lerig mo fanns rikligt med fayalitslagg och bränd lera samt lite kopparskrap. 442 hade inslag av silverglimrand korn och ett jordprov från lagret har analyserats vid Norges Tekniske Høgskole, Trondheim (N 104021, se Espelund, kapitel 4.4.). Dessa glänsande flagor har nu omtalats vid ett flertal tillfällen. Det kan ge intryck av att de var vanligt förekommande men så var inte fallet. De påträffades fläckvis och i vissa lager och just för att de inte fanns överallt, har de alltid uppmärksammats och noterats inom FB-kvadranten.

I nära anslutning till de olika nedgrävningarna hittades rester av pinnhål (456, 481, 675). Dessa framstod oftast som grå siltfläckar i gula sandskikt. (De flesta sandskikten har placerats i fas 3:1, medan pinnhålen inbegripits i 3:2). Ibland satt förkolnade spetsar kvar i hålen. Flera än de som har uttritats på planen har funnits. Den övre delen av lager 675, FB 5, var helt översållad av dessa lämningar. Förekomsten har en teknisk förklaring. Käppar har stuckits i koppargjöt eller smälta, för att förhindra oxidation samt för nödvändig omröring. När pinnarna inte använts tycks de ha stuckits ned i marken intill ugnsanläggningarna.

Östre delen av FB 2 innehöll kompakta lager med tätt packad slagg samt kolstybb och träavfall (149, 153 dumpningslager). Detsamma gjorde dumpningsområde FB 6/7 vilket av stratigrafiska och och tidsmässiga skäl närmare beskrivits i ett särskilt avsnitt (se 3.9.).

Sand har haft ett stort användningsområde inom metallhanteringen. Sandinslag och sandskikt som 704 och andra liknande lager i kommande fas

utgör troligen spill från olika arbetsmoment. Sand har lagts som ett täcke över de smälta metallerna i deglarna för att förhindra oxidation och för att dra åt sig kvarvarande slaggineslutningar. Sand har använts som magringsmedel i leran då ugnsschakt uppförts eller gjutformar tillverkats. Sand kan också ha använts som flussmedel och slaggbildare om metallreduktion ingått i verksamheten.

Datering.

Kol samlad vid ugnsanläggning 151 har analyserats vid Svedberglaboratoriet i Uppsala av Göran Possnert. ^{14}C -dateringen gav 1220 +/-60 BP vilket kalibrerats till 785 e Kr. Även denna tidsbestämning blev äldre än väntat. Eftersom kolet fått samma ålder som det organiska materialet i fas 2, bör felkällan vara densamma och skall antagligen sökas i de slagg- och metallförande lagrens sammansättning eller i kemiska processer till följd av den medeltida verksamheten. Kan närvaron av strontium och rubidium ha påverkat resultatet? Tjernobylnedfallet?

Kommentar.

De i denna fas beskrivna anläggningarna hörde till de bäst bevarade inom FB-området. Sekvenserna med gropar i norra delen av FB 5 förmedlar antagandet, att det relativt ofta varit nödvändigt att bygga om konstruktionerna. Varken häller eller lerschakt har förmodligen hållit för ett längre, intensivt utnyttjande. Igenslaggning av ugnarna var säkert ett problem liksom anhopning av koldamm och sandspill.

Ugnar tycks genomgående ha varit anlagda i en grop och bestått av kantställda häller med överbyggnad i form av lerschakt. Principen grop - häller - lerschakt anknyter till den norska traditionen och är i linje med andra ugnstyper från samma period. De medeltida järnframställningsugnarna i Dokka verkar t.ex. ha konstruerats enligt nyss nämnda princip¹, även om likheterna i övrigt inte är speciellt slående. Svenska ugnstyper saknar inslaget med hällar, varför det är troligt att Mellagerteknologin var inhemsk och norsk.

Jordlager.

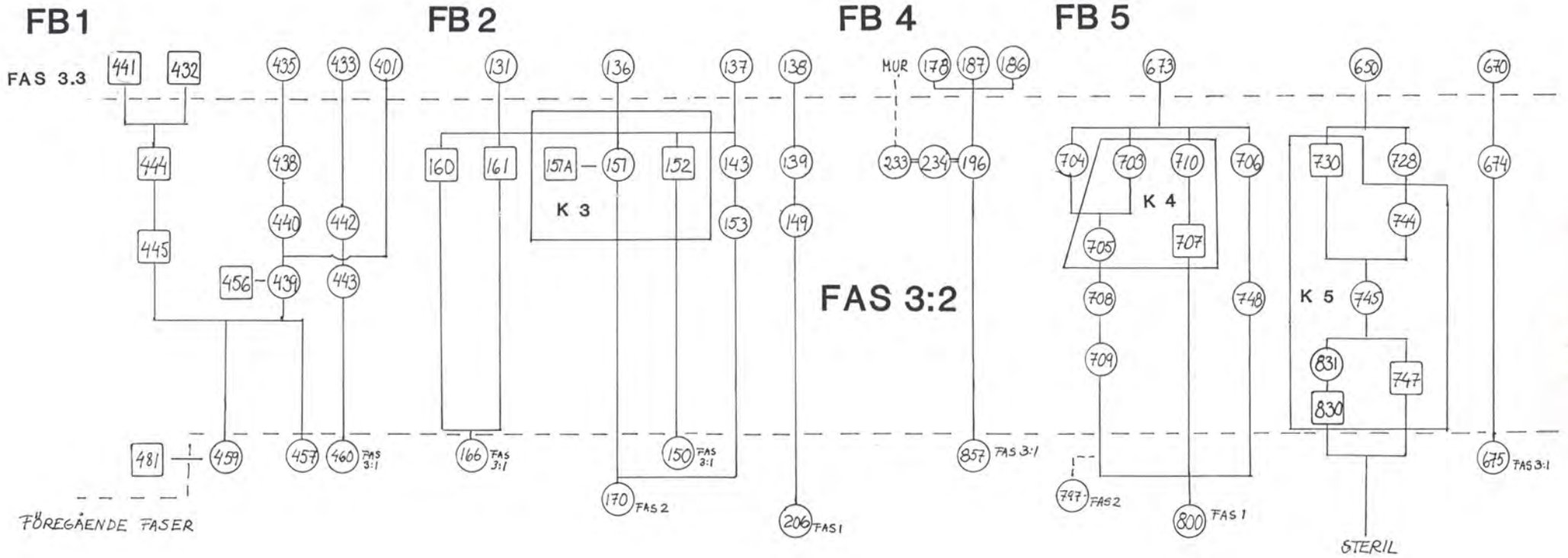
FB 1: 438, 439, 440, 442, 443

FB 2: 143, 149, 139, 151, 153

FB 3/4: 196, 233, 234

FB 5: 703, 704, 705, 706, 708, 709, 728, 744, 745, 748

¹ slutsats dragen efter föredrag av Jan Henning



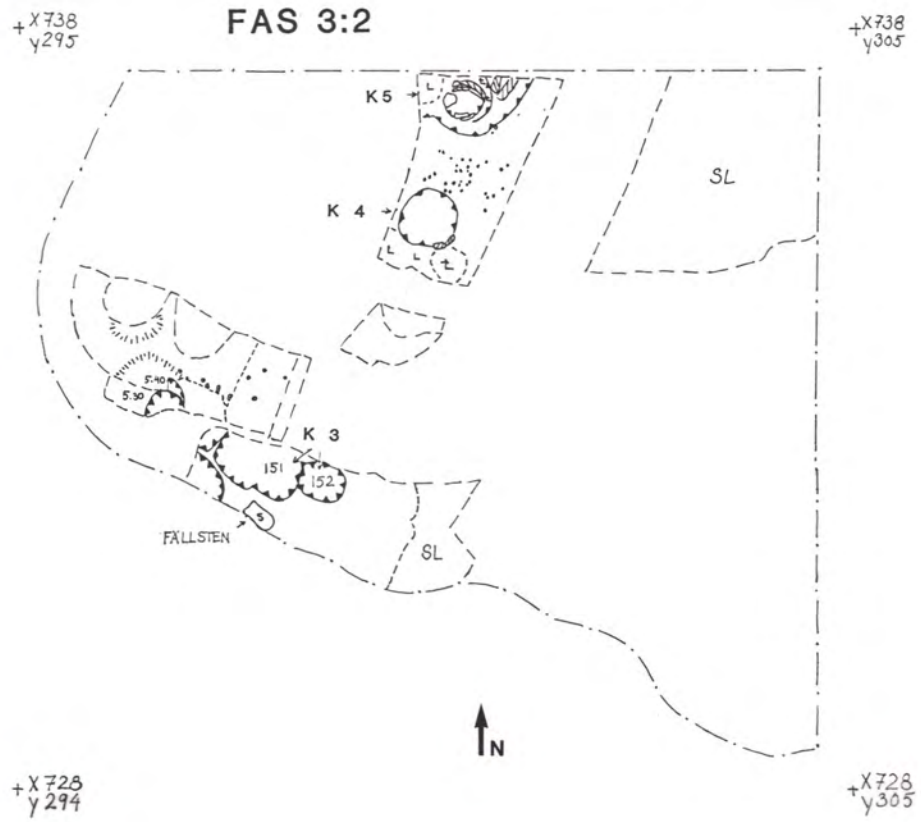


Fig. 38. F-fältet, kvadrant FB: Fas 3, nivå 2. Skala 1:100.

K3 UGNSANLÄGGNING

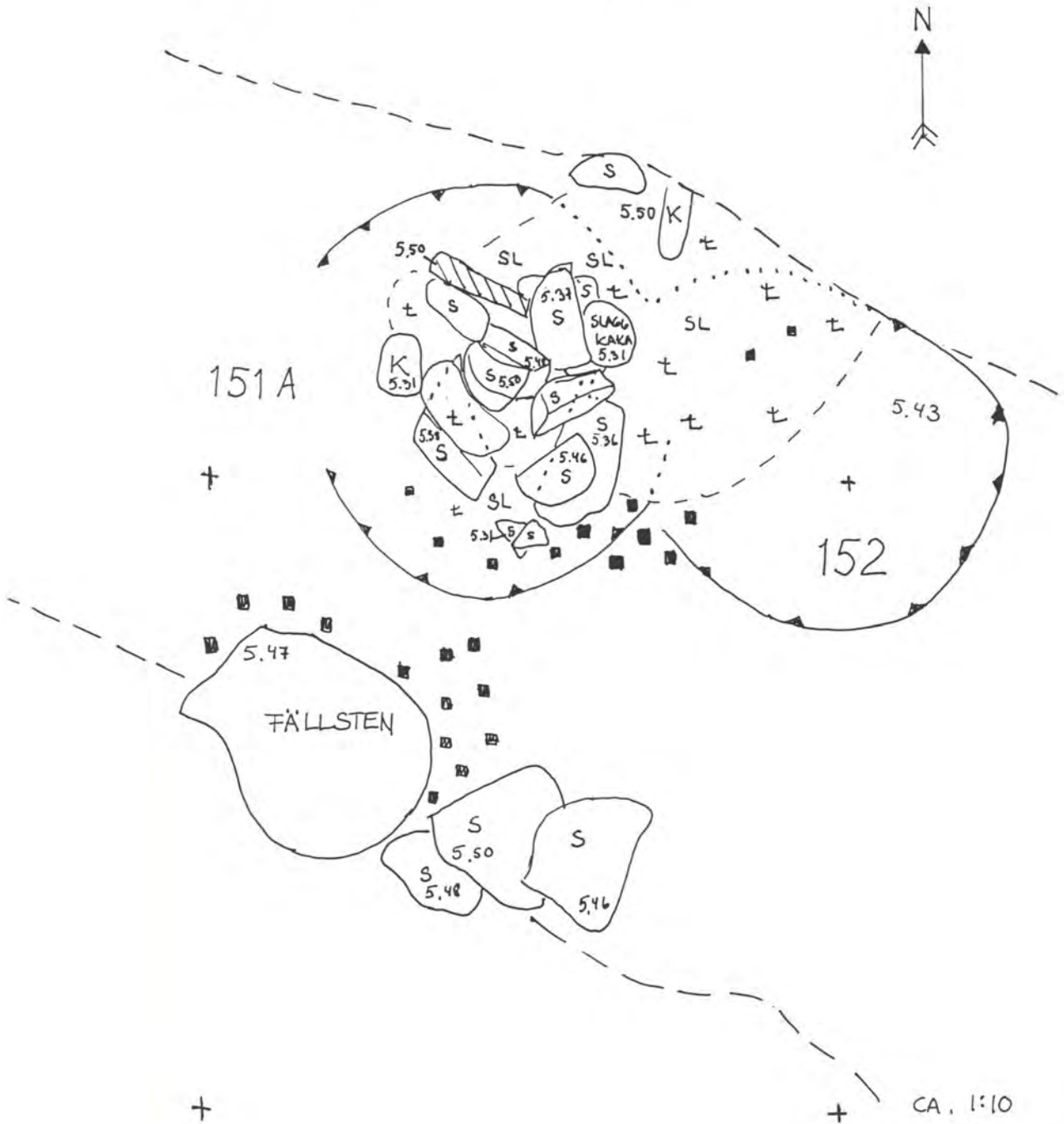


Fig. 39. Detaljert plan av härd K3. Skala 1:10.

3.8.7. Fas 3:3 (Fig. 40).

Arbets- och golvnivå.

Nivån har tillkommit på grund av en mer eller mindre uppenbar golvläggning. K2 förmodas fortfarande stå kvar, även om de fåtaliga byggnadsindikationerna skulle kunna tolkas som att ett nytt hus uppförts eller verkstaden ombyggts. De metallurgiska konstruktionerna, som var relativt tydliga i 3:2, är hädanefter så gott som fullständigt raserade och endast fragmentariska delar av dem återstår.

Konstruktionsbeskrivning.

K2 utökas med stolphål (?) 130, trälera 137, plankrest 156 samt de varvade lerlagren 646 och 649.

En mindre bräda, 134, låg i FB 2 ovanpå ett kraftigt lager rödbrun trälera, 137. Öster om brädan var leran nedtryckt och urskälad som efter en stock. Detta markerade avsnitt mellan verkstads- respektive slagglavlagringar bör representera någon form av golv och/eller väggkonstruktion.

Stolphål 130 var osäkert och kan lika gärna ha varit en nedgrävning av annat slag. Det mätte 36 cm i diameter, var 32 cm djupt och innehöll mörkbrun och rödbrun mo, kolfragment, några slaggbitar samt ett par mindre stenar men inga egentliga trärester. Intill 130 fanns ett mörkt rödbrunt lersjok med kol- och träfragment (inräknat i 136) vilket skulle kunna tolkas som återstod av golv eller arbetsyta. K2 var i FB 4 synlig som plankrest 156. Under träet låg ett tunnt lerskikt, 185. FB 5 anknyts till södra delen av fältet genom den andra förmodade golvnivån av varvad lera (646, 649) vilken anses motsvara lerlager 137.

Övrig stratigrafi.

FB 1-området hade varken golv- eller trärester. Skikten utgjordes i stället av karaktäristiska, blandade verkstadsavlagringar. Grundstommen bestod av mörk lerig mo, innehöll rikligt med kolfragment och sandigare partier. Avvikande var ett rent kollager, 400, samt två smärre groprester, 432, 441, vid södra schaktväggen.

Spår av anläggningar noterades i FB 2. Skörbrända hållrester låg spridda kring en närmast fyrkantig, hård, svart och sotig leryta med cirkulär, urskälad, central fördjupning. Detta var antagligen resterna av en lerklädd ugnsbotten och den kallmurade (?) påbyggnaden. Så gott som kant i kant med denna omgärdade några stenar paritellt återstoden av en nedgrävning. Endast dess östra halva var klart avgränsbar på grund av, att där fanns den brända lerinfodringen kvar. Båda lämningarna hade en diameter på cirka 40 cm och ingick i lagnummer 131. Ca 10 cm av en rund, bränd leryta sågs även vid den östra profilväggen. Den har ej utritats på fasplanen, (Fig. 40).

Längst i norr inom FB 5 uppmärksammades en något bättre bevarad konstruktion. Den utkristalliserade sig genom lagerskiljen, en anhopning stenflisor samt två kantställda hållarvilka stack fram ur profilen (244).

I övrigt noterades i samtliga områden sotiga, blandade verkstadsavlagringar, renare gula sandskikt och kolfläckor. Avfallslager med hårt packad fayalit- och gjutslaggar hade dumpats i östra delen av FB 2 (132, 138)liksom i FB 6.

Datering.

Inga daterbara föremål blev funna och inga ¹⁴C-analyser har utförts.

Kommentar.

Kontinuiteten i verkstadslagren och nedgrävningarnas placering emotsäger att ett helt nytt hus uppförts. Verkstad K2 tros därför ha reparerats/ombyggt eller fått en förhöjd golvnivå. De tekniska konstruktionerna var alltför dåligt bevarade för en mer ingående beskrivning, diskussion och tolkningsförsök. Fortfarande är dock (ugns?)anläggningarna närmast runda och har fundament av kantställda hållar. Lerklädda bottnar och lerinfodrade gropar verkar nu bli vanligare.

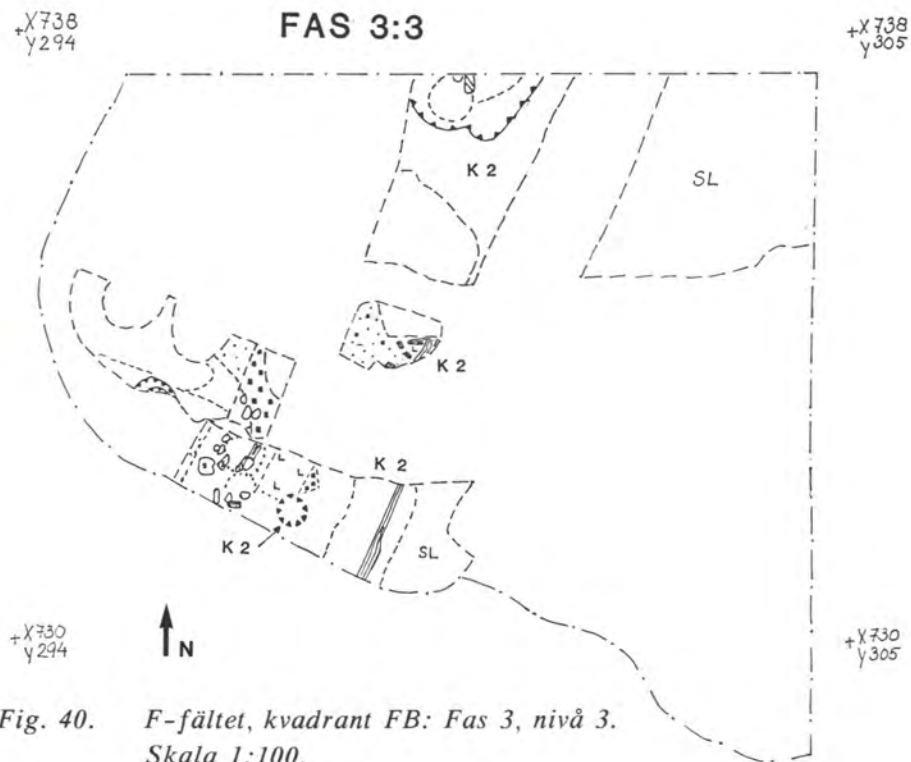
Jordlager.

FB 1: 400, 401, 402, 403, 404, 405, 433, 435

FB 2: 131, 132, 133, 136, 137, 138

FB 4: 145, 157, 158, 167, 178, 186, 187

FB 5: 244, 250, 253, 254, 255, 646, 649, 650, 670, 671, 673

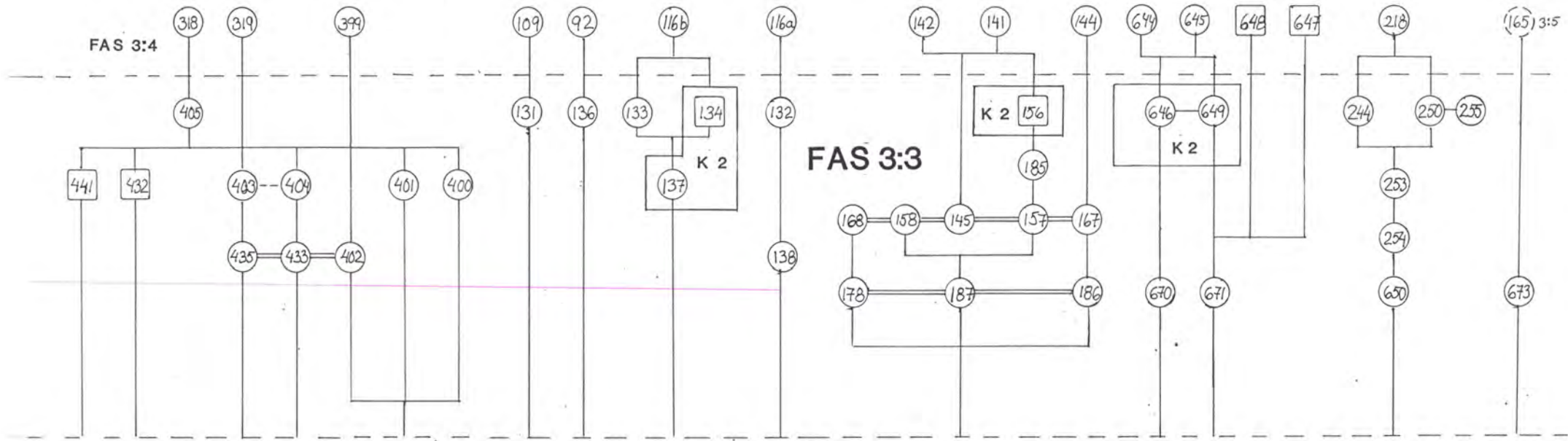


FB 1

FB 2

FB 4

FB 5



3.8.8. Fas 3:4 (Fig. 41).

Närmare en halv meter ovanför golvnivån i 3:1 finns återigen byggnadsindikationer. De är av samma art som tidigare och uppträder på samma platser. Spåren är alltför vaga för att tolkas som en helt ny huskonstruktion. En ny golvnivå har emellertid uppkommit och verkstad K2 kan ha ombyggt. K2 antas därmed fortfarande existera och fas 3 fortsätta.

Verkstadsavlagringarna tyder på kontinuitet, även om nivå 3:4 är speciellt klart avgränsad inom FB 2-området. Sammankopplingen med andra ytor var endast problematisk vad gäller FB 5. Där har ånyoen förmodad golvnivå av varvad lera valts att motsvara de sydligare lerskikten och träresterna.

FB 1-området förekommer här för sista gången. Det avskars sedan av fyllnadsmassor.

Konstruktionsbeskrivning.

K2 utökas på denna nivå med plankbitarna 92A, 111 och 919A samt ett lager rödbrun lera med trärester, 92B.

Inom K2's ungefär en meter breda avsnitt mellan verkstad och slaggavfall i FB 2 hittades plank 92A. Under denna fanns lite gul sand och sedan ett 1-2 cm tjockt lager trälera, 92B. Den sydvästra delen av leran var bränd och hade en skålad form som efter en stock. I urgröningen låg en kolkoncentration. Skiktet under 92B bestod av rödbrun mo med ansevärliga mängder kol. Därefter följde återigen påförd sand.

K2 i FB 4 utgjordes av plankbit 111 som låg över smala koltäta lager med VNV/OSO riktning.

K6 Kolgrop 109, ca 60 x 60 x 20 cm.

I FB 2 framkom en kraftig kolkoncentration vilken i öst begränsades av kvarstående och nedfallna mindre hällar. Stenarna hade ställts på en 5 cm bred och 1-2 cm tjock bräda. I norr och väster utgjordes i stället inhägnaden av kantställda plankor och i söder av skikt med bränd lera och delvis bränd lerig silt. Det senare innehöll mycket porös, lätt och mångfargad slagg (gjutslag?). Vid och i kolkoncentrationen gjordes fynd av kopparskrap, degelfragment, grå och rosa lätt slagg samt en keramikskärva skandinaviskt rödgods vilken brukar dateras till 1250-1350.

K7 Groparna 257 och 261 i FB 1, båda ca 80 cm i diameter och ca 40 cm djupa.

Det är oklart om groparna bör räknas till nivån i fråga eller till verkstadsperioden över huvud taget. De och återstoden av FB 1 avskars och överlagrades av högst blandade jordmassor. 257 var fylld med sotig mo, kol, träfragment, lera och småsten (249). Dessutom ingick några mindre tegelbitar. 261 upptogs också av 249 men bara till en tredjedel, resten var nedrasat, löst packat material, huvudsakligen sand, sten och slagg. I den sistnämnda nedgrävningen hittades en skärva skandinaviskt (?) svartgods från 1100 - 1200-talen.

Groparnas form passar väl in i metallhållningsperioden och det är svårt att förstå vilken funktion de skulle kunna ha haft i ett senare skede. Om efterreformatiska bör de ha grävts ned genom ett trägolv. Fyllningarnas blandade innehåll tycktes stamma från flera tidsavsnitt och antydde delvis en yngre datering. En möjlig tolkning är, att själva groparna tillhört en av verkstadsfaserna 3:4 eller 4 och definitivt igenfyllts då området avplanats inför uppförandet av efterreformatisk bostadsbebyggelse.

Övriga konstruktioner.

Bland lämningarna värda ett omnämnande hör en 35 - 40 cm stor yta med bränd, mycket sandig lera som framträdde i lager 92, FB 1. Leran uppvisade en hel del kopparutfällningar i form av gröna prickar och runt omkring den låg några skörbrända hållflisor. Med tanke på bottenskållarnas sandiga undersidor skulle detta kunna röra sig om en fragmentarisk ugsbotten.

FB 5 innefattade flera nedgrävningar. 146 var en uttjänad anläggningsgrop vari verkstadsavfall senare dumpats. Den innehöll främst bottenskållor och en hel del förglasad slagg, förslagad lera, träflis och enstaka degelfragment. Den ovala, nedgrävningen 148 var infodrad med orangebränd lera och mätte 65 x 55 x 20 cm. Den skar en något äldre grop, 648, vars bevarade del var 25 x 50 x 10 cm. Båda konstruktionerna skars av murstörningen i öst. 214 utgjordes av en stenanhopning i en mindre försänkning och kan ha varit rest av en eller eventuellt två (ugns?)anläggningar. Ytterligare en grop hade uppmärksammats i nordväst. Den uppslukades nästan fullständigt av profilbanken och hade inte numererats. Efter rensing av schaktväggen avtecknades den emellertid tydligt, var 40 cm vid, 30 cm djup och innehöll hållrester. En annan grop hade grävts ned i denna och torde upprinnligen ha haft samma mått. Slaggbitar var synliga på dess botten.

Övrig stratigrafi.

Jordlagren var sedvanliga sotiga eller sandiga verkstadslager blandade med bränd och obränd lera, slagg, kopparskrap och mycket kolstybb (ex 92). Skikt 90 i FB 1 hade märkbart stor inblandning grågrön lera, speciell porös slagg, träfragment samt röda och gröna utfällningar från metalloxider. Samma lager hade ett 110 x 60 cm stort lertäcke impregnerat med kol och gröna kopparprickar. Detta kan ha varit en arbetsyta sammanhängande med kolgrop 109.

FB 5 skiljde sig markant från kvadranten i övrigt. Den yta som inte upptogs av nedgrävningar hade kraftiga, något siltiga lerlager vilka ibland avbröts av sandstråk. Leran var oftast varvad, annars fläckig. Åtminstone en klar golvnivå kunde urskiljas (173 = 919), möjligen har ytterligare en eller rentav två funnits.

Slaggavfallslager fanns i östra delen av FB 2 (132, 138) samt över hela FB 6.

Datering.

En skärva sydsandinaviskt rödgods daterar nivån till 1250 - 1350. Svartgodset har antagligen hamnat sekundärt i grop 261 och anses inte relevant.

Kommentar.

Byggnadsindikationerna var för vaga för att slutsatser om nybyggnation skulle vågas dras. Smärre antydningar i form av smala kollager i FB 4 och en eventuellt borttagen, bränd stock i FB 2 leder till mistanken, att nivåns översta gräns eventuellt utgjort skilje mellan en äldre, nedbrunnen? byggnad och en återuppförd verkstad.

Jordlager.

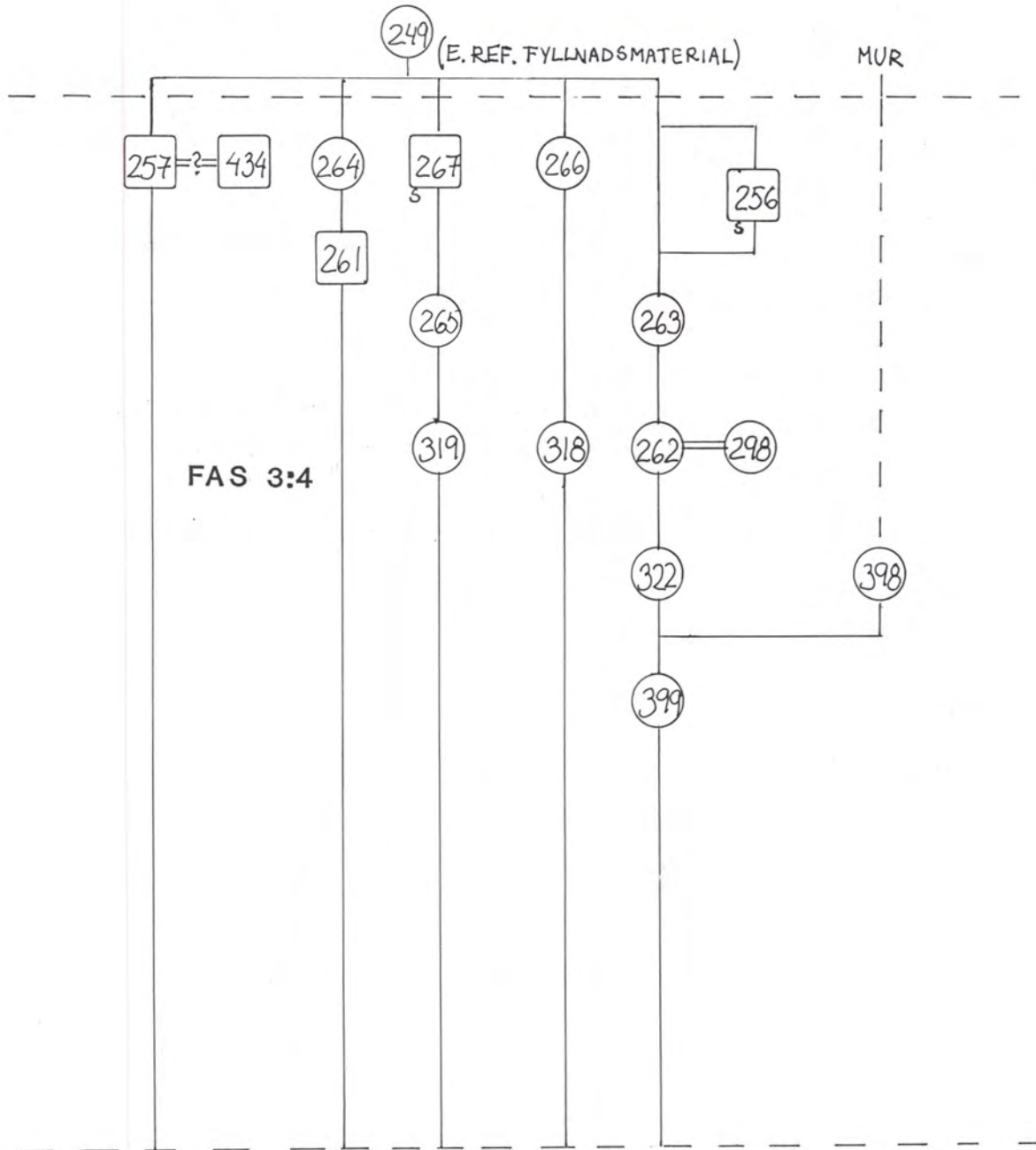
FB 1: 249, 262, 263, 264, 265, 266, 298, 318, 319, 322, 398, 399

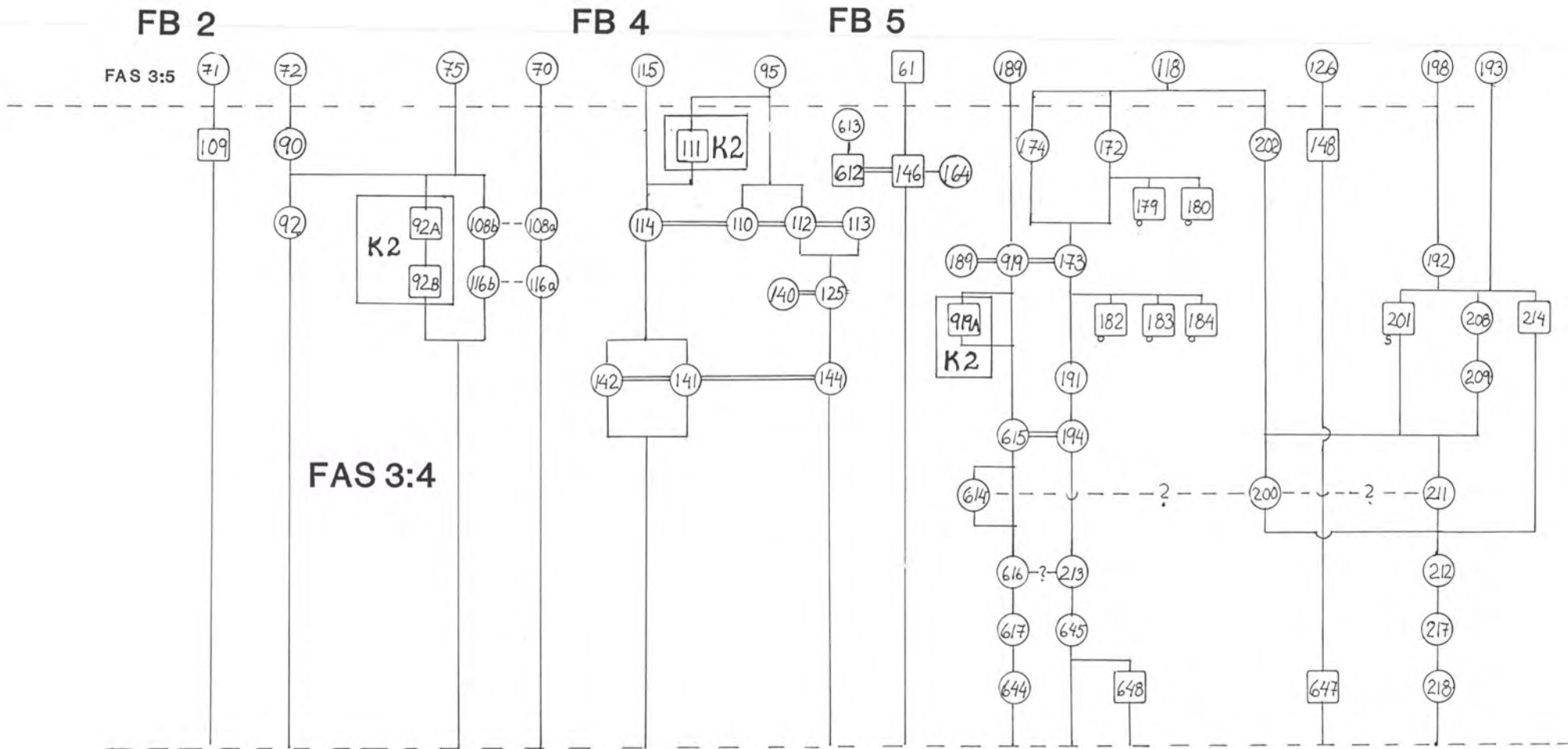
FB 2: 90, 92, 108, 116

FB 4: 110, 112, 113, 114, 125, 140, 141, 142, 144

FB 5: 172, 173, 174, 189, 191, 192, 194, 200, 202, 208, 209, 211, 212, 213, 217, 218, 615, 616, 617, 644, 645, 919, 164, 613

FB 1





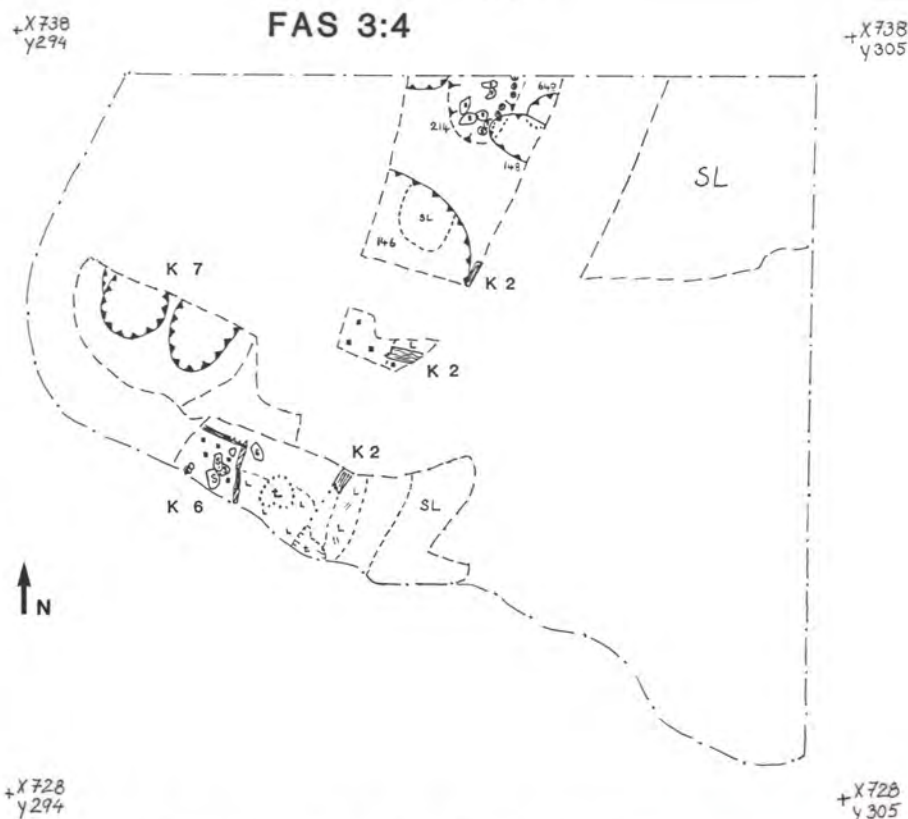


Fig. 41. F-fältet, kvadrant FB: Fas 3, nivå 4. Skala 1:100.

3.8.9. Fas 3:5 (Fig. 42).

Starka kolhaltiga lager, lerskikt och diverse gropar fortsätter att karakterisera verkstadsytorna. Slaggdumpning pågår ännu i kvadrantens östra del och K2's skiljande avsnitt i FB 2 kvarstår om än något mindre framträdande. FB 1-området har upphört.

Konstruktionsbeskrivning.

K2 Verkstadsgräns K2 markeras genom flammig sand över tunnt kollager sedan sand igen (49).

Övriga konstruktioner och stratigrafi.

I FB 2 påträffades groprest 48. Den skars av schaktkanten och endast den södra halvan fanns inom området. Nedgrävningens form bör ursprungligen ha varit rund eller oval. Vidden kunde uppmätas till ca 60 cm och djupet var 26-29 cm. Den var tydligt utrangerad och fylld med slagkakor samt några stenar. Grop 48 omgavs av lager 46 och 47 vilka täckte 71. 47 bestod av svart lerig mo med talrika klarblå och gröna utfällningar och kopparskrap vars insamlade vikt uppgick till 260 gram. (En liten kopparbit vägde i allmänhet 5 gram eller mindre, nitarna ca 10). 46 var även det sotigt men mindre lerigt och hade fläckvis en rödbrun ton då det förutom koppar- också innehöll järn?-utfällningar troligen från slaggen. Under dessa två avlagringar framkom grågrön lera varvad med millimetertunna skikt brun sandig mo. Leran var fullständig översållad med 1-2 mm stora prickar kopparazurit. Även en hel del annat kopparavfall ingick. Lerskikten kan tänkas ha fungerat som arbetsytor intill olika anläggningar, men i det här fallet får de också betraktas som någon sorts avfallslager från metallhanteringen.

FB 1 innehöll en rektangulär yta med bränd lera, ca 60 x 20 cm. Denna kan inte kopplas till någon speciell anläggning eller funktion. I FB 5 registrerades en större grop, 61. Även den var utrangerad och fylld med verkstadspill och slagg. Några mer oformliga konstruktionsrester fanns i områdets norra del. 99 utgjordes av en stensamling (60) över lager med bränd lera (101, 102). Ett par pinnhål (103, 104) syntes dessutom samt ett rent kolskikt, 106. Två stolphål har markerats strax intill (128, 147). De undersöktes på ett relativt tidigt stadium innan någon större kunskap notts om anläggningarnas karaktär. Inget i beskrivningarna tyder på att det verkligen rört sig om stolphål. Nedgrävningarna innehöll gråbrun, siltig sand, kolfragment, skörbrända stenar, hållrester och brons(?) vilket snarare pekar i riktning mot metallhanteringsgropar.

Övriga lager i verkstadsdelarna var kolrika, leriga och ibland sandiga. Rena sandskikt förekom också (ex 118, 129).

Slaggdumpningsskikten var som vanligt mycket kompakta och bemängda med antingen kolstybb eller mer rödbrunt stoff. Urskiljde sig gjorde ett upp till 1 cm tjockt lager med rost/röd färgat material i FB 2 (36). Det har ej analyserat men kan ha varit rödockra, rostad malm (rostgods) eller dikopparoxid.

Datering.

En skärva Grimston upptäcktes i lager 64, FB 5. Denna dateras till 1250 - 1350 e Kr.

Kommentar.

Lagren verkade alltmer utslätade och förberedde huskonstruktionen i fas 4.

Jordlager.

FB 2: 36, 37, 46, 47, 49, 70, 71, 72, 75

FB 4: 62B, 95, 96, 115

FB 5: 60, 62, 100, 101, 102, 105, 106, 107, 117, 118, 126, 127, 129, 165, 188, 193, 195, 198, 199

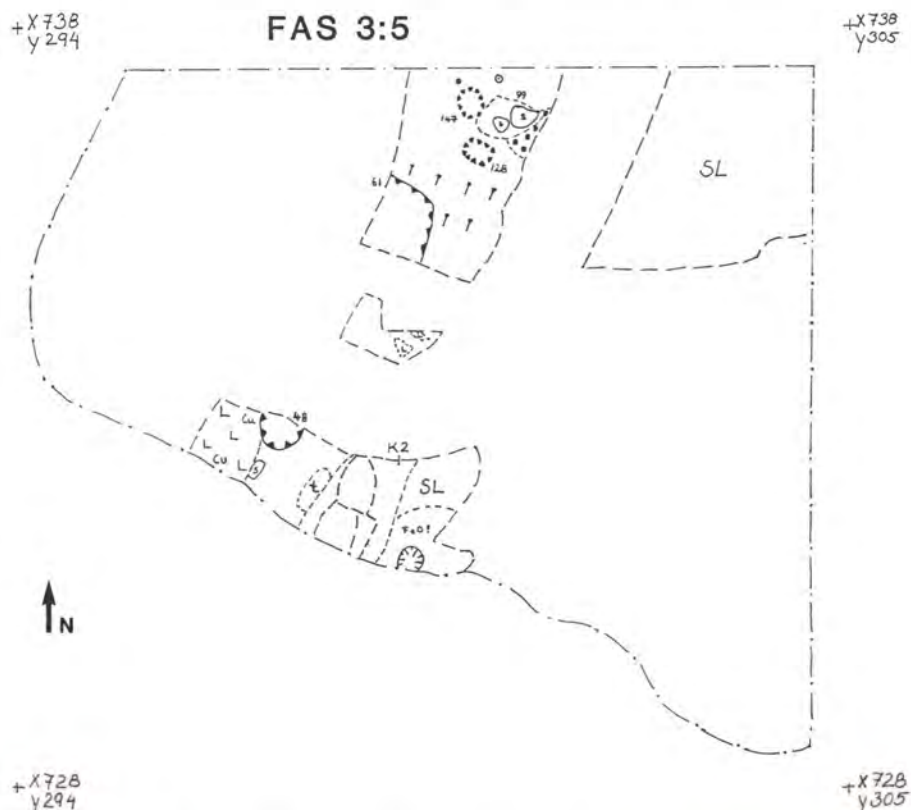
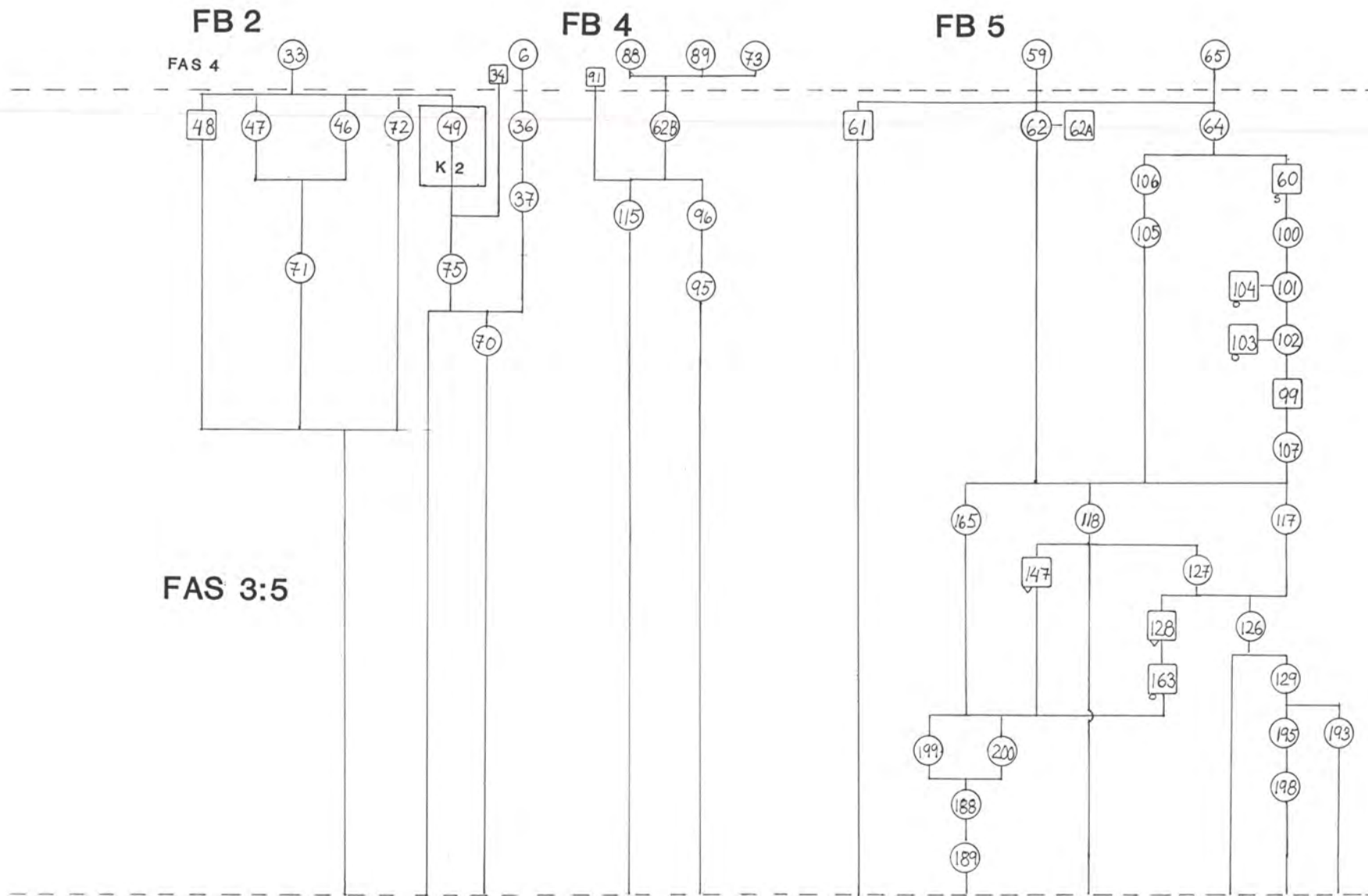


Fig. 42. F-fältet, kvadrant FB: Fas 3, nivå 5. Skala 1:100.



3.8.10. Fas 4 (Fig. 43).

Ny verkstadsbyggnad.

Av de träförande avlagringarna framgår att en ny byggnad uppförts. Skikten ovanför utgörs av kolrika lager med slagg och hantverksspill varför huset varit ämnat och använt som verkstad.

Konstruktionsbeskrivning.

K8 Ny verkstadsbyggnad påvisad genom plankbitarna 91, 24A och 79 samt trärester i 33, 56, 59, 65, 89.

33 i FB 2 var ett 5-10 cm tjockt, sotigt verkstadslager innefattande en mängd trärester. Inga tydliga plankor utkristalliserade sig, men träet gick i riktning NV-SO och SV-NO både över och under vartannat. Liksom de äldre lämningarna efter K2 följde träbitarna i FB 4 och 5 sina respektive områdens schaktkanter. Den nya byggnaden bör således ha konstruerats på samma plats och förmodligen varit av samma storlek.

Övriga konstruktioner och stratigrafi.

Ovanpå 33 låg ett ca 25 cm tjockt kolrikt verkstadslager, 6. Det var spritt över hela FB 2's yta och täckte därmed även det forna slaggdumpningsområdet. Lagret verkade homogeniserat och utslätat och hade antagligen utsatts för en avplaning. I östra delen övergick det utan mellanliggande träskikt i slaggavsättningar, varför den yttre gränsen mot slaggdumpning trots allt torde ha behållits. Emellertid fanns en närmast oval kolgrop (34), ca 70 x 60 x 30 cm, på en del av det tidigare gränsavsnittet vilket något komplicerar bilden. Öster om kolgropen var rester efter två vertikalt nedstuckna brädor. Även annat horisontellt trä följde samma kant i riktning NO-SV.

I FB 4 hade en oregelbunden, ca 40 cm vid och 15 cm djup, nedgrävning noterats. Den innehöll verkstadsavfall och tre pinnhål (53, 57, 73, 74). FB 5 saknade spår av gropar och endast ett litet pinnhål påträffades (78). Jordlagren var mycket enhetliga och snarlika och alla med undantag av sand 24 var rikligt kolbemängda. Slagg och metallavfall ingick. För verkstadslager 6 hade t.ex. 61 kopparfragment vägande drygt två hekto registrerade bland fynden. Detta var en förhållandevis stor mängd. I samma lager hittades också ovanligt många krukskärvor. Skikt 59 innehöll degelfragment.

FB 6 upptas liksom tidigare framför allt av dumpade slaggmassor.

Datering.

De fem keramikskärvorna från lager 6, FB 2, har identifierats som 2 Scarborough (1200 - 1320 e Kr), 2 holländskt rödgods (1275 - 1350) och 1 Grimston (1250 - 1350).

Kommentar.

Verkstadslagren var mycket lika varandra i samtliga områden. De verkade utjämnade och utspridda. En avplaning och eventuell avschaktning då kolgrop 34 avklippes har antagligen gjorts inför en senare byggnadsfas.

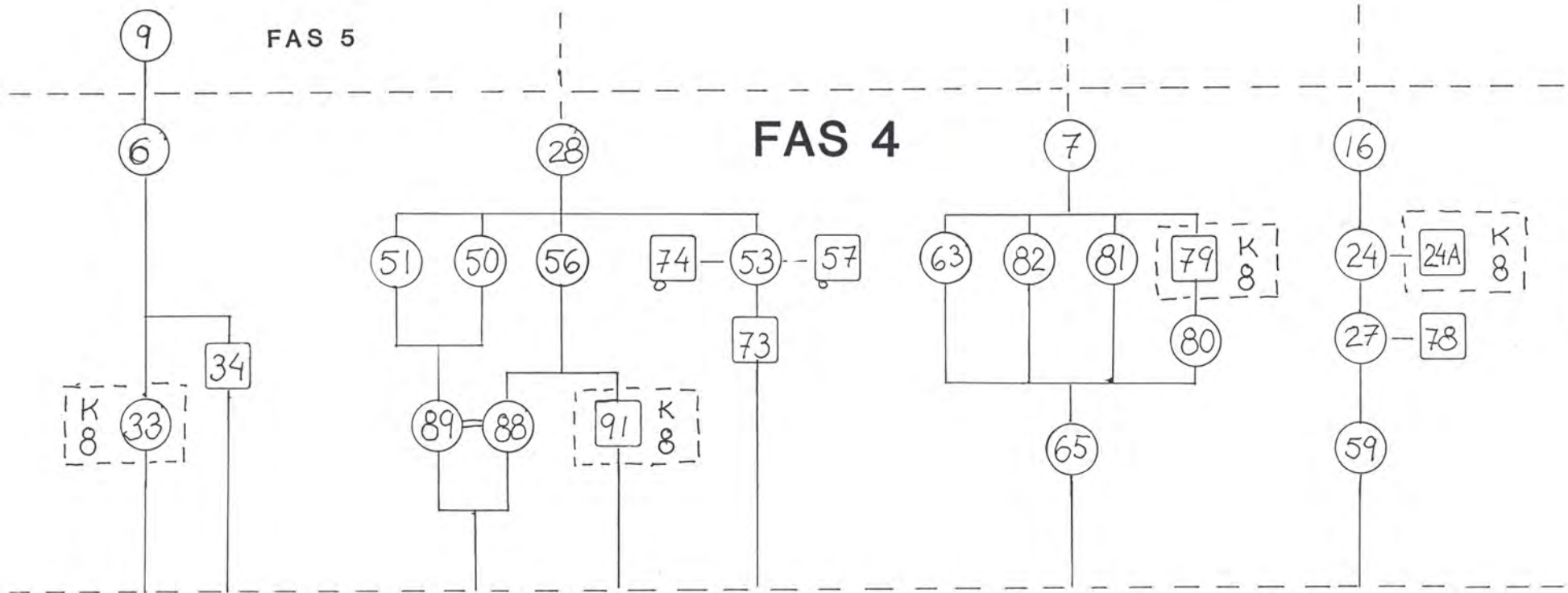
Jordlager.

6, 7, 16, 24, 27, 28, 33, 50, 51, 53, 56, 59, 63, 65, 80, 81, 82, 88, 89.

FB 2

FB 4

FB 5



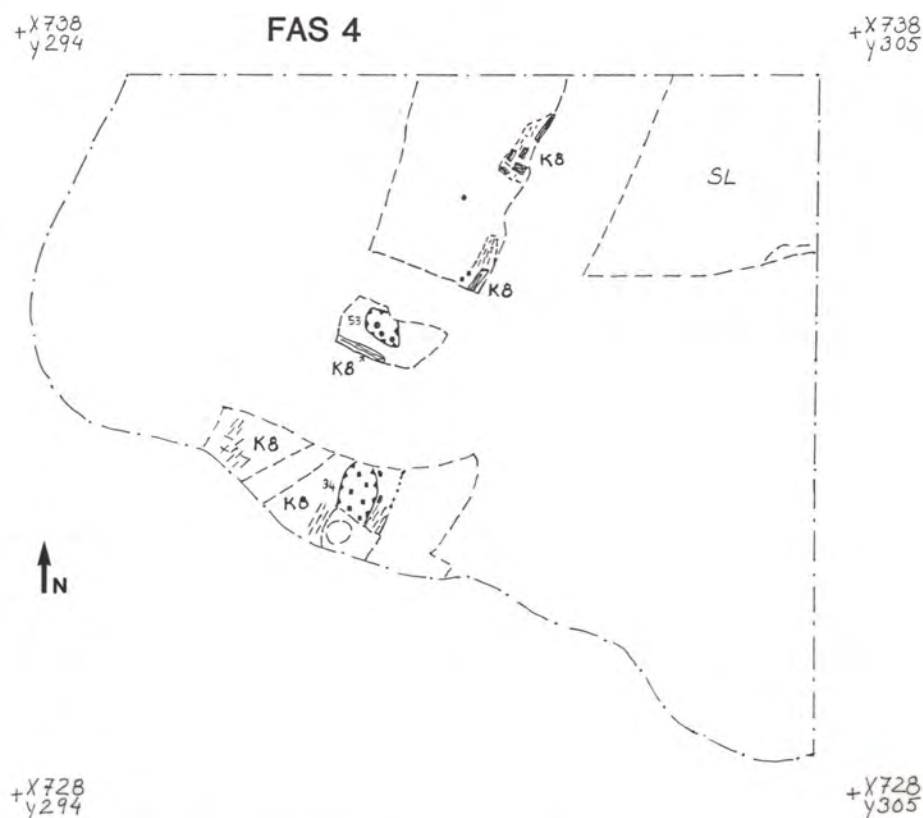


Fig. 43. F-fältet, kvadrant FB: Fas 4. Skala 1:100.

3.8.11. Fas 5 (Fig. 44).

Efterreformatoriska lämningar.

I den här fasen sammanställas efterreformatoriska lämningar med egna lagnummer.

FB 2 hade i ytan efter avschaktning mer välbevarat träverk vilket gav intryck av 1600-tal (9). Det samma gällde för FB 5 där det stora inslaget av obrända ben fick avgöra tillhörigheten i kombination med den typiska och lätt identifierbara efterreformatoriska keramiken.

FB 2 innehöll åtminstone ett stolphål med omgivande grop vilket säkert kunde placeras i fas 6. Samma område avslutades i öster av en träskodd källare fylld med sand och krukskärvor från 1600 - 1700-tal. Källaren hade grävts ned helt till steril. 29 var en sentida nedgrävning som skiljde område FB 4 från FB 5.

Lager med efterreformatoriskt material.

8, 9, 10, 13, 29, 30, 31, 32, 52, 76, 77.

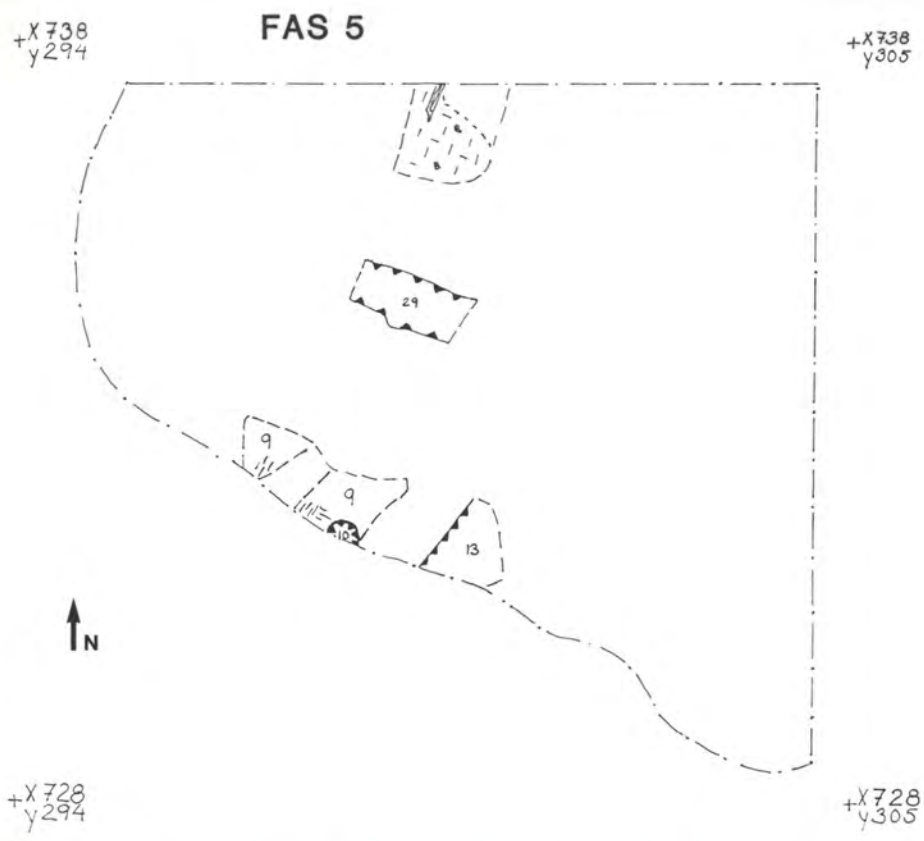
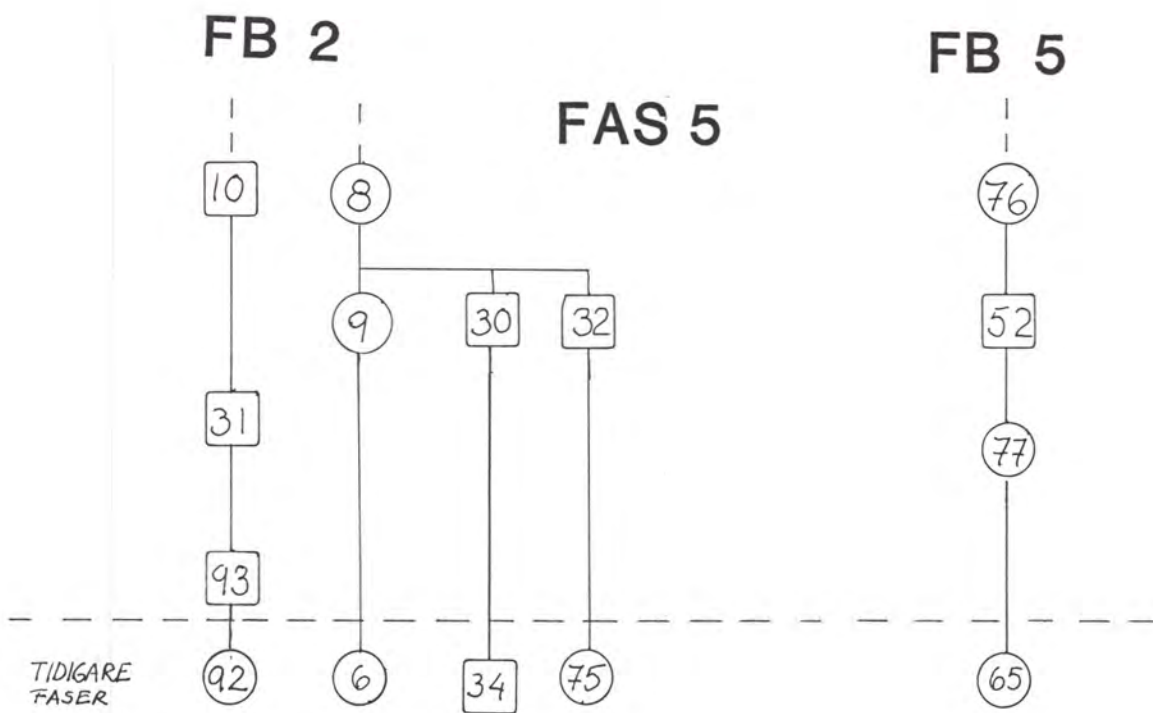


Fig. 44. F-fältet, kvadrant FB: Fas 5. Skala 1:100.

3.9. Slaggdumpningsområde FB 6, FB 7 och FA 6 (Fig. 35-44, 44a).

Slaggdumpningsområdet i östra delen av kvadrant FB har hittills knappast mer än nämnts, vilket beror på att det varit omöjligt att säkert sammanlänka det med varkstadsdelen. I stället sätts det i relation till det närliggande FA 6 som också bestod huvudsakligen av slagglager om än med större sandinslag. En dryg meter skiljde de båda områdena åt och ihopkopplingen försvåras av, att i FB 6 hade de undre lagren spridits som ringar på vattnet från ett centrum utanför den grävda ytan i sydost.

FB 7 var en utvidgning av FB 6 vilken framkom under en modern rördnedsättning. Mindre än 10 cm fanns kvar av avlagringarna varför de inte kommer att behandlas närmare. De finns emellertid med i matrix och vad beträffar innehållet hänvisas till motsvarande skikt inom FB 6.

I alla de tre områdena igenkändes fas 1 ursprunglig markyta (69, 304, 340, 341, 342). FA 6 hade över detta ett heltäckande, hårt slagglager med träavfall (301), varpå följde sand skikt 287 som i SV-NO riktning delades av en kantställd bräda, 292. Denna var 2-6 mm tjock och 3-4 cm hög. Någon motsvarighet fanns inte inom FB 6. Där var ytan uppsplittrad i tre delar. Ett sydöstligt parti med svarta, moiga leriga lager innehållande speciellt kopparutfällningar, metallskrap, degelfragment samt rikligt med organiskt material som läder, textilier och pälsrester (290, 335, 336). Den västra och norra delen karakteriserades av ett stort sandinslag bland slagglager och träavfallet (289, 334), medan mittpartiet hade mycket hårt packad, sammansintrad reduktionslag, 321, vilken uppenbarligen dumpats i varmt tillstånd. 321 gick också in mellan sandskikten 289 och 334 i väster.

FA 6 fortsatte på de högre nivåerna att ha slagglager (259, 260, 270, 277, 284, 286) varvade med sandskikt (271, 273, 274, 278, 279, 283).

FB 6 övre halva var ett enda kompakt slagglager, 210. Det var 80 - 90 cm tjockt och saknade i stort sett sand med undantag av lins 275 utmed norra schaktkanten. 275 fortsatte förmodligen som 273, 274 i FA 6. Den enda variationen i övrigt hos lager 210, var en växlande kolstybsmängd vilken inte visade sig i form av skiktningar utan snarare som flammighet. Lagret innehöll förutom bottenskällor, förglasad slagg, bränd och förslaggad lera ett stort mått träflis, pinnar och annat organiskt material (hasselnötskal, ben, bark, näver, horn, fibrer). Kopparskrap och gröna, korroderade klumpar påträffades ofta. Cirka 200 stycken vägande närmare ett kilo insamlades. Området grävdes med krafsa varför säkert lika många förbisettes. Dessutom fanns gröna stänk på pinnar och slagg samt kopparutfällningar vilka var för små för att kunna tas tillvara. Bland de tillvaratagna fynden märktes även 11 degelfragment, 3 krukskärvor, 2 gjutformar samt en vacker, något skadat brons? nål eller stylo med krönt huvud.

Datering.

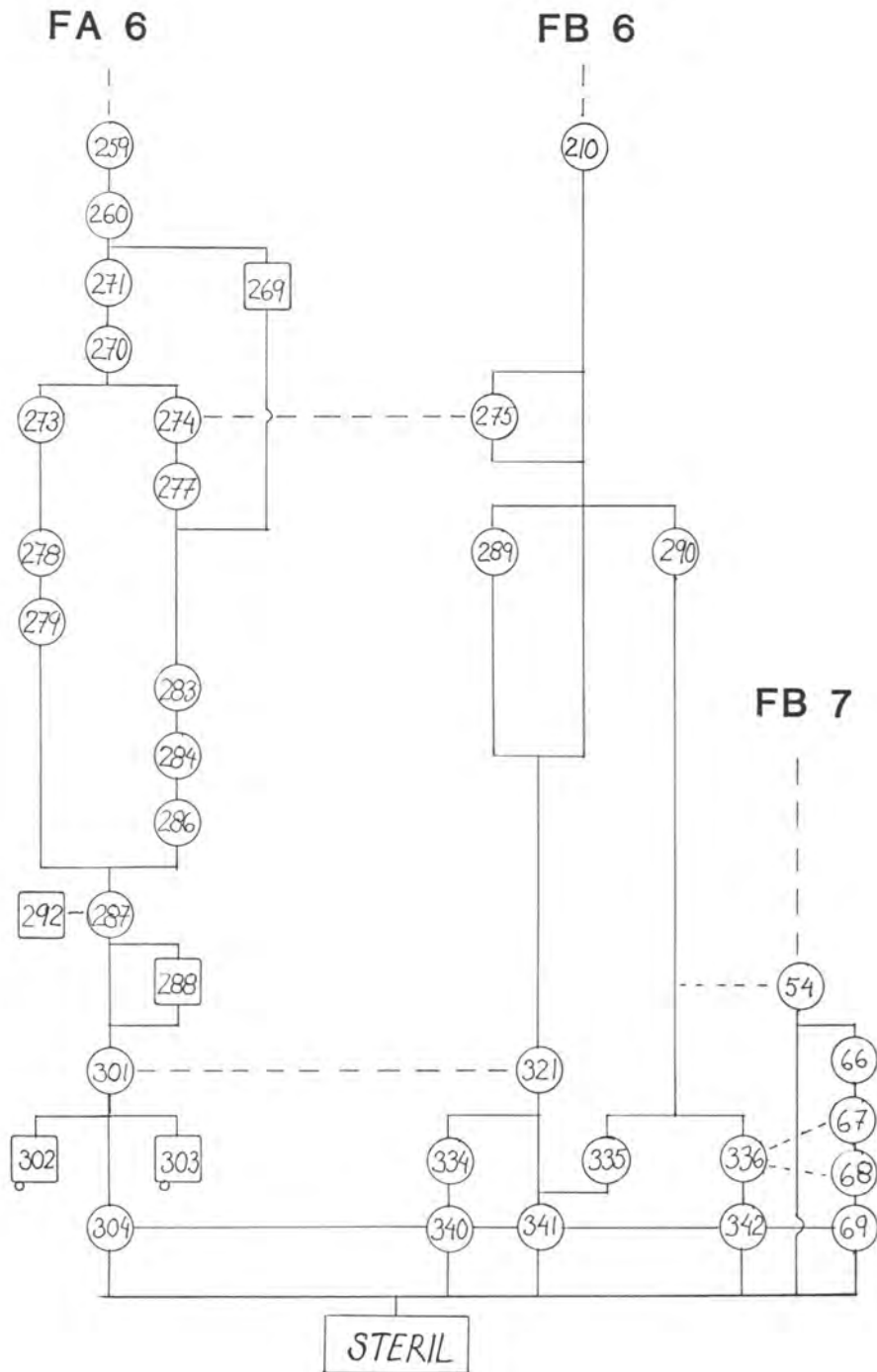
Allra överst skikt 210 hittades en skärva Siegburg med datering 1300 - 1400-tal. I undre delen av samma lager framkom en skärva Grimston, 1250 - 1350, och en bit tyskt protostengods från slutet av 1200-talet. Skikt 286, FA 6, innehöll en skärva Scarborough vilken tidsbestämmer lagret till 1200 -1300-tal.

Kommentar.

Det har varit omöjligt att göra en trovärdig fasindelning av slaggdumpningsområdena FA 6 och FB 6-7. De bör emellertid ha avlagrats under FB-områdets verkstadsfaser 3 och 4.

Anmärkning.

Groparna 276 och 305 med fyllning 282 respektive 306 i FA 6-området är ej med i matrix. Den förra var 3 cm djup och bestod antagligen av nedtryckt material. Den senare hade orsakats av murstörning i norr.



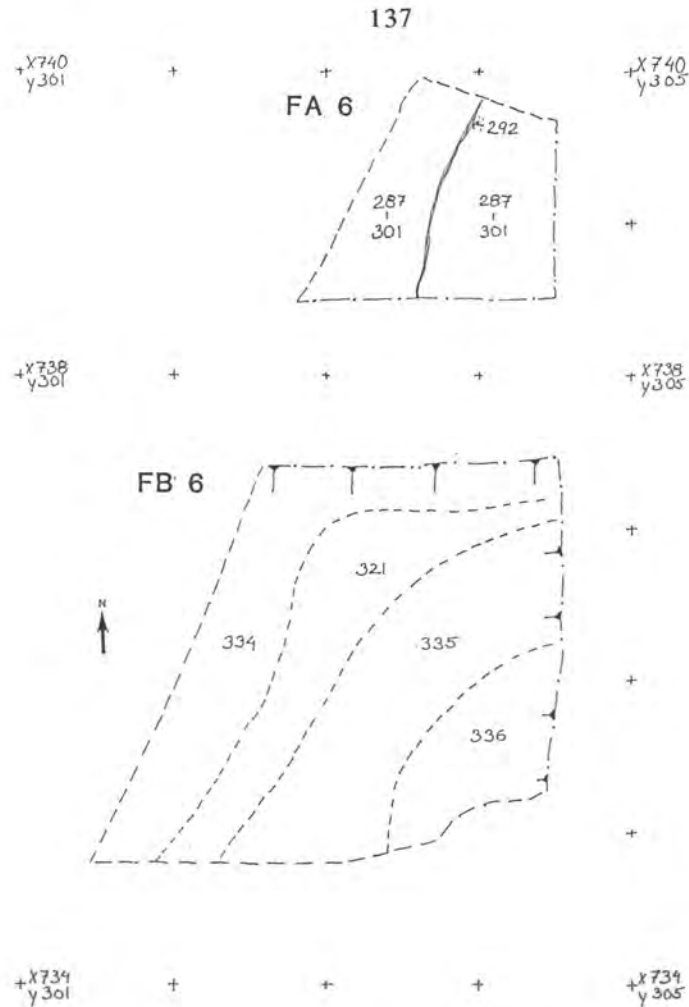


Fig. 44a. Område FA 6 och FB 6. Skala 1:50.

3.10. F-site: Quadrant C (FC).

3.10.1. Introduction: General characteristics (Figs. 6, 45, 46 and 47).

This area lies to the SE of F-site. It was heavily disturbed by post-medieval intrusions - latrines, cellars, pits, sewage pipes etc. Nevertheless some areas of medieval deposits survived. These were divided into 4 separate units of excavation - FC1 to 4 (see Fig. 6). Due to pressure of time there has been no attempt to construct internal phasing of these sub-areas, or cross-correlation between them and other parts of F-site and Trench B.

Fig. 45 is a composite plan showing the broad pattern of surviving structural elements, notably the aligned fragments of wood and other aligned features. None have been correlated and the plan must not be read as showing an array of contemporary arrangements, but as providing an insight into the general structural pattern.

Fig. 46 shows the location and extent of a pair of ditches cut at right-angles to each other, and found within the body of natural sands and gravels.

All these individual elements will be discussed under the relevant areas, and will be followed by a general discussion of the pattern noted in quadrant C and the possible implications in relation to the rest of F-site and Trench B.

3.10.2. Area FC1.

General characteristics.

This was one of the first areas to be examined on F-site, though it had to be abandoned in favour of areas of more extensive deposits in FC2 and 3, and was never excavated to natural ground.

Even in this small area a considerable number of layers were recorded in complex relationships. These were predominantly gravelly sands, charcoal concentrations, mixed clayey sands with slags etc., burnt and unburnt clay spreads, fragments of timbers etc. In fact, the area bears all the hallmarks of intensive sequential deposition of metalworking waste noted elsewhere in relation to workshops. No definite hearths or pits were located. One apparent structural division was recognized.

Layers in FC1

38, 39, 40, 41*, 42, 43, 45, 83, 84, 85, 86, 87, 94, 97*, 98*.

* Layers also extending into FC2, cut away by intervening modern pipe trench.

Traces of constructions (Fig. 47).

41a: planking ? Very fragmentary lengths of wood, unburnt, orientated WNW-ESE. On compact sand 41. Lay within an area (58) of abutting layers, hinting further at a consistent stratigraphical division here. Wall-line ?

Dating evidence.

From 58 (a collective number for layers 38-45 relating to 41a wood) two sherds of pottery: date-range 12th century to mid-14th century.

3.10.3. Areas FC2 and FC3.

General characteristics.

These sub-areas will be discussed together, as they comprise neighbouring areas of quite significant remains.

FC2 was disturbed to a greater depth generally than FC3 which held the greatest surviving depth of medieval deposits in quadrant C. Consequently FC3 was excavated first in order to bring it down to a level comparable to FC2, though some preparatory work on FC2 early in the season produced contexts 41, 44, 85, 86, 87, 94, 97, 98, 119. These comprised layers of very similar character to those in FC1 (some correlate, see below).

FC3 contained a dense array of layers and structural evidence and despite its small area produced much valuable information which clearly relates to intensive and successive workshop activity. The medieval deposits were sealed directly beneath discontinuous cobbled surfaces producing 17th and 18th century pot-sherds, and this area therefore includes evidence which potentially provides an upper limit to the medieval activity. Likewise the information derived from the lowest contexts provides insight into the earliest of human activity on F-site.

Layers in FC2 and FC3.

FC2: 41*, 44, 85, 86, 87, 94, 97*, 98*, 119, 732, 733, 734, 735, 736.
(* correlates with same context in FC1).

FC3: 215, 216, 219, 222, 224, 238, 248, 252, 258, 268, 293, 294, 295, 296, 297, 309, 310, 317, 320, 324, 325, 326a, b and c, 327, 329, 346, 347, 349, 354a, b and c, 355, 358, 389, 421, 422, 429, 430, 431, 470, 471, 472, 504, 526, 527, 528, 529, 542, 547, 553, 554, 556, 588, 592, 596, 602, 603, 620.

Traces of constructions (see Fig. 47).

No K-numbers have been allocated - the features will be discussed under their original context numbers.

- 216a: planking ? Lies to the N of FC3. A curved length of unburnt timber, orientated approximately NE-SW. Lies in charcoally sandy "wood-chip" layer 216, which also had content of slag, stone and clay. The first contexts encountered on removal of post-medieval deposits.
- 316: planking. Short length of slightly charred flat-lying timber, under 219 charcoally sand with waste debris, in layer 317 black charcoal-laden sand/gravel with waste debris. Plank lies in WNW-ESE orientation. Length ca. 50 cm by 10 cm broad. Charred slightly on S edge. Structural element ? Cf. 348.
- 348a: round log/timber stock. Length of log, unburnt, under 324 grey sand mixed with clayey sand, abuts charcoal layer 349, over 471 gravelly sand. The stock lies flat in WNW-ESE orientation, at a lower physical/stratigraphical depth than 316, though in practically the same alignment and location. Length ca. 55 cm by 10-11 cm broad. This is abutted by 348b immediately to the S (see below). Cf. also 477.
- 348b: round log/timber stock (not drawn on plan as lies directly under line of 316). Length of heavily-burnt log; abuts 348a lying in charcoal layer 349. Orientated WNW-ESE. Length ca. 18 cm by 10 cm broad. Clearly part of same activity represented by 348a: burnt collapsed (?) structural/walling component ? Cf. 477.
- 424: planking. Three parallel flat-lying lengths of timber planking bounded to the S by a plank standing on edge. All unburnt. Lie under 358 charcoally clayey sand, in 429 clayey silty sand abutting, to N, charcoal layer 355. Orientated WNW-ESE: max. length 47 cm by average breadth of 9 cm. Flooring and walling components ?
- 477: slotted plank with up-standing plank. A composite feature comprising a flat-lying plank, pointed at W end and pierced by a longitudinal slot containing a vertically standing length of planking set on edge. Under 472 gravelly sand with waste debris in 471 gravelly sand. N.B. Comparable stratigraphical position to 348a and b ? - also close stratigraphical conformity to 424 ? Orientated WNW-ESE. Flat-lying slotted plank ca. 37 cm long by ca. 20 cm broad. Slot begins ca. 8 cm from pointed end. Vertical plank doesn't fill all the slot, beginning ca. 5 cm from W extremity thereof and having a total length of ca. 20 cm. Cut away by post-medieval cellar to E. Structural element - slotted sill-beam with remnant of plank walling ? Structural relationship with 348 and 424 ?
- 641: compressed wood, partly burnt. Area of charcoal and unburnt "wood-chips" which to S is not so heavily burnt, with evidence of ca. 0,5 cm thick lengths of wood, though heavily compressed and merged with sand and clay laminations. Under 620, over 664. Possible flooring remains ? Unburnt area only marked on plan.
- 555: vertically-standing plank. Unburnt. Under (?) 471 gravelly sand - abuts 553 and 556. Long length: ca. 82 cm; orientated approx N-S. Unknown function.

737: planking. In FC2. Consists of four parallel flat-lying lengths of wood, unburnt. Under (?) 431, in 732 organic, sandy layer. Orientated WNW-ESE. Two overlapping thinner lengths of wood to S; to N two lengths (of same timber originally ?) of thicker timber ca. 10-12 cm thick and of near-rectangular form. Max. length surviving: ca. 1 m. Sill-beam with collapsed walling ?

828 and 855: two ditches (see Fig. 46). 828 lies in FC2. Precise cutting level uncertain, though it appeared only on removal of slag-bearing deposits and is cut by 804 pit. Appears likely that it occurs as an entity within the body of natural gravelly sands in which it was first observed, though the possibility of planing-off at higher levels may exist. In connection with this possibility a localized hollow 803 filled with laminated deposits 750 lay just to the S, and this activity may have removed the upper portion of 828. Nevertheless it can be argued that 828 was filled and out of use at the time of 803 activity, and that 828 comprises one of the earliest features in this area, and possibly on F-site as a whole. The precise nature of natural here was difficult to determine ie. there was some slight evidence of charcoal contamination, and inclusions of soft grey silty/organic material occasionally occurred as patches within the body of natural sands/gravels. Consequently it may, tenuously, be compared to similar deposits described as "half-natural" in FA (see 3.7.1.).

The ditch is orientated WNW-ESE. It is cut away to the W by a major cellar disturbance. To the E of its extent it shallows out sharply and has a bluntly pointed end. The surviving length is 2,10 m; max. breadth is 65 cm; max. depth ca. 50 cm (rising to E). It had steep sides with a slightly rounded base.

The fill 829 comprised a series of deposits clearly distinguishable from the natural sands and gravels. From the top these were:

- A: yellow-brown sandy gravel ca. 10 cm thick.
- B: black charcoally sand with some wood fragments (including a sloping fragment of planking), and occasional slag: 5-6 cm thick.
- C: yellow-brown sandy gravel with grey soft silty sandy flecks.
- D: black charcoally sand with grey soft silty sandy flecks; some slag.
- E: to the W end a 6 cm thick yellow sandy gravel.

The few slags in the fill were very heavy and corroded and of a "rusty" nature. Top of fill = ca. 5,26 m.a.s.l.; base (lowest point) at 4,72 m.a.s.l. At right-angles to E end lies 855 ditch (see below).

855: lies mainly in FC3. Similar problems apply to determining the cutting level of this feature as to 828. Again it appeared within the body of natural apparently sealed by grey sand layers 654, 662 and 684, which all bore traces of metalworking activity.

This long ditch is orientated approx. NE-SW and is apparently complete in length, with rounded ends, though that to the S is narrower. It was not so sharply-defined as its companion, and the edges were rather more difficult to establish - hence its rather less regular form - and it does not apparently get shallower towards its ends. At the S end a "slot" occurred within the base. 855 is a steep-sided cut, ca. 4 m long by ca. 70 cm max. breadth by ca. 30 cm max. depth. The base is of

irregular depth, lying between 4,73 m.a.s.l. to S and 4,87 m.a.s.l. to N. Top of fill lay at ca. 5,08 m.a.s.l. Heights comparable to those of 828.

The fill was not as complex as that of 828, consisting primarily of a ca. 30 cm thick deposit of yellowish sand with flecks of grey soft silty sand (humusy/organic); at base hereof some heavy "rusty" slags (as in 828).

The function of these ditches is uncertain, though they may well comprise evidence for a former structure ie. foundation ditches ? See also 885 below. N.B. Similar ditch evidence within natural is found elsewhere in Trondheim - see Forretningsbankens tomt, Søndre gt, 1971.

885: portion of ditch/pit ? (Fig.46). In FC3. Lies some 20 cm to the N of 855. Under grey sand layer 684: possibly contemporary with 855 and 828 ? Only part of feature preserved: cut away to N and W. Sloping sides, rounded bottom. Filled with material similar to that in 855: yellowish sand with flecks of dark grey soft organic (?) silty sand, with one slag found - a "slag-cake" or "furnace-bottom". Depth: 40 cm. Top height: 5,20 m.a.s.l.; bottom 4,80 m.a.s.l.

May comprise the end of a further ditch which may lie at right-angles to 855 ? Possibly slightly over-excavated.

Dating evidence.

Layer 238: two pot sherds: date-range mid-13th to mid-14th centuries.

Layer 293: two pot-sherds: date-range 13th - 14th centuries.

Layer 326a: one pot-sherd/crucible ?: 13th century.

Layer 355: pot-sherd: 14th century.

Layer 735: pot-sherd/crucible (?).

Ditch 828; fill 829D: ¹⁴C date: 1883-1641 B. C. (calibrated - Stuiver/Pearson).

Awaits re-examination.



Ditch 828 in natural, FC (Area 2), looking W.

3.10.4. Area FC4.

General characteristics.

This area lay at the NE extremity of quadrant C. It was heavily disturbed on all sides by cellar intrusion, and much of the body of the area itself was completely cut away by a cellar though some medieval layers lying just above natural ground were located beneath this. The deposits comprised sand/gravel spreads, mixed charcoally clayey sands with slags, wood chips etc., and some tenuous features were found, the most notable being what appeared to be a gully or ditch. No clear trace of the compact gravel horizon, though 241 a possibility (?).

Layers in FC4

225, 226, 232, 240, 241, 243.

Traces of constructions. (Fig. 47)

227: ditch/gully. Cutting level uncertain. Possibly cuts thin body of slag layers which lie just above natural here. The gully's base lies within natural. Orientated WNW-ESE. Length: ca. 2,40 m (cut away to W and E); breadth 16-24 cm; depth 5-10 cm (deepest to W). W-E bottom heights = 4,86 m.a.s.l. - 4,78 m.a.s.l.: slopes to E. Fill 231: complex. Bulk consisted of gravelly sand over a charcoally sandy deposit with some slag. Base undulated slightly. To the NW a stake-hole ca. 5 cm diam. by 10 cm deep located at edge of feature which bore also occasional fragmentary traces of lengths of up-standing wood/planking ? Gravel fill spread out over 225.

Possible interpretation: a drainage gully, formerly lined with wood (cf. Britanniatomta), sloping down towards former line of river ?

Dating evidence.

None from these contexts.

3.10.5. Discussion.

Metalworking evidence occurs within all these excavated areas. FC2 and 3 were the most fruitful and bore clear traces of activities which appear to have been taking place, at least at a number of different stratigraphical levels, within structural boundaries, which, although fragmentary, comprise components that can be compared favourably in form and alignment with those similar traces surviving in quadrants A and B (Fig. 45). The pattern of alignment cannot be regarded as simply fortuitous in the light of the sum of evidence on F-site. The structural details will be discussed in chapter 7, though it can be stated here that some of the wood fragments, notably 348, 424 and 477 may provide valuable evidence for building techniques.

Pit and hearth/furnace activity occurred across the excavated areas, with notable concentrations in FC2 and 3. Evidence for on-site drainage may survive in FC4 (227).

The ditch complex (828, 855 and ? 885) provides tempting evidence for an early structure on F-site. These lie at a low stratigraphical level beneath the bulk of intensive metalworking activities. Their fills comprise material which bears only occasional slags, perhaps suggesting their disuse at a time when metalworking was not yet in full sway. Their form and lay-out suggests that they may be foundation trenches for a formerly rectangular or square structure of uncertain character. Their orientation compares favourably with

the stratigraphically higher wooden elements more clearly assignable to the metalworking period.

In conclusion, it seems reasonable to postulate a row of workshops or a long partitioned structure lying NE-SW across the quadrant. This activity, judging from the dating evidence, appears to have taken place at least within the 12th to 14th centuries. No pottery later than ca. A.D. 1350 was found in the excavated areas. The ^{14}C date from the 828 ditch fill was obtained from organic material (turf?) and may reflect the age of the material rather than when it was deposited within the ditch. The structural evidence here lies parallel to the similar arrangements in FA and FB and may comprise a contemporary neighbouring range of successive workshops.

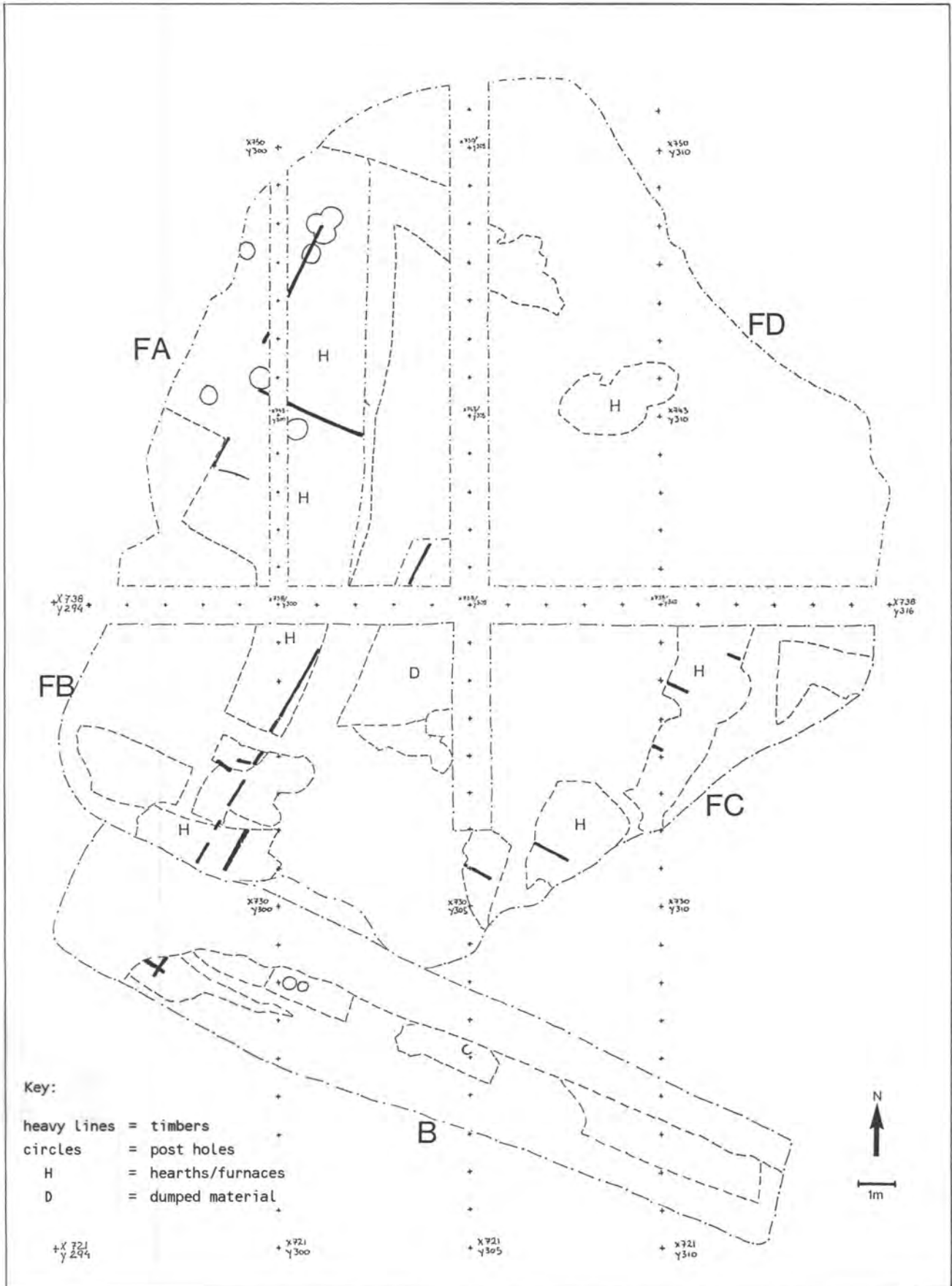


Fig. 45. General site plan showing locations of aligned structural elements and superimposed hearths etc.

+ X738
Y316

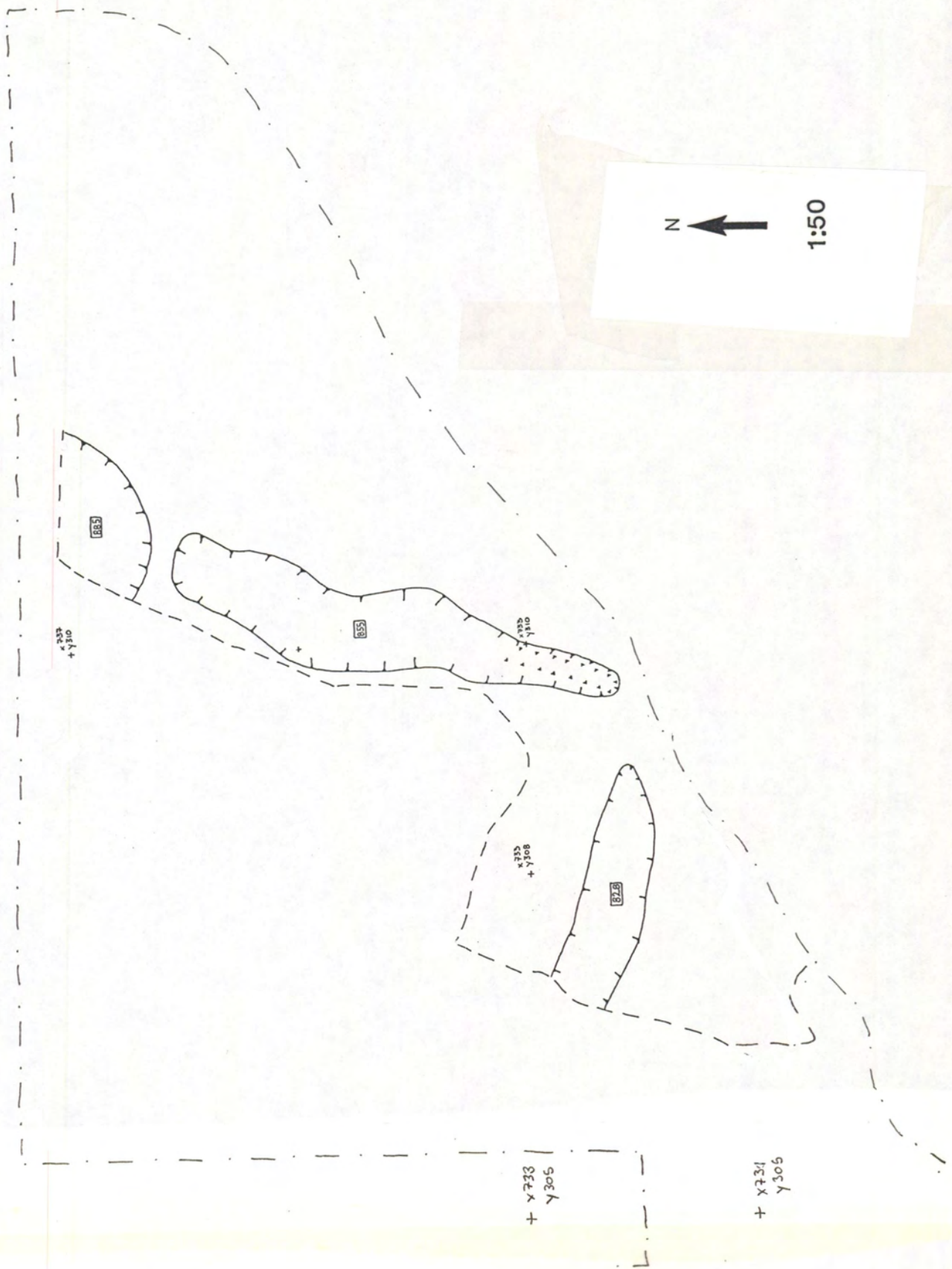


Fig. 46. F-site Quadrant FC: Ditches in natural.

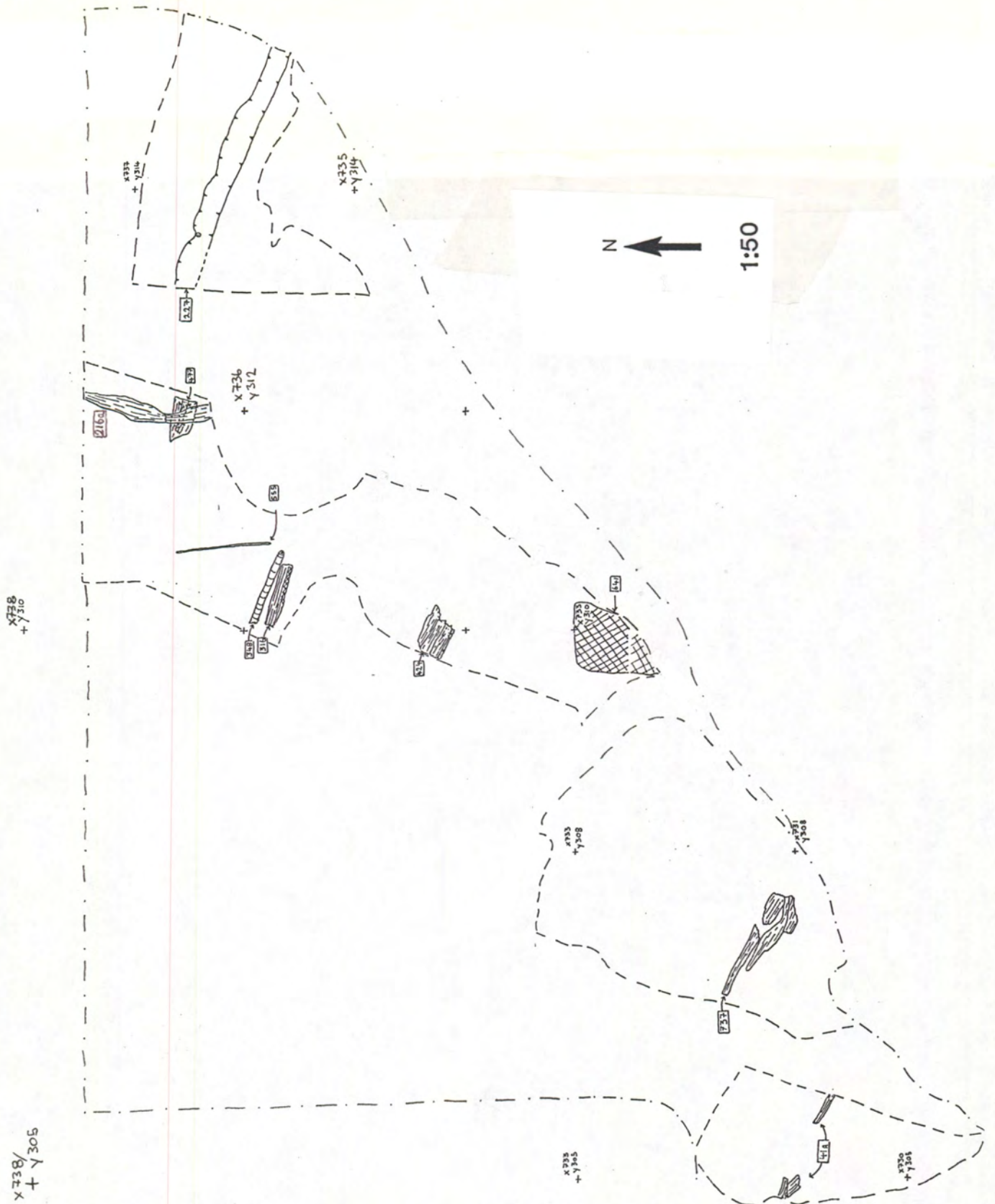


Fig. 47. F-site Quadrant FC: Various structural elements at different levels.

3.11. Fält F : Kvadrant D (FD) (Fig. 6).

3.11.1. Inledning.

Kvadrant FD (918) bestod övervägande av moderna och efterreformatiska lämningar. Bland de senare märktes 1700-talskällare och en stinkande latringrop från vilken glas, keramik och en stickad, finmaskig strumpa tillvaratogs. Större delen av kvadranten schaktades bort med maskin. Kvar fanns till slut två mindre områden med medeltida kulturlager. Det nordligaste, FD 1, mätte ca 1,60 x 1,60 meter och var 20-30 cm tjockt, FD 2 stod kvar som en enslig ö i kvadrantens mitt. Den var 2 x 3 m och innefattade 1 m tjocka avlagringar. Det förra schaktet fingrävdes och har därför fasindelats. Det senare låg orört fram till sista arbetsdagen då det krafsades ned till 3/4. Intrycken resumerades under ett lagnummer, övrig dokumentation utfördes i form av skisser och fotografier. Kvadrant FD illustreras endast med planteckning för fas 1.

3.11.2. Redovisning av FD 1.

Steril grund registrerades på nivå 5,90 - 6,00 m ö h.

Fas 1. Ursprunglig markyta.

Även här påträffades den grå, hårda och kompakta sanden som betecknades ursprunglig markyta. Den hade lagnummer 373.

Fas 2. Slaggdumpning.

Ovanpå markytan låg ett sotigt, kompakt slagglager, 372. Detta täcktes av ett centimetertjockt sandskikt 371 varefter mörka slagglager, 356, 343, 339 fortsatte i ytterligare ca 15 cm. 339 avbröts vid ett tillfälle av en tunn gruslins inom en mindre, begränsad yta (350). Längs den sydöstra kanten av FD 1 sågs rester av en langsträckt nedgrävning, 371. Den var fylld med sotig silt, slagg och lera, 357. Dess funktion har ej gått att utröna.

Fas 3. Verkstad.

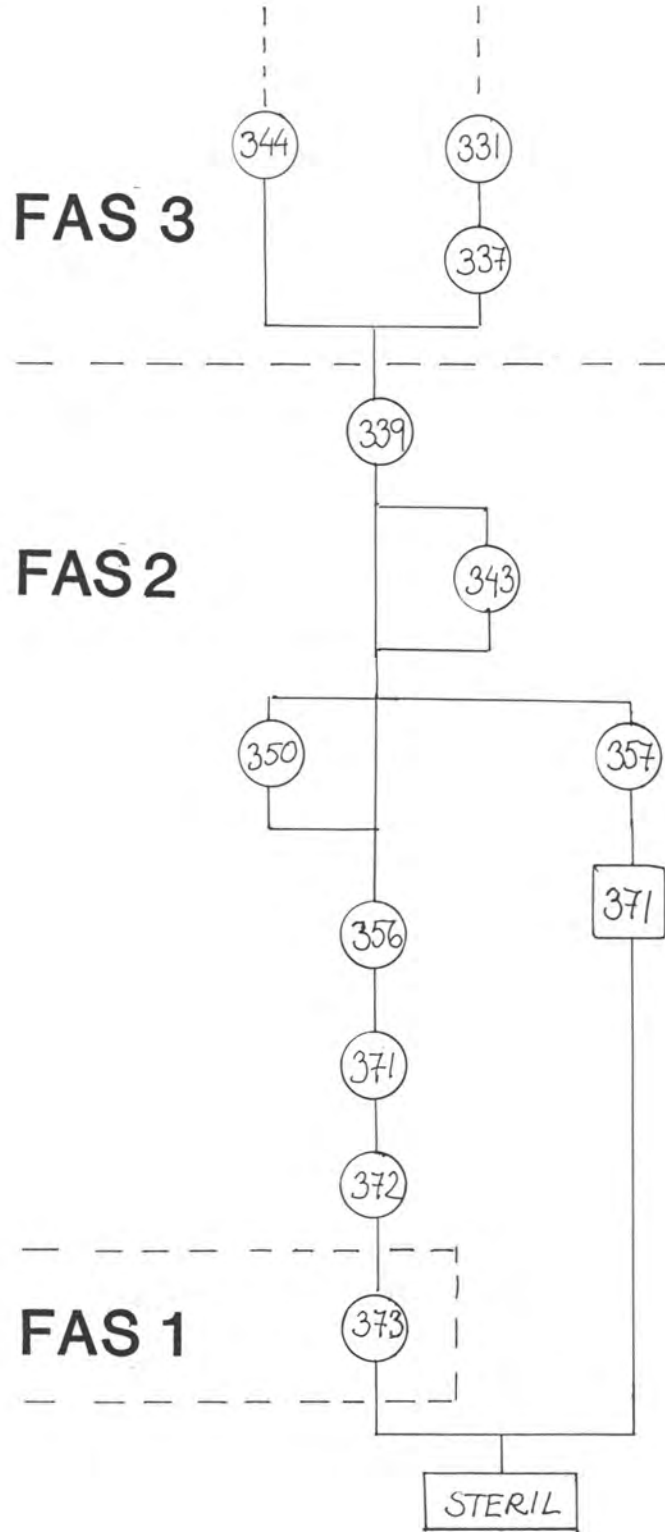
Över fas 2 sotiga slagglager fanns lera bemängd med träfragment (VNV-OSO och ONO-VSV riktning), 337. Den avbröts i nordöst av ett ca 30 x 40 cm stort område med mycket, hård, kompakt, grå lera, 344. Lertäcke 337 följdes av ett svart slagglager innehållande träflis och trärester, 331.

Kommentar.

Då inga tydliga tecken på verkstadsaktiviteter fanns i fas 2 tolkas lagren som dumpat avfall. I fas 3 utgjorde lerlager 337 förmodligen en golvnivå, varför en byggnad måste ha uppförts. Inom den hade metallhantering bedrivits att döma av skikt 331.

Fas 2 skulle kunna motsvara FB-områdets fas 3, medan fas 3 kan knytas till fas 4 inom samma kvadrant. Detta är en första, mycket osäker bindning som bör kontrolleras genom jämförelser med kvadrant FA.

FD 1



3.11.3. Redovisning av FD 2.

FD 2 krefsades ned från nivå 6,50 till 5,80 m ö h. Resterande skikt studerades endast i profil. I områdets västligaste del uppmättes steril till 5,73 m ö h, grunden sluttade sedan nedåt mot öster till 5,53.

Ovanför ursprunglig markyta återfanns sekvensen trälera - sand - trälera vilken tidigare kunnat iaktas i FB, fas 3:1. Den följdes av typiska verkstadsavlagringar, dvs sotig silt med bränd och obränd lera, smärre sandlinser och lersjok.

5,60 - 6,00 m ö h noterades plankrester i områdets allra sydligaste del. Träriktningen pekade mot O-V eller OSO-VNV. På samma nivå låg en lite gles men rak stenrad (riktning N-S), på en sandbädd. Denna var husgrundslignande och möjligen hade här en ny byggnad uppförts. Preliminärt förslag till motsvarande nivå inom FB-området är fas 3:4. Därpå fortsatte verkstadsavlagringarna och växte i höjden ca en halv meter utan att några fler husindikationer påträffades. Däremot framkom en intressant ugnsanläggning. Den började som en rund, kolfylld grop på vars kant en ovanligt stor fyrkantig sten samt ett par bottenskållor låg. Efter ungefär 10 centimeters nedgrävning hade de sotiga skikten norr därom växlat till ett gult sandlager och en större, omgivande grop avtecknade sig. Samtidigt övergick kolgropen till en steninfodrad konstruktion, där fyra kantställda hållar stod kvar på ursprunglig plats. Den inre, stensatta gropen mätte ca 40 cm i diameter och innehöll rikligt med kol. Dessutom hittades bränd lera, dito sand och ett par slagkakor invid hållarna. Kolgropen och den undre stenkonstruktionen uppfattades som sammanhängande vid grävningstillfället. Det är emellertid tänkbart, att en mindre hastig undersökning skulle gett det rakt motsatta intrycket.

En annan anmärkningsvärd avlagring ovanför 6-metersnivån var ett uppskattningsvis 50 cm stort och 1-2 cm tjockt lersjok kraftigt magrat med krossad bergart. Stenmaterialet var ljusgrönt, mycket finkornigt och fett i konsistensen. Det bör ha rört sig om täljsten, eventuellt grönsten eller olivin. Leran har antagligen varit ämnad att användas vid ugnskonstruktion eller vid tillverkning av gjutformar och den minst 50-procentiga inblandningen bör ha gjort den ordentligt elffast.

Bland de insamlade fynden från detta område fanns flera degelfragment, åtskilliga gröna metallbitar, en blybit, ett bryne, ett järnverktyg (mejsel, huggjärn eller liknande), bränd och obränd flinta, pälsfibror samt olika typer av slagg.

FD 2 har utan tvekan varit del av en metallverkstad och skikten tros motsvara de olika nivåerna inom FB-områdets fas 3, eventuellt också 4.

3.12. Schakt B.

3.12.1. Inledning (Fig. 2 och 6).

Schakt B var ett av de fem provschakt vilka enligt ursprungsplanen skulle grävas på Mellagertomten och det första som undersöktes. Grävningen tog nio dagar i anspråk, utfördes under tidspress och utan tillgång till stadens koordinatsystem.

Som första åtgärd utmättes ett ca 15 meter långt område med riktning VNV-OSO på gårdsplanen till Olav Tryggvasons gate 2a. Den norra halvan maskinschaktades ned till steril sand, varefter den då uppkomna södra profilväggen rensades, avritades och studerades. Förutom två moderna störningar som helt skar igenom lagren, innehöll den övre halvan (ca 1 m) i huvudsak efterreformatiska lämningar med bland annat flera golvnivåer ca 6,30 - 6,50 m ö h. Dessa var troligen från 1600-talet av keramiken att döma. Under och

emellan de sentida störningarna fanns ett påfallande tjockt, sotigt lager bemängt med slagg. Detta följdes sedan av sandlinser, trärester och diverse tunnare sandiga siltiga eller leriga skikt. Allra underst iaktogs ett 2-4 cm tjockt, grått lager vilket tycktes förekomma längs större delen av profilen. Detta tolkades senare som ursprunglig markyta.

Återigen togs grävmaskinen till hjälp och det moderna materialet samt huvudparten av det mäktiga, svarta slaggförande skiktet skalades av i schaktets sydligaste halva. Samtidigt utökades undersökningsområdet i den östra delen med drygt 5,5 meter. Resterande avlagringar grävdes därefter medelst krafsa och skärsvlev varvid följande fas kunde konstateras.

3.12.2. Fasindelning (se Fig. 48).

Fas 1. Lämningar under ursprunglig markyta (Fig. 49).

Några mycket osäkra rännor noterades under ursprunglig markyta i schaktets östra del (40, 49). Dessa var lätt ljusgrå - skiftande och knappast skönjbara i den omgivande gula sanden. De innehöll enstaka obetydliga kol- och träfragment vilka kan ha hamnat där på ett naturligt sätt.

Ränna 40 mätte 120 x 80 x 20 cm och gick i riktning NNV-SSO. 49 hade närmast VNV-OSO riktning och avskars av en modern rörnedläggning. Material från denna kan ha infiltrerat området och i dethär fallet gett upphov till sandens färgskiftning.

Det är också oklart ifall rännorna varit nedskurna genom det hårda markytslagret eller inte. Om nedskurna kan de tillhört F-fältets eventuella dräneringssystem. Om inte är de med största sannolikhet naturligt avlagrade.

I övrigt framkom på denna nivå 5 ljusgrå siltfläckar, 4-10 cm i diameter och 1-3 cm djupa.

Jordlager.

45, 46, 47, 48 (samtliga beskrivna som fyllning i ränna 49).

Fas 2. Ursprunglig markyta (Fig. 50).

I områdena B2-B5 fanns över steril ett oftast 2-4 cm tjockt grått/mörkgrått lager med grusig sandig mo. Ytan var mycket plan, slät, hård, kompakt och svärgenomtränglig (13, 20, 28, 34). Kraftigare än de övriga var lager 13 vars tjocklek uppmättes till hela 12 cm. Dess ytskikt bestod av ett lager grus och de första 3-4 centimeterna var mycket hårda. Sedan blev konsistensen lösare och strax därefter ljusnade också färgen.

Övannämnda skikt påträffades även inom F-fältet (se FB fas 1, kap. 3.8.3.). Det har där tolkats som markyta vilken uppkommit efter avplaning och utjämning av området. Samma tolkning anammats här. Lager 13 bör dock ha legat längre i öppen dager och kan ha tjänstgjort som gårdsplan.

Jordlager.

13, 20, 28, 34

Fas 3. Nedgrävning från markytan (Fig. 50).

I den här fasen placeras en svårtolkad nedgrävning. Den saknade spår av metallhantering och förmodas därför inte tillhöra verkstadsperioden.

Markytsskiktet förekom inte mellan lager 20 och 28 i schaktets västra del. Där fanns istället spår av en eventuell nedgrävning, 44. Den upptog en ca 80 x 60 cm stor yta och var huvudsakligen fylld med fläckig och flammig grå silt samt gulbrun sand. Mot botten avtecknade sig årderspårsliknande smala remsor vilka korsade varandra. Samtidigt fanns några små runda siltfläckar 2-5 cm i diameter. Under detta var sanden småprickig som efter växtlighet.



Gravel surface (Phase 2) in Trench B, looking W.

Avlagringarna i 44 var mycket besynnerliga och svårförståerliga. Några årderspår kan det knappast ha rört sig om då formationen bara förekom på en liten begränsad yta. Möjligen har en träkasse varit nedgrävd på platsen. De understa siltprickarna var alltför små för att kunna tolkas som annat än växtlighet.

Fas 4.1. Byggnadsindikationer (Fig. 51).

Från och med nu delar sig schakt B i en västlig verkstadsdel med metallhantering och ett östligt slaggdumpningsområde. I fas 4.1 redogörs för byggnadsindikationer medan 4.2 tar upp hantverksavlagringar. Motsvarande nivåer inom FB är 3:1 respektive 3:2.

Huslämningarna i B1 är förmodligen en sydlig fortsättning av verkstad K2 inom FB-området. Byggnadsindikationerna i B3 och B4 tros tillhöra en annan verkstad, eftersom en ca 1,5 m bred passage med dumpat avfall (B2) skiljer lämningarna.

Konstruktionsbeskrivning.

K2 K2's rödbruna lerlager med trä- och plankrester återfanns här i 35, 37 och 39. Till samma byggnad räknas sand 33 och grå lera 31 (förhöjt golv?), båda med bräd- och träfragment. Dessutom tillkommer stolphål 27.

Underst i västra delen av B1 påträffades ett 1-3 cm tjockt lager med rödbrun trälera, 39. Det följdes av 37 som utgjordes av samma material men var tunnare (0,3 - 2 cm) och hade större östlig utbredning. I detta sågs också kolfragment och en plankstump vilken skars av störningen i söder. Där träriktningen kunde urskiljas pekade den åt NO-SV. Över 37 låg ett tunnt, onumererat sandskikt varpå ytterligare ett lager trälera iaktogs (35). 35 var några centimeter tjockt och hade en plankrest på samma plats som föregående lager. Den var emellertid lite längre och mätte 10 x 23 cm.

Stolphål 27 var 20-25 cm i diameter och 25 cm djupt. Nedre delen av stolpen satt fortfarande kvar men hade splittras i fyra delar och fläkts ut åt sidorna. Väster om 27 låg flera brädbitar inbäddade i 32 som bestod av mörkgrå lerig mo med många grågröna lerklumpar. Trärester fanns också i sandlager 33 öster om 27. Sanden innehöll dessutom ett tunt rödbrunt lersjok samt kolfragment.

K9 Verkstadsbyggnad vilken förnäms genom rödbrun trälera 8, 12, 21, 30 och de eventuella stolphålen 10, 23 och 24. Lerlagren hade mellanliggande sandskikt 9, 22 och överlagrades av sand 7 och 18.

I ett sandigt avsnitt mellan lager 21 och 30 i B3 fanns två osäkra stolphål. 23 hade närmast romboid form, mätte 32 x 30 och var bara 6 cm djupt då det upptäcktes. Det innehöll träfragment, lite slagg samt rödbrun och grå sandig mo. 24 var rund, ca 40 cm i diameter och 15-20 cm djupt. Det verkade ha haft en spetsig avslutning, hade likadan fyllning som 23 och visade sig på samma nivå, 5,34 m ö h. Grå humös sand 22 verkade ha lagts över groparna efter det stolparna tagits bort.

En möjlig stolphålsrest, 10, undersöktes vid område B4 norra schaktkant. Den kvarvarande delen var halvcirkelformad och mätte 27 x 20 x 13 cm. Innehållet utgjordes av mörkgrå sandig mo och längs kanten fanns åtskilliga kolfragment. Trälera 12 i samma område låg direkt på ursprunglig markyta, täcktes av sand 9 som överlagrades av trälera 8, varpå sand 7 följde och omgav flera nedgrävningar (se fas 4.2).

Verkstadsbyggnad K9 har varit åtminstone 6,5 meter bred och antingen haft en fortsättning norrut på F-fältet liksom K2 eller möjligen sträckt sig till Nedre Allmenning om denna gata fanns under denna tidsperioden ifråga. De understa slaggdumpningslagren i FB 6 hade formats som ringar på vattnet från ett spridningscentrum utanför området i sydost. Om K9 fortsatt norrut är det tänkbart, att avfallet åtminstone delvis kommit från denna verkstad. Mellan K2 och K9 fanns ett 1,5 meter brett område med dumpat verkstadsavfall (se 4.2).

Datering.

En bit av en kam, vilken färgats helt grön av kopparen i marken, hittades i lager 8. Den placerar verkstad K9 någonstans mellan 1100 och 1300, troligen 1200-tal. Ett tyskt degel? fragment från stolphål 10 tidsbestämmer fasen till 1100 - 1200-tal.

Kommentar.

Två verkstadsbyggnader tycks ha funnits inom schakt B. De separerades av en ca 1,5 m bred passage.

Fas 4.2. Metallhantering (Fig. 52).

B1, B3 och B4 uppvisar spår av verkstadsaktiviteter i form av groprester och metallskrapförande, kolrika lager. B2 och B5 har utnyttjats för i första hand slaggdumpning.

Konstruktionsbeskrivning.

Byggnaderna K2 och K9 var i bruk och nedanstående lämningar 5, 6 och 27b upptäcktes innanför dessa.

Övriga konstruktioner.

En kolgropsrest 27b fanns vid och skars av B1's västra schaktkant. Den bevarade halvcirkelformade delen mätte 30 x 15 cm, var 20 cm djup och innehöll endast små kolbitar.

Kolrik var också nedgrävning 5 i B4. Dess norra parti hade kapats av vid nedschaktningen, kvarvarande del var 50 x 50 x 17 cm och formen bör ursprungligen ha varit oval. Längs gropens västra kant fanns gott om träfragment, men det gick inte att fastställa om de stammade från någon konstruktionsdetalj. Nedgrävning 5 innehöll i övrigt sotig mo samt grågröna lerklumpar. Anläggningen omgavs av ett skikt gul och rödbrun sand med stort inslag av bränd lera (del av 7).

Ytterligare en grop, 6 påträffades inom samma område. Den skars av störning i söder, återstoden var halvcirkelformad 30 x 40 x 10 cm. Fyllningen utgjordes av mörkgrå mo, mindre slaggbitar, kol- och lerfragment. Intill 6 fanns två pinnhål med kvarsittande, förkolnat trä.

Nedgrävning 4 vid B4 västra kant var tveksam. Den bestod av ett skikt sotig mo, sedan ett lersjok som följdes av sotig mo med mycket slagg. Lagren sluttade nedåt mot 1600-talskällaren och kan ha tryckts ned då denna byggdes.

I dumpningsområde B5 fanns slagggrop 42. Den var ca 145 cm vid och 60 cm djup. 42 blev inte utgrävd men fylldes enligt profiltäckning av lager 25, 26, 52 och 53.

Övrig stratigrafi.

Slaggrop 42 och ett efterreformatoriskt stolphål var de enda konstruktioner som fanns i den östligaste delen av schakt B. Ytan täcktes av mörka, sotiga, sandiga, ibland grusiga lager med kolstybb, slagg i mer eller mindre mängd samt träavfall (14, 15, 29). B5 bör därför betraktas som avfallsområde. Samma funktion tycktes B2 ha haft eftersom olika sortar slagg, bränd och förslaggad lera samt träavfall dominerade lager 18 och 19. De innehöll i tillägg rikligt med gröna, obrända ben, hasselnötskal, kohorn och kopparutfällningar. Siltinslaget skiftade i grått, rödbrunt och svart. 19 var dessutom grusigt.

Verkstadslagren i de övriga områdena var av gängse modell, dvs sotiga med mindre andel av slagg vilken företrädesvis var förglasad och sandrik (2, 3, 17). Lager 17 uppmärksammades speciellt på grund av ben som färgats knallturkos och ett inslag kiselstenar vilka hade turkosblå utfällningar på brottyorna. Föremålsfynd var sällsynta. I skikt 2 påträffades emellertid en grön pincett (tillväxtnummer 103049?) som kan ha tillverkats på platsen. En vacker liten gjutform av täljsten hittades också i ett av verkstadslagren. Tyvärr försvann den spårlöst innan den hunnit registrerats. En skärva Grimston-keramik framkom under rensningsarbete med krafsa just där en snibb av lager 3 stötte ihop med två olika störningar, varför den inte kan tas upp under "datering". Nivå 4.2 motsvaras i kvadrant FB av 3:2.

3.12.3. Sammanfattning.

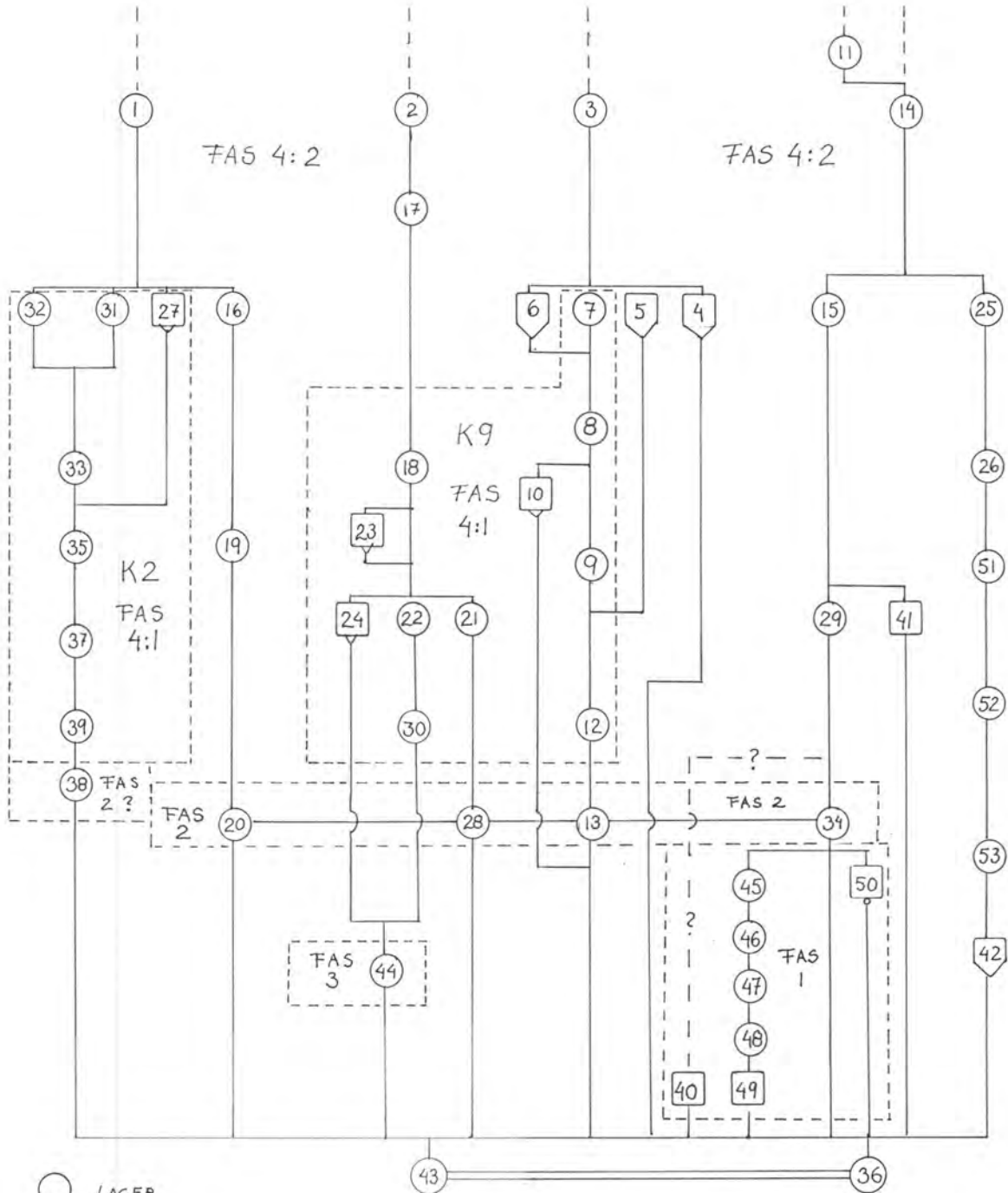
Fasindeligen uppvisade i stort sett samma mönster som FB-området. Schakt B fas 2 kan kopplas ihop med FB fas 1 medan 4:1 och 4:2 motsvarar 3:1 och 3:2.

Två eventuella rännor skulle kunna vara spåren efter den tidigaste verksamheten inom schakt B. De var emellertid mycket osäkra, knappt skönjbara och saknade i motsats till rännor i FB-området tecken på metallhantering. Den rimligaste tolkningen är, att det här rörde sig om naturliga avlagringar.

Fas 2 utgjordes av ursprunglig markyta, medan fas 3 fick representeras av en närmast otolkningsbar lämning, nummer 44. Möjligen var 44 resterna av en obestämbart nedgrävning vilken fyllts igen med sand. Den kan fasmässigt vara felplacerad.

I schakt B började metallhanteringen först i fas 4 och fältet delade sig i västlig verkstadsdel och östligt slaggdumpningsområde. Två byggnader hade uppförts och skiljdes åt genom en smal passage. Det västligaste huset tros vara fortsättning på K2 inom FB. Båda byggnaderna hade tjänstgjort som verkstader av avlagringarna och fynden att döma. Den kopparhaltiga jorden hade färgat allt ben- och hornmaterial grönt eller turkos och var en bidragande orsak till att denna metall uppfattades som huvudråvara inom bearbetningen.

MATRIX 1987/3 B



- LAGER
- KONSTRUKTION
- △ NEDGRÄVNING
- ▽ STOLPHÅL
- PINNHÅL

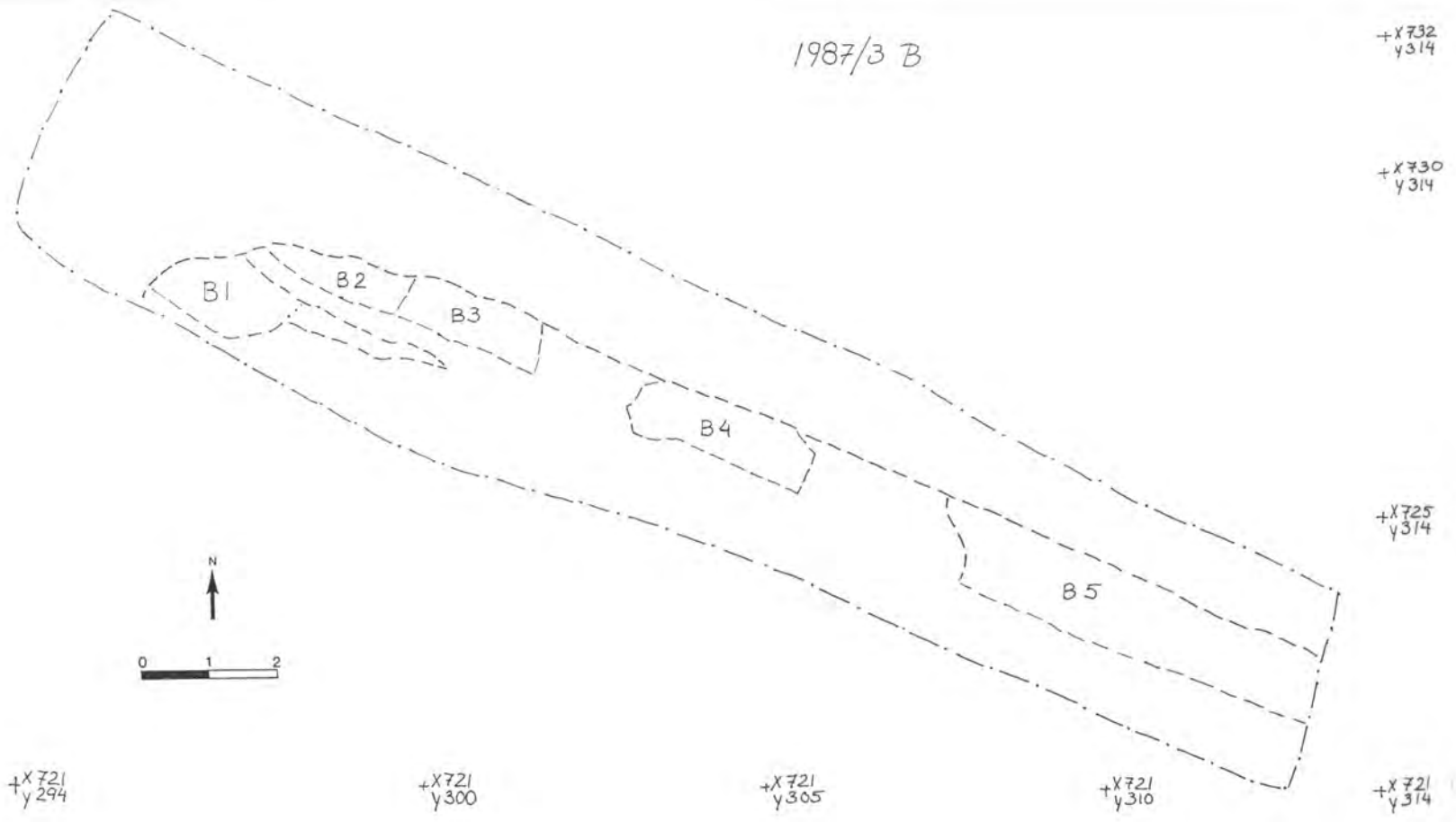
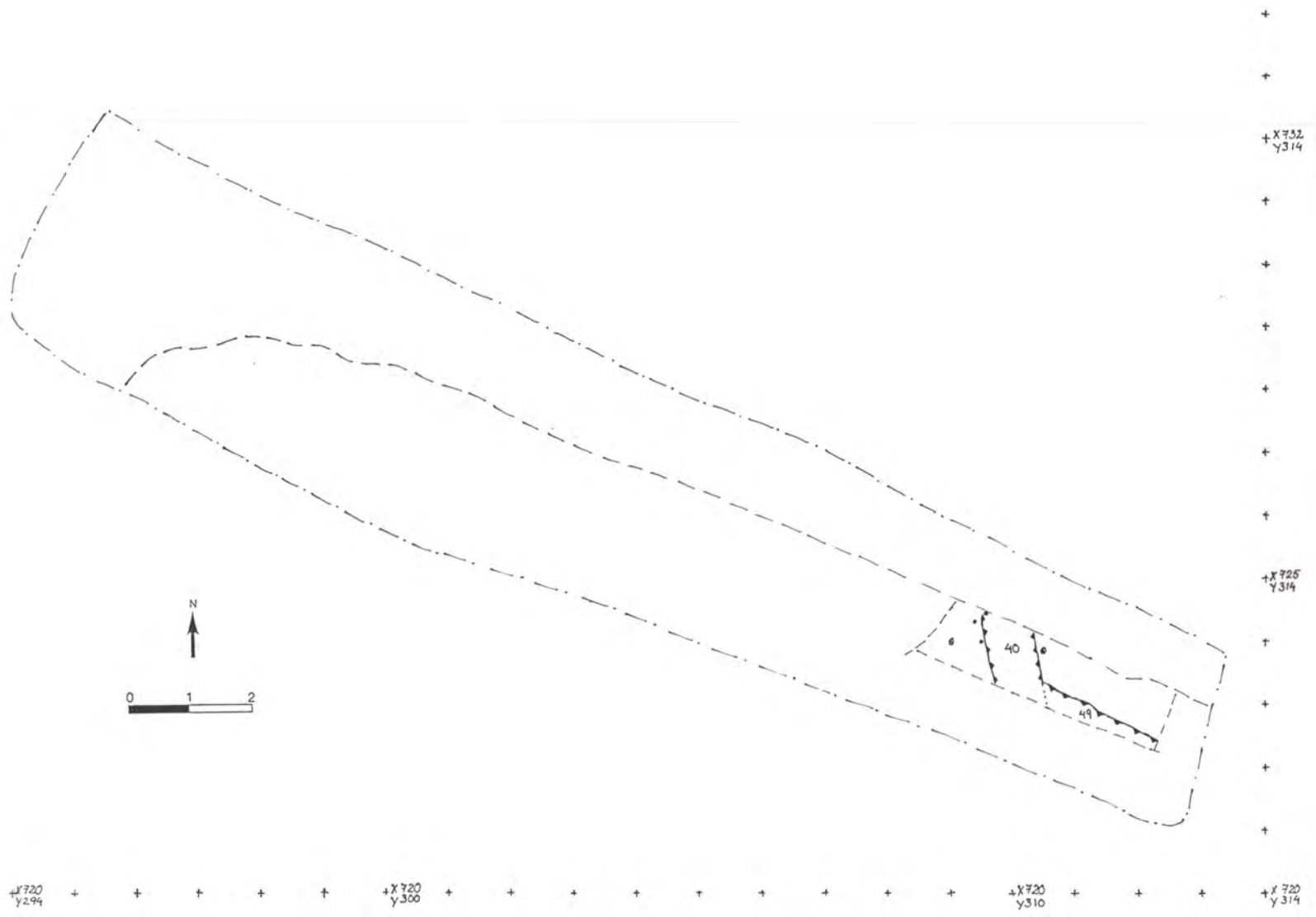


Fig. 48. Schaki B: Underindelning. Skala 1:100.

Fig. 49. Schakt B: Fas 1. Skala 1:100.



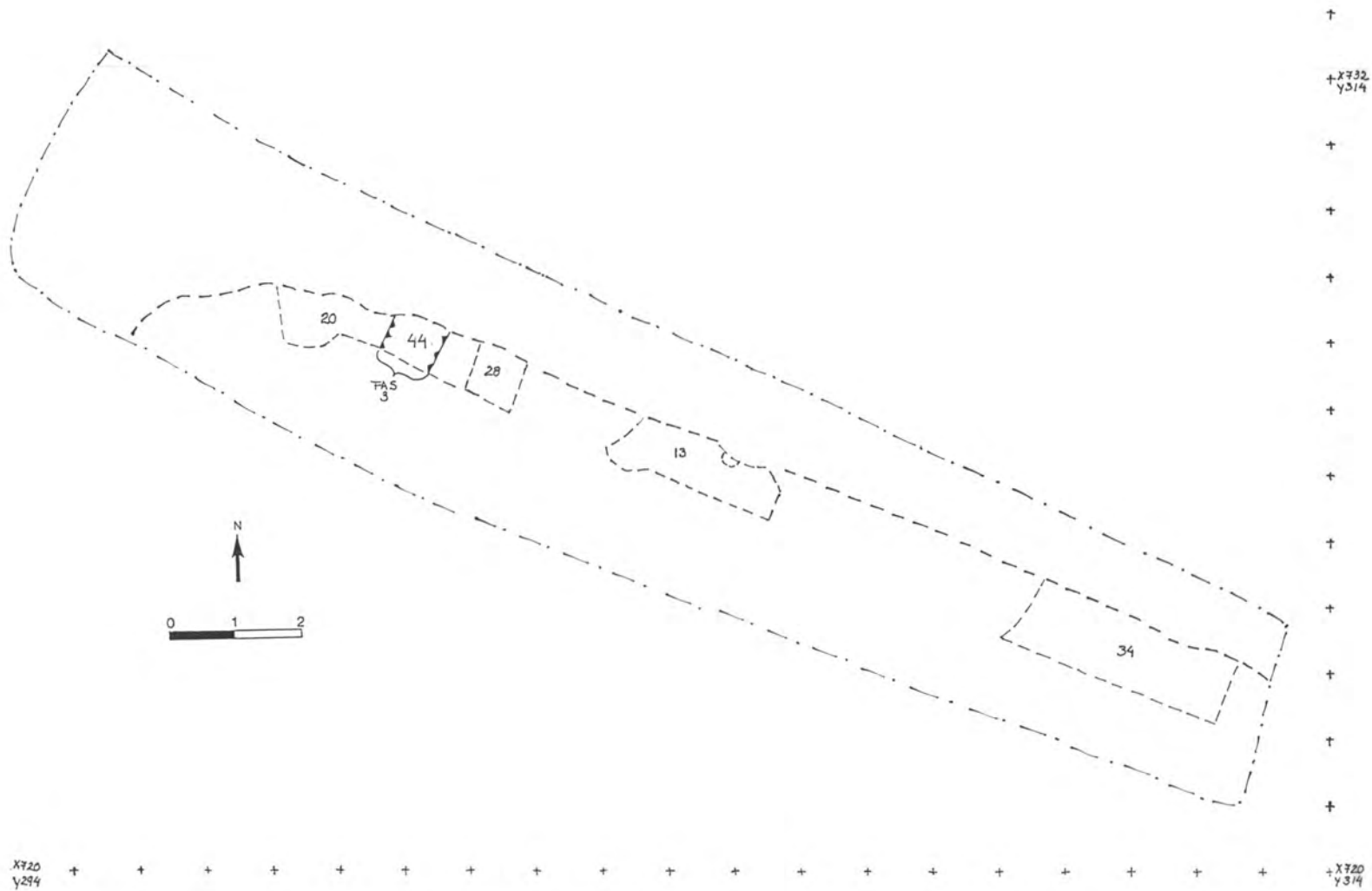


Fig. 50. Schakt B: Fas 2 och 3. Skala 1:100.

Fig. 51. Schakt B: Fas 4, nivå 1. Skala 1:100.

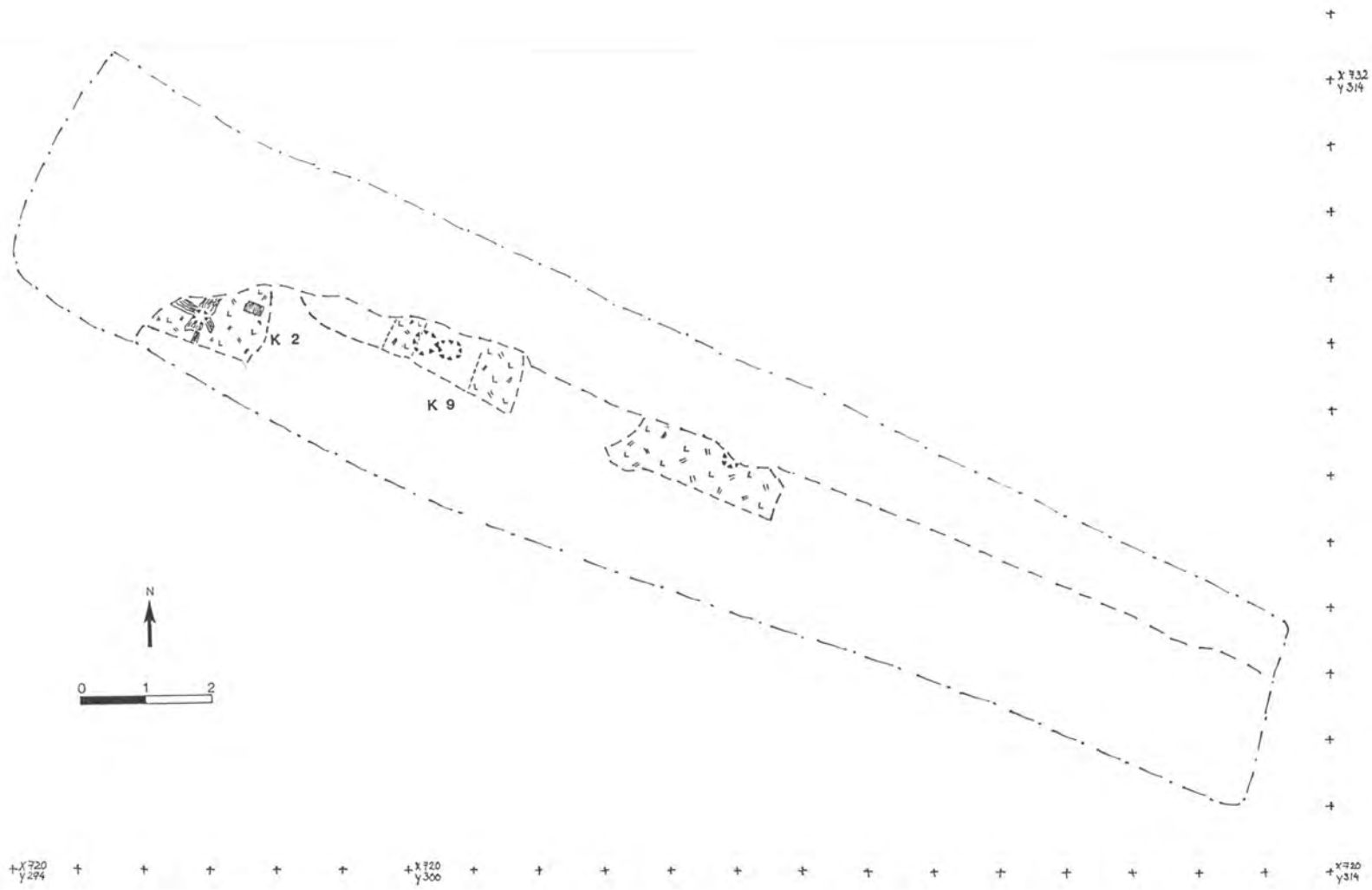
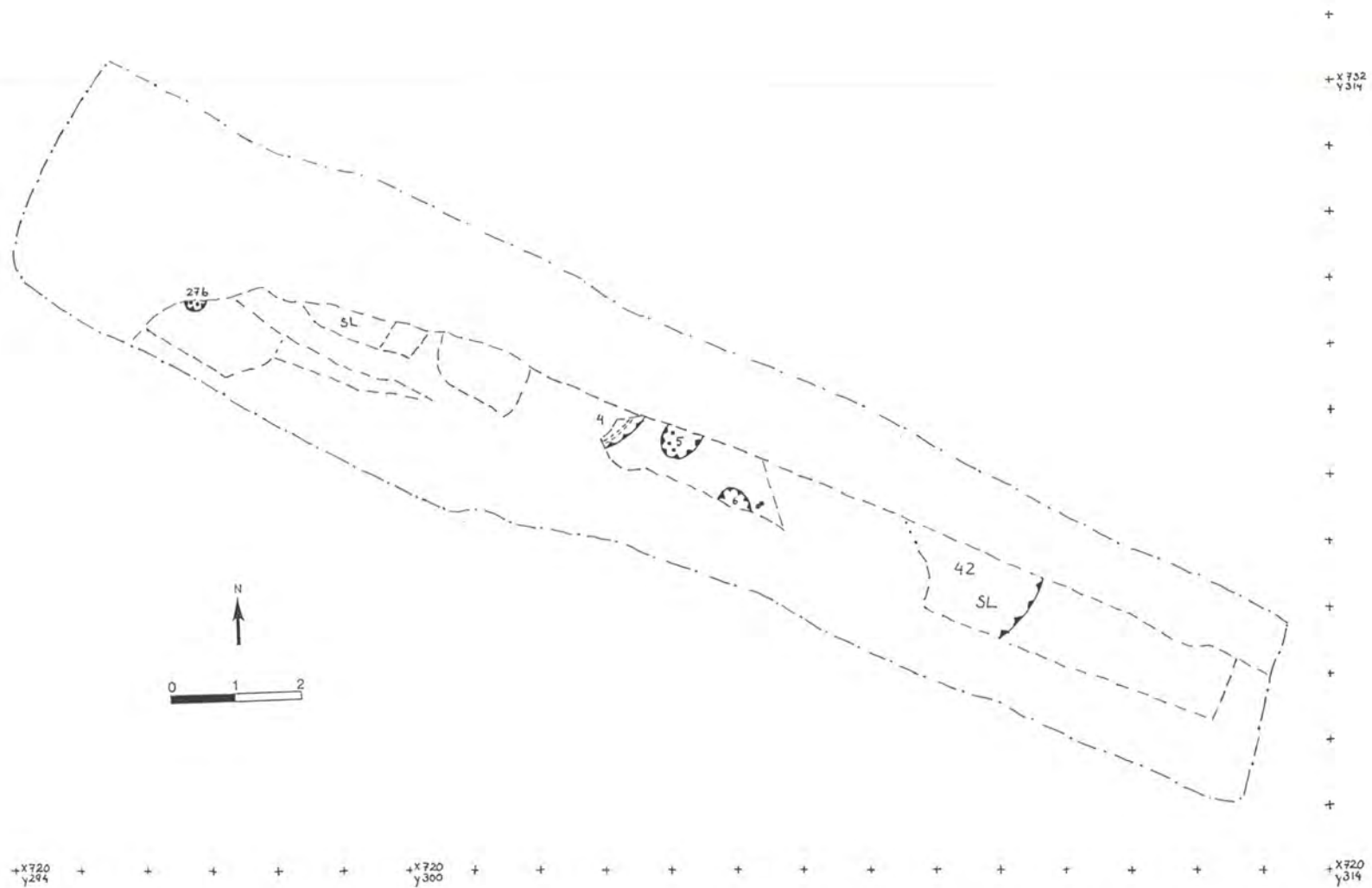


Fig. 52. Schaki B: Fas 4, nivå 2. Skala 1:100.



3.13. Main Phasing: Correlation of F-site's quadrants FA and FB and Trench B (Figs. 53-61).

The following master phasing is built upon correlations established through the main E-W baulk between FA4 and FB5. The aim is to create a picture of contemporary trends and developments between the areas, with particular regard to the building pattern and associated industrial features. The correlating of phases was broadly successful, though the slope of the terrain, the unseen effect of activity within the baulk, and the broad similarity of successive deposits, make precise definition very difficult. The Main Phase plans are "composites" compiled from the various individual plans. Consequently, they give a generalized view, and for complete phases it is advisable to refer back to the detailed expositions in 3.7., 3.8., 3.9., 3.10. and 3.11.

The main phasing is as follows, with the main cross-correlations presented, followed by a short characterization. Roman numerals are used for denoting the Main Phases.

Main Phase I: FA phase 1; no equivalent phase in FB; ? = Trench B phase 1 (Fig. 53).

This comprises the body of "half-natural" contaminated alluvial sands and gravels with camp-fire evidence, lying to the higher N part of the area. To the S this material may have been removed/ planed-off, or does not exist in the same recognizable form; Trench B has some highly dubious evidence. N.B. The various (unphased) ditches in Quadrant FC have also been included for purposes of comparison. They may also relate to II and III, below.

This phase bears slight traces of occasional human activity within a still-active riverine environment, and may be regarded as comprising the pre-metalworking period.

Dating: ¹⁴C: A.D. 900-1025: awaits re-examination.

Main Phase II: FA phase 2 = FB phase 1 = Trench B phase 2 (Fig. 54).

The compacted grey gravelly horizon/surface, which lies discontinuously over the two quadrants and Trench B. This is regarded as an entity in itself, although features/contexts from the following phase may relate to activity taking place on this surface. This marks the first widespread human activity on site: first phase in metalworking period? (N.B. Features in FC included for reasons of comparison.)

Dating: ¹⁴C date A.D. 660-890 (FA): awaits re-examination.

Main Phase III: FA phase 3, levels 1-4 = FB phase 2 = ? Trench B phase 3 (Fig.55).

In FA a concentration of superimposed features and an array of isolated features occur, which are deemed to have been cut from above the Phase II horizon, though precise cutting levels and interrelationships uncertain. In FB a major zone of intrusive activity has removed much of the Phase II horizon to the SW. This activity may relate closely to that in both the previous main phase and that succeeding it. Clear evidence for metalworking. (N.B. Again, FC features are included, though their stratigraphic positions are unresolved.)

Dating: 12th century - coin and potsherd from FB1. ¹⁴C date: A.D. 677-894 (FB); awaits re-examination.

Main Phase IV: FA phase 3, level 5 = FB phase 3, level 1 and level 2* = Trench B phase 4, level 1 and level 2 (Fig. 56).

*(N.B. Cut features in level 2 may in fact correspond to those cutting

FA phase 4 level 1 ie. K32). Gravelly sands 788 (FA) and 675 (FB), and overlying clays 785 (FA) and 729 (FB) appear to correlate.

In FA the features assigned to Phase III should probably be seen as one with this phase, wherein the area's first range of structural features appears. No wood survives herein, though an array of post holes and a ditch may constitute evidence for at least one elongated workshop structure, possibly partitioned, or alternatively, two juxtaposed workshops on the same NE-SW alignment with suggestions of a neighbouring structure set off to the NW.

In FB and Trench B fragmentary traces of aligned lengths of timber occur which extend the evidence of workshop activity further along the SW-NE orientation noted above. Again, a partitioned structure is hinted at, though whether there formerly existed a further partition or complete break between the FA and FB/Trench B structures, is not clear.

Nevertheless, a clearly regulated structural unit is implicit in the consistent cross-quadrant alignment of this elongated building or row of buildings. That there was intensive activity within the structural confines is evident from the abundance of cut features especially in the FA4 and FB5 areas, though with complementary evidence from FB1 and FB2 as well. These are predominantly hearths associated with slag and charcoal-bearing deposits, and this phase constitutes the first (decipherable) workshop activity in the metalworking period. An area set aside for the dumping of waste material, in FB6 and the E part of FB2, is a consistent characteristic of all metalworking phases from now on.

In the E length of Trench B structural evidence is very slight, though there are some post-holes, K9, which might be interpreted as the remains of a further structure neighbouring those to the W and perhaps corresponding to a row of workshops ranged to the E of the FA-FB line. FC quadrant bears some structural evidence which may tie in with Trench B's K9 (see Fig. 45). These latter could not be correlated and there is no subsequent evidence from Trench B.

There is no firm evidence for a passage separating the K2 and K9 structures. An open area to the NE of FB is implicit in the aforementioned continuous use of the area for the dumping of slag and organic waste - a back-yard?

Dating: as Phase III? (12th century), though from Trench B some evidence for 13th century as well as 12th century (comb and pot). ¹⁴C date: A.D. 689-886; awaits re-examination. (See 7.2.6. for further dating info.).

Main Phase V: FA phase 4, levels 1 and 2 = FB phase 3, level 3 (Fig. 57).

Gravelly sands 717a (FA) and 670 (FB) correlate. Laying of this sand appears to mark new structural organization, though on identical alignments to Phase IV. Both in FA and FB traces of aligned timbers are very fragmentary, but, viewed in association with post-pits, aligned stones etc. a tentative picture emerges of a second phase of workshop building(s) aligned NE-SW. Also in this phase possible indications of a wall-division occur to the S of FA4 in the form of burnt timbers K31. Hearth activity occurs in the same locations as noted in Phase IV (though see also Phase VI below).

Unlike Phase IV, there are slight indications that this phase ended in a fire (the burnt timbers), though, as in Phase IV, clearance in antiquity may have obscured the picture.

Dating: 12th - 13th centuries - one sherd of pot from FA.

Main Phase VI: FA phase 5, levels 1 to 3 = FB phase 3, level 3 (continued) (Fig. 58).

Here the cross-correlation is less certain, though it is proposed that FA's clay spreads 694, 695 and 718 correspond to those in FB, 646 and 649. The evidence for a phase boundary between V and VI exists only in FA and the thick build-up of deposits in FB's phase 3, level 3 arguably requires the presence of some break, although firm structurally-related evidence is lacking. Again continuity is the norm in structural alignments and dispersal of associated features. For the first time, however, a complex of pits and possible hearths/furnaces (K37) occurs to the N of FA. Evidence for a S wall-division may lie in K44 burnt timbers in FA 2 and 4, and this and other elements may suggest destruction of this, the third phase of workshop activity, by fire.

Dating: 12th to 13th centuries - pot sherds from FA.

Main Phase VII: FA phase 6, levels 1 to 7 = FB phase 3, level 4 (Fig. 59).

Here again the cross-baulk correlations are not clearly demonstrable. However, there is an observable comparative sequence of thinner deposits to either side of the baulk, with slaggy sandy deposits, charcoal spreads, and thin laminated clay layers. In FA these consist of 589, 608, 610, and 611 which correspond in height and character to the complex in FB which includes 174, 173, 194, 200 etc.

In FA the substantial sequence of clays sealing waste-bearing charcoally sands accounts for the complexity of levels which have been interpreted as successive floors and accumulations of debris thereon. The most well-preserved timbers occur in this phase to the N with less structural clarity to the S of the quadrant, though some slight evidence exists for a division between the FA arrangements and those to the SW in FB, as well as evidence for a possible thin partition in the FA 2 and 4 areas. The sequence of possible floor levels preserved in FA 2 and 4, despite some contrary evidence, may well have been deposited within one long-lived structure, itself compartmentalized, stretching NE-SW as before. The location of industrial features is largely as before, though the substantial spreads of clay herein are a characteristic, in scale and repetition, of only this and succeeding phases.

In FB surviving timbers are fragmentary, though these may indicate fresh structural alignments corresponding to those in FA, the unit of workshop activity being maintained on previous lines. Intensive hearth activity is attested in FB 5, while in FB 2 a charcoal-filled timber-lined pit, K6, survives. In FA 2-4 a wood-lined pit K68 occurs, though not filled with charcoal. In fact, the digging of large pits seem to be a characteristic of this phase. It is not certain whether or not this phase ended in a fire. It is the fourth episode of workshop activity.

Dating: 12th to 14th centuries: pot sherds from FA and FB.

Main Phase VIII: FA phase 7, levels 1 and 2 = FB phase 3, level 5 (Fig. 60).

Correlating layers marking this new phase are 364 (FA) and 118 (FB).

In FA the reorganization/structural break is demonstrated by new make-up along the WNW-ESE mid-quadrant wall-line K70. These new deposits also appear to seal the probable flooring of Phase VII to N and S thereof. Only fragmentary indications of walling and internal workshop activities survive in this quadrant. There are some slight hints at an

expansion to the NW of structural organisation, a trend more observable in the next phase. The insecurity of the internal correlations may perhaps, on further investigation, allow this "floating" phase to be lowered or raised into the preceding or subsequent phases.

In FB continuity in location of industrial activity is observable, though again evidence for walling is negligible. Evidence from FB 1 is now lacking. This may constitute a fifth workshop episode.

Dating: 13th century to 14th century - pot sherds from FA and FB.

Main Phase IX: FA phase 8, levels 1 and 2 = FB phase 4 (Fig. 61).

Very fragmentary evidence herefrom (none from Trench B) and the precise correlation of FA and FB is very insecure.

In FA evidence, in the form of a line of possible pad-stones K76, and a confusing array of intercut pits etc., may suggest that a structure and associated flooring extends into the NW part of the quad. covering what appeared to have been dumped deposits in preceding phases. Discontinuous spreads of compacted clay (flooring?) and associated hearths may indicate continuity of forms of activity noted in Phase VII.

In FB some fragmentary timbers survive and these conform to previously noted alignments, arguing for a sixth restructuring episode, which conforms to the evidence in FA. In FB this is the final phase in the metalworking period and workshop activity is superseded by post medieval arrangements. In FA overlying evidence was removed by machine, including some metalworking deposits, so the interface between medieval and post-medieval deposits was not investigated.

Dating: A.D. 1200-1350 - pot sherds from FB.

Main Phase X: FA phase 9 = FB phase 5 (Fig. 44 and archive plans).

As stated above, much of the post-medieval evidence in FA was removed by machine. This quadrant was the least disturbed of the four. Little time or effort was given to examining the disturbances found herein, the most major of which comprised a rounded (?) pit to the SW, a square wood-lined latrine (?) to the N and a major wall foundation aligned NE-SW to the E of the quadrant which belonged to the last standing house torn down in the 1987 building operations. Interestingly enough, the orientation of this foundation wall (19th century?) displays a remarkable conformity to the alignments noted in the medieval period.

In FB (and also in Trench B) the metalworking deposits lay directly under (patchy) cobbled surfaces which produced 17th century pottery - also remains of wood found in these contexts. A large 17th or 18th century cellar cut away much of the SE part of the quadrant.

As stated, where observable, the 17th century cobbled surfaces (yards?) cleaned off directly onto medieval slag/charcoal deposits. No evidence for intervening turf-lines or slag-free soils were discerned, so it appears that some planing-off of the area in preparation for settlement of the area in the 17th century took place.

Dating: 17th century to 20th century: numerous pot-sherds etc. from FA and FB.

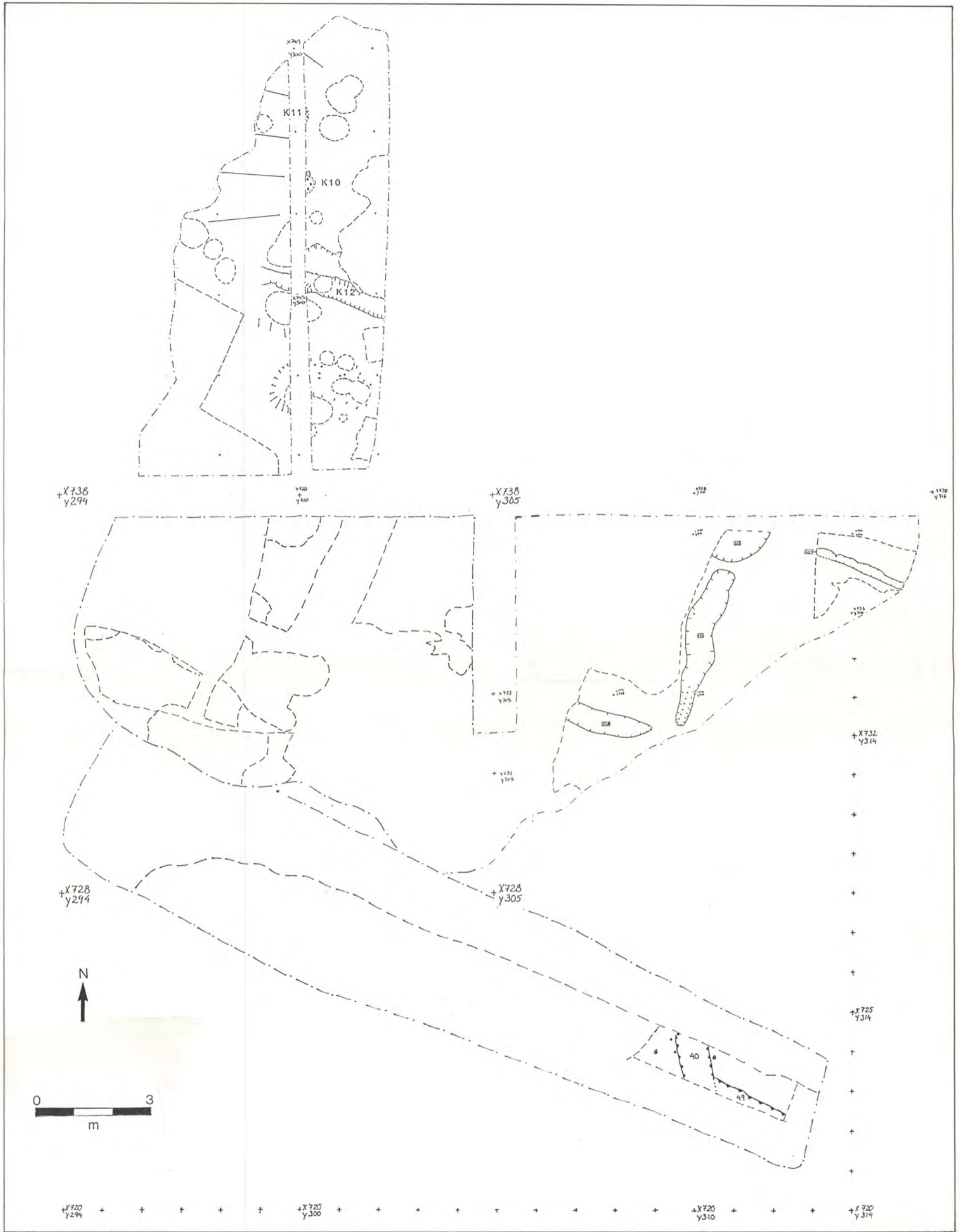


Fig. 53. Main Phase I. Features in natural (steril). 1:100.

165 ay 166

s 165 A3 Fig. 53

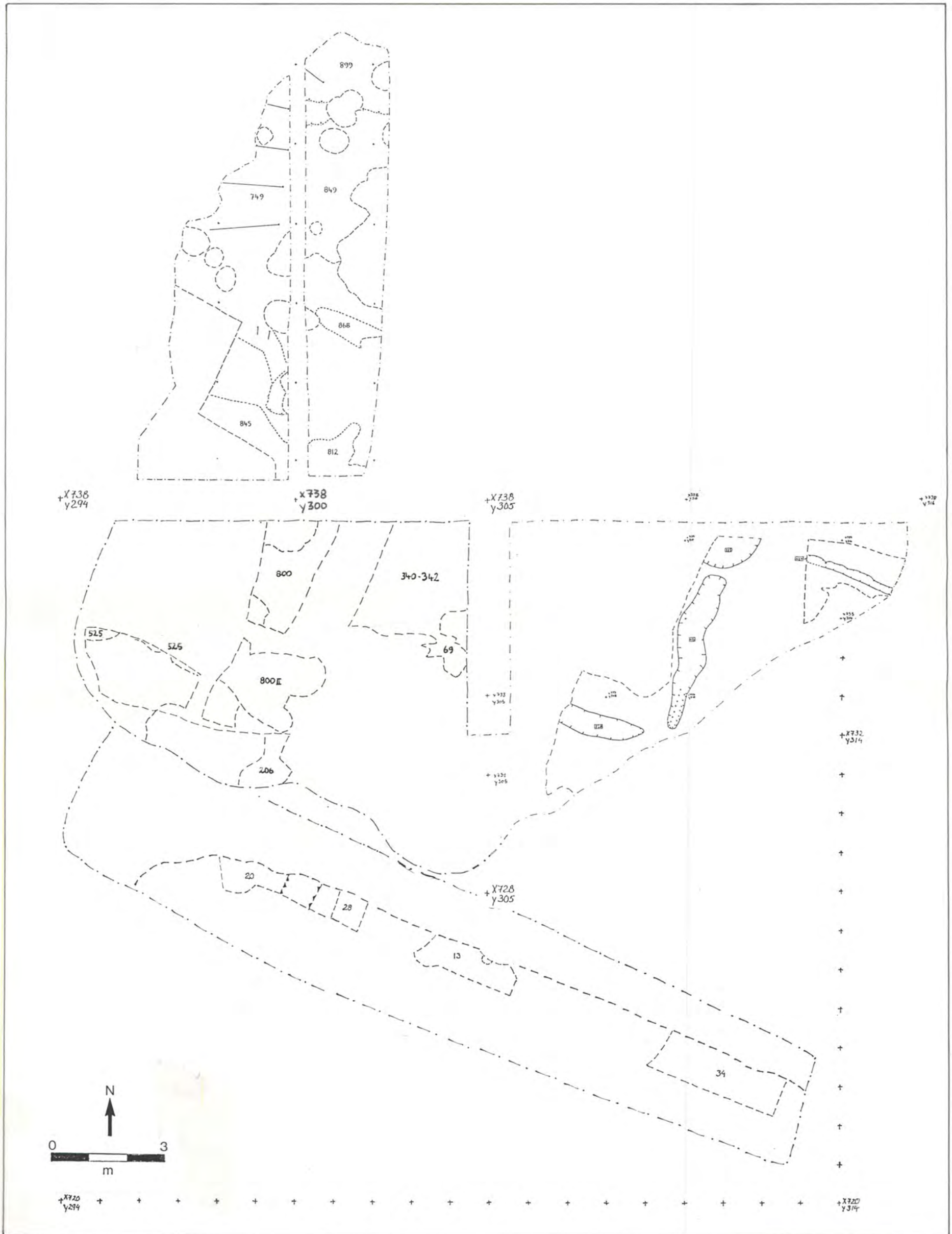


Fig. 54. Main Phase II. The gravel surface / primary occupation horizon. 1:100.

167 *ag* 168

s 167 A3 Fig. 54

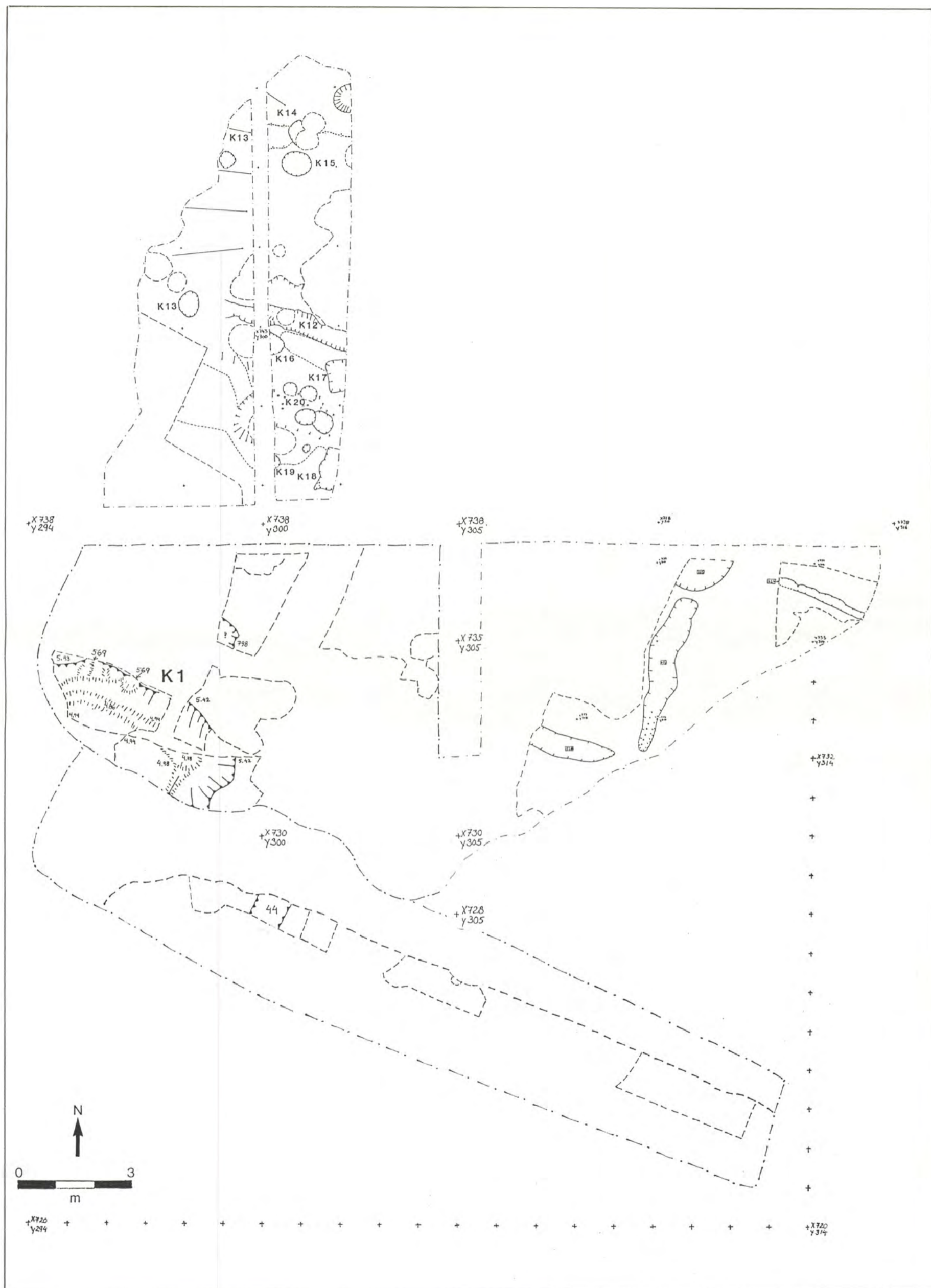


Fig. 55. Main Phase III. Features cutting the gravel surface. 1:100.

169 ay 170

s 169 A3 Fig. 55

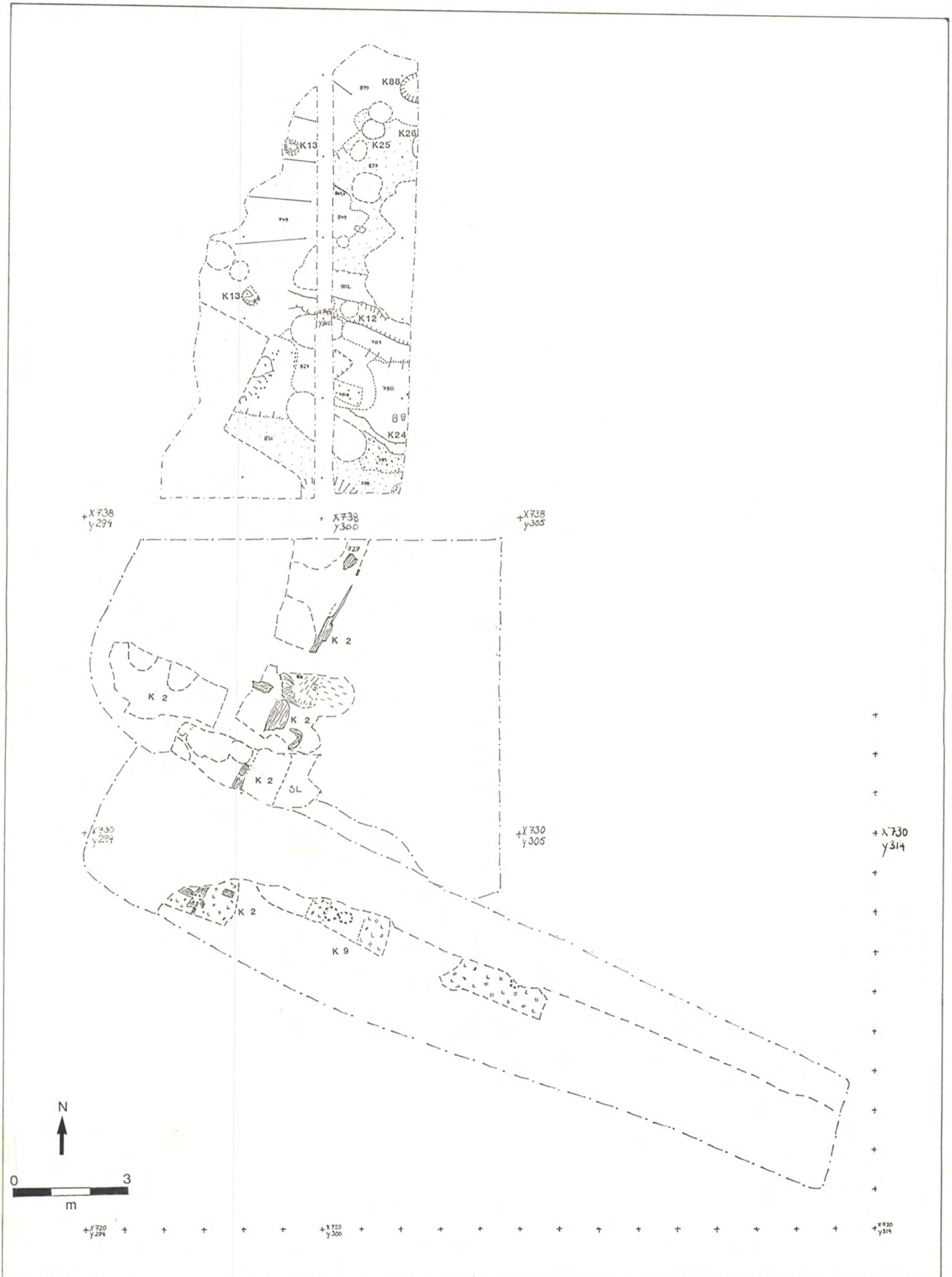


Fig. 56. Main Phase IV. First major deposits and timber elements etc. (Quads B and C unphased.) 1:100.

171 ay 172

s 171 A3 Fig. 56

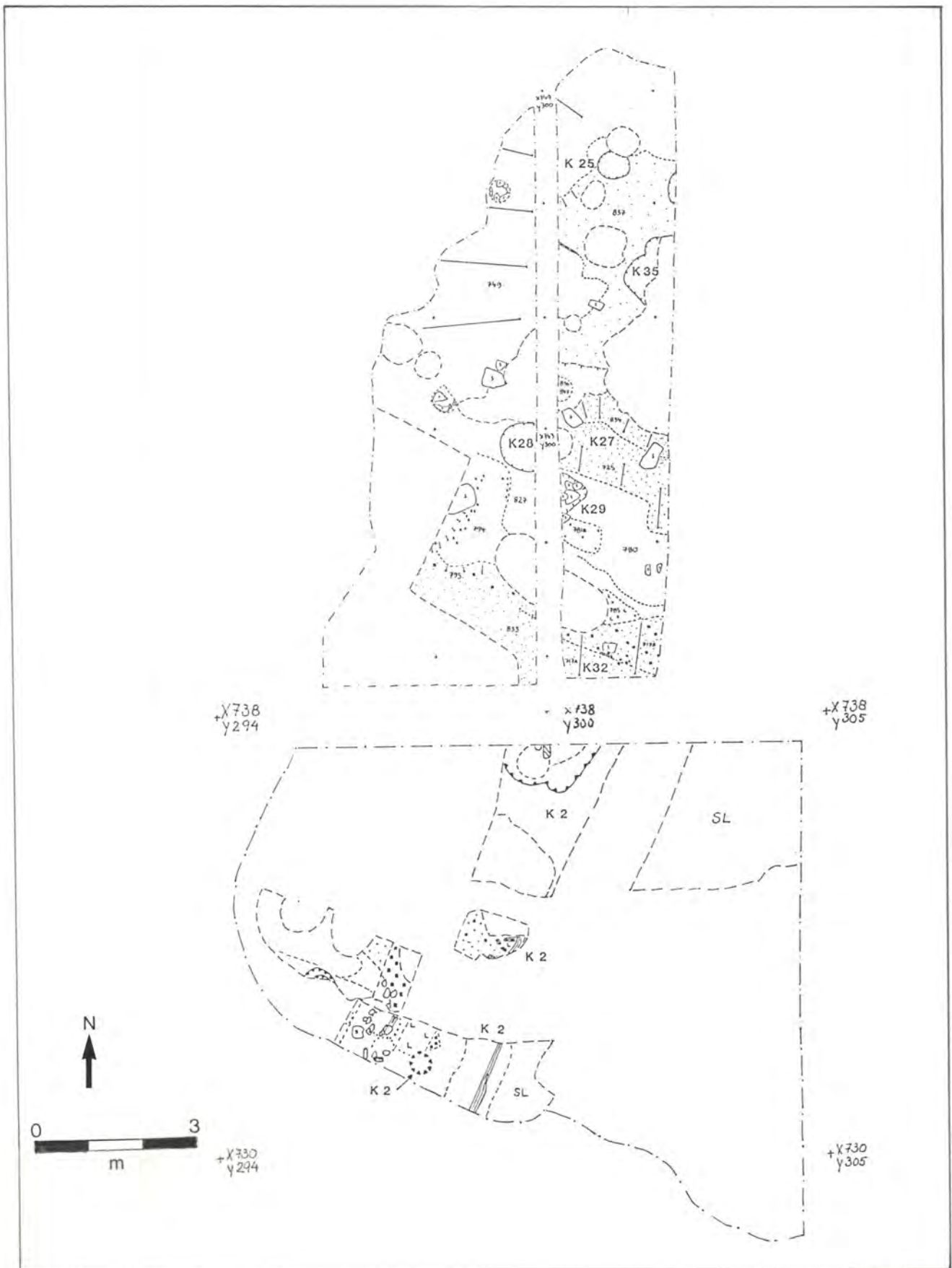


Fig. 57. Main Phase V. New structural and industrial elements in FA and FB (F-site). 1:100.



Fig. 58. Main Phase VI. New structural/industrial elements in FA. 1:100.

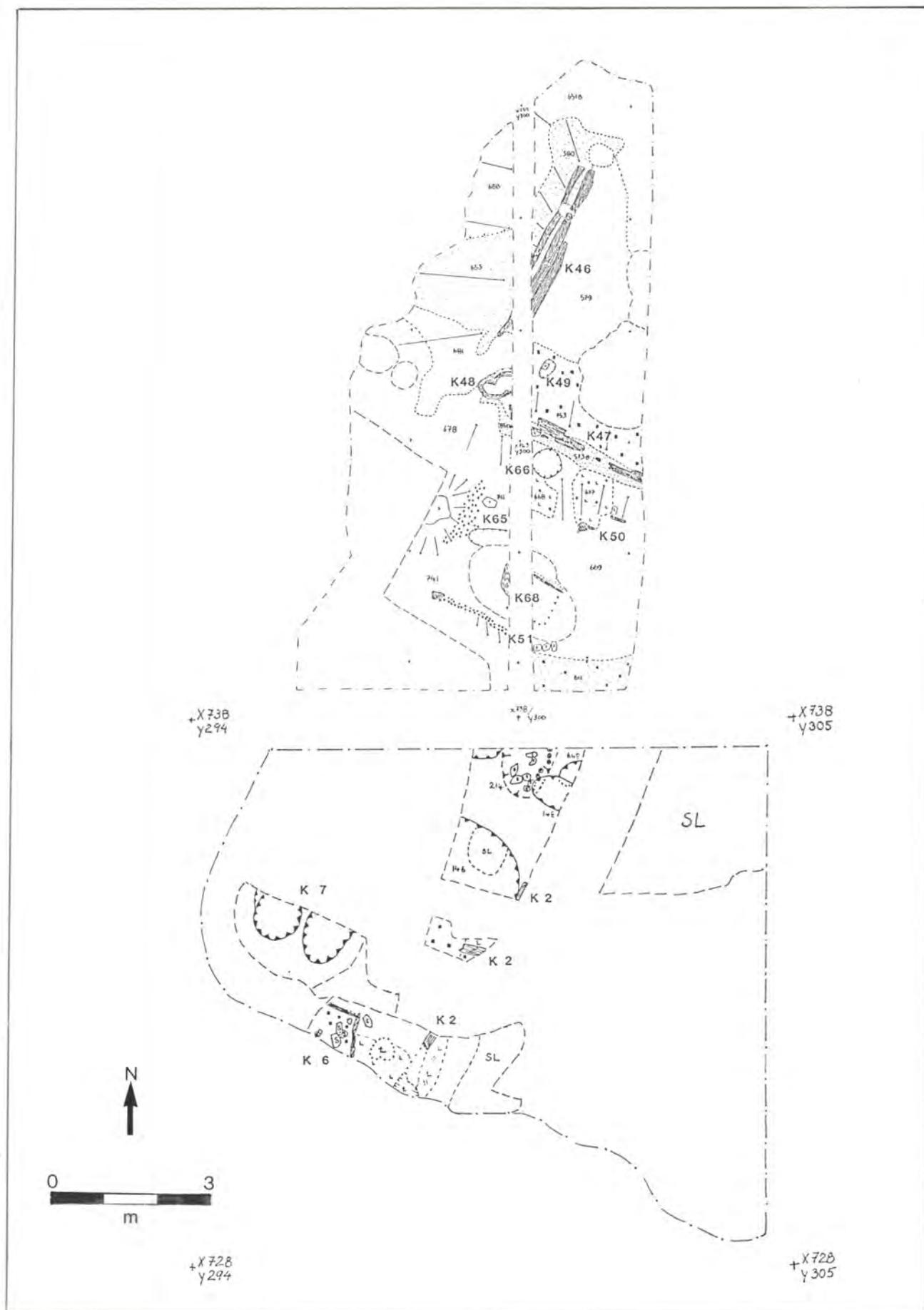


Fig. 59. Main Phase VII. New structural/industrial elements in FA and FB. 1:100.

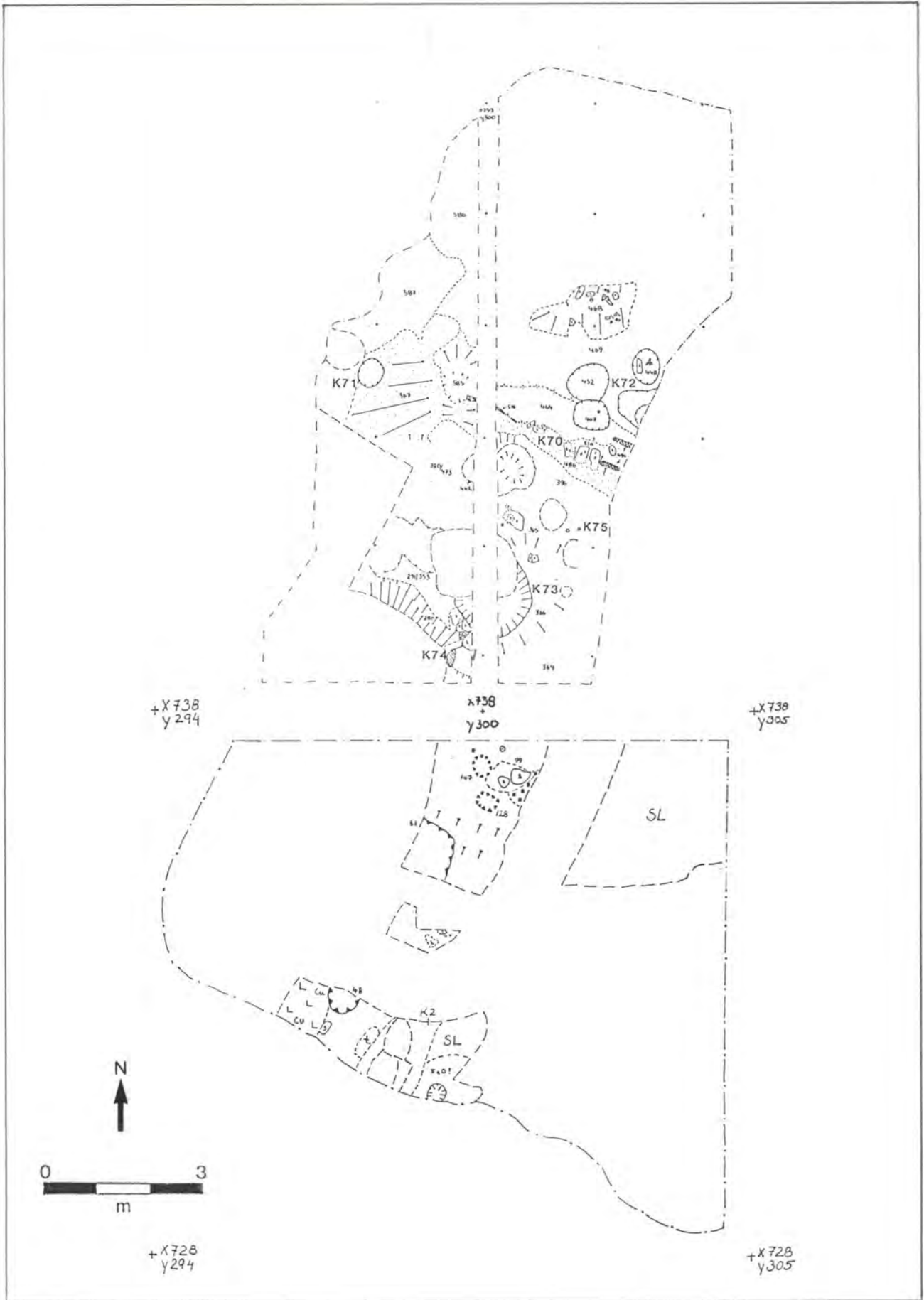


Fig. 60. Main Phase VIII. New structural/industrial elements in FA and FB. 1:100.

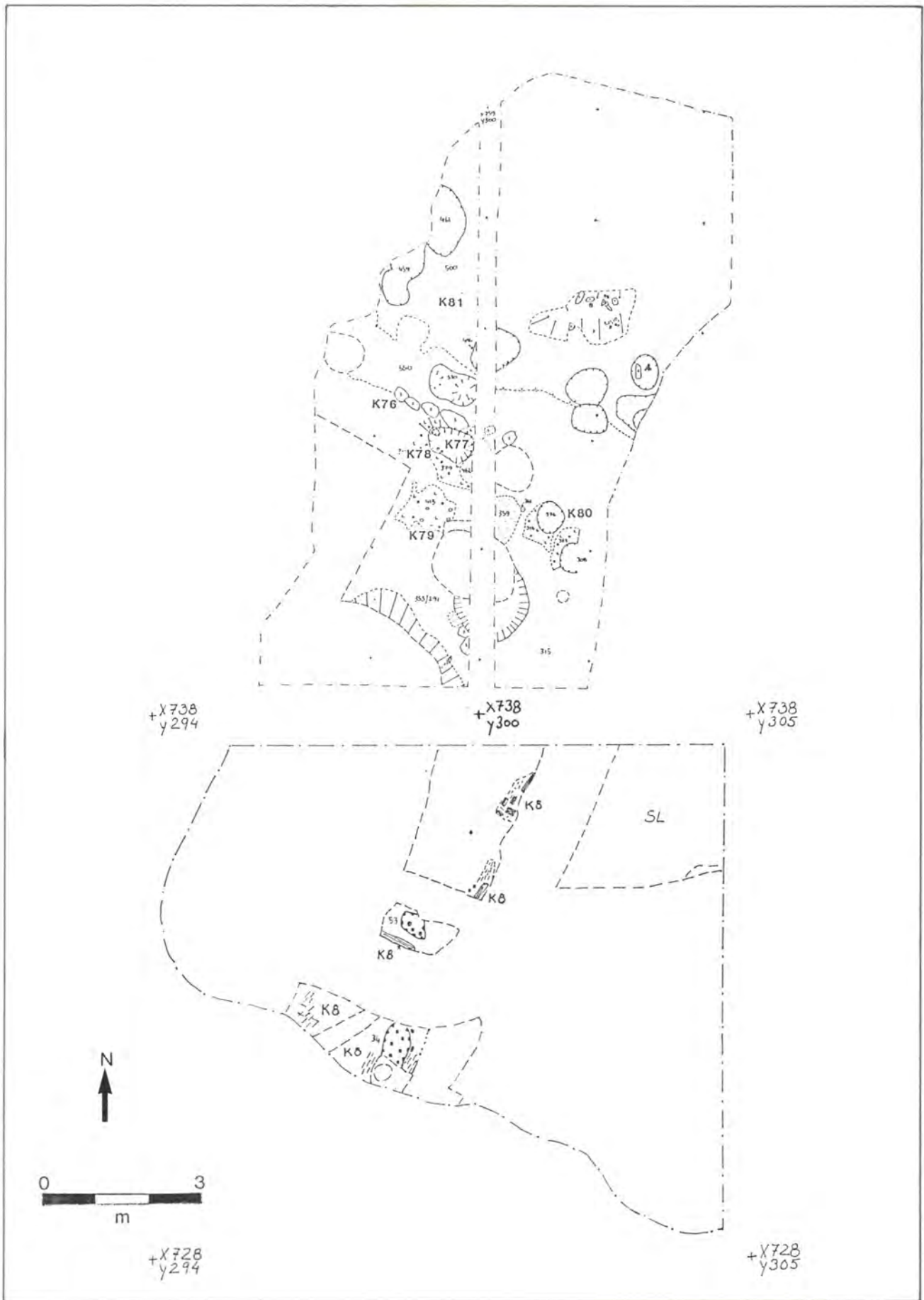


Fig. 61. Main Phase IX. New structural/industrial elements in FA and FB. 1:100.

3.14. Övriga undersökningsområden på Mellagertomten (Fig. 2).

3.14.1. Schakt A (Fig. 62 och 63).

Under gårdsplanen till Krarbugata 13 lades ett 15 m långt och 3 meter brett provschakt i riktning nordnordost-sydsydväst. Den norra halvan bestod endast av modernt, omrört material vilket givetvis grävdes bort helt med maskin.

Den södra halvan blev på grund av lämningarnas karaktär upp-splintrad i tre delar. Den östligaste delen var störd av en recent nedgrävning för grundmur och togs bort. Den västligaste delen grovschaktades ned till 7,05-7,25 m ö h. Ytan utgjordes då av fyllnadsmassor från sentida verksamhet i form av större stenar, tegel, grus, sand och brun mo.

Mittpartiet gav på samma nivå ett intressantare intryck med sina inslag av kol och bränd lera. Det handgrävdes därför ned till steril sand som påträffades 6,70 - 6,80 m ö h. Inga säkra medeltida lager kom i dagen och lämningarna verkade avgjort efterreformatoriska.

Kommentar:

Inga spår av metallhandtering hittades således och området kan knappast ha bebyggts före 1500-1600-tal. Äldst var schaktets enda konstruktion, en 60-80 cm vid och 60 cm djup grop. På färgfoto men ej på profiltäckning tycks gropen ha ett samband med lämningarna ovanför, där bl a lager med bränd lera och träfragment fanns. Konstruktionen skulle möjligen kunna tolkas som stolphål.

3.14.2. Schakt E (Fig. 64, 65 och 66).

Tretton meter väster om Kjøpmannsgata 50 och parallellt med detta hus lades ett 19 m långt och 3 m brett schakt. Den östra schakthalvan, vilken delvis löpte längs en recent betongmur, maskin-grävdes ned till steril sand. Förutom moderna störningar borttogs då i den sydligaste delen rester av en efterreformatorisk källare.

Oavbrutet körde lastbilar i skytteltrafik på den västra kanten av schaktet. Detta medförde ständiga ras som försvårade och ibland omöjliggjorde dokumentation. Konstateras kunde emellertid, att den västra schakthalvan innehöll övervägande rester av 1600- och 1700-tals källare, (speciellt söder om X-linje 809), samt en knut-timrad brunn, ca 1,10 x 1,10 m, vilken inte kunde följas till botten på grund av omgivande lös sand. Även en något senare, stensatt brunn kom till synes i den västra profilväggen. De efterreformatoriska källarna var tydligt brandskadade, då väggar och golv bestod av helt eller delvis förkolnade plankor.

Kommentar:

Inga medeltida lämningar hittades. Rimligtvis borde sådana ha funnits även på den norra delen av kulturhustomten. Det är svårt att förstå, att endast lägre liggande områden i söder tagits i bruk. En möjlig förklaring är, att mycket tunna lager avsatts under medeltiden, att platsen legat ännu högre än vi i dag kan utläsa, samt att marken avplanats vid senare verksamhet varvid äldre lämningar försvunnit. Samtidigt infinner sig en liten misstanke, att vissa konstruktioner och lager som automatiskt klassas som tillhörande 1600-1700-tal egentligen är ett eller två sekel äldre.

I schakt E kunde endast ett mått tas på steril. Vid koordinaterna X 812,35/Y 350,9 uppmättes en höjd av 6,75 m ö h.

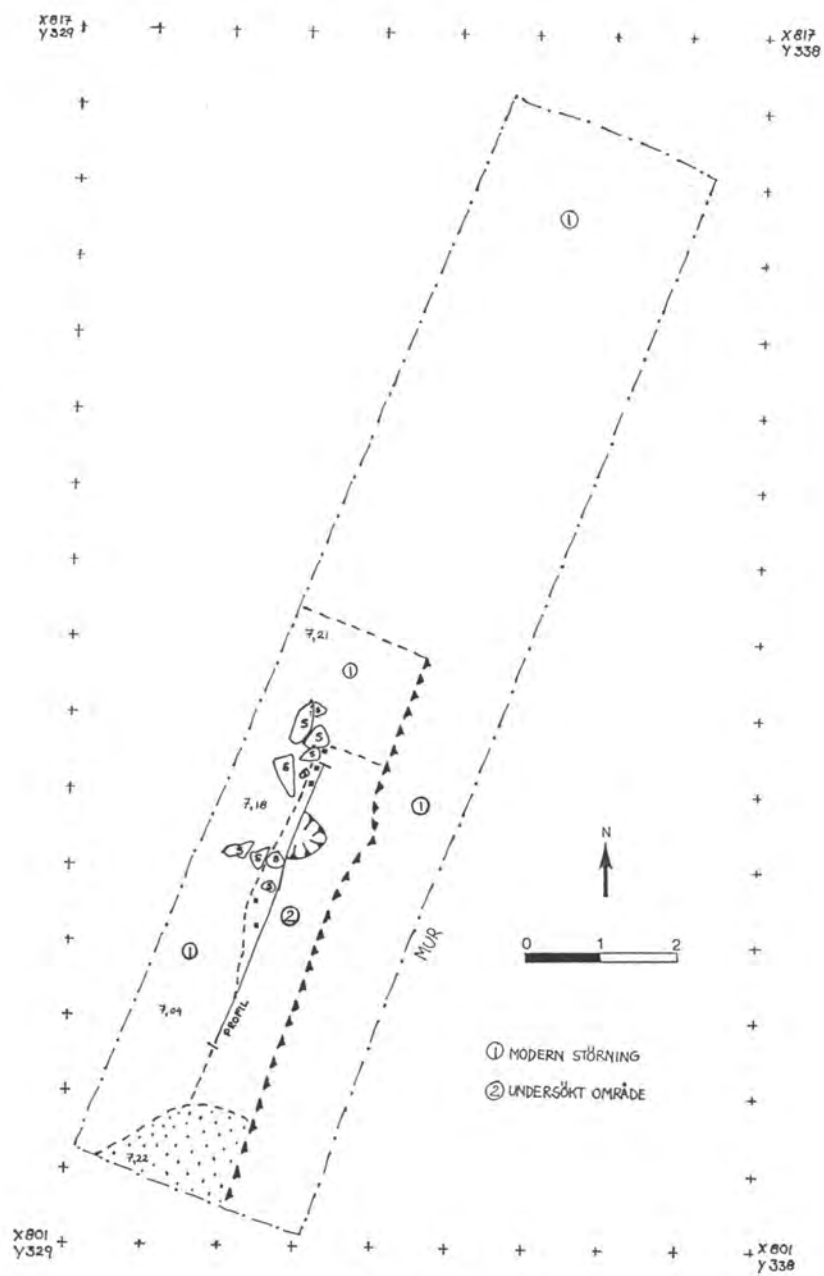
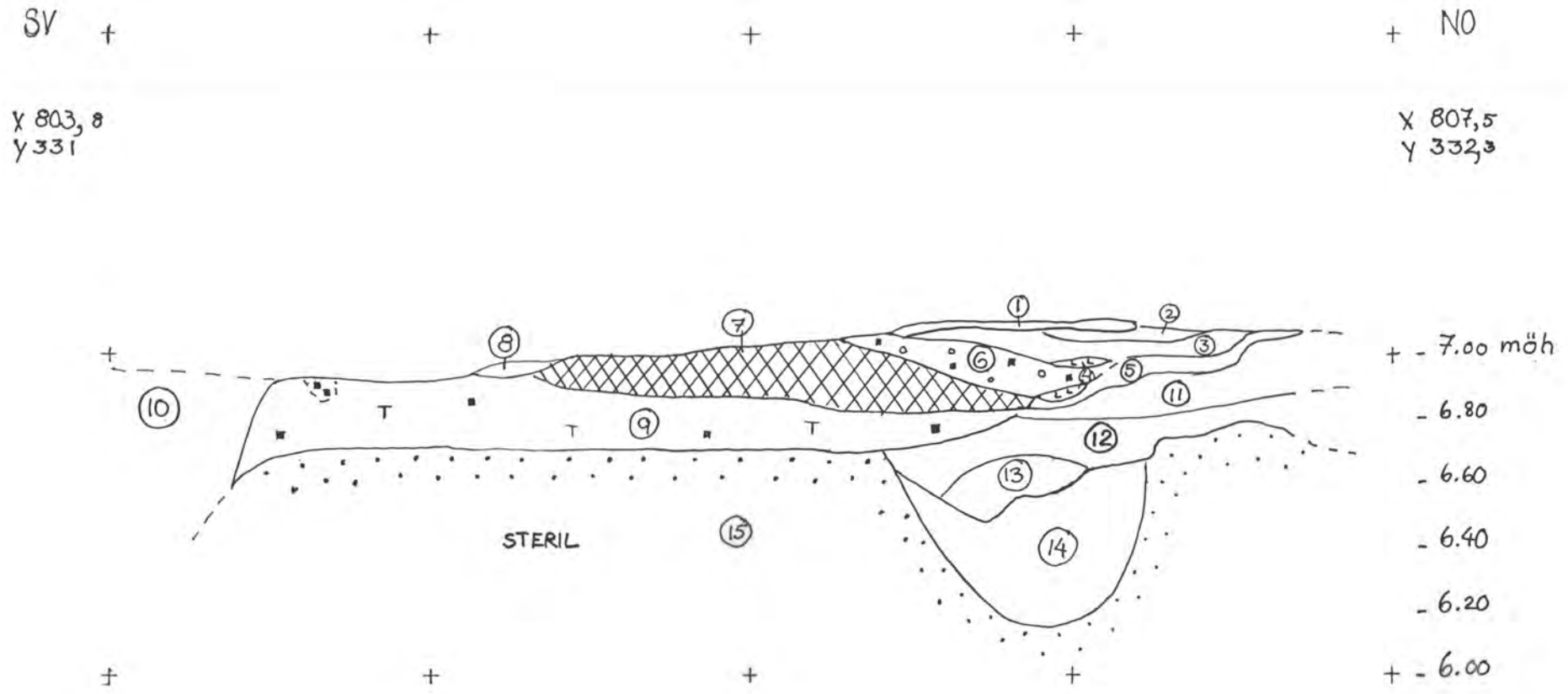
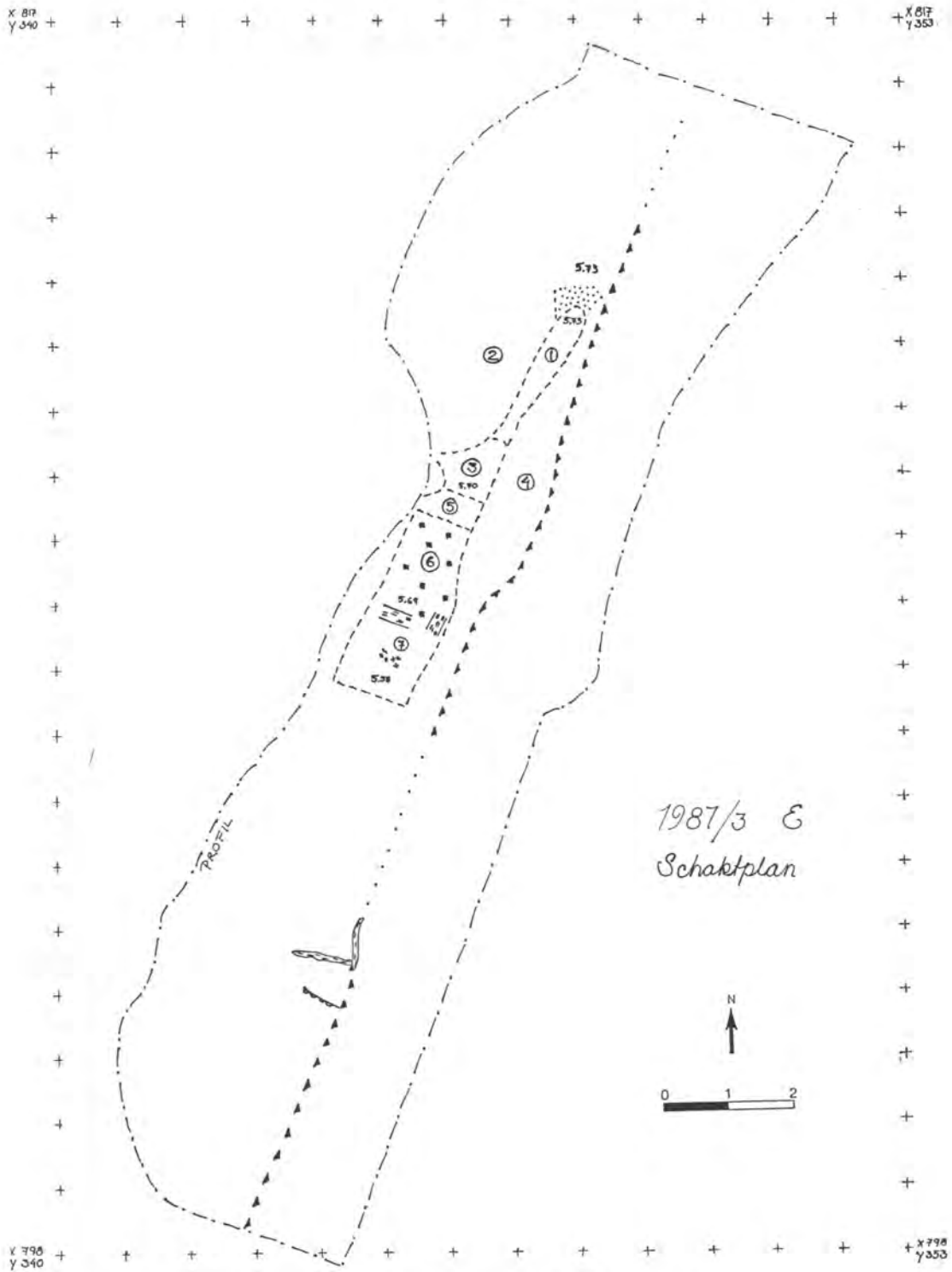


Fig. 62. Schakt A: Plan. Skala 1:100.

Fig. 63. Schakt A: Profil mot öst. Skala 1:20.



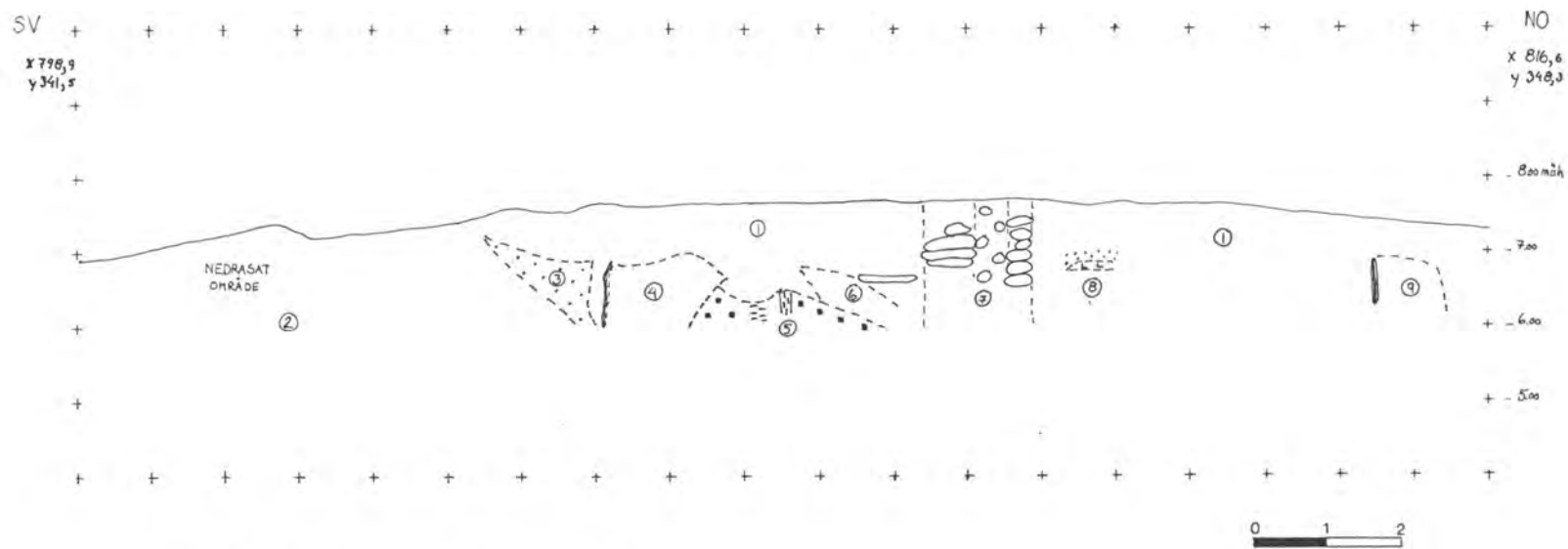
- | | | | |
|---|---|----|---|
| 1 | grå sand | 8 | mörkbrun sand |
| 2 | sotig sandig mo | 9 | mörkbrun moig sand, tegel kol och träfragment |
| 3 | mörkbrun och rödbrun något sotig mo | 10 | fyllnadsmassor |
| 4 | bränd lera | 11 | rödbrun sandig mo, träfragment |
| 5 | något sandig sotig mo, träfragment | 12 | sotig sandig mo |
| 6 | mörkbrun sandig mo, kol och träfragment | 13 | brun sandig mo, kolfragment |
| 7 | brandlager | 14 | brun moig sand |



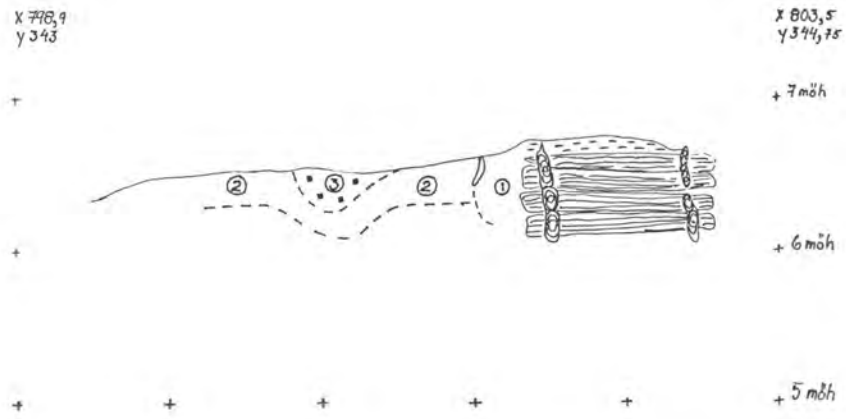
- 1 gråbrun sandig grusig mo, kol och tegel
- 2 nedrasat material
- 3 kol sot och sandig mo
- 4 grå sandig grusig mo, sten och tegel
- 5 tegel
- 6 kol sot och lite sandig mo, rostade järnklumpar
- 7 förkolnade brädor
- 8 brunn

Fig. 64. Schakt E: Plan. Skala 1:100.

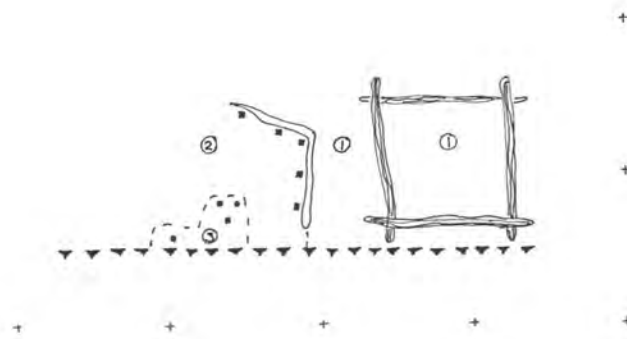
Fig. 65. Schakt E: Profil mot öst. Skala 1:100.



- 1 fyllnadsmaterial, mestadels brunsmutsig sand
- 2 nu gul sand, innan rasen fanns 1600-talskällare
- 3 gul sand
- 4 tegel och bränd lera
- 5 förkolnat trä
- 6 ihopsintrat rött och gult tegel; sekundärbränt
- 7 stenfundament och brunn
- 8 lins med lera och sand
- 9 rest av källare, brädan förkolnad mot norr



- 1 ljust gråbrun grusig sand, mindre stenar
- 2 humös sand
- 3 sotig mo



- 1 ljust gråbrun grusig sand, mindre stenar
- 2 humös sand
- 3 sotig mo

Fig. 66. Schakt E: Timrad brunn, plan och profil. Skala 1:50.

3.14.3. Profil D (Fig. 67 och 68).

Cirka en halv meter söder om Kjøpmannsgata 50 avritades en lager-följd mellan koordinaterna X 791,5/Y 362,5 och X 790/Y 366,5. Schaktväggen gick i närmast VNV-OSO riktning. Av praktiska och tolkningsmässiga skäl har den något komplicerade originalplanen förenklats och indelats i tre huvudpartier.

Redovisning av den förenklade profilen

Den sterila nivån låg i väst på 4,87 m ö h och i öst på 3,97. Det ackumulerade materialet sluttade således markant ned mot Kjøpmannsgata.

- A Partiet ovan steril utgjordes av brungrå, humös sand med en något grusig lins på nivå 4,24 - 4,32. Förutom en liten sotstrimmel fanns obrända ben och enstaka träfragment. Inget tegel var synligt.
- B Mittpartiet karakteriserades av grå, humös sand med sot-strimmor. Kol- och träfragment förekom liksom några små flisor rött tegel.
- C Det yngsta partiet bestod övervägande av brungrå och grå humös sand varvat med trä- och lerlager (tre av varje). Sanden innehöll kol- trä och benfragment, rött tegel samt enstaka skärvor orange- och brunglaserad keramik. Lerinslaget var emellanåt stort. Så gott som underst i C fanns ett ca 1 cm tjockt lager förkolnat trä. Någon decimeter ovanför detta var leran del-vis bränd.

Kommentar:

Lagren var i verkligheten mycket tunna, strimmiga och svåra att rita av. En möjlig tolkning är, att de stammar från bakgårdsverksamhet. Träskikten i C-partiet skulle då härröra från bro-läggning av gårdsplanen.

Inga tecken fanns på metallaktiviteter och lagren bör rimligen dateras till sen medeltid - sextonhundratals.

3.14.4. Profil G, vid Kjøpmannsgata (Fig. 69).

Schaktväggen utmed Kjøpmannsgata avritades mellan de ungefärliga koordinaterna X 770/Y 360,5 och X 759,5/Y 356,5.

Profilen bestod i huvudsak av en igenfylld källare, sentida störningar och fyllnadsmassor där en hel del brandskadat 1600-talsmaterial ingick. Få originalskiktningar fanns. På två ställen återkom dock samma formation. Tjugu till förtio centimeter tjocka lager med ljusare brun till svartbrun sandig mo, kol- och trä-fragment, delades på mitten av ett sandstråk. I det nordligaste partiet förekom små röda tegelbitar. Dessa avlagringar såg ut att vara äldre än resterna av troligen 1681 års brand.

Inga tecken på metallhantering fanns i profilen.

Steril uppmättes på nivåerna 4,82, 4,51 och 4,25 m ö h. 4,82 är antagligen en felmätning då markeringen på planen ligger ca 4,69 m ö h.

V

1987/3 D

O

Fig. 67. Profil D: Profil mot syd. Skala 1:20.

X 791,5
y 362,5

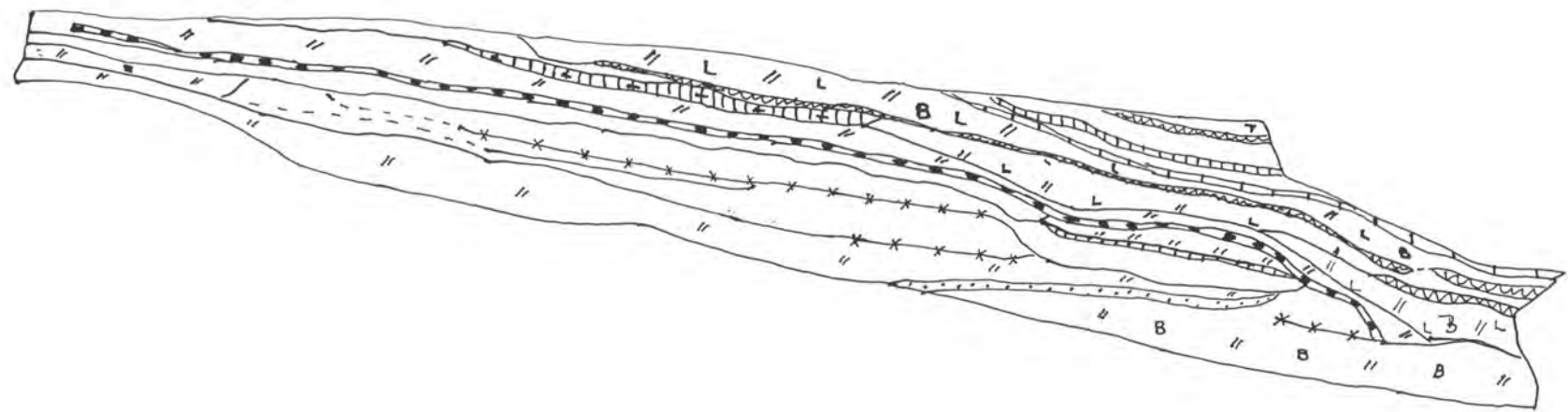
X 790
y 366,5

MÖH
- 5,00

- 4,50

- 4,00

+ 3,75



+ + + + +

// // TRÄFRAGMENT

■ ■ KOLFRAGMENT

▬ BRÄNT TRÄ

* * TUNN STRIPA MED KOL OCH BRUNT ORGANISKT MATERIAL

▨ TRÄLAGER

L L LERFLÄCKAR

▬ STORT INSLAG LERA

▬ LERLAGER

▬ BRÄND LERA

B B BEN

1987/3 D, FÖRENKLAD PROFIL

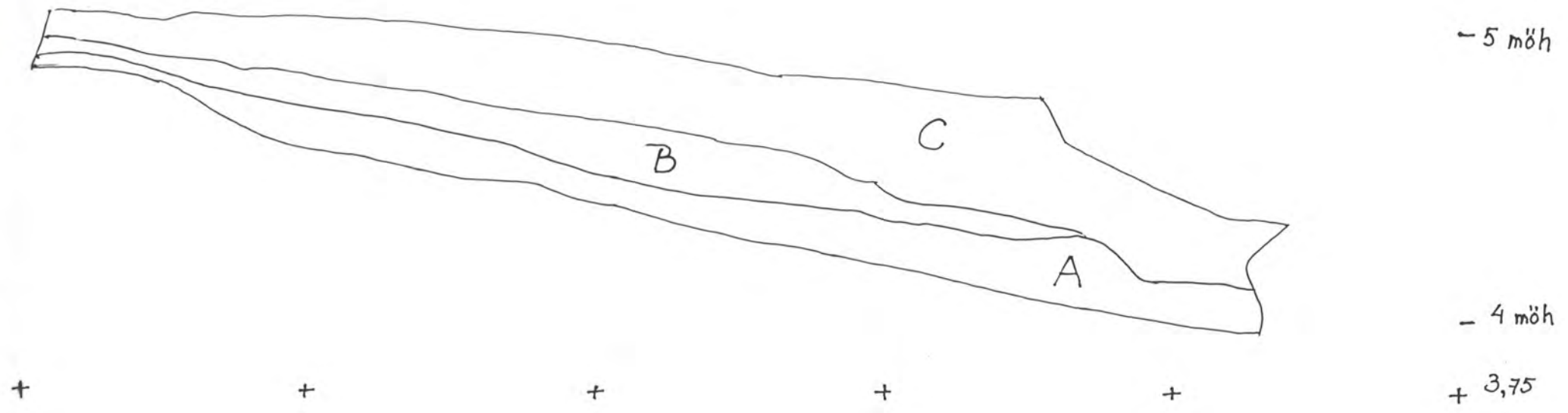


Fig. 68. Profil D: Förenklad profil mot syd. Skala 1:20.

Fig. 69. Profil G: Profil mot vest. Skala 1:50.

1987/3 G, förenklad profil

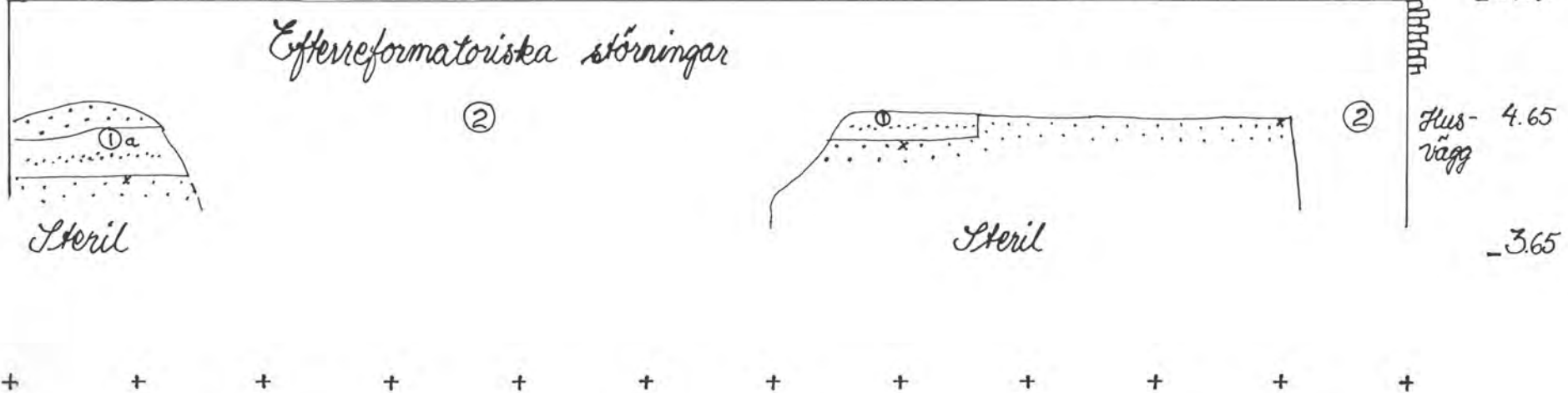
NNO

SSV

X 770
Y 360,5

X 759,5
Y 356,5

-5.65 mät



① Ljusbrun till svartbrun sandig mo med kol- och träfragment.
I a även rött tegel.

② Övervägande fyllnadsmaterial; sand, grus, sten, rött och
gult tegel, bränt trä, keramikskärvor från 1600-1700tals-
krus m m.

x Steril uppmätt

3.14.5. Profiler H, under Krabugata (Fig. 70 och 71).

Vid schaktövervakning upptäcktes under Krabugata två mindre områden med delvis medeltida lager. Den södra lämningen betecknades H:1, profilritades och fotograferades. Den norra H:2, tecknades med en snabbskiss. Tyvärr togs inga höjdmått vid den senare. Emellertid var avståndet mellan profilerna endast ca fem meter, vilket borde innebära att nivåskillnaden på steril inte var så stor.

Med hjälp av beskrivna lager har en matrix uppställts och en relativ fasindelning gjorts.

(För lagerbeskrivningar se profiler, i övrigt se bilagd matrix.)

Fas 1: Ursprunglig markyta

På nivå 5,44 - 5,52 m ö h i H:1 återfanns den hårt ihoppackade grå sanden allmänt kallad ursprunglig markyta.

H:2 lager 7 bör antagligen räknas till steril, eftersom det innehöll ett naturligt skikt med järnutfällningar vanligt förekommande en bit ned i orörd sand.

Fas 2: Metallhantering

Fas 2 består av diverse grå, leriga, ibland något grusiga lager med sandstrimmor eller fläckar. Inslag finns av slagg, kol-fragment och åtskilliga obrända ben.

H:1 och H:2 tycks kunna sammanlänkas i detta avsnitt. En viss anknytning kan också finnas till 1987/3 F, då lager 170 sett i profil starkt påminde om ovanstående.

Slaggen daterar lagren till den medeltida verkstadsperioden. Det samma gör en keramikskärva av Grimstontyp som påträffades i H:1 9.

Fas 3:

Lagren har nu en brunare ton och innehåller organiskt material i form av ben, träfragment och kol. I H:1 5 märktes också små, röda tegelbitar, gult tegel däremot fanns ej.

Även här bör avlagringarna vara medeltida (1200-1600).

Fas 4:

Karaktäristiskt för dessa skikt är den stora andelen trärester vilka eventuellt härrör från 1600-talesbyggnader. En något högre ålder är också möjlig. Det sotiga lagret H:1 11 vittnar troligen om en av de efterreformatoriska stadsbränderna. Ett samband skulle kunna finnas med det kraftiga brandlag som syntes längs Krabugata 11-13.

Fas 5:

Keramiken samt källarkonstruktionen i H:2 daterar denna fas till 1600-1700-tal.

Kommentar:

Inga uppenbara tecken på äldre gatunivåer var till synes. Dock skulle träskiktet och rullstenarna i H:2 1 kunna tolkas som gatu-beläggning. Om detta är riktigt bör denna del av Krabugata ha fått sin nuvarande sträckning runt år 1600 eller senare. 1604 kom ett påbud att gatorna skulle stensättas. Denna uppmaning efterföljdes inte omedelbart och upprepades därför ett flertal gånger under 1600-talet (Berg 1951).

Fig. 70. Profil H 1: Mot syd. Skala 1:20.

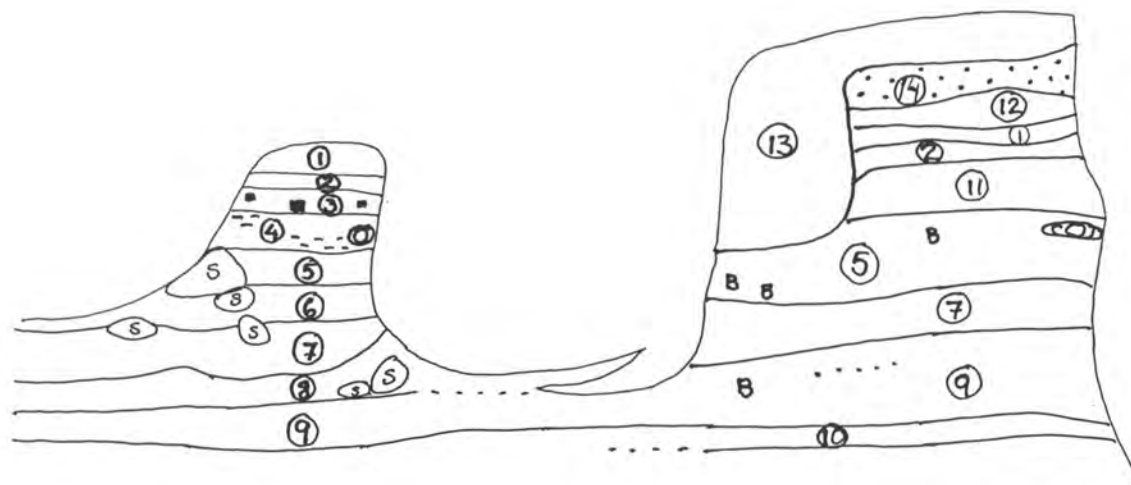
NV

X 738,5
Y 283

SO

X 737
Y 385,5

+ - 7.00 möh



+ - 6.00

+

+

+

+

+ - 5.00

- 1 mörkgrå sandig mo
- 2 brun, något sandig mo, 1600-talskeramik
- 3 gråbrun mo, kolfragment
- 4 mörkt rödbrun moig lera, trärester
- 5 gråbrun mo, rikligt med obrända ben, dessutom rött tegel och trä
- 6 grå lerig mo, bränd lera
- 7 grå moig lera; benfragment

- 8 grå, en aning grusig sandig lerig mo med ben
- 9 grå sandig lerig mo, sandfläckar och ben
- 10 grågrön mycket hårt packad sand
- 11 svart sotig mo
- 12 gråbrun sandig mo
- 13 stenig grusig gråbrun mo, slagg trärester och ben; utgör fyllnadsmaterial
- 14 gul sand

X 748
Y 285

V.

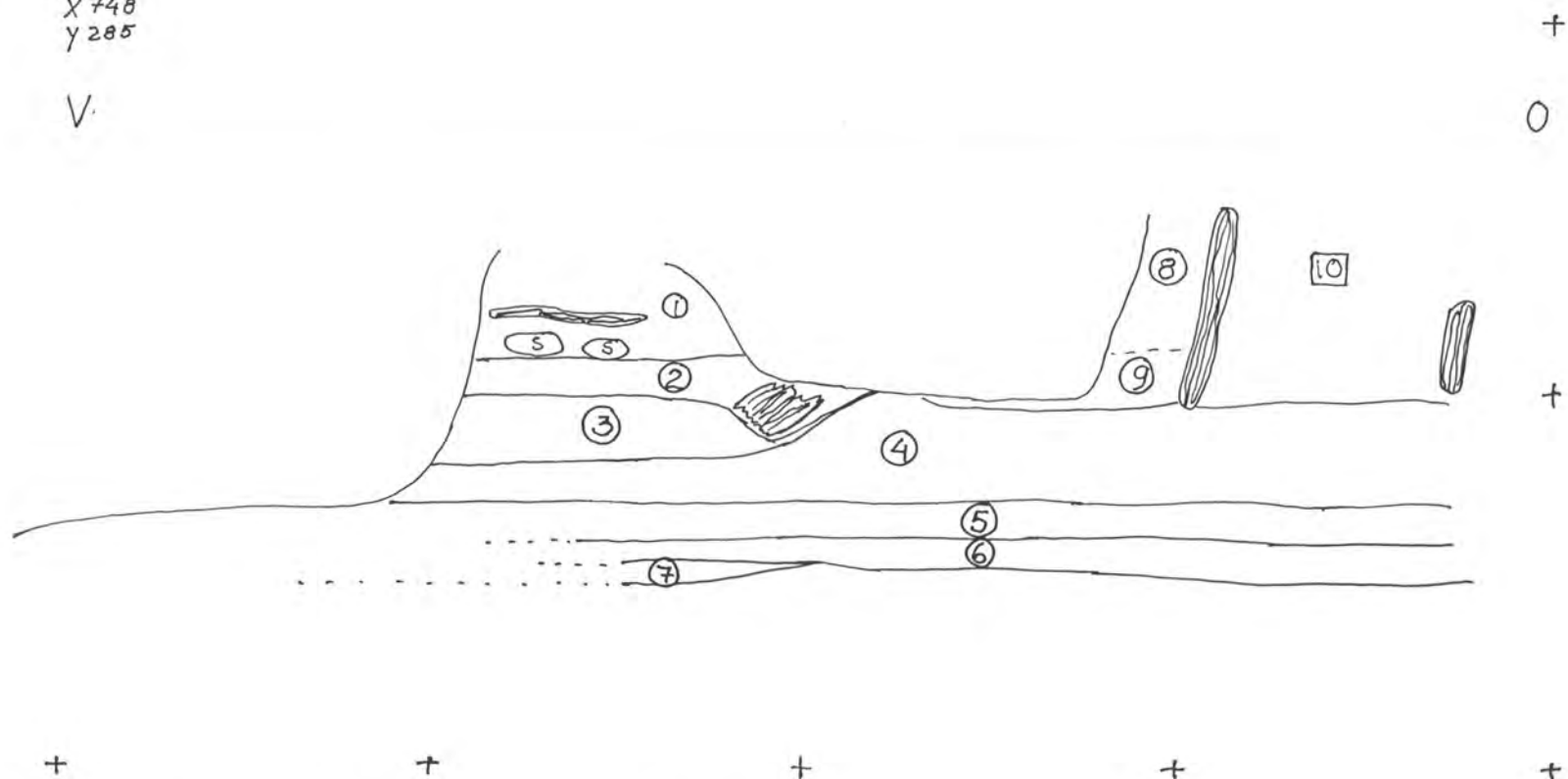


Fig. 71. Profil H 2: Mot syd. Skala 1:20.

- 1 mörkbrun moig sand, trärester och kullerstenar
- 2 brun lätt lerig moig sand, gulbruna fläckar, träfragment
- 3 fläckig gråbrun och gulbrun lerig moig sand, ben- trä- och kolfragment
- 4 kompakt mörkgrått lager med sandfläckar, lite slagg
- 5 brungrå moig sand, gulbruna strimmor, kol- ben- och trä-fragment, slagg
- 6 grått homogent lätt grusigt lager
- 7 ljusgrå moig sand, skikt med järnutfällningar
- 8 brun avföring
- 9 gulbrun gödsel
- 10 källare

3.14.6. Profiler I, utmed Olav Tryggvasons gate (Fig. 72 och 73).

Ett tunt skikt med ursprungliga lagerföljder hade bevarats mellan källaren till O Tryggvasons gate 2A och själva gatan. Efter att schaktväggen avritats och fotograferats och grävmaskinisten skrapat av den ytterligare en gång, fanns inte längre några spår av lämningarna.

De medeltida lagren återfanns på två huvudsträckor, ca 6,20 respektive 6,50 meter långa. Dessa dokumenterades med var sin profilteckning. Resterande delar av schaktväggen utgjordes av efterreformatoriska störningar och fyllnadsmassor.

Profilen mellan koordinaterna X 714/Y 305 och X 716,5/Y 299 kallas hädanefter I:1. En sentida störning skär rakt igenom dess lagerföljder, varför den östra profildelen av praktiska skäl betecknas I:11 och den västra I:12. Den västligaste profilen mellan de ungefärliga koordinaterna X 718/Y 294,5 och X 720,5/Y 288,5 benämns I:2. Koordinaterna är uträknade i efterhand med hjälp av karta och uppgifter på planerna varför de kan brista i exakthet.

I:1 är relativt utförligt dokumenterad och får en egen fasindelad beskrivning. I:2 föreligger i ett skissartat utförande med knapp-händig information.

Fasindelning av profil I:1

Den sterila nivån låg på 4,88 - 5,18 m ö h.

Fas 1: Ursprunglig markyta

Liksom på många andra områden i de olika delfälten, finns här ovan steril ett skikt med grå, grusig, hårt packad sand vilket skulle kunna utgöra ursprunglig markyta (lager 19 och 27). I I:12 finns mellan detta lager och steril ett skikt gul och grågrön sand samt ett med gråblå dito. Förmodligen har det orörda botten-materialet färgats av metallutfällningar.

I I:11 går den grå markytan under en nedskärning. Om denna ej är naturlig utan grävd, kan det innebära, att den hårda avlagringen uppkommit oavsiktligt genom påverkan från verksamheten ovanför, och att tolkningen måste ifrågasättas.

Fas 2: Verkstadsfas

Direkt på markytan ligger ett mer eller mindre sotigt lager innehållande en stor mängd slagg samt ben. Detta bryts på nivå 5,30 -5,50 av en tunn sandlins. Slaglagret fortsätter, men nu finns också rester av diverse gropliknande konstruktioner med bränd lera, stenar, sand m m.

I I:11 syns en horisontellt liggande, större flat sten, vilken på profilritningen betecknats malm?. Det är möjligen i stället en grönstensplatta, som av eldpåverkan fått det rödbruna, skiffrika utseendet. Det kan också röra sig om magnetkis vilken vittrat och rostet på grund av den kolrika omgivningen.

Fas 3: Byggnadsindikationer?

På nivå 5,60 - 5,80 slutar slagglagret och avlöses av ett lager med trärester (egentligen skiktat trä, sotig mo, trä).

Fas 4:

Efter träresterna följer i I:11 ett ca 3 cm tjockt sandskikt 10, därefter brun, sandig mo 9. I:12 har i stället ett lager gråbrun, sandig mo där inslaget obrända ben är påfallande.

I västenden av I:12 gränsar trälagret till en störning. Där fanns en av Mellagrets största bottenskållor, 30 cm i diameter och 10 cm tjock.

Fas 5: Efterreformatiskt blandat, ej homogent material

Lagren i fas 4 avskärs av fyllnadsmassor där både rött och gult tegel förekommer.

Kommentar:

I samtliga faser utom den första finns slagg i större eller mindre mängd.

Hur faserna 3 och 4 skall tolkas är osäkert. De bör dock vara medeltida och kan eventuellt tillhöra metallhanteringsperioden.

Beskrivning av profil I:2

Steril återfanns 5,30 m ö h. Också här följer den grå, grusiga s k markytan, toppmått 5,36 - 5,38. Därpå vilar ett 40 cm tjockt, mörkgrått slagglager. Ytterligare ett sotigt, slaggförande, orangefläckigt lager finns innan de efterreformatiska fyllnadsmassorna vidtar.

Kommentar:

I-profilerna bevisar att metallhanteringsområdet sträckt sig åtminstone en bit in under nuvarande Olav Tryggvasons gate. Eventuella lager under själva gatan har antagligen borttagits vid senare verksamhet.

I:1-s utseende antyder, att en verkstad funnits på platsen. I:2 i sin tur tycks representera ett område med slaggvfall.

3.14.7. Area J, post-medieval latrine (Fig. 2).

This feature was discovered by Ian Reed on 26.6.87 following machine excavation of a piling trench on the eastern perimeter of F-site. This clearly comprised formerly a substantial post-built wood-lined square structure; however, only the basal remains (ca. 1m x 1m) and a couple of large pointed wooden posts (ca. 15 cm diam.) survived the machine disturbance.

Lying compressed within the dark evil-smelling layers of excrement was a rich assemblage of household refuse, the bulk of which was salvaged. This assemblage included a large amount of locally-produced and imported pottery (particularly Dutch, and also a fair proportion of Chinese porcelain), glass (vessels, window-, spectacles, mirror-), and a leather wooden-heeled shoe.

The location of this latrine, which is datable to the mid-18th century, has some interest in relation to the former line of Adelsgaten which ran parallel to Kjøpmannsgata immediately to the west of the present buildings facing that street (see Berg, 1951). Adelsgaten disappeared from the town plan following Cicignon's restructuring after the fire of 1681. This latrine lies directly on its presumed former line affirming the use of this area as a back-yard at least by the mid-18th century.

3.14.8. Profil K (Fig. 74).

Ett cirka en meter brett avsnitt med stratifierade avlagringar upptäcktes vid schaktövervakning mellan koordinaterna x 729,8/y 293,1 och x 729,2/y 293,9.

De understa lagren 6, 7, 8 och 9 liknade K1 fyllnadsmaterial, så som det sett ut i profil i område FB 1 (fas 3). Skikt 2, 3, 4 och 5 var förmodligen en del av verkstad K2 i fas 4.1 - 4.2. Profilens översta lager, 1, såg betydligt yngre ut och tolkades som senare påförda brandmassor uppblandade med mo.

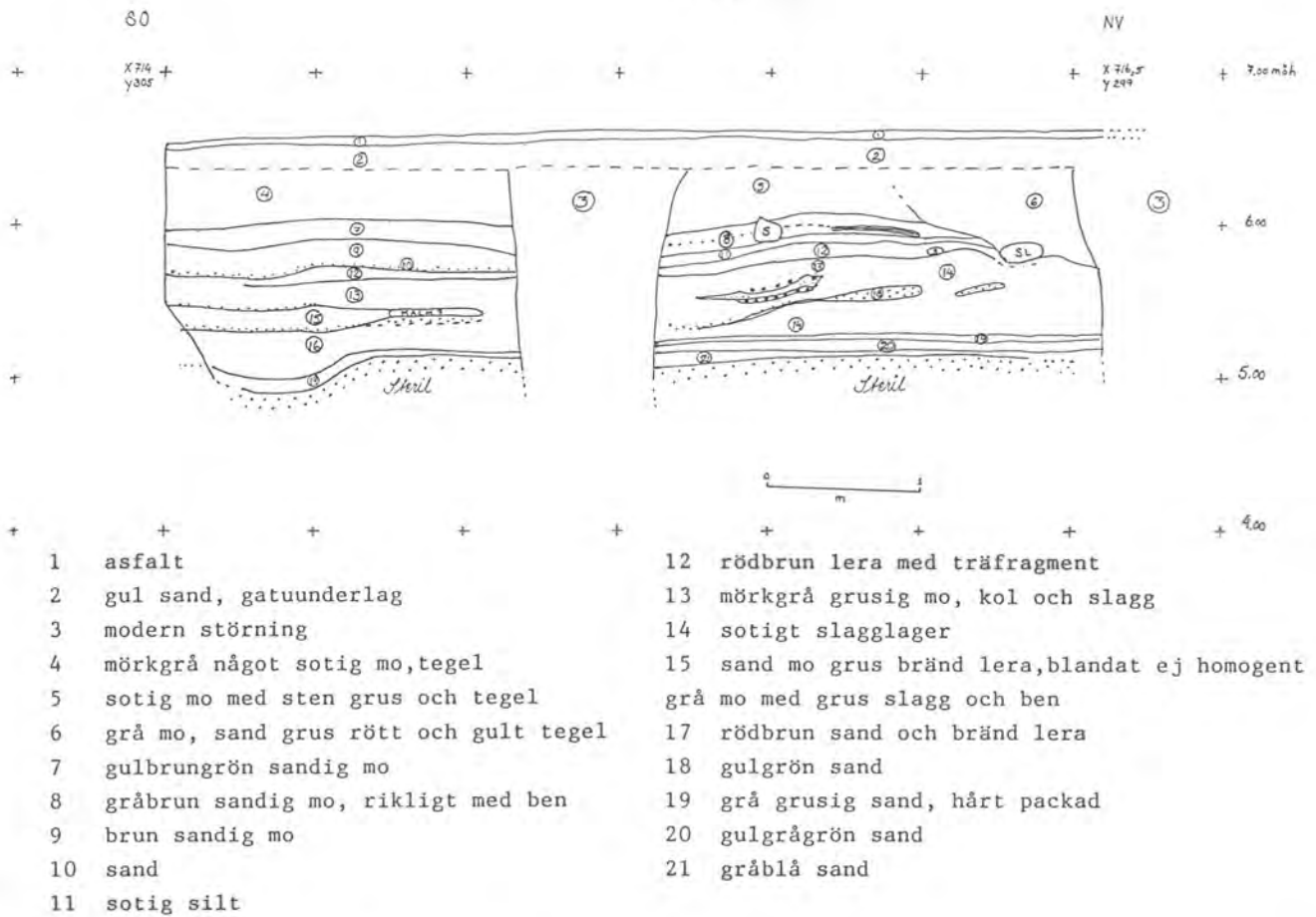


Fig. 72. Profil I 1: Mot nord. Skala 1:50.

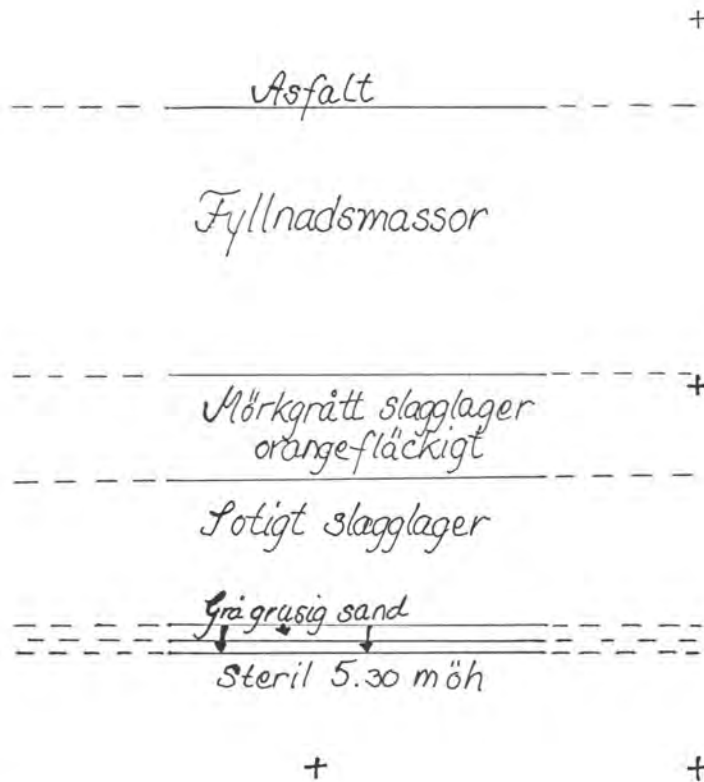
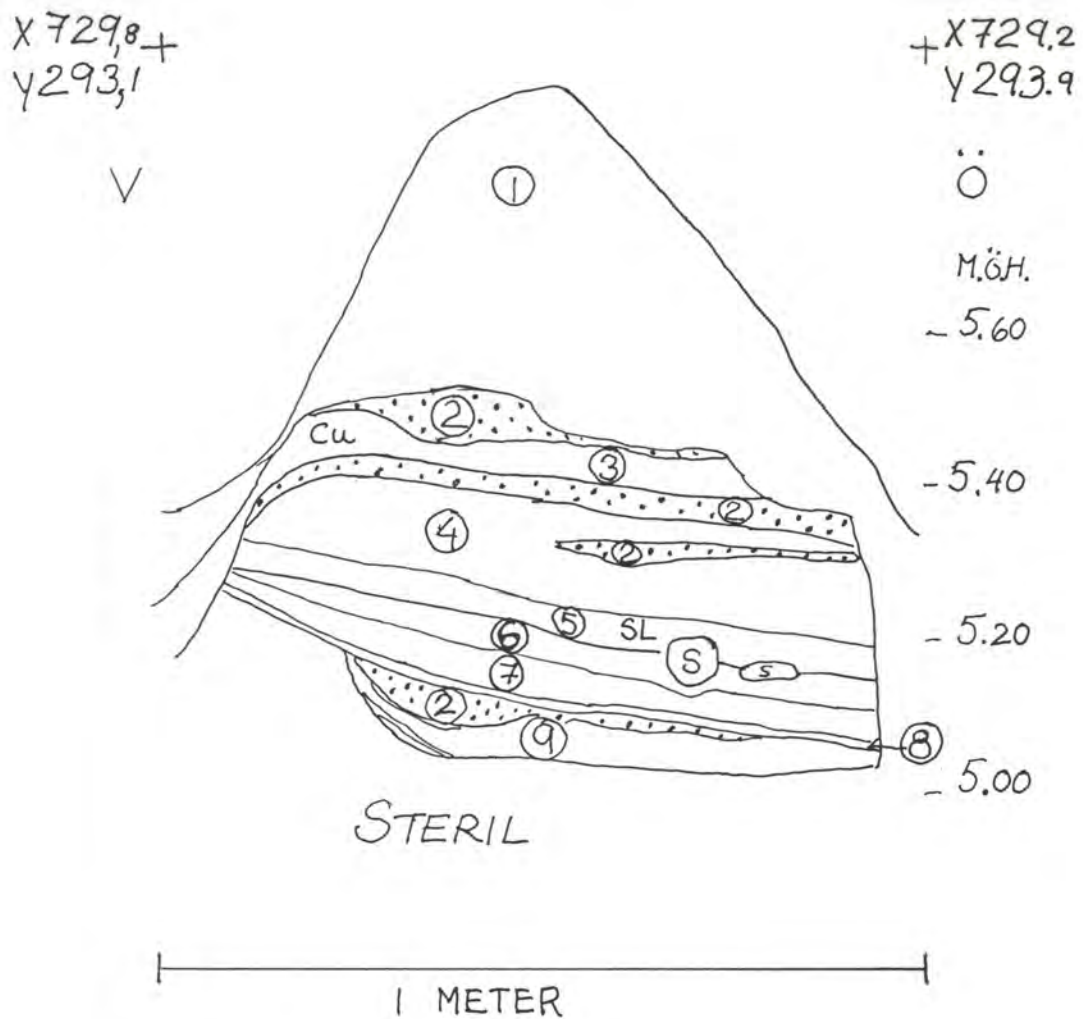


Fig. 73. Profil I 2: Mot nord. Skala 1:20.



- 1 sotig mo; brandmaterial från 1600-talet?
- 2 gul sand
- 3 brun och gråbrun lera med träfragment
- 4 mörkgrå sandig mo
- 5 rödbrun lera med slagg och stenar
- 6 mörkgrå lera
- 7 grå siltig sand
- 8 grå lera
- 9 strimmor av gråbrun sandig silt och grå siltig sand

Cu=koppar

SL=slagg

Fig. 74. Profil K: Mot syd. Skala 1:10.

4. METALLURGISKE UNDERSØKELSER (A. Espelund).

4.1. Innledning.

Mellagertomta representerer en plass, der behandling av metaller har utgjort en viktig del av virksomheten. Dette blir dokumentert på den ene siden av fysiske rester av produksjonsutstyr, slik som ovner, - ofte i form av enkle herder -, støpeformer o.l. Beskrivelse av funnsituasjonen for slike levninger og deres karakter inngår i den arkeologiske delen av rapporten.

Den andre delen av funnmaterialet som støtter en slik påstand er typiske avfallsprodukter etter behandling av metaller, slik som slagg, trekolbiter, sand, glødskall o.s.v., eller noe som er mistet på grunn av sin størrelse, slik som fragmenter av metall.

En må være oppmerksom på at visse former for avfall kan ha blitt "usynlige": Biter av jern har korrodert til rust. Oksyd av jern, bly og tinn er vanskelig å identifisere direkte. De kan bare påvises ved analyse på vedkommende grunnstoff, bortsett fra stoffer som kan påvises med magnet. Forbindelser av kobber derimot er oftest lett synlige på grunn av grønnfargen.

Det må derfor understrekes at arbeidet med de metallurgiske sidene ved funnet på Mellagertomta kan lide under mangel på representativitet. Visse prosesser og/eller metaller vil etterlate mer identifiserbare rester enn andre. Selve utgravningen var også preget av et stramt tidsskjema. Endelig vil valget av prøver avhenge av erfaringsbakgrunnen hos dem som er med på gravningen, og den valgte form for arbeidsdeling mellom arkeologen og metallurgen.

Det har i denne metallurgiske delen ikke blitt foretatt noen vurderinger knyttet til lokaliseringen av vedkommende funn. Heller ikke var de relative mengdene av ulike stoffer kjent da denne rapporten ble skrevet. Dokumentasjonen av ovner o.l. og vurdering av deres funksjon er ikke med i denne delrapporten.

Det må påpekes at nøkkelen til forståelse av hva som har foregått på Mellagertomta ligger i materiale, som på en eller annen måte har med metallurgi å gjøre.

4.2. Problemstillinger.

Det er naturlig å stille følgende spørsmål, som har en hierarkisk karakter:

- a. Hva slags metaller ble det arbeidet med?
- b. Hva slags produkter ble framstilt?
- c. Hvilke typer av metallurgiske prosesser og handverk ble anvendt?
- d. Hva slags råmaterialer ble brukt og hvor kom de fra?

4.3. Presentasjon av materialet.

Til disposisjon har foreligget følgende produkter:

- I. Jordprøver
- II. Prøver av metall
- III. Slaggprøver
- IV. Fragment av ovnsvegg
- V. Identifiserbare tilsatsmaterialer

I. Jordprøver er i dette tilfellet ansett for å være et viktig utgangspunkt fordi finfordelt materiale som er tapt må ha blitt akkumulert på golvet. Analyse på grunnstoff vil røpe alle stoffer som er brukt i produksjonen over lengre tid, utenom gasser og visse ikke-metaller. Men det har liten hensikt å foreta en

kvantitativ vurdering, fordi mengden som er tapt vil avhenge av hva slags prosess som foretas, av metallets karakter og av dets verdi. Ved smiing av jern dannes eksempelvis mye glødskall, mens støping av bronse knapt etterlater noen spor av metall.

To jordprøver er analysert med røntgen fluorescens XRF og diffraksjon XRD ved Geologisk institutt, NTH.

I sammenheng med tolkningen av jernoksydholdige slaggskoller ble de samme jordprøvene også slemmet opp i vann og magnetisk materiale separert ifra. De utskilte partiklene ble studert i mikroskop.

II. Prøver av metall kan prinsipielt representere et metallisk råstoff eller avfall fra produksjonen på stedet, som må antas å være av halv- eller helfabrikata. I tillegg kan tilfeldige funn, f.eks. av mynter, gi viktig informasjon av en helt annen karakter.

Både form og analyse på metallfragmenter vil ha utsagnsverdi. Analyse er foretatt på fragmenter av kobber og bly, kobber i form av avklipp av tynn plate og metall som har flytt i en tynn strøm, som så har størknet. Den siste prøven ser ut som en "metemark". En metemarkliknende prøve av bly er også analysert. Noen prøve av jern er ikke undersøkt. Det er bare funnet få rester av redskap, som vitner mer om funksjon enn om metall som kan ha vært produsert på stedet.

Ingen prøve som kan ha vært et metallisk råstoff er identifisert.

En prøve av kobber og en av bly er analysert ved Boliden Metall A.B. To prøver av kobber er undersøkt med sveipe-elektronmikroskop SEM ved Metallurgisk inst., NTH.

III. På tomte er det funnet et meget stort antall slaggekaker, de fleste som konveks-konkave "slaggskoller". De er tunge, ofte brune på overflaten og grå til svarte på en snittflate. De fleste har nokså stor andel runde porer. Formen kan vitne om bunnen av digler: Slaggen kan ha ligget på toppen av en metallsmelte i halvt plastisk tilstand. Metallsmelten har så blitt helt ut. Digelen kan ha blitt satt til side, slaggen har størknet helt, og deretter er kakene tatt ut ved å vende digelen opp-ned.

Alternativt kan man tenke seg at slaggskollene kan stamme fra bunnen av en smiavl. I så fall stammer de fra en smiprosess som ikke er i almen bruk i nyere tid.

Slaggekakene er undersøkt ved røntgen fluorescens analyse XRF ved Geologisk institutt. To kaker er undersøkt våtkjemisk. For en av disse kakene er brunt belegg på opp- og nedside undersøkt med XRF.

Det er også utført noen undersøkelser med XRD. En må være oppmerksom på at SiO₂-rike slagger ofte har røntgenamorfe faser og derfor ikke gir gode diffraksjonslinjer. En utsnitt av en enkelt slaggsprøve er undersøkt i SEM.

Det er også funnet mindre biter av grønnlig og relativt porøs slag. Slike stykker er analysert med XRD og XRF ved Geologisk institutt.

IV. En enkelt prøve av en ovnsvegg med tydelig grønn slagget innside og rødlig grovkornet ildfast masse utvendig er undersøkt i SEM ved Metallurgisk inst.

V. Mulig tilsatsmateriale. Det ble funnet ca. 1 cm store stykker av hvit stein på tomte. Det var grunn til å undersøke om de kan ha vært beregnet som tilsatsmateriale i smelteprosessen. De er blitt undersøkt med XRD-analyse på Geologisk institutt.

4.4. Analyser.

4.4.1. Jordprøver.

Jordprøver merket 1987/3F 615 N 104281 og 1987/3F 442 N 104021 er analysert med røntgen fluorescensanalyse XRF og diffraksjonsanalyse XRD. XRF-diagrammet for den første prøven er vist i fig. 75 og oppviser markerte topper for grunnstoffene Fe, Ca, Mn, Cu, Pb, Ti, Sr, Zn og Rb, i rekkefølge med avtagende intensitet. (Toppene for molybden kan neglisjeres da de stammer fra røntgenrørets anode).

Grunnstoffer med lave atomnumre, slik som Al, Si, Mg og Na blir ikke registrert med et slikt opptak.

Det tilsvarende XRD-diagrammet er vist i fig. 76 og viser nærvær av mineralene kvarts, plagioklas, kalifeltspatt, magnetitt, wüstitt, kloritt og glimmer. Krystalline forbindelser av tungmetallene utenom jern blir ikke registrert, til det er mengden for liten. For disse grunnstoffene gir XRF-opptaket størst utsagn.

Magnetisk pulver er separert ifra ved oppslemming i vann av begge jordprøver. De magnetiske partiklene ble studert i mikroskop og viste seg å bestå av glinsende grå-svarte partikler, ofte i flak. Det forekom også brunlige partikler i prøvene.

Tolking av jordprøveanalyser:

De nevnte stoffene kan grupperes:

- a. Kobber, bly og sink stammer oftest fra sammensatte sulfidmalmer, knyttet til kobberkis CuFeS_2 , (sjeldnere kobberglans Cu_2S eller andre kobberminerale), blyglans PbS og sinkblende $(\text{Zn,Fe})\text{S}$. I slike malmer foreligger ofte også svovelkis FeS_2 og "bergart", normalt silikater. Det fins også en rekke andre mineraler med kobber, bly og sink i naturen, men bare i små mengder. En må regne med at kobber, bly og sink er bragt til dette verkstedet, i form av malm, røstet malm eller råmetall.
- b. Tinn foreligger i naturen hovedsakelig som tinnstein SnO_2 . Mineralet er en sjeldenhet i Skandinavia.
- c. Kalsium og strontium er begge jordalkalimetaller og følger hverandre i kalksteinførende forekomster.
- d. Rubidium er et alkalimetall. Det må antas at Rb har fulgt med som klorid, på samme måte som koksalt NaCl . Som nevnt registreres ikke Na ved opptak med XRF. Koksalt i grunnen kan forventes i et miljø nær Trondheimsfjorden.
- e. Jern, mangan og titan følger hverandre i oksydiske bergarter eller forvitningsprodukter, slik som sand og leire.

Det er åpenbart at grunnstoffene kobber, bly og tinn har vært en viktig del av produksjonen. For kobber og bly blir dette bekreftet av metallanalyser (se neste avsnitt). Tinn er ikke noe ledsagermetall i malmer som fører kobber og bly. Tinn er trolig importert, og det er derfor langt fra noen tilfeldighet når det opptrer. En bør være oppmerksom på at tinn kan opptre i returmetall fra kobberslagerier. Sink derimot kan ha fulgt med de øvrige metallene fra et mineralsk råstoff.

Kalsium og strontium kan uten videre antas å henge sammen med tilsatsmaterialer ved en av smelteprosessene, trolig for å få en mer lettflytende slagg.

Nærvær av jern kan lede i flere forskjellige retninger: Det første spørsmålet er om det kan ha foregått produksjon av jern. Slik produksjon må ha vært basert på myrmalm, som har blitt røstet forut for selve smeltingen. Det andre råstoffet er trevirke. Drift av ovner for jernframstilling i denne

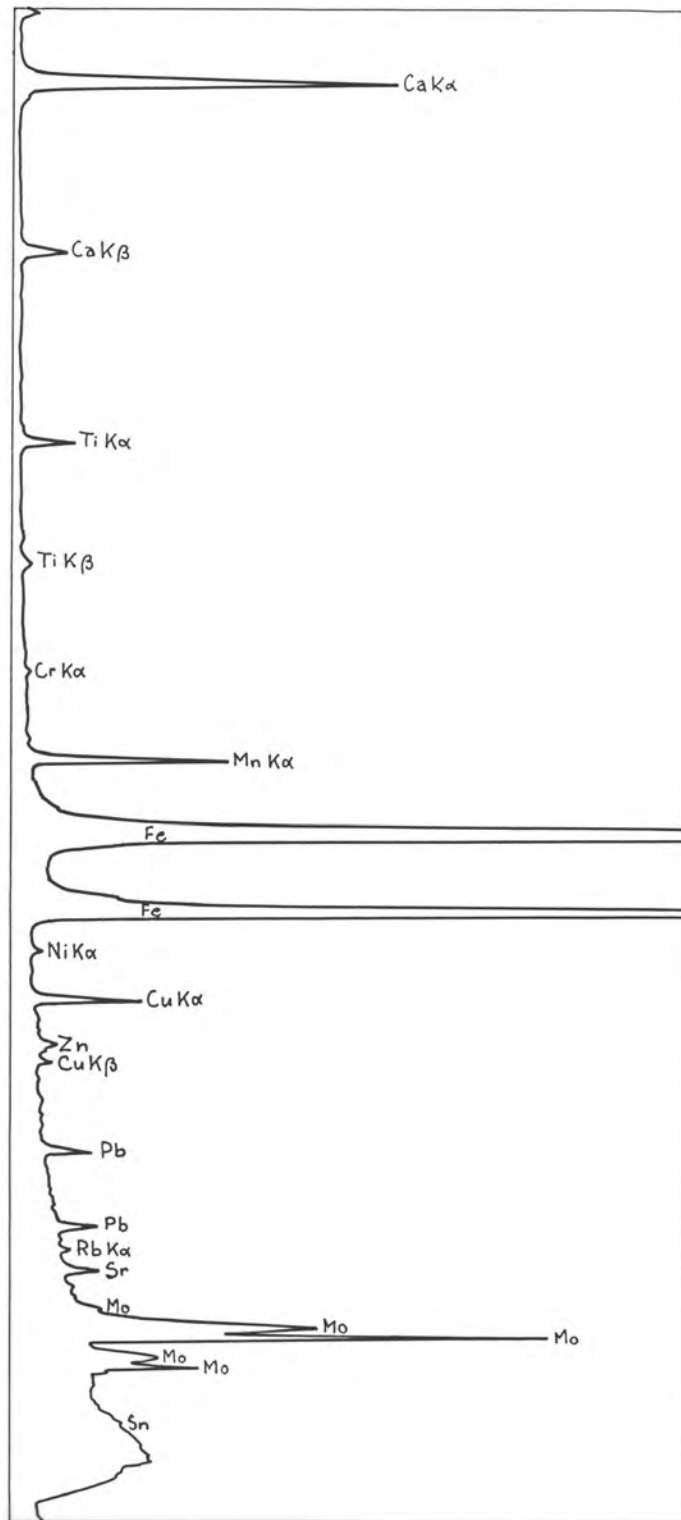


Fig. 75. XRF-diagram av jordprøve 1987 3/F 615.

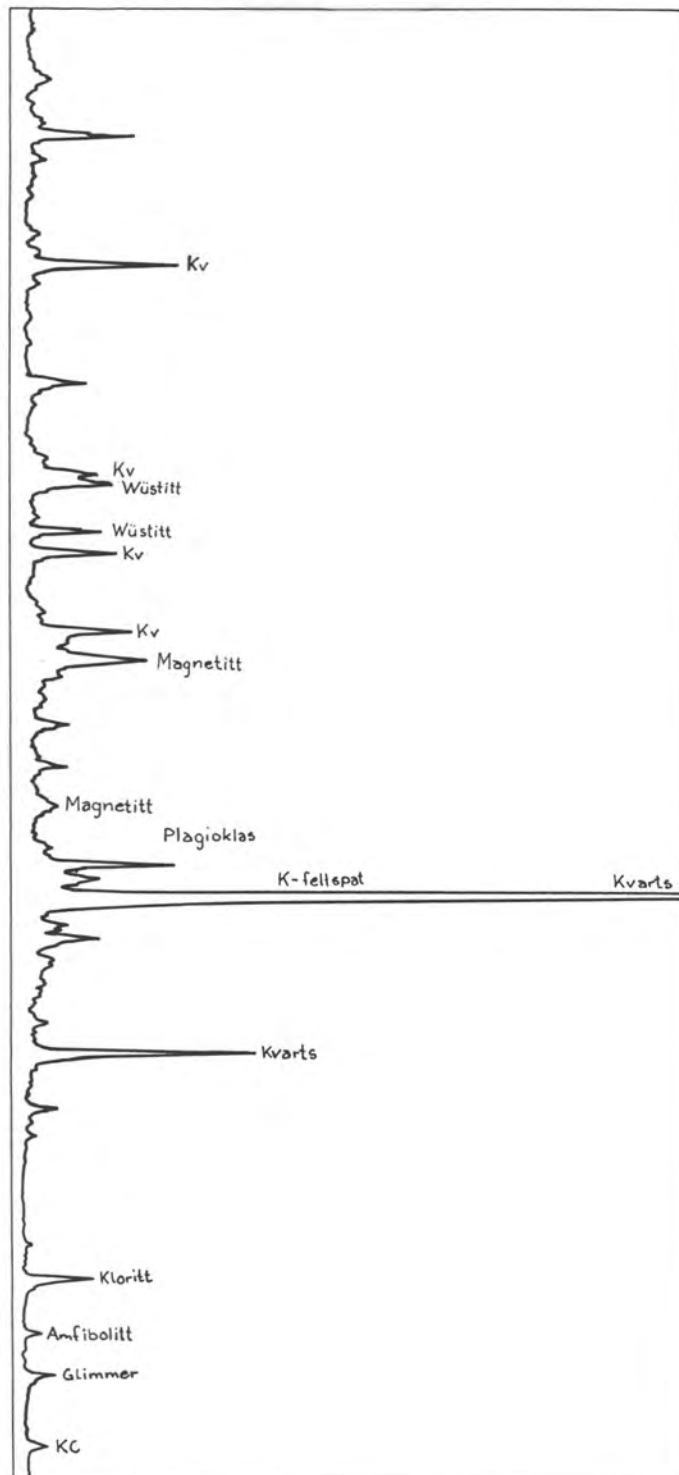


Fig. 76. XRD-diagram av jordprøve 1987 3/F 615.

perioden var basert på trekol. Avfallsproduktet ville ha vært svart slagge med ca. 50% Fe, rest hovedsakelig SiO_2 .

Det er meget sterke indisier på at det ikke foregikk noen produksjon av jern i Mellagerverkstedet. Produksjon ville ha resultert i større slaggmengder enn de som er funnet og dessuten krevd lang transport på råstoffene myrmalm og ved. Fra denne perioden er det også kjent at det foregikk produksjon av jern i overgangen mellom skogs- og høyfjellsterreng, blant annet i Gauldalen med sidedaler. Slagge fra jernframstilling i denne perioden har en helt annen ytre form enn slaggekollene fra Mellagerverkstedet.

Dernest kan en spørre om det har foregått smiing av jern som ble framstilt på et annet sted og så bragt til dette stedet. Smiing ville ha etterlatt visse typer smislagge og glødeskall, foruten rester av smiavl o.s.v.

Som nevnt ble en prøve av hver av jordprøvene N 104281 og N 104021 slemmet opp i et reagensglass og en magnet ført på utsiden nedefra og opp til overflaten. En viss mengde magnetisk pulver fulgte med. Dette pulveret ble studert med mikroskop og sammenliknet med glødeskall fra varmvalsing ved A/S Norsk Jernverk. Brunt stoff i begge prøver tyder på fine fragmenter av jern, som har rustet under lagring i fuktig miljø. Prøvene så praktisk talt identiske ut. Dette kan anses som bevist at en relativt stor del av det svarte stoffet i de to jordprøvene er magnetitt, som stammer fra vanlig smiing av jern. Smiing og varmvalsing er beslektet hva gjelder oksydasjonsforhold. (Se også under punkt 4.4.3. Slagge).

Magnetitt ble også påvist røntgenografisk i gjennomsnittet av de to prøvene.

Den andre muligheten for jernforbindelser som avfallsprodukt er knyttet til metallurgien for kobber, evtnt andre ikke-jern metaller.

Det eksisterer to prinsipielt forskjellige muligheter: a) jernet har fulgt med råstoffet fra malmen, slik som CuFeS_2 , eller b) jern som grunnstoff er tilsatt bevisst.

Det er klart at jern vil opptre som avfallsprodukt fra kobberframstilling når utgangspunktet er kobberkis eller et råmetall basert på kobberkis, slik som "svartkobber", det vanlige jernholdige produktet ved norske kobberverk fram til 1880-årene. Den siste raffineringen besto i å fjerne jernet fra en kobbersmelte ved såkalt garing. Slik raffinering kan ha vært utført ved Mellagerverkstedet.

Det er imidlertid også et indisium på at grunnstoffet jern kan ha blitt ført til dette verkstedet, utenom noen assosiering med kobber, slik som i kobberkis, kobberkisførende malmstykker eller som forurensning i svartkobber: Jordprøven oppviser nemlig mangan sammen med jern. Mangan forekommer ikke i det vanlige kobbermineralet CuFeS_2 . Denne kombinasjonen er derimot typisk i oksydiske jernmalmer. Det foregikk neppe noen bryting av bergmalm med jernoksyd på denne tida. Derimot ble myrmalm med jern og en viss andel mangan brukt ved tallrike blesterovner på den aktuelle tida. Jernoksyd kunne være aktuelt som tilsatsmateriale dersom et kobberholdig råstoff var særlig rikt på silika, som måtte forslages som fayalitt. (Se også senere under slaggeprøvene).

Det er også en mulighet for at jern og mangan opptrer sammen i avfallet dersom grovsmidde jernlupper med stor andel reduksjonsslagge er blitt foredlet videre ved smiing ved Mellagerverkstedet.

Nærvær av grunnstoffet mangan og glødeskall peker dermed i samme retning. (Se også under 4.4.3. Slagge.)

Analysene på disse jordprøvene har dermed gitt ganske viktige indisier for den videre tolkningen.

4.4.2. Metallprøver.

Det har vært utført analyser på metalliske prøver av kobber og bly. Kjemisk totalanalyse er utført på en prøve av hvert metall ved Boliden metall AB. Utskrift 17-12-1987, Intyg nr. 111 518, signert Joel Carlsson.

Lab.nr. 88 90 46 Prøve 1 kobber: (1987/3F lag nr.210, ikke tilvekstregistrert: Ag 0.15%, Fe 0.002%, Ni 0.016%, Pb 0.002%, Bi under 0.01%, As under 0.01%, Sn 0.6 g/t, Sb 0.025% Denne prøven er av et stykke buklet plate, ca. 0.5 mm tykk, med korrosjonsprodukt, trolig også slag vedheftet.

Lab.nr. 88 90 47 Prøve 2 bly: (1987/3 F 706 N 105677). Prøven er som en "metemark" med korrosjonsprodukt. Ag 51 g/t, Sn 1.6 g/t.

Videre er det utført analyse med sveipeelektronmikroskop SEM på to kobberprøver: 1987/3B lag nr. 7 - N 102878: "Mark" som har flytt ut av sprekk eller liknende. SEM: Matriks: 99.3% Cu, 0.206 Si, 0.189 Pb, 0.139 Zn. Lys partikkel: 26.7% S, 23.6% Sb, 18.9% Pb, 14.5% Ni, 12.1% Cu, As, Sr, Sn. Grå partikkel 1: 38.6% Cu, 29.7% Ni, 29.3% Sn. Grå partikkel 2: 81.5% Sn, 14.2% Cu, S, Si, Ni. Mengdeandel av partikler, visuelt observert, under ca. 1%.

Metall 2: Spon av hamret kobber: Matriks: 99.2% Cu, 0.54% As. Lys fase: 27.2% Pb, 24.3% Cu, 22.7% Sb, 11.3% Sn, 8.2% S, 4.3% Fe, 1.1% Sr. Mellomgrå fase: 72.7% Sn, 21.5% Cu, 2.1% Fe, 1.1% Sr. Liten mørk partikkel: 71.3% Cu, 27.5% Si. Mengdeandel for partikler, visuelt bedømt, under ca. 1%.

En ser at "grå partikkel 2" i prøve 1 svarer til "mellomgrå fase" i prøve 2.

Tolking av metallanalyser:

Kobberet bør betraktes som ren-kobber, idet forurensningene utgjør en meget liten del. Det er derfor viktig i denne sammenhengen at ikke for stor vekt legges på resultatene for kobberprøvene fra SEM. Fordi partiklene eller inneslutningene i kobberet er så små må en anta at de er sekundære, utskilt under størkning og videre avkjøling. For eksempel ville medrevet slag fra siste smelteprosess ha gitt større inneslutninger. Den mengden som partiklene representerer kan svare til forurensningene som er bestemt ved kjemiske metoder ved Boliden, nemlig ca. 0.2%. Metallet har derfor en renhet på ca. 99.8%.

Det er bare analysert en blyprøve, slik at en bør være forsiktig med vidtgående tolkning. Men den ene prøven har et meget lavt innhold av såvel sølv som jern, slik at den kan betraktes som "rent" metall.

Den viktigste grunnen til å lage rent kobber må være ønsket om duktilitet eller plastisk formbarhet. Det er knapt noen indikasjon på at kobberet skulle bli brukt til støping av ferdiggjenstander.

Prøver av metallisk tinn eller sink er ikke påtruffet.

4.4.3. Slagg.

Slaggen er som nevnt i hovedsak i form av konveks-konkave svarte kaker med brun overflate og med en stor andel porer. En karakteristisk slaggkake er vist i fig. 77. Porene er runde og kan tyde på gassutvikling etter at størkningen er begynt. Det fins også en viss andel grønn slagg, som kanskje i stedet bør kalles dross el. likn., fordi den ikke gir inntrykk av å ha vært godt smeltet.

Et stort antall slaggkaker er blitt analysert med XRF, og to med våtkjemiske metoder. En av slaggkakene er også undersøkt med SEM.



Fig. 77. Slagg ("skolle"), gjennomskåret. Jnr. 870517.

Resultater av XRF på svarte slagkaker:

De fire første prøvene er studert med både krom- og molybden røntgenrør. Alle grunnstoffer til nr. 19 blir ikke registrert. (Slike som Na, Al, Mg, Si, P, S, Cl).

1. 1987/3 B 14 N 103 501	Jnr. 871226	Cr: <u>Fe</u> , Ti, Ca, Cu Mo: <u>Fe</u> , Mn, Ca, Cu, (Ti)
2. 1987/3 F 151 N 107 266	-27	Cr: <u>Fe</u> , Ti, K, Ba Mo: <u>Fe</u> , Ca, Cu, Ti
3. 1987/3 F 170 N 104 129	-28	Cr: <u>Fe</u> , Ca, Ti, (Cu) Mo: <u>Fe</u> , Ca, Mn, K, Ti, (Sr)
4. 1987/3 F 170 N 104 129	-29	Cr: <u>Fe</u> , Ca, <u>Ti</u> , Cu, As, Ba Mo: <u>Fe</u> , Mn, Ca, Ti, As
5. 1987/3 F 170 N 104 129	-30	Mo: <u>Fe</u> , Ca, Mn, Ti
6. 1987/3 F 210bN 106 874	-31	Mo: <u>Fe</u> , Ca, Mn, Ti
7. 1987/3 F 216 N 106 008	-32	Mo: <u>Fe</u> , Ca, Mn, Ti
8. 1987/3 F 475 N 104 611	-33	Mo: <u>Fe</u> , Ca, Mn, Ti
9. 1987/3 F 557/558 N 106 365	-34	Mo: <u>Fe</u> , Ca, Mn, Ti
10. 1987/3 F 591 N 104 534	-35	Mo: <u>Fe</u> , Mn, Ca, Ti
11. 1987/3 F 689 N 107 028	-36	Mo: <u>Fe</u> , Ca, Mn, Ti
12. 1987/3 F 756 N 104 728	-37	Mo: <u>Fe</u> , Ca, Mn, Ti
13. 1987/3 F 840 N 106 136	-38	Mo: <u>Fe</u> , Ca, Mn, Ti

Do, hvite krystaller:

Mest SiO₂.

Et karakteristisk opptak er vist i fig. 78.

Stort sett er det stor overenstemmelse mellom alle prøvene, kanskje bortsett fra prøve 1, som oppviser et høyere Cu-innhold enn de andre. Den er derfor blitt analysert våtkjemisk, med følgende resultat: 0.96% Cu.

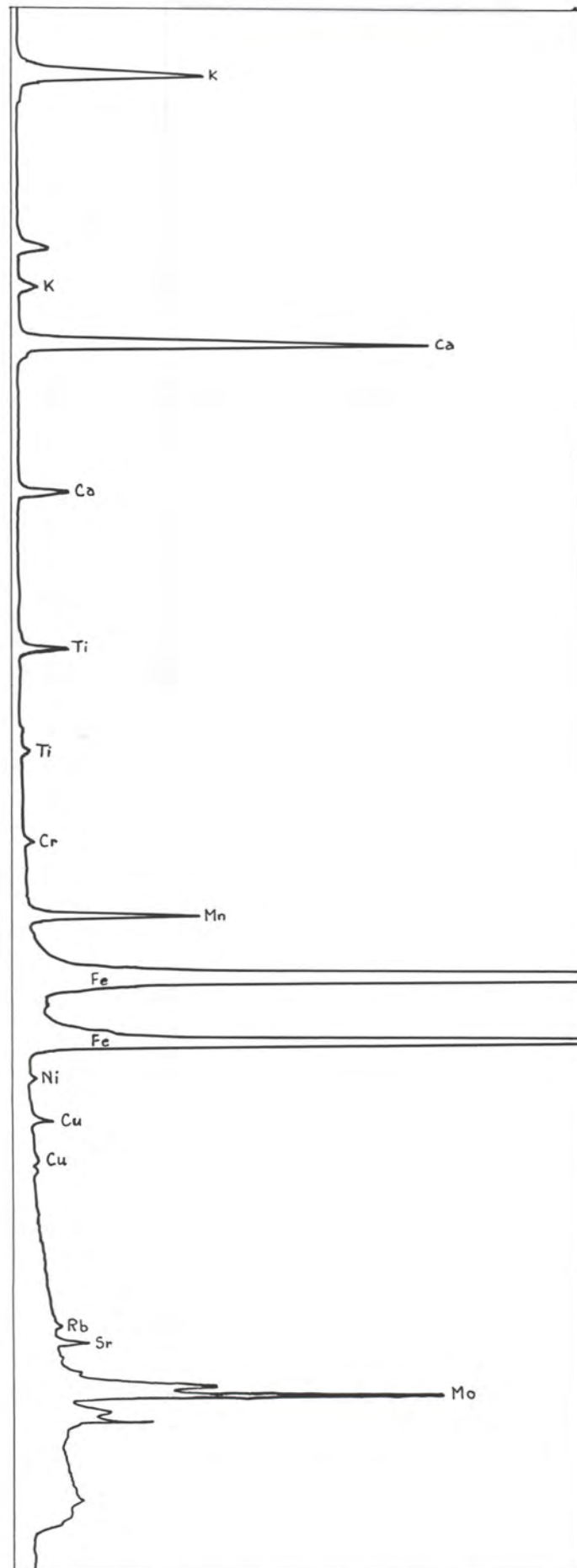


Fig. 78. XRF-diagram av typisk slaggsolle, slik som vist i fig. 77.

Slaggprøven, vist i snitt på fig. 77, samt en slaggprøve til er analysert våtkjemisk ved Geologisk institutt, med følgende resultat:

Prøve nr. 870517: 1987/3 F Lag nr. 70, ikke tilvekstregistrert.

#1: 17% SiO₂, 3% Al₂O₃, 1% MgO, 55% Fe₂O₃, 3.7% CaO, 0.78% P₂O₅, 85 ppm Cu, Na₂O under 0.5%.

#2: 16.8% SiO₂, 41.3% FeO, 35.1% Fe₂O₃, 4.9% CaO, 2.3% Al₂O₃, 0.5% TiO₂, 0.8% P₂O₅, 1.5MgO, 0.5 MnO.

Prøve nr. 870518: 1987/3F 92. Ikke tilvekstregistrert.

#1: 20% SiO₂, 4.5% Al₂O₃, 2.5% MgO, 47-48% Fe₂O₃, 1.7 % K₂O, 5.5% CaO, 0.52% P₂O₅, 245 ppm Cu. Na₂O under 0.5%.

#2: 25.0% SiO₂, 46.0% FeO, 16.0% Fe₂O₃, 4.4% CaO, 3.8% Al₂O₃, 0.4% TiO₂, 0.5% P₂O₅, 3.2% MgO, 0.5% MnO.

For begge prøvene er # (parallell) 2 sikrest, fordi både tradisjonell kjemisk analyseteknikk og atomabsorpsjon har vært anvendt. For # 1 bare XRF.

På den andre av de to prøvene ble det brune belegget på opp- og nedside skrapet av og analysert på kobber. Resultatene ble: Oppside: 1.99%. Nedside: 1.94%.

Opptak med XRD viser at prøve 870517 har noe fri α -kvarts og fri wüstitt ved siden av fayalitt, mens prøve 870518 har all kvarts omdannet til fayalitt.

Se fig. 79 og 80, der prøvene er sammenliknet med diagrammene for fayalitt, wüstitt og kvarts.

Andre slaggprøver:

Grønn slagg i klumper, merket 1987/3B Lag nr. 14: XRF viser tydelig nærvær av Fe, Cu, Sn, Pb, Zn, nevnt i rekkefølge. Med XRD er identifisert kupritt Cu₂O, atakmitt Cu₂Cl(OH)₃ og tinnstein SnO₂. Se fig. 81, jnr. 87 06 88.

Svart, tung slagg ved rød overflate: Overflaten SiO₂ (kvarts og kristobalitt. 87 06 89

Svart, tung slagg med blankt brudd: XRD fayalitt Fe₂SiO₄ og wüstitt FeO. 87 06 90.

Grønn slagg i en klump med vedheftet metall 1987/3F Lag nr. 210 (NB samme metall som er analysert ved Boliden j.nr. 889046 - se ovenfor): XRF med Fe, Cu, Pb, Ca, Sn, Zn, Mn, Ni. J.nr. 880005. XRD spinell, kvarts SiO₂. Se fig. 82, j.nr. 870691.

Tolking av slaggene:

De svarte slaggkakene har et visst lite innhold av kobber og andre tungmetaller utenom jern, slik at det er grunn for å hevde at de kan ha hatt noe med kobber-metallurgi å gjøre. Men innholdet er så lavt (100-250 ppm i to analyserte prøver) at slaggen ikke stammer direkte fra oksyderende raffinering av det vanlige halvfabrikatet svartkobber, i eldre tid kalt garing. Slaggkakene har dessuten et høyere innhold av SiO₂ enn det som var vanlig ved 1700-tallets garing. En slik raffineringsslagg fra "garing" ville trolig være grønnlig.

Den eneste slaggen som skiller seg ut er prøve nr. 1 J.nr. 871 226.

Et innhold på ca. 1% kan minne om slagg som går i avgang fra kjente prosesser for framstilling av metallisk kobber.

Det er mer sannsynlig at slaggen kan stamme fra en reduserende etterbehandling av slagg fra garing. Imidlertid er det vanlig at det vanlige avfallsproduktet fayalittslag har mellom 0.2 og 1% Cu, mens to av de analyserte prøvene har et kobberinnhold på mellom 1/10 og 1/100 av disse verdiene.

Den andre slaggtypen kan derimot minne om garingsslagger. De inneholder imidlertid flere av tungmetallene: både Cu, Pb og Sn, slik at raffineringen må ha berørt flere verdimetaller enn bare kobber. Desverre har det ikke lyktes å finne i hvilken form bly foreligger i prøve 870691, trass i leting etter linjer

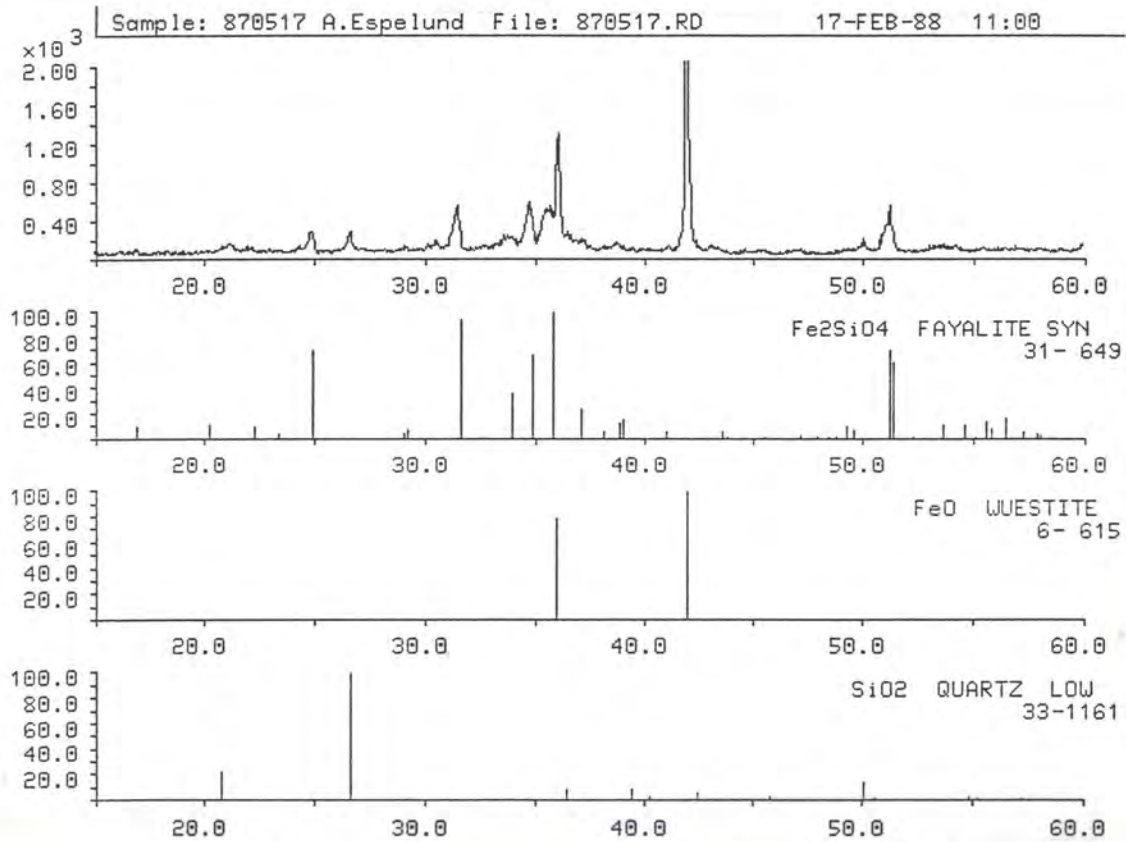


Fig. 79. XRD-opptak av slaggekaken, vist i fig. 77. Jnr. 870517.
Sammenlikning med fayalitt, wüstitt og kvarts.

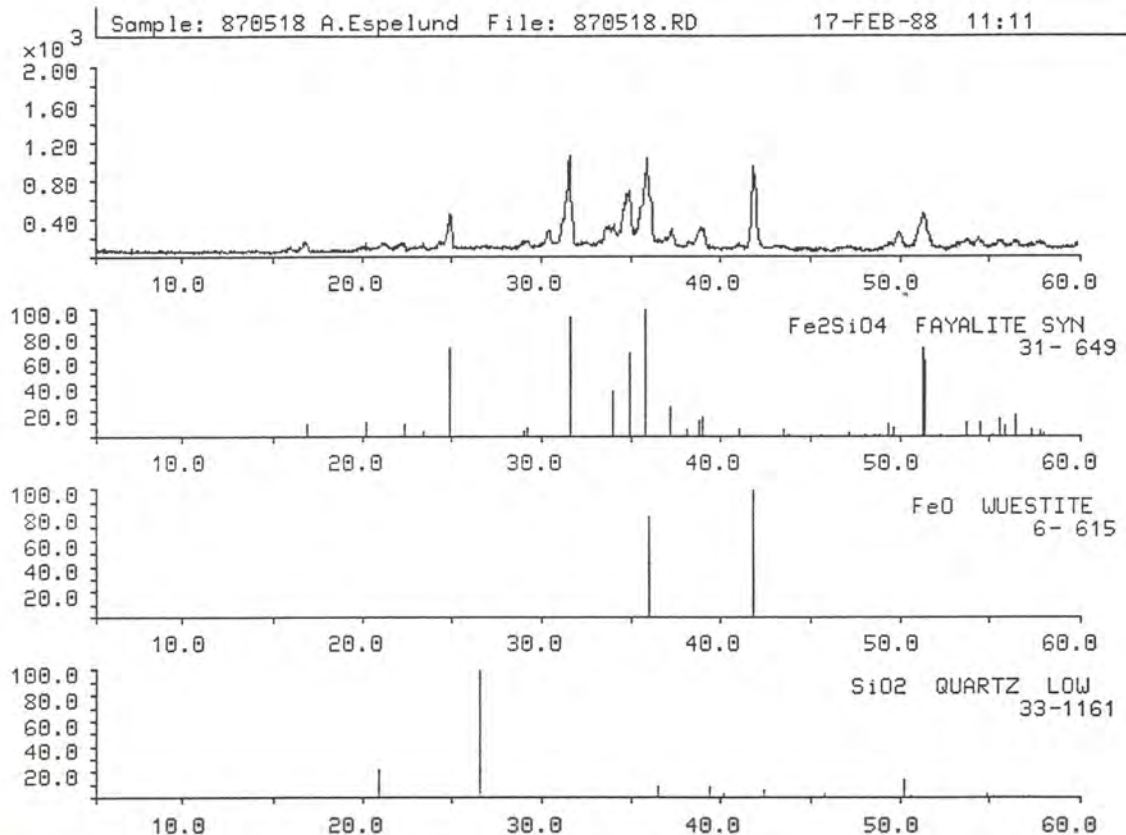


Fig. 80. XRD-opptak av slaggekake. Jnr. 870518.
Sammenlikning med fayalitt, wüstitt og kvarts.

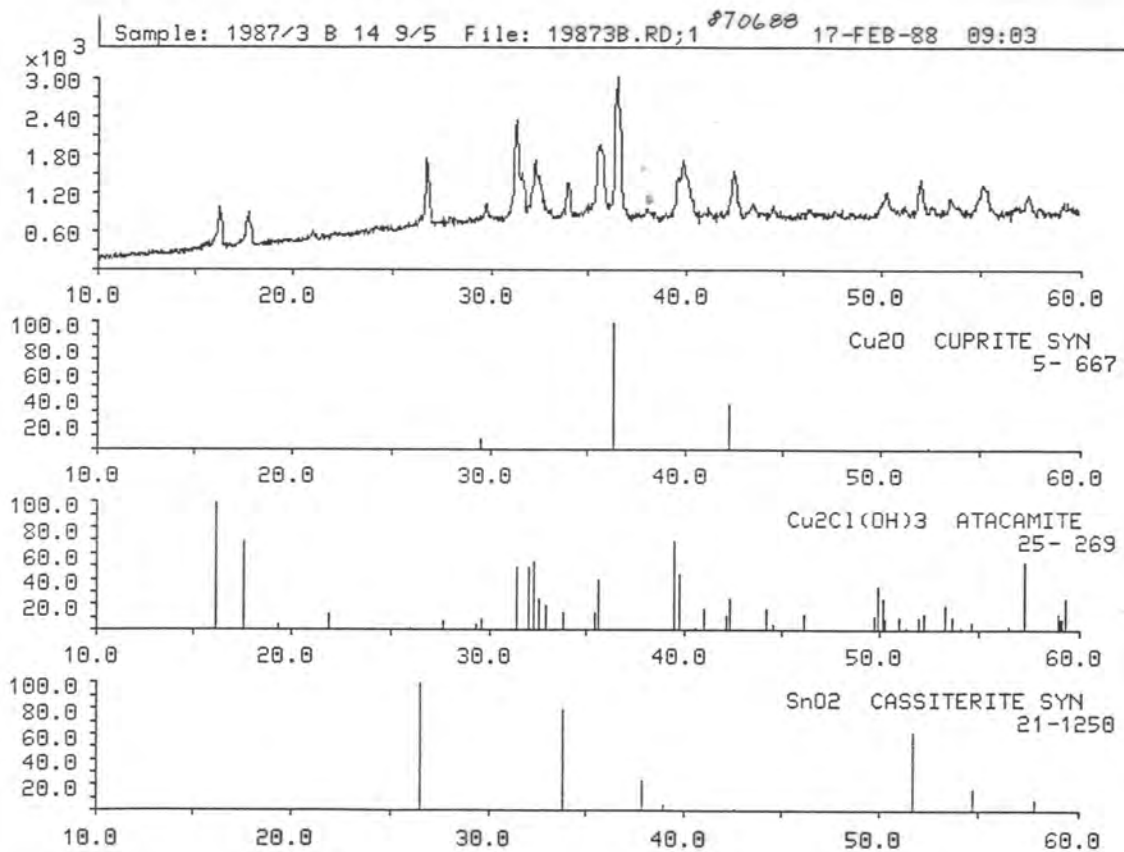


Fig. 81. XRD-opptak av grønn slagg. Jnr. 1987 3/B 9/5.
Sammenlikning med kupritt, atakamitt og tinnstein.

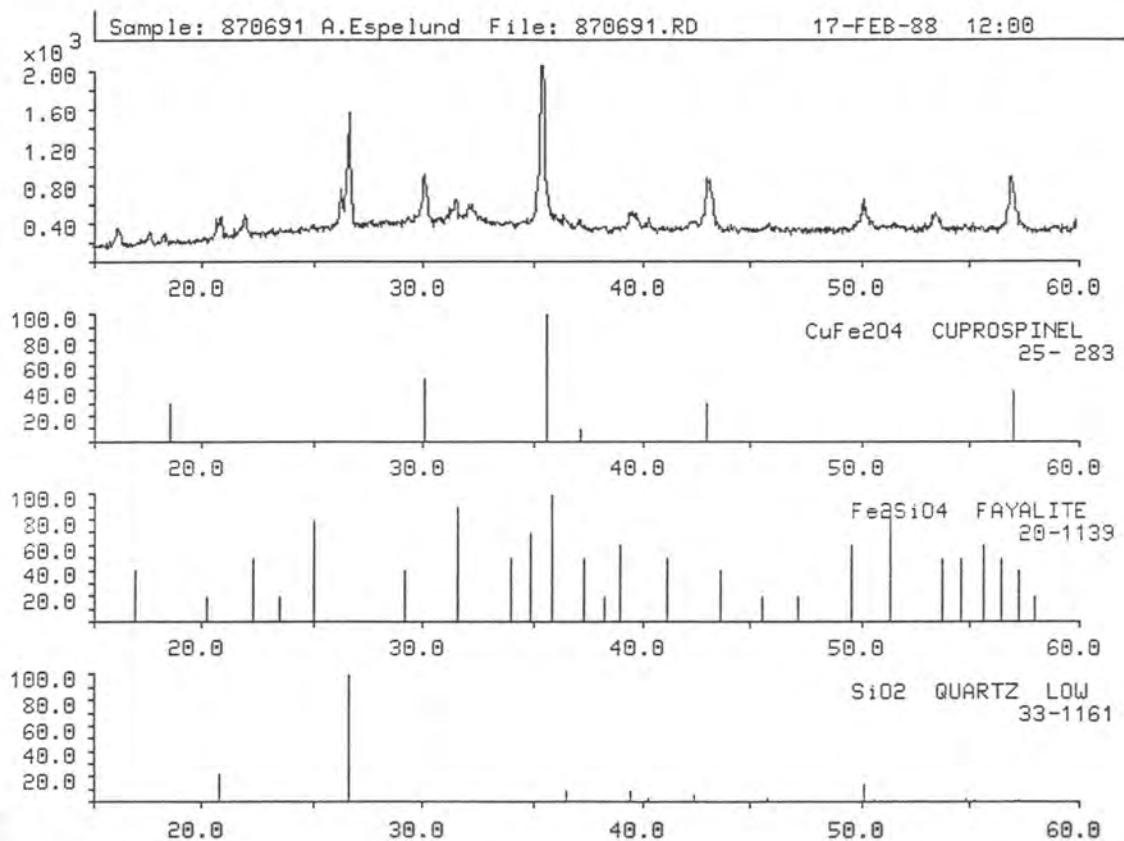


Fig. 82. XRD-opptak av grønn slagg. Jnr. 870691.
Sammenlikning med (kupro)spinell, fayalitt og kvarts.

for sannsynlige blyforbindelser i XRD-opptaket. For denne prøven viste XRF-opptaket relativt stor andel av dette metallet.

De svarte slaggene virker meget heterogene fordi de inneholder såvel wüstitt, kvarts, fayalitt og "spinell", i tillegg også muligens glassaktige faser. Det er ikke normalt å finne så mange faser dersom likevekt ved høy temperatur var innstilt mellom de ulike slaggdannende stoffene. En av slaggekakene hadde også en bit av uoppløst hvit SiO_2 sittende fast i overflaten, slik at en kan anta at silika var tilsatsmateriale. En kan dermed heller ikke regne med at slaggen hadde vært i noen likevekt med en metallfase.

Desverre kan en ikke røntgenografisk med XRD skjelne mellom spinell av typen magnetitt Fe_3O_4 , maghemitt Fe_2O_3 eller f.eks. kuprospinell CuFe_2O_4 når disse stoffene foreligger i små mengder.

Porene i slaggekakene skyldes gassutvikling under størkningen. Det skal imidlertid meget lite gass til for å lage en viss andel porer.

Mens kobberinnholdet i slaggene peker i retning av kobbermetallurgi, så trekker manganinnholdet, silikatilsats og den heterogene karakteren i retning av smislagg for jern. I så fall er det en smislagg, ikke fra ren forming av metall til et ferdigprodukt, men av den typen som oppstår ved frigjøring av de siste rester av reduksjonsslagg.

Slaggekaker gravd ut ved Helgeandsholmen i Stockholm og som kan minne om slaggs-kollene ved Mellagerverkstedet er tolket som slaggg fra esse med horisontal lufttilførsel (Dahlbäck 1982). Det er ikke oppgitt noen kjemiske analyser som støtte for påstanden eller funn av gløds skall.

Ved utgravning av vikingebyen Haithabu ved Slien i Schleswig er det påtruffet kaker av smislagg, som i ytre form minner om slaggekakene fra Mellagerverkstedet (Thomsen 1971, Westphalen 1986). 3 av prøvene inneholder 65-71% FeO og 27-24% SiO_2 . Det hevdes av begge forfattere at jernet som er smidd er blitt befridd for rester av reduksjonsslagg ved oppvarming i esse.

Ole Evenstad sier i sitt kjente kildeskrift fra 1782 følgende: "Det Jern, som ikkun er smeltet fra Malm til Rue-Jern i Blæsteren, det være endog af allerbedste Slags, er uskicket til al Brug; thi vel lader det sig smede og arbejde til grove Redskaper, men naar det gaaer i Stykker lader det sig ikke svejse sammen igien. Det har endnu nogle fremmede Deelee hos sig, hvilke det maae skilles ved, førend det bliver fuldkommen got, hvilket kan skee ved Omsmelting i Smidden." (Evenstad 1790).

Evenstad beskriver i detalj hvordan dette skal gjøres. Blant annet skal smiavlens renses helt, og bleståpningen være bare 1 tomme over smiavlens. Etter at avlen er fylt med trekol, som har fått brenne friskt, legges en halv til en hel blestersmelting jern på kolet.

Jernet skal bli så varmt at det gnistrer. Det holdes i en tang like ved blestmunningen. Slagg samles åpenbart i gropen mens jernet smis på en amboltstein til den form som er egnet (Evenstad 1790).

Det er påfallende at noen av slaggs-kollene ifra funnene i Haithabu på en side har en utvekst i vinkel med selve slaggs-kollen. Denne utveksten kan ha et hull, som svarer til det Ole Evenstad nevner. Denne vinkelen representerer åpenbart slaggg som har grodd fast på essesteinen (Thomsen 1971).

Robert Thomsen har foretatt omsmelting av slaggblandet jern, framstilt ved egne eksperimenter i en ovn av Drenghstetypen. Han fulgte oppskriften til Ole Evenstad. Forsøket synes å bekrefte at slaggs-kollene i Haithabu stammer fra slik omsmelting (Thomsen 1968).

Om slaggs-kollene stammer fra omsmelting, skulle analysene være sammenliknbare med slaggg fra et produksjonssted et sted i Trøndelag eller Jemtland. Utsagnsverdiene for jernoksyd- og silika-innhold er ikke klare nok i de foreliggende analysene, og det foreligger ikke nok av sammenliknbare analyser for de andre stoffene. Det vil være mest interessant å sammenlikne smislagg fra Mellagerverkstedet med reduksjonsslagg på stoffer som kan

forventes å anrikes på veien fra myrmalm til slagg, slike som K_2O , Al_2O_3 , MnO og P_2O_5 .

Når det er indisier på at slaggs-kollene i hovedsak stammer fra smiing av sterkt slaggholdig jern, bør det vanlige avfallsproduktet gløds-kall kunne finnes på plassen. Som nevnt ovenfor ble jordprøver slemmet opp i vann og en magnetisk fraksjon separert ifra. Denne var helt tydelig gløds-kall, iblandet små mengder rust etter fragmenter av jern som hadde korrodert.

Det konkluderes derfor med at slaggs-kollene i hovedsak må stamme fra en form for omsmelting i esse av jern, som inneholdt mye slagg fra selve reduksjonsprosessen. Det er også mulig at det kan ha foregått en viss karburisering av jernet ved denne etterbehandlingen. Det primære jernet hadde vanligvis et meget lavt karboninnhold.

Det fins forskere som ikke godtar at smislagg kan likne på reduksjons-slagg (Piaskowski 1983). Det skyldes trolig at de mulige typene smislagg vurderes ut ifra smiing av nokså rent metall.

Kobberinnholdet, som veksler mellom 100 ppm og 1% kan tyde på en "smitteeffekt" fra metall, omsmeltet og bearbeidet under samme tak. Det er til og med en mulighet for at essa, som er en ganske hendig utstyrsenhet, også ble brukt for omsmelting av kobberslagg, men henblikk på gjenvinning av kobber. Den ene slaggs-prøven, merket 1, har et kobberinnhold langt over de andre prøvene. Et høyt kobberinnhold på overflaten av en av slaggs-kollene, samtidig med at det gjennomsnittlige innholdet er lavt, vitner også om "smitte".

En ytterligere påpekning av flere bruksmåter av en slik herd finnes hos Linné: "När blästren fälles eller smältes i härden, procederas nästan som i en garhård, at järnet hålles ofwanpå kolen alt stadigt, tils det nedsmultit, medelst tänger, och då det smält, fylles härden alt öfwer med kohl och tillblåses *ad consumptionem* och tillblåses med trampepust, tils de förbrännas, då järnet mitt uti uptages och smides" (Linné 1953).

4.4.4. Ovnsvegg.

Et enkelt stykke, merket 1987/3 B N 103 526, som må stamme fra en ovnsvegg er blitt undersøkt. Stykket er grønt og slagget på den ene siden, og rødlig, sandaktig, grovkrystallint på den andre. Krumningen vitner om en diameter på ca. 0.5 m. Det er en markert "vannlinje" tvers over innsiden, som sier hvor overgangen mellom to faser (slaggs/metall eller slaggs/skjærstein, evnt. skjærstein/metall) var.

Stykket ble snittet og det ble laget to preparater, som ble slipt, pådampet karbonbelegg og undersøkt med SEM. Se fig. 83 a og b, som viser hvor "vannlinjen" gikk og hvor den undersøkte prøven ble tatt.

SEM-analyse nr. 103 526: Cu-kule på ca. 1mm diam: ren Cu. med antydning av Sb- og Ag-inneslutninger. Mørk fase inne i kulen: Trolig Cu_2O . Grunnmasse utenfor kulen: Si, Al, Ca, Pb, Cu i avtagende rekkefølge. "Nåler", som er utkrystallisert: Cu, Fe, Si i sammenliknbare mengder, langt mindre av andre grunnstoffer. Ovnsvegg: Utsnitt 1: Si, Al, Ca. Utsnitt 2: Si, Al, K.

Tolking av analysene.

Det ser ut til at stykket representerer overgangen metall-slaggs i en ovnsvegg: Kulen av metall stammer fra den mindre delen av stykket, som har en nokså knudret, mørk grønn overflate. Denne delen kan representere nivået for det flytende metallet. Den andre delen er mer glasert og kan minne om størknet slagg.

Det er ellers ikke noe overraskende ved analysene i den konteksten dette stykket er funnet. Den relativt store diameteren og den grovkrystalline karakteren av det ildfaste materialet gjør det naturlig å tolke stykket som en

ovnsvegg og ikke noen digelvegg. Ovnene har trolig blitt brukt for kobbersmelting, eventuelt kobberraaffinering.



Fig. 83a. Grønn ovns- eller digelvegg. Slaggside med "slagglinje" avmerket. Prøvestykke med kobber-kule tatt ved pilen. (Possible tuyère (?) of burned and slagged clay. C.McL.)



Fig. 83b. Samme stykke, baksiden med keramikk: grovkornet, rødlig.

4.4.5. Mulige tilsatsmaterialer.

Det er bare funnet to slags synlige tilsatsmaterialer, nemlig hvite stykker av kvarts SiO_2 og kalkstein/brent kalk. Begge deler er vanlige: kvarts for å slagge jernoksyd, og kalkstein for å gi bedre flytbarhet for bl.a. fayalitt-slagger. Et kvartsstykke hang fast i svart-brun slaggekake nr. 13. Det tyder på at kvarts ble tilsatt, og at denne biten ikke var oppløst.

4.5. Diskusjon.

Denne metallurgiske undersøkelsen av Mellagerverkstedet er først og fremst basert på avfall fra virksomheten, funnet ved den arkeologiske utgravningen sommeren 1987. Dette er første sammenfattende rapportering av undersøkelsen.

Det er et stort problem ved tolkningen at visse stoffer representerer et reellt avfall fra produksjonen, andre stoffer er "mistet" fra en ukjent sirkulerende mengde, andre stoffer igjen er hjelpemidler, som kan ha gått i stykker og er blitt henslengt. Det er f.eks. meget vanskelig å få et begrep om den sirkulerende mengden mynter i det norske samfunnet ut ifra hva man kan finne på gaten.

Tallet på bruskorker sier langt mer, i dette tilfellet om hvor mye mineralvann som blir drukket, fordi korkene er avfall. Analogien med Mellagerverkstedet er følgende: Bruskorkene svarer til slaggekollene og til glødskalet, mens myntene svarer til grønn slag og fragmenter av verdimetall.

Det er en rekke ledd som mangler for en entydig sammenfatning av virksomheten:

- a. Det er ikke funnet noe helt klart metallisk råstoff.
 - b. Det er ikke funnet noe sannsynlig ferdigprodukt.
 - c. En karakteristisk slag som kan representere avgangen ved kobber-raffinering er ikke funnet i rimelig store mengder.
- Det er ikke funnet noen prøve av metallisk tinn.

Tolkningen av virksomheten ved Mellagerverkstedet blir dermed preget av en viss argumentering, som går i flere retninger:

Det anses imidlertid som sikkert at det på Mellagerverkstedet foregikk smeltemetallurgisk virksomhet som omfattet metallene kobber og bly. Det arealet som verkstedet utgjør vitner om at det var en stor bedrift. Samtidig er det ingen tegn på at det har vært større produksjonsenheter, slik som store sjaktovner på tomta. Sjaktovner er karakteristiske for primærproduksjon av flere metaller. Større sjaktovner var alltid knyttet til utnyttbar vasskraft. Dessuten krevde de større kvanta trekol til driften. Ingen av delene fantes på eller ved Mellagertomta.

Det må derfor ha foregått en form for "digelmetallurgi" eller sekundærmetallurgi for kobber og bly ved dette verkstedet, prosesser som kan ha omfattet nedsmelting, eventuelt raffinering, i alle fall utstøping, i det minste til halvfabrikata.

Begge metaller kobber og bly er funnet i "ren" tilstand. Også tinn som grunnstoff er påvist, men bare i forbindelser i slag o.l., og det er derfor litt uklart hvilken rolle dette metallet har spilt. Sink er også påvist, men det kan ha opptrådt som ledsagermetall for de primære metallene kobber og bly. Begge metaller tinn og sink er bare funnet i ubetydelige mengder i de undersøkte metallstykkene av kobber og bly, metallstykker som hva gjelder analyse kan representere produktene ved verkstedet. Blystykket kan være egnet for støping, kobberstykkene for hamring til plate.

Av metallurgiske grunner må en tenke seg separate flytskjemaer for hvert av de to metallene kobber og bly. Begge metallene vil inngå i hva en

kan kalle "sirkulerende" materiale, med minst mulig avfall. Det er funnet små mengder av en tilsvarende rik slagg, riktignok med flere av verdimetallene i blanding.

Det er en stor andel jernoksyder og silisiumdioksyd i alle avfallsprodukter utenom de rene ikke-jern metallene og enkelte grønnfargede slagger. Slik slagg kalles gjerne fayalittslagget etter hovedkomponenten fayalitt Fe_2SiO_4 . Det er funnet store mengder skolleformede slaggstykker, hvert av vekt ca. 800 g.

FeO og SiO_2 inngår normalt i typiske reduksjonsslagger for jern, som påtreffes i store mengder ved produksjonssteder oppe i fjellene fra romersk jernalder og fram til reformasjonen. Hvert slaggstykke fra den aktuelle tida har en karakteristisk ytre form, som er typisk for den ovnstypen som var i drift. Det anses som helt usannsynlig at det har foregått noen produksjon av jern ved dette verkstedet, bl.a. fordi slaggstykkene på Mellageret har en helt annen ytre form. Samtidig er analysen på slaggstykkene sammenliknbar med reduksjonsslagget.

Ut ifra form er det indisier på at de store slaggsbollene har sammenheng med smiing eldre tiders smiing, som blant annet tok sikte på å fjerne slagg fra primært produsert jern. Den heterogene karakteren vitner om store temperaturgradienter, som er typisk for ei esse, mens en må regne med at digler plassert inne i en ovn ville ha gitt en glattere underside og en mer uniform karakter, kjemisk og termisk. Formen kan minne om avtrykket av ei esse. Manganinnholdet i slaggekakene i forhold til jerninnholdet er imidlertid typisk for jernmalm eller reduksjonsslagget.

Innhold av metalloksyder som CaO , MgO , Al_2O_3 er heller ikke typisk for en moderne smislagget. Men i dette tilfellet kan det dreie seg om en smislagget, som dannes ved at rester av reduksjonsslagget presses eller renner ut av en luppe av den typen som ble laget i blesterovner på denne tida. Det glødskalet som er funnet i jordprøvene bekrefter at en form for smiing har funnet sted.

Det som ikke passer er innhold av kobber i de slaggsprøvene som har vært undersøkt. Den alternative muligheten: at slaggekakene er et avfallsprodukt fra kobberaffinering ved Mellageret vil derfor bli gjennomgått:

Fayalittslagget er et vanlig avfallsprodukt også ved industriell framstilling av kobber fra kobberkis CuFeS_2 , hva enten den foregikk via halvfabrikatet "svartkobber" (med ca. 5% Fe), vanlig i tidsrommet ca. 1600-1880 ved Røros og andre kobberverk, eller ved skjærsteinsmelting og bessemring, som ble innført ved Røros og i Sulitjelma etter 1880. Kravene ved smeltinga var renest mulig kobber og best mulig utvinning av verdimetall. Denne behandlingen ga et kobberinnhold på ca. 0.5% i den slaggen, som til slutt ble kastet. Slaggsbollene fra Mellageret har et innhold på ca. 100-250 ppm, d.v.s. 100-250 g/tonn slagg, altså under 1/10 av hva moderne kobbersmelting gir av slaggtap. En enkelt slaggsprøve inneholder imidlertid ca. 1% Cu.

For sammenlikning er de viktigste trekkene ved svartkobberframstilling vist i fig. 84.

De funne produktene metallisk kobber, slaggsboller og grønn slagg kan minne om henholdsvis Rent Cu, slagg 1 og slagg 3 i fig. 84. Ved siden av at dette produksjonsutstyret ikke fantes på stedet er kobberbitene fra Mellageret renere enn på flytskjemaet i fig. 84, og slaggsbollene som nevnt med et lavere kobberinnhold enn slagg 1.

Om denne hypotesen allikevel følges videre, kan det stilles opp to prinsipielt helt motsatte forslag:

a. Jernet i slaggsbollene stammer fra den kobbermalmen, som var utgangspunktet for smeltinga. Dette er en smeltepraksis som likner på den tidligste industrielle metoden og baserer seg på kobberkis CuFeS_2 eller jernholdig "svartkobber".

b. Jernet i slaggsbollene stammer fra tilsatsmateriale ved smeltinga.

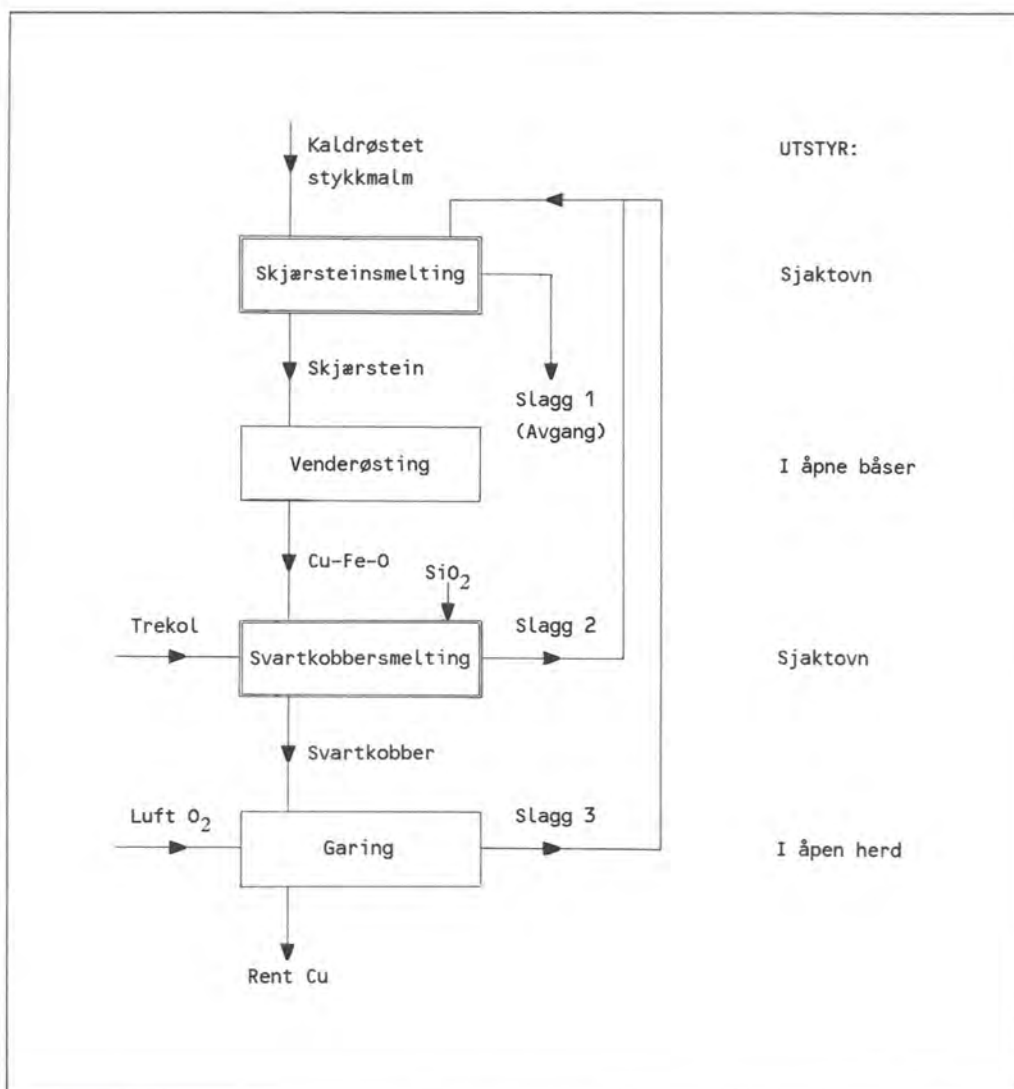


Fig. 84. Hovedtrekkene ved svartkobberframstilling, vanlig på 1700-tallet.

a. Det antas som den enkleste muligheten at svartkobber er bragt til Mellagerverkstedet. Den viktigste forurensningen er jern.

Et forslag til flytskjema er vist i fig. 85. Ved siden av at forslaget krever at svartkobber må være framstilt et annet sted, vil neppe dette flytskjemaet gi et så rent kobber og så kobberfattige slaggsoller som er tilfellet.

Den enkleste utvidelsen vil bestå i å foreta garing i to trinn, eventuelt også reduserende smelting av slagg i to trinn. Det er mulig at slik behandling ville føre til de analysene som er karakteristiske for de aktuelle bitene av metallisk kobber og slaggsollene.

Dette forslaget forutsetter framstilling av svartkobber på en annen plass. Slik framstilling på 1200-tallet er bare kjent i Falun og Garpenberg i Sverige.

b. Dette forslaget er fortsatt knyttet til kobberets metallurgi, men er helt motsatt det første: Det forutsetter at et bergartrikt, men jernfattig halvfabrikat er bragt til Mellagerverkstedet. For å få "konsolidert" metallisk kobber til større biter av sammenhengende metall, må metallet over smeltepunktet 1083°C

større biter av sammenhengende metall, må metallet over smeltepunktet 1083°C og bergarten må "flukses", d.v.s. omdannes til flytende slagg. Fluksing av SiO_2 -rik bergart kan utføres med jernoksyd.

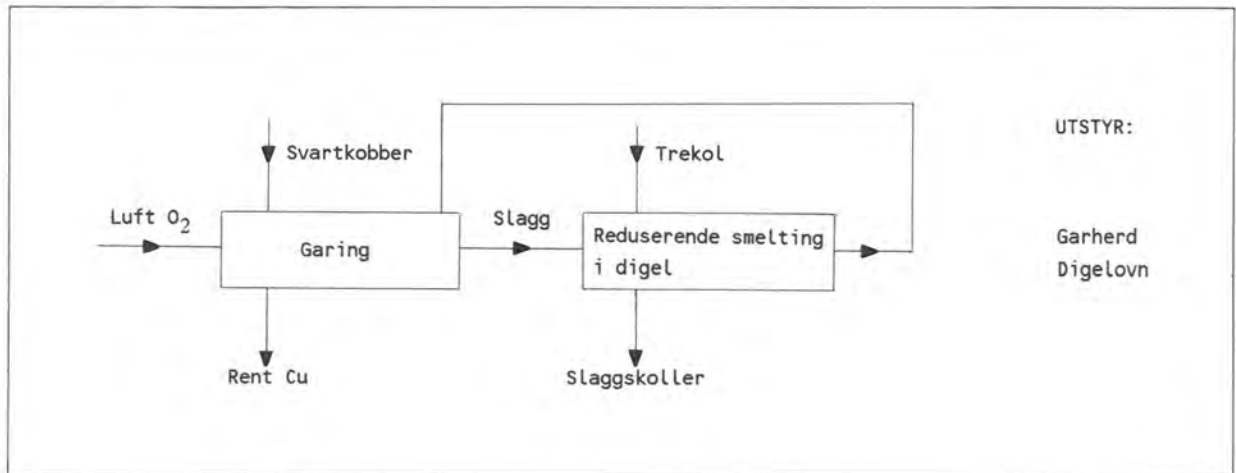


Fig. 85. Enklest tenkelige flytskjema for behandling av svartkobber.

Mens en i det første tilfellet flukser jernoksyd med SiO_2 , gjør en i det siste tilfellet det motsatte. Men siktemålet er i begge tilfelle lettsmeltende fayalittslag, som skal separeres ifra i flytende tilstand. Det enklest tenkelige flytskjemaet er vist i fig. 86. For å få de rette analysene på metallet og slaggskollene kan en forestille seg en to trinns behandling.

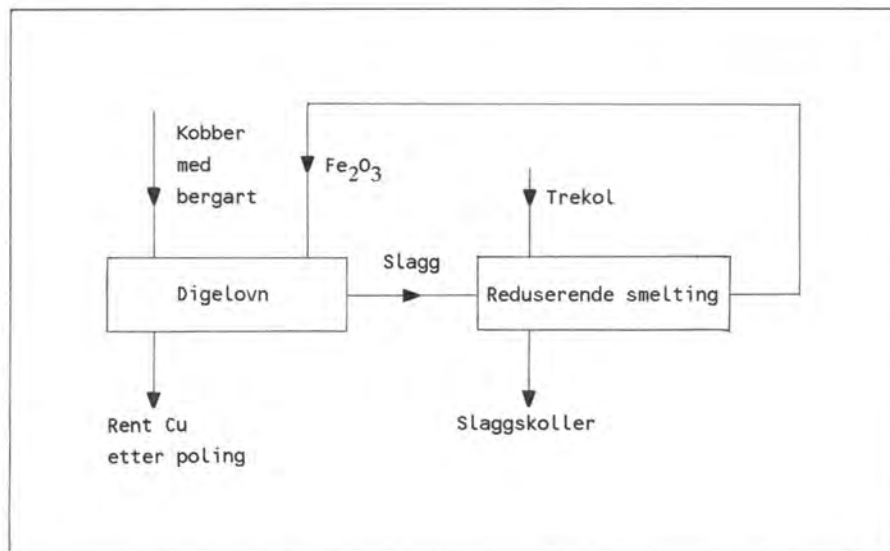


Fig. 86. Framstilling basert på jernfattig, men SiO_2 -rikt råstoff.

En indikasjon på at det siste forslaget kan være tenkelig er nærvær av mangan i slaggene. Mangan følger oksydiske jernmalmer, ikke sulfidmalmer. Det mest aktuelle tilsatsmidlet er jernmalm i form av myrmalm. Eventuelt ble myrmalmen satt til etter en viss varmebehandling, slik som røsting.

Mens det første forslaget under a) krever en smeltemetallurgisk behandling av kobberkis, - prosesser som først kom med vår tidligste industri, ville råstoffet for forslaget under b) kunne være malm som knapt hadde vært forbehandlet, eller forbehandlet ved en lavteknisk prosess som røsting på et åpent bål. Det aktuelle kobbermineralet ville være f.eks. kobberglans Cu_2S . Ved røsting ville sulfidet gå over i oksyd. Oksydet kunne lett reduseres til dråper av metallisk kobber i glødende trekol.

En kunne også tenke seg at syntetisk kobbersulfid kunne bli framstilt ved såkalt kjernerøsting. Ved kjernerøsting ble stykkmalm med kobberkis lagt i store hauger på toppen av brennende ved.

Ved varmebehandlingen oksyderes malmens jerninnhold, slik at malmstykkene får et jernoksydrikt skall. Dette skallet kunne hamres bort med meisel. I kjernen ville en ha en kobbersulfidrik masse, som eventuelt kunne bringes til et sted som Mellagerverkstedet. Med de moderat store mengdene som forelå, ville avdriving av svovel neppe by på noe stort problem.

Om forslaget under b) er gyldig, vil det kunne gi et innblikk i en lavteknisk kobberproduksjon, et emne som har opptatt arkeologer, metallurger og historikere i mange land.

Forslaget stemmer overens med hva bl.a. Tylecote har foreslått som en av mulighetene for framstilling av det første jernet. Ved drift av en fattig kobberforekomst viste det seg at tilsats av et brunlig stoff (jernmalm) førte til avrenning av flytende slag og konsolidering av alle dråpene av metallisk kobber (Tylecote 1976).

Det er også prinsipielt tenkelig at kobber er utvunnet ved våtveis utfelling fra kobbersulfatoppløsning ved hjelp av skrapjern.

Alle forslagene som relaterer slaggsbollene til kobberaffinering vil vitne om et avansert metallurgisk miljø i Trøndelag på 1100-1200-tallet. Det virker lite sannsynlig, fordi det er så lite av ringvirkning å spore. Om slaggsbollene derimot forbindes med smiing av jern, er tolkningene mer sannsynlige.

Det er langt mindre grunnlag for å gå i detalj i denne rapporten for framstilling av bly og den rollen tinn har spilt på Mellagerverkstedet. Mens kobber trolig er framstilt som råmateriale for kobberslagere, kan en kanskje tenke seg bly anvendt for støping av pilgrimsmerker og enkle drikkebegre. Tinn kan ha vært i bruk som legeringsemne eller for fortinning av kobbergjenstander.

Selv om slaggsbollene kan stamme fra smiing av jern, er det klart at det har vært en omfattende produksjon av kobber, trolig i plateform, ved Mellagerverkstedet. Det har sikkert vært et enormt behov for kokekar av kobber på denne tida. Det fantes ikke jerngryter. Det var nettopp ved hamring til tynt blikk at metallet ble utnyttet aller best, slik at prisen kunne bli akseptabel. Hamring forutsatte et meget rent kobber, med analyser av den typen som er konstatert.

Det er mindre sannsynlig at det har foregått støping av kobberlegeringer ved Mellagerverkstedet. Karakteristiske støpelegeringer er ikke påtruffet. (Noen støpeformer er ikke blitt forelagt meg).

Størrelsen på Mellagerverkstedet passer ikke for et vanlig kobberslageri. Det er mer trolig at råemnene for kobberslagerne ble laget der. Slike råemner må ha blitt støpt ut i en form for "kaker".

Det anses som mest sannsynlig at ferdige gjenstander av kobber ble laget ved små kobberslagerier rundt om i Trondheim og andre steder, på samme måte som ved verksteder i Balkanlanda i våre dager.

Tinn kan stamme fra biter av returmetall fra kobberslagerier. Tinn ble brukt for fortinning.

Det er påfallende at bitene av kobbermetall har så høy renhet: ca. 99.8%.

4.6. Konklusjon.

Ved Mellagerverkstedet har det foregått smeltemetallurgi for kobber og bly, med sikte på framstilling av rene metaller i en egnet form:

For kobber har produktet trolig vært plater av ganske rent metall, godt egnet for videre bearbeiding til kokekar o.l. Hvert av disse metallene må ha vært behandlet i en separat produksjonslinje.

En full beskrivelse burde omfatte såvel prosesser som produksjonsutstyr. Det er desverre ikke mulig å sette opp godt begrunnede forslag for behandlingen av kobber og bly. Det anses som mest viktig å avklare forholdene for kobberets vedkommende.

Det har ikke foregått noen primær framstilling fra kobberkiskrik malm, tilsvarende prosesser som er kjent i Norge fra ca. år 1550.

Det kan ha foregått raffinering av svartkobber framstilt et annet sted og bragt til Mellagerverkstedet, f.eks. med skip. Det er også tenkelig at spesielle kobberrike råstoffer har vært behandlet.

Mengden av normalt og akseptabelt avfallsstoff fra slik virksomhet er imidlertid minimal. De grønnfargede restene som finnes, utenom slaggstykker, er mer preget av en "smitteeffekt" enn av regulært avfall fra produksjonen. En må være klar over at grønnfargen er gjennomtrengende, og den kan ha oppstått etter at verkstedet var i drift.

Det er også umulig å si noe om den produserte mengden av kobber og bly.

Det mest tydelige avfallsproduktet fra virksomheten er et stort antall slaggskoller. Det er lagt fram sterke indisier på at de er stammer fra smiing av jern med stor andel slagg, som er bragt til Mellagerverkstedet fra produksjonssteder rundt om i Trøndelagsfjellene. På disse produksjonsstedene er det knapt tegn på smiing, ut over en første smiing mens jernluppen enda var rødvarm, like etter at den var tatt ut av blesterovnen.

Det viktigste indisiet er en stor andel gløds skall i de undersøkte jordprøvene. Gløds skall kan bare ha oppstått ved smiing.

Inntak av et grovsmidd produkt og framstilling av et foredlet halvfabrikat, f.eks. barrejern, anses derfor for å være den tredje produksjonslinjen. Ved denne omsmiingen er det mulig at det også foregikk en viss karburisering. Både renhet og et visst karboninnhold var ansett som viktig av smeder, den gang som nå.

Det er usikkert om også tinn er tatt inn som råstoff. Kanskje det bare er kommet til Mellagerverkstedet i form av avklipp og skrap fra kobberslagere rundt om.

Den alternative tolkningen går ut på at slaggskollene er et avfallsprodukt ved kobberframstilling. Stammer de fra kobbersmelting, så blir forklaringen preget av en meget avansert metallurgi for kobberets vedkommende, en form for metallurgi som ikke kan spores i form av noen ringvirkning, hverken i tid eller rom.

Det eneste indisium som peker mot jernmetallurgi i form av smiing av slaggrikt jern til et halvfabrikat i barreform er et visst kobberinnhold i slaggskollene, riktignok langt lavere enn i vanlige avfallsprodukter. Det er imidlertid sannsynlig at dette er en smitteeffekt fra produksjon under samme tak, eller ved at essene for eksempel også kan ha vært brukt for gjenvinning av metall fra kobberrike avfallsprodukter.

Med denne tolkningen framstår Mellagerverkstedet som en bedrift der det har vært framstilt halvfabrikata av jern, kobber og bly. Beliggenheten har vært meget logisk for en "eksportrettet" bedrift, fordi produktene kunne skipes ut. Dette forslaget svarer godt til bedrifter i det moderne Trondheim.

Slaggskollene kan gi mulighet for interessante studier av proveniens for jernets vedkommende. Funnet slutter seg dermed meget tilfredsstillende til

prosjektet "Jernvinna i Midt-Norge". Parallellen til slagganalysene bør finnes i slagghauger fra Middelalderen rundt om i trønderske fjell.

Også for kobber og bly åpner funnet for interessante studier av proveniens. Analyse på et ti-tall grunnstoffer i kobber og ca. seks i bly bør gi en forklaring på hvor disse metallene ble hentet.

Utgravningen på Mellagertomta har bidratt til å skape et større perspektiv over tidlig metallurgi i Norge. Studiene slutter seg meget tilfredsstillende til arbeid som er i gang.

4.7. Forslag om videre arbeid.

Det bør foretas full kjemisk analyse av et stort antall slaggskoller. Skulle mengden kobber ligge høyere enn det som her er rapportert, bør den alternative forklaringen: avfallsprodukt fra kobbersmelting gås gjennom på nytt. Hvis innholdet av kobber svinger sterkt, kan det tyde på at digelen eller essa, der de oppsto har vært brukt både for jernsmelting og for kobberslagger.

Hvis teorien om at de er smislagg holder, så bør analysedata samles opp for å gå inn i en "bank" for sammenlikning med slagget fra produksjonssteder. (Det er alt gjort et betydelig arbeid med inventering og utgravning av slike anlegg).

Prøver av kobber og bly bør analyseres meget bevisst for å kartlegge serien av grunnstoffer, som kan avdekke proveniens.

Det kunne også være grunnlag for eksperimentelt arbeid, såvel med kobber-raffinering som med smiing av slikt jern, som ble framstilt i blesterovner i middelalderen.

4.8. Addendum: Slagglager på mikronivå (M. Pagoldh).

I det material som normalt frånskiljs ved pollenanalys iakttog Paula Sandvik metallkuler og andre avvikende ämnen. Som ett experiment mikroskopoperades därför jordprover från lager 138, 139 och 153, slaggsprovruva 1, delfält F.

Genom dekantering och silning borttogs alla partiklar mindre än 250 my. Det kvarvarande materialet befanns något grumligt kokades i lut. Detta hade en viss negativ effekt, då tidigare för ögat synliga kopparflagor tycktes ha försvunnit. I stället fanns nu ljusgröna och rostfärgade klumpar vilka lätt pulveriserades vid beröring. Kornstorlekerna var så små, att de vid sönderfallet bildade en rökslinga. Samma konsistens och rykande förmåga hade också ett ljusgult material som kan ha varit blyoxid.

Proverna bestod emellertid övervägande av kvartskorn och kol. Ett stort inslag utgjorde även slaggen. Till synes gråsvarta, intetsägande bitar visade sig under mikroskopet vara vackert flerfärgade. Kraftigt klarblå fläckar fanns på gråsvarta, glasiga ytor. Andra slaggstycken hade praktfulla rosa, laxrosa, starkt tegelfärgade och vita partier. Ytterligare andra var övervägande blå, gröna och glänsande. Troligen rörde det sig om gjut- och lerslagger.

Fascinerande var också ett tiotal runda kulor. De bestod av ett hårt men sprött skal och var ihåliga i mitten. Kulorna var antingen ljusgrå, rosa eller blåsvartskimrande. Ytan var inte alltid slät och de mörka gav intryck av metall med hög kolhalt. De matta grå påminde om bly eller eventuellt tenn. Kulorna bör ha formats av flyktiga ämnen vid gjutning och smältning som en sorts avfallsprodukt.

Ett annat resultat av metallhantering var troligen också de oftast rektangulära, hårda men spröda, blå-röd-lilla-svarta flaken.

I övrigt fanns bränd lera och stjärkar, vävnader och dylikt av växtdelar

samt långa genomsinkligna fibrer vilka utseendemässigt liknade sentråd; en var dock svagt blåfärgad, en annan rosa.

Proverna gav intryck av slagglager i miniatyr.

4.9. Tilläggskommentarer nov.-des. 1988 (A. Espelund).

De metallurgiska prövene fra Mellagertomta står for en ganske bred virksomhet. Det er meget gunstig om visse sider kan defineres og trekkes ifra det totale funnmaterialet. Det er nå grunnlag for å sortere ifra det viktigste avfallsproduktet, de plan-konvekse slaggsbollene.

Videre har tanken om utvinning av sølv meldt seg. En metallurgi som omfattet kobber- og bly-malmer eller -råmetall kan også ha innbefattet sølv. Bly er godt egnet for ekstraksjon av sølv i fra komplekse smelter. Kunnskapen å få ut sølv ifra bly ved såkalt kupellering er kjent i fra gammel tid.

Fordi de svarte og brune slaggekakene hadde mye materiale fra smiavl, ovnsvegg eller digel sittende fast på undersiden er de alle prøvetatt på nytt slik at bare den karakteristiske, indre delen er tatt med. Disse prøvene har fått nye navn, som lista viser:

A	1987/3	B 14	N 103	501	
B	1987/3	F 151	N 107	266	
C	1987/3	F 170	N 104	129	
D	"	"	N "	"	
E	1987/3	F 210b(b?)	N 106	874	øvre del, glødet
F	"	"	"	"	nedre del
G	1987/3	F 216	N 106	008	
	"	"	"	"	hvit stein
H	1987/3	F 475	N 104	611	
I	1987/3	F 557/558	N 106	365	
J	1987/3	F 591	N 104	534	
K	1987/3	F 689	N 107	028	
L	"	"	"	"	
M	1987/3	F 756	N 104	728	
N	1987/3	F lag nr. 70,	ikke tilvekstregistrert		
O	1987/3	F " 92,	"		

Kjemiske analyser av disse prøvene er gjengitt i tabellen nedenfor (alle tall i %): (Analysene er utført ved Geologisk inst., NTH).

	Gløding (vektøkkn.)	SiO ₂	Fe ₂ O ₃ tot	FeO	Fe ₂ O ₃	CuO	MnO	Al ₂ O ₃	Na ₂ O
A	3.8	8.8	90.1	60.7	22.6	0.5	0.7	1.6	0.2
B	3.4	15.2	83.3	60.3	16.3	0.1	0.2	2.1	0.5
C	3.9	24.5	70.8	53.7	11.1	0.1	0.2	3.0	0.6
D	3.5	28.0	66.9	56.5	4.1	0.1	0.2	3.4	0.7
E	-0.3	32.2	52.3	7.7	43.7	3.7	0.1	3.8	0.8
F	2.9	15.4	82.3	58.8	17.0	0.1	0.2	4.3	0.4
G	2.7	12.6	86.9	57.5	23.0	0.4	0.6	2.8	0.5
H	2.8	13.1	83.9	57.1	20.4	0.4	0.3	2.3	0.5
I	2.5	17.3	72.9	53.2	13.8	0.2	0.2	2.8	0.5
J	1.7	21.3	73.6	56.9	10.4	0.2	0.4	3.2	0.5
K	3.3	25.7	68.2	54.8	7.3	0.1	0.4	3.6	0.7
L	3.7	15.0	77.9	51.0	21.2	0.2	0.2	4.0	0.6
M	3.2	20.2	76.3	58.8	11.0	0.1	0.1	3.3	0.7
N	4.0	11.9	85.3	50.5	29.2	0.2	0.4	2.5	0.7
O	3.6	25.4	61.8	52.3	3.7	0.8	0.6	4.4	1.1

1. Innholdet av bly (ikke med i tabellen) er konsekvent under 50 ppm. Slaggene kan ikke stamme fra noen prosess som omhandlet bly.

2. Innholdet av kobber varierer fra 0.1 - 0.5% (en på 0.8), bortsett fra en prøve på 3.7%. Slagger med tilknytning til kobberframstilling må påregnes å ha et kobberinnhold på 1% eller mer. Derfor har alle slaggrøvene bortsett fra en ikke noe med kobberframstilling å gjøre. Unntaket - prøven merket E - blir behandlet separat - se nedenfor.

3. Jerninnholdet, målt som Fe_2O_3 total, varierer mellom 61 og 90% (bortsett fra prøve E). Oksydasjonsgraden uttrykt i mengde "fri" Fe_2O_3 er ganske forskjellig, mens verdien for FeO ligger mellom ca. 50 og 60%. Prøvene er ikke analysert på metallisk jern, slik at en eventuell andel er medregnet i % FeO.

4. Mengden av SiO_2 varierer mellom ca. 9 og 28% (utenom prøve E - se nedenfor).

5. Mengden MnO og Al_2O_3 er på henholdsvis ca. 0.1-0.7% og 1.5-4.5%, uten større utsagnsverdi.

Prøvene merket C, D, J, K og O har en kjemisk sammensetning som er karakteristisk for den slaggen en finner etter vellykket framstilling av jern i blesterovner, altså ved reduksjon. Det er utelukket at myrmalm og trevirke eller trekol i større mengder er blitt bragt til Mellageret for å lage jern på stedet. Dertil er slaggmengden liten, uten den karakteristiske formen, som svarer til teknikken i middelalderen, og med stor spredning i analysene. Samtidig er formen på slaggekakene som et avtrykk av en smiavl. Til sammenlikning med de nevnte slaggrøvene tas med en analyse på slagg fra Håen I, et slagghvarp ved en ovn datert til ca. 700 AD, beliggende ca. 30 km sør for Trondheim og studert ved utgravning i 1985:

Gløding	SiO_2	Fe_2O_3 tot	FeO	Fe_2O_3	CuO	MnO	Al_2O_3	Na_2O
-	23.2	74.3	61.1	6,4	-	1.1	4.3	0.89

(Totalanalysen lyder: SiO_2 23.2, Fetot 52.0, Fe^{++} 47.5, Fe^0 0.04, TiO_2 0.22, Al_2O_3 4.3, MnO 1.1, CaO 0.55, MgO 0.51, P 0.02, Na_2O 0.89, K_2O 0.69).

Slaggene C,D,J,K og O er derfor åpenbart et resultat av omsmiing av jern, framstilt på et annet sted. Dette jernet må ha inneholdt mye slagg, som så er blitt presset ut ved oppvarming i esse og varmsmiing. Slaggene med sitt høye innhold av FeO i forhold til Fe_2O_3 er derfor en reduksjonsslagg. Dette blir bekreftet ved at slaggrøvene tiltok i vekt ved gløding. For alle unntatt den kobberrike prøven merket E, var det en vektøkning mellom ca. 2 og 4 %. Disse slaggsbollene har derfor fått sin kjemiske sammensetning fastlagt ved selve framstillingen av jern i en blesterovn, og bare i mindre grad blitt påvirket av påfølgende oppvarming i selve smiavlen, der metallet var i kontakt med glødende trekol.

Slaggsbollene med et høyere Fe_2O_3 -innhold stammer trolig fra omsmiing, som har ført til en viss avbrann av metallisk jern i smiavlen.

Prøvene E og F er samhørende, fra samme slaggsbolle. Den nedre delen av slaggsbollen (F) er karakteristisk, som de øvrige, mens prøve E er full av trefliser. Den ble derfor glødet før kjemisk analyse, slik at storparten av jern eller FeO er oksydert til det høyeste oksydet.

Det høye innholdet av kobber kan tyde på et forsøk på å gjenvinne kobber fra et avfallsprodukt i en smiavl. Det er ikke lagt spesiell vekt på denne prøven, idet den ikke anses for å være karakteristisk.

De siste analysene sier helt klart at slaggsbollene svarer til omsmelting av jern. Det jernet som ble framstilt i ovn ble kalt "blåsterjern". Dette ble

smidd om til "fellujarn", eller videre til hva som kalles "teint jarn". Det siste svarer til hva vi i dag ville kalle emnesjern.

Slaggsbollene er avfallsproduktet fra "omsmeltinga" til fellujarn, mens en stor del av glødskalet svarer til omsmiing av fellujarn til teint jarn.

Hva gjelder kobber og spørsmålet om proveniens, kan det nevnes at en prøve av garkobber fra skipet Perlen, som sank i året 1781 utenfor Trøndelagskysten inneholdt 0.22% Zn og 50 g/t Ag. Til sammenlikning uttrykker en av de få analysene på kobber fra Mellageret ca. 0.14% Zn og 1500 g/t Ag. Garkobberet vil være nokså representativt for kvaliteten på kobber framstilt i Trøndelag i eldre tid. En prosess som nokså tydelig skilte sinkholdige og kobberholdige mineraler kom først med flotasjonen først på 1900-tallet. De få analysene som er kommet tyder dermed på at kobberet på Mellageret kan stamme fra en annen forekomst enn de som er typiske for Trøndelag.

5. POLLENANALYSER (P. U. Sandvik).

5.1. Innleiding.

Mellagertomta ligg på den nord-austre og lågaste delen av den store grusøyra som dannar Nidarneset. Området har i høve til havoverflata heva seg 4 - 5 m sidan AD 900 (Anundsen 1977), og var truleg ikkje landfast med resten av Nidarneset AD 1000 (Christophersen 1987).

Metallverkstaden som kom i drift var såleis plassert på ein verhard stad der nord-vestlege vindar stod rett inn frå fjorden. Samstundes høvde staden godt for eit arbeid som innebar stor fare for spreiding av brann, ettersom busetnaden på Nidarneset og verkstaden på dette viset var skild av vatn utan at det var vanskeleg å koma frå den eine staden til den andre.

Overgangen mellom steril grunn og funnførande lag ligg mellom kote 5.5. og kote 4.5. på feltet. Dette skulle tyde på at deler av området var oversvømt ved flo sjø og at grunnvasstanden var høg då metallverkstaden var i drift, truleg frå AD 1100 og nokre hundre år framover i tida.

I samband med dei arkeologiske utgravningane på Mellagertomta vart det teke prøvemateriale for pollenanalyser. Siktemåla med pollenanalysene var

- 1) å skaffe kunnskap om naturtilhøva på området før det vart teke i bruk,
- 2) å finna ut om utbygginga av metallverkstaden var den første aktiviteten menneska starta på området,
- 3) å finne ut korleis drifta av metallverkstaden påverka området.

Ein kjende ikkje til tidlegare undersøkingar der pollenanalyse var nytta som metode til å utforska utviklinga på og omkring eit metallverkstodområde. Dette gjorde arbeidet særleg spanande og utfordrande og gav høve til å prøva ut fordelar og ulemper ved pollenanalyse i ein samanheng og på eit materiale der metoden tidlegare ikkje hadde vore prøvd.

5.2. Metodikk.

5.2.1. Prøvetaking.

Materialet til den pollenanalytiske undersøkinga vart samla inn 21.08.1987, samstundes med avslutninga av det arkeologiske gravearbeidet.

Ein ønskte å samle inn materiale frå ulike deler av feltet og ved konstruksjonar så som renner, avfallsgroper, stolpehol og restar etter bygningar. Prøvetakningsstadana vart difor valt ut ved avslutninga av utgravninga då oversynet over området ut frå arkeologiske funn var så godt som råd.

Prøvematerialet vart teke frå rensa profilvegg med spatel og overført til merkte glas eller plastposar.

Dei einskilde prøveseriane inneheld materiale frå alle lag i eit vertikalt snitt gjennom lagfølgja på staden, frå steril grunn nederst til funnførande lag lengre opp.

Til saman utgjer materialet 12 prøveseriar med i alt 91 einskildprøver. Alle seriane har eit serienummer, og innan kvar serie er prøvene nummerert ovanfrå og ned. Plasseringa av prøveseriane i utgravningsområdet er markert med serienummer på oversynskartet (fig. 7). Prøveseriane er også markert på profildeikningar, som er arkivert ved Riksantikvarens utgravningskontor. Plasseringa av seriane 10 og 11 er vist på fig. 9 i denne rapporten.

I første omgang vart desse prøveseriane valt ut til pollenanalyse:

Serie 3 og 11: frå den delen av feltet der det var flest restar etter konstruksjonar.

Serie 8: frå den lågaste delen av feltet der overgangen mellom steril grunn og kulturlaga ligg omlag ved kote 4,5.

Serie 7: frå eit relativt homogent materiale i ei avfallsgrop.

Etter kvart syntte det seg at ingen av dei nemte seriane inneheld materiale frå steril bakke før verkstaddrifta kom i gang, og ein valte å supplera med to seriar, 2 og 5 som ein vona ville innehalde det ønskete materialet.

5.2.2. Laboratoriearbeid.

Det vidare arbeidet med materialet fann stad ved Botanisk institutt, AVH.

Preparering for pollenanalyse.

Materiale til preparering for absolutt pollenanalyse vart overført med spatel til gelatinkapslar med volum $1,4 \text{ cm}^3$. Kvar prøve fekk tilsett eit kjent antal tablettar, kvar med 12500 ± 500 *Lycopodium clavatum* sporar (Stockmarr 1971). Tablettane vart løyst opp i 10% HCl og tilsett prøva før preparering etter standard framgangsmåte (Fægri og Iversen 1975). Etter at prøva var koka i KOH under prepareringa, vart materialrestar større enn $250 \mu\text{m}$ sila frå og teke vare på. Dei største minerogene partiklane vart fjerna ved dekantering. Ein del av prøvene inneheldt store mengder minerogene partiklar som måtte fjernast ved hjelp av HF.

Analyser.

Partiklar større enn $250 \mu\text{m}$ vart studert under lupe med 16 og 40 gonger forstørring. Denne fraksjonen inneheldt sand og andre minerogene partiklar og trekol.

Dei ferdigpreparerte prøvene inneheldt pollen, sporar og kolstøvpertiklar og tilsette *Lycopodium clavatum* sporar. Dei store kolstøvmengdene i prøvene gjorde analysearbeidet tidkrevjande. Silar med maskevidder på $5 \mu\text{m}$ og $100 \mu\text{m}$ vart nytta for å fjerna noko av kolstøvet, sjølv om pollentypen større enn $100 \mu\text{m}$, i dette materialet granpollen, dermed ville gå tapt. Sjølv etter siling var det framleis så mykje kolstøv i nokre av prøvene at det var uråd å finne pollen og *Lycopodium clavatum* sporar. Deler av materialet var pollenfattig, og pollen og sporar var dårleg oppbevart. I slike prøver vart andelen av ubestemte pollenkorrelativt stor.

Kornpollen vart skild frå resten av pollenkorrela frå grasfamilien, men ikkje bestemt til type. Hassel- og porspollen, som var vanskeleg å skilja, vart samla i ei gruppe. Det same gjeld pollentypene nesle, humle og hamp, som også vart samla i ei gruppe.

5.2.3. Utrekningar og grafisk framstilling.

Konsentrasjonen, k , av dei ulike partikkeltypene (pollen, sporar eller kolstøvpertiklar) vart rekna ut som antal pr. cm^3 prøvemateriale etter denne formelen:

$$k = \frac{\text{tilsette sporar} \cdot \text{funne partiklar}}{\text{funne sporar} \cdot \text{prøvevolum}}$$

Konsentrasjonen av pollen vart rekna ut for alle prøver med meir enn 10 registrerte pollenkorrel. Alle resultatane av konsentrasjonsutrekningane er framstilt langs ein logaritmisk skala (fig. 87).

I prøver med pollensum større enn 100 er prosentvis representasjonen for dei ulike pollentypene rekna ut.

Representasjonen til dei ulike sporetypene er rekna som prosentvis andel av summen av pollen pluss sporetype.

Resultata er framstilt i stolpediagram. Alle utrekningar og teikningar er utført ved hjelp av dataprogrammet "POLLEN" (P.C & P.U.Sandvik 1988) som er laga for bruk på PC.

Både på figurane og i teksten er norske namn på pollen og sporetyper nytta. Kap. 5.4.6. inneheld oversyn over norske og latinske namn på pollen- og sporetyper. Plantenamna som er nytta i teksten er i følge Lid (1985).

5.3. Presentasjon av materialet.

Materialet synte fleire særdrag både med omsyn til fossiltyper og fordeling mellom dei ulike typene av makro- og mikrofossilar. Oversyn over materialet er gjeve i fig. 87.

5.3.1. Makrofossilar.

Makrofossilane vart skilt ut under prepareringa (kap. 5.2.2.) og omfattar partiklar større enn $250\ \mu\text{m}$.

Alle prøvene inneheldt store mengder minerogene partiklar, og kvarts- og glimmerkorn var vanleg i alle prøvene.

Andre typer minerogene partiklar skil seg ut som karakteristiske for materialet frå Mellagret. Arbeidet med metalltilverking har produsert avfall, og to typer, slagg og metallkuler, kunne skiljast ut under lupe. Som nemt i både den arkeologiske og metallurgiske delen av rapporten, vart det funne store mengder slaggbitar med ulik storleik over heile utgravningsfeltet. Under lupe kunne slaggbitaner skiljast frå andre minerogene partiklar både på ulik overflatestruktur og farge. Metallkulene syntes å vera av to typer, massive kuler og brent materiale innkapsla i metall. Storleiken på kulene var $250 - 1000\ \mu\text{m}$ og mest truleg vart dei danna under smelting ved at flytande metall spruta utover (Arne Espelund, pers. medd.).

Mengdene av trekol varierte sterkt. I særleg grad var skilnaden stor mellom prøvene frå steril grunn, som inneheldt få eller ingen trekolbitar større enn $250\ \mu\text{m}$, og prøvene frå funnførande lag, som var rike på trekol (fig. 87). Bortsett frå trekol var det lite organisk materiale å finne i denne fraksjonen.

Materialet kan ut frå makrofossilinnhaldet delast inn i to hovudtyper:

- 1) Sand blanda med metallavfall og trekol i rikelege mengder, og
- 2) Sand med få eller ingen innslag av metallavfall og trekol.

5.3.2. Magnetiske partiklar.

Prøver frå alle laga i serie 5 vart undersøkt med magnet. Det synte seg at alle prøvene med metallrestar (fig. 87) også inneheldt magnetiske partiklar, og at metoden raskt og enkelt kunne skilje materiale med metallrestar frå rein sand.

Dei magnetiske partiklar kunne vera tilført materialet på fleire måtar, til dømes frå gløds kall som inneheld magnetitt, Fe_2O_3 , og som er avfall oppstått ved smiing av jarn eller stål (Arne Espelund, pers. medd.).

5.3.3. Trekolpartiklar.

Samanlikna med materiale frå andre utgravningar i Trondheim (Selvik 1986, Foulks og Sandvik 1987), var dette materialet svært rikt på kolstøv. Kolstøvet vanskeleggjorde både prepareringa for pollenanalyse og i særleg grad sjølve analysearbeidet (kap. 5.2.).

5.3.4. Pollen og sporar.

Pollen og sporar var dårleg oppbevart i mange av prøvene, og særleg var materialet frå steril bakke pollenfattig (fig. 87). I nokre av prøvene var det vanskeleg å finna pollen og sporar i det heile teke fordi konsentrasjonen av kolstøv var svært stor. Som det går fram av fig. 87, er pollenkonsentrasjonen ikkje rekna ut i slike tilfelle. For mange av prøvene måtte analysearbeidet avsluttast utan at pollensummen var stor nok til å danne eit godt statistisk grunnlag for prosentvis fordeling av pollentypene (P.C. Sandvik, pers. medd.). For nokre av prøvene var pollensummen likevel stor nok til at totalkonsentrasjonen av pollen og fordelinga innan gruppene treslag- og urtepollen (AP og NAP) kunne reknast ut (kap. 5.2.3. og fig. 87).

Dominerande pollentype i alle prøvene var gras. Det vart registrert relativt mange typer urtepollen. Pollen frå korgplantefamilien, storrfamilien, korn og teiebær vart funne i vekslende mengder i alle prøvene, medan andre pollentypar fanst med vekslende frekvens (fig. 88, 89, 90 og 91). Andelen av treslagspollen var låg samanlikna med fordelinga i materiale frå naturlege avsetningar frå same tidsrom.

5.4. Tolkning og konklusjon.

Materiale frå arkeologiske utgravningar byr på mange vanskar i arbeide med pollenanalyse. Tolkningsproblema er store fordi pollen blir tilført materialet frå både lokal og regional vegetasjon, og i samband med ulike former for menneskelege aktivitetar som medfører tilførsel av plantemateriale. Greig (1982) gjev oversyn over ulike transportveggar for pollen til materiale i kulturlag i byar. Han nemner også faktorar som påverkar oppbevaringstilhøva for pollen og sporar og som kan synast å ha særleg interesse i samband med denne undersøkinga:

- høg grunnvasstand hindrar oksygentilførsel og minskar korrosjon av pollen og sporar
- korrosjonsprodukt frå koppar betrar oppbevaringa av pollen og sporar
- omroting av materialet fører til auka oksygentilførsel og dermed auka korrosjon av pollen og sporar.

Vanlegvis blir pollen og sporar, som blir avsett på ei sandoverflate og seinare blanda inn i sand, dårleg oppbevart på grunn av oksydasjon. Høg grunnvasstand og koppartilførsel kan ha minska korrosjonen av pollen og sporar, men ikkje i så stor grad at dette materialet skil seg positivt ut i samanlikning med anna materiale frå same tidsrom.

Pollentypar kan sjeldan bestemmast til art, men oftast til slekt, grupper av slekter eller familie. Ei pollentype kan såleis representera artar med ulike krav til lys og næringstilgang og med tilknytning til ulike vegetasjonstyper. Resultat av pollenanalytiske undersøkingar av materiale frå kulturlag kan difor ikkje direkte brukast til å rekonstruera vegetasjonstyper. Derimot kan ein vurdera ulike vegetasjonstyper som mogelege kjelder til pollenfloraen i materialet.

I området ved Gaulosen er det gjort ei registrering av strandengvegetasjonen (Baadsvik 1974) og ei omfattende plantesosiologisk undersøkning av elvekantvegetasjonen (Skogen 1972). Begge desse arbeida gjev verdifulle opplysningar om dagens vegetasjon ved ein elveos ved Trondheimsfjorden.

Det er dessutan tidlegare gjennomført ei pollenanalytisk undersøkning på Folkebibliotekstomta som syner karakteristiske trekk ved pollenfloraen i materiale frå elvekanten og sumpområdet lengre oppe langs Nidelva (Selvik 1986).

5.4.1. Strand- og elvekantvegetasjon.

Mellagertomta låg strandnært og ved utløpet av Nidelva i tidsrommet då metallverkstaden var i drift (kap. 5.1.). Pollenfloraen i alle prøvene er dominert av typene gras og storr. Fjøresaltgras (*Puccinellia maritima*), kveke (*Elytrigia repens*) og raudsvingel (*Festuca rubra*) er av dei grasartane som kan ha vokse på området. Storrpollen kan vera spreidd frå sivaks- og storrartar som gjerne veks på fuktige område både på elvekantar, i strandsonen og på stader med høg grunnvasstand. Pollen av strandrug, (*Elymus arenarius*) som let seg skilja frå resten av graspollentypene i nokre av prøvene (fig. 88 og 89), syner spor etter ei plante med tilknytning til strand og elvekant. Pollentypa mjødukt, som truleg representerar mjødukt (*Filipendula ulmaria*), vart funne i mange av prøvene. Mjødukt veks også på fuktige stader. Fleire pollentypar kan representera både urgrasflora og havstrandflora. Typene melde og tungras som er registrert i dette materialet, og som i innlandet ville bli sett på som dyrkningsindikatorar, kan like gjerne reknast som element knytt til plantesamfunn på havstrender og elvebankar i strandnære område (Tolonen 1985). Omkring tangvollar veks nitrogenelskande artar så som melder og nesle. I tillegg kan artar frå nellikfamilien, korgplantefamilien, krossblomsterfamilien, rosefamilien, ertefamilien og syrer ha gått inn i urtevegetasjonen. Det vart registrert orepollen i alle prøvene. Gråor (*Alnus incana*) er i dagens vegetasjon vanleg som kantskog langs elvar. På Folkebibliotekstomta vart orepollen registrert saman med rikelege mengder tindvedpollen (Selvik 1986). I dette materialet vart tindvedpollen funne i berre ei av prøvene (fig. 91). Einerpollen vart funne i det meste av materialet. I dagens strandengvegetasjon veks einer (*Juniperus communis*) på gamle strandvollar (Baadsvik 1974).

5.4.2. Spor etter menneske.

Som nemt i 5.4.1. er det i mange tilfelle vanskeleg å fastslå for ein del pollentypar om dei har opphav i strandvegetasjonen eller om dei skriv seg frå ugras og dyrkning.

Nokre typer har sikker tilknytning til dyrkning, først og fremst gjeld det kornpollen som er funne i alle prøvene her (fig. 88, 89, 90 og 91). Det er påvist spor etter åkerbruk på Nidarneset frå omkring AD 1000. Både i Apotekerveita og ved Britannia er det funne ardspar i grunnen. Pollenanalytiske undersøkingar frå Apotekerveita (Hafsten pers. medd.), Folkebibliotekstomta (Selvik 1986) og Britannia (Bjerck og Jansson 1988) syner spor etter korn dyrking frå AD 1000. Kornblompollen er også representert i nokre av prøvene, men med små prosentandelar. Tidlegare var kornblom (*Centaurea cyanus*) eit vanleg åkerugras, og pollentypen er registrert saman med kornpollen i dei tidlegare nemte undersøkingane. Tågbærpollen er vanleg i dette materialet, men i sterkt varierende mengder. Tågbær (*Rubus saxatilis*) er vanleg i heile landet og veks på steinete stader. Renningar av planta vart nytta til flettearbeid (Høeg 1976).

5.4.3. Regional vegetasjon.

Fleire vegetasjonshistoriske undersøkingar utført ved Botanisk institutt, AVH, gjev oversyn over utviklinga av skogen i Trøndelag frå AD 1000 og utover i mellomalderen. Furu- og bjørkepollen er dei vanlegaste av treslagstypene i dette materialet (fig. 88, 89, 90 og 91). Furu (*Pinus sylvestris*) og bjørk (*Betula sp.*) var enno i tidleg mellomalder dei vanlegaste skogdannande treslag i Trøndelag. Granpollen manglar i prøve 3.3 (fig. 88), og andelen er låg i dei andre prøvene (fig. 89, 90 og 91). Grana (*Picea abies*), som etter kvart kom sterkare inn i skogsbiletet, har i høve til furua låg pollenproduksjon og dårleg spreiringsevne, og blir underrepresentert i pollenprøvene. Andelen av granpollen i kulturlag frå AD 1500-1600 syner låge andelar granpollen, sjølv om grana då var dominerande treslag i skogane omkring Trondheim (Foulks og Sandvik 1987). Varmekjære treslag er representert ved einskildkorn av alm- og eikepollen i dette materialet. Pollentypen hassel/pors representerar planter med svært ulike krav til veksestad. Medan hassel (*Corylus avellana*) går inn som element i ein varmekjær vegetasjon, kan pors (*Myrica gale*), som er ei myrplante, tåla kaldare klima, sjølv om planta i dagens vegetasjon har atlantisk utbreiing.

Ein grunn til generelt låge andelar av treslagspollen kan vera at urtepollen blir tilført i rikelege mengder gjennom ulike former for menneskeleg aktivitet, og at pollenfloraen på det viset gjev inntrykk av urtedominans i vegetasjonen. Ein annan grunn kan vera at det voks få tre i byen, og at det var relativt langt til næraste skog.

Andelen av treslagspollen i prøvene frå kulturlaga er låg samanlikna med prøver frå naturlege avsetningar frå same periode.

5.4.4. Opprinneleg overflate.

Ein tok i utgangspunktet sikte på å finne materiale som gav grunnlag for å samanlikna pollentilførselen til området før og etter at metallverkstaden kom i drift.

Prøvene frå steril grunn frå serie 2, 3, 7, 8 og 11 inneheld minimale pollenmengder (fig. 87). Grunnen er truleg at den opprinnelege markoverflata vart fjerna i samband med planering då området vart gjort klart for metallverkstaden.

Den prosentvise andelen av treslagspollen i prøve 5.4. (fig. 89) er langt høgare enn i nokon av dei andre prøvene (fig. 88, 90 og 91), og prøve 5.4. synes difor å kunne representere den opprinnelege overflata i området. Grunnen er ikkje den at konsentrasjonen av treslagspollen er større i 5.4. enn i dei andre prøvene, men at urtepollenkonsentrasjonen er mindre. Grunnen kan vera at treslagspollen i større grad enn urtepollen vart spreidd til området frå omliggjande vegetasjon, og difor utgjorde eit meir konstant innslag i pollenregnet.

Urtepollen kan ha hatt opphav i lokal vegetasjon og tilført plantemateriale, og urtepollenregnet ville bli sterkare påverka av inngrep i form av graving, planering og liknande, og difor variera meir i takt med inngrepa i området.

Påverknaden av salt- og brakkvatn ved høg flo og sjøsprut ved sterk vind ville avta etter kvart som landet heva seg, og planter som ikkje tåler saltvatn kunne etter kvart innta området og danne ein meir variert flora.

5.4.5. Kulturlag.

Ut frå materialet som danna grunnlaget for den pollenanalytiske delen av undersøkninga, synest det klart at metallverkstaden var den første menneskelege påverknaden av området.

Lagdelinga innan kulturlaga er særmerkt. Det synes å vera fylt på lag med rein sand over avfallslaga frå metallverkstaden med jamne mellomrom, anten fordi ein ville rense opp grunnen, eller fordi ein ønskte å planere området før ein vidareførte arbeidet. Vekslinga mellom avfallslag og sandlag kjem tydeleg til syne også i skilnaden i innhald av ulike fossiltypar i prøvene. Medan avfallslaga inneheld rikeleg med kolstøv, trekol, slagg og metallkuler og lite identifiserbart pollen, er sandlaga rikare på pollen og mindre prega av kolstøv (fig. 87).

Ut frå pollen- og sporeinnhaldet synes prøvene frå materialet i kulturlaga å vera relativt like (fig. 88, 89, 90 og 91).

Den påfylte sanden vart mest truleg henta frå det næraste området omkring verkstaden, og pollenfloraen vart difor prega av strand- og elvekantplanter saman med pollen frå tilført materiale.

Ein kunne tenkja seg at grunntilhøva på dei delene av Mellagertomta som vart mest brukt under metallverkstadstida, kunne få som resultat eit utval av planter som kunne nyttegjera seg det høge innhaldet av metall i jorda. Denne undersøkninga har ikkje kunna påvisa nokon slik samanheng. Grunnane kan vera fleire. Graving og tråkk i samband med arbeidet kan ha gjort tilhøva dårlege for alle typer vegetasjon. Kolstøvinnhaldet i deler av prøvene var så stort av ein ikkje kunne gjennomføra pollenanalyser av materialet (sjå 5.2.2.), og dessutan har metoden avgrensningar som gjer at ein sjeldan kan knyta pollenfunn til artar av planter (sjå 5.4.).





Dette materialet har vist tydeleg kor store problem ein kan støyta på i arbeide med pollenanalyser av materiale frå arkeologiske utgravningar. Samstundes har det vist kor viktig det er at både makro- og mikrofossilane i eit materiale blir studert. Ved det kan ein, som her, oppdaga nye fossiltypar, og sist, men ikkje minst, få eit langt meir fullstendig bilete av materialet.

5.4.6. Pollen og sporetyper.

Norsk namn	Latinsk namn
Alm	<i>Ulmus</i>
Bjørk	<i>Betula</i>
Bregner	<i>Polypodiaceae</i>
Eik	<i>Quercus</i>
Einer	<i>Juniperus</i>
Erteplanter	<i>Fabaceae</i>
Furu	<i>Pinus</i>
Gran	<i>Picea</i>
Gras	<i>Poaceae</i>
Hassel	<i>Corylus</i>
Korgplante 1	<i>Asteraceae</i>
Korgplante 2	<i>Cichoriaceae</i>
Korn	<i>Cerealia</i>
Kornblom	<i>Centaurea cyanus</i>
Krekling	<i>Empetrum</i>
Krossblom	<i>Brassicaceae</i>
Lilje	<i>Liliaceae</i>
Linbendel	<i>Spergula arvensis</i>
Lusegras	<i>Lycopodium selago</i>

Norsk namn	Latinsk namn
Lyng	<i>Ericales</i>
Malurt	<i>Artemisia</i>
Marimjelle	<i>Melampyrum</i>
Melde	<i>Chenopodium</i>
Mjødurt	<i>Filipendula</i>
Mynte	<i>Mentha</i>
Nellik	<i>Caryophyllaceae</i>
Nesle	<i>Urtica</i>
Or	<i>Alnus</i>
Osp	<i>Populus</i>
Pors	<i>Myrica</i>
Rogn	<i>Sorbus</i>
Rose	<i>Rosaceae</i>
Rublom	<i>Rubiaceae</i>
Røsslyng	<i>Calluna</i>
Skjerimplante	<i>Apiaceae</i>
Soleie	<i>Ranunculaceae</i>
Storr	<i>Cyperaceae</i>
Strandrug	<i>Elymus</i>
Strid kråkefot	<i>Lycopodium annotium</i>
Syre	<i>Rumex</i>
Teiebær	<i>Rubus saxatilis</i>
Tindved	<i>Hippophaë</i>
Torvmose	<i>Sphagnum</i>
Tungras	<i>Polygonum aviculare</i>
Vier	<i>Salix</i>

Oversyn over makro- og mikrofossilar i materialet

Trekol  myk je middels lite  Metallkuler  Slagg 

Prøvenr.	Makro-fossiltyper	ΣPollen	Kolstøvpertiklar pr. cm ³ prøvevolum								Pollen pr. cm ³ prøvevolum											
			Totalt (AP NAP)			Træslogs pollen (AP)			Urte pollen (NAP)													
			10	100	1000	10000	100000	1000000	10000000	10	100	1000	10000	100000	1000000	10	100	1000	10000	100000	1000000	
2.1		11																				
2.2		19																				
2.3		24																				
3.1		110																				
3.2		391																				
3.3		181																				
3.4		0																				
3.5		4																				
3.6		7																				
3.7		8																				
3.8		32																				
5.1		0																				
5.2		465																				
5.3		460																				
5.4		447																				
7.1		0																				
7.2		0																				
7.3		0																				
7.4		0																				
7.5		0																				
7.6		0																				
8.1		4																				
8.2		560																				
8.3		505																				
8.4		0																				
8.5		343																				
8.6		0																				
8.7		432																				
8.8		57																				
8.9		1																				
8.10		2																				
11.1		446																				
11.2		2																				
11.3		404																				
11.4		3																				
11.5		12																				
11.6		2																				
11.7		1																				
11.8		0																				
11.9		3																				

Fig. 87. Innhold av makro- og mikrofossilar i prøvene.

MELLAGRET SERIE 3.

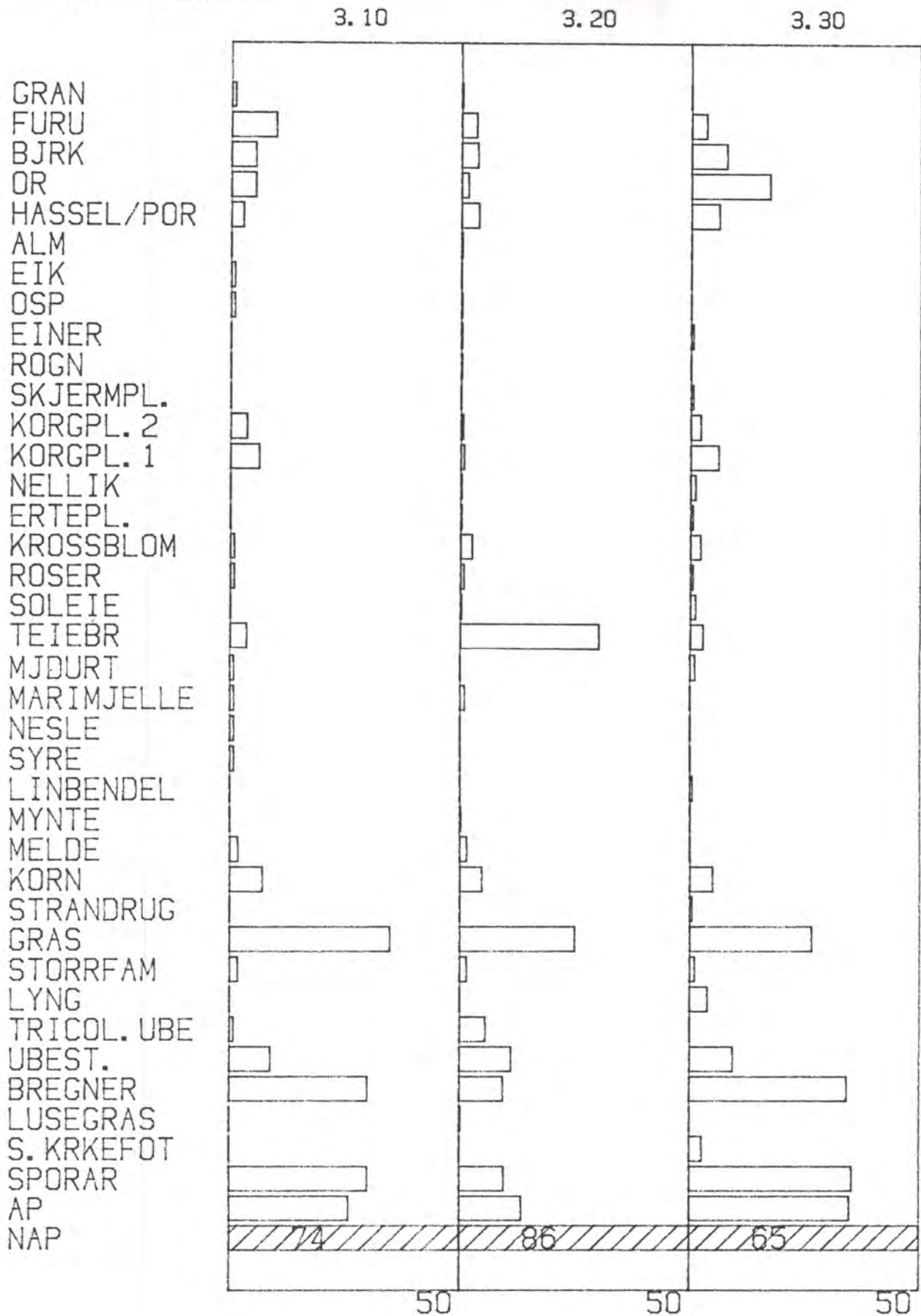


Fig. 88. Prosentvis fordeling av pollen- og sporetyper.

MELLAGRET SERIE 5.

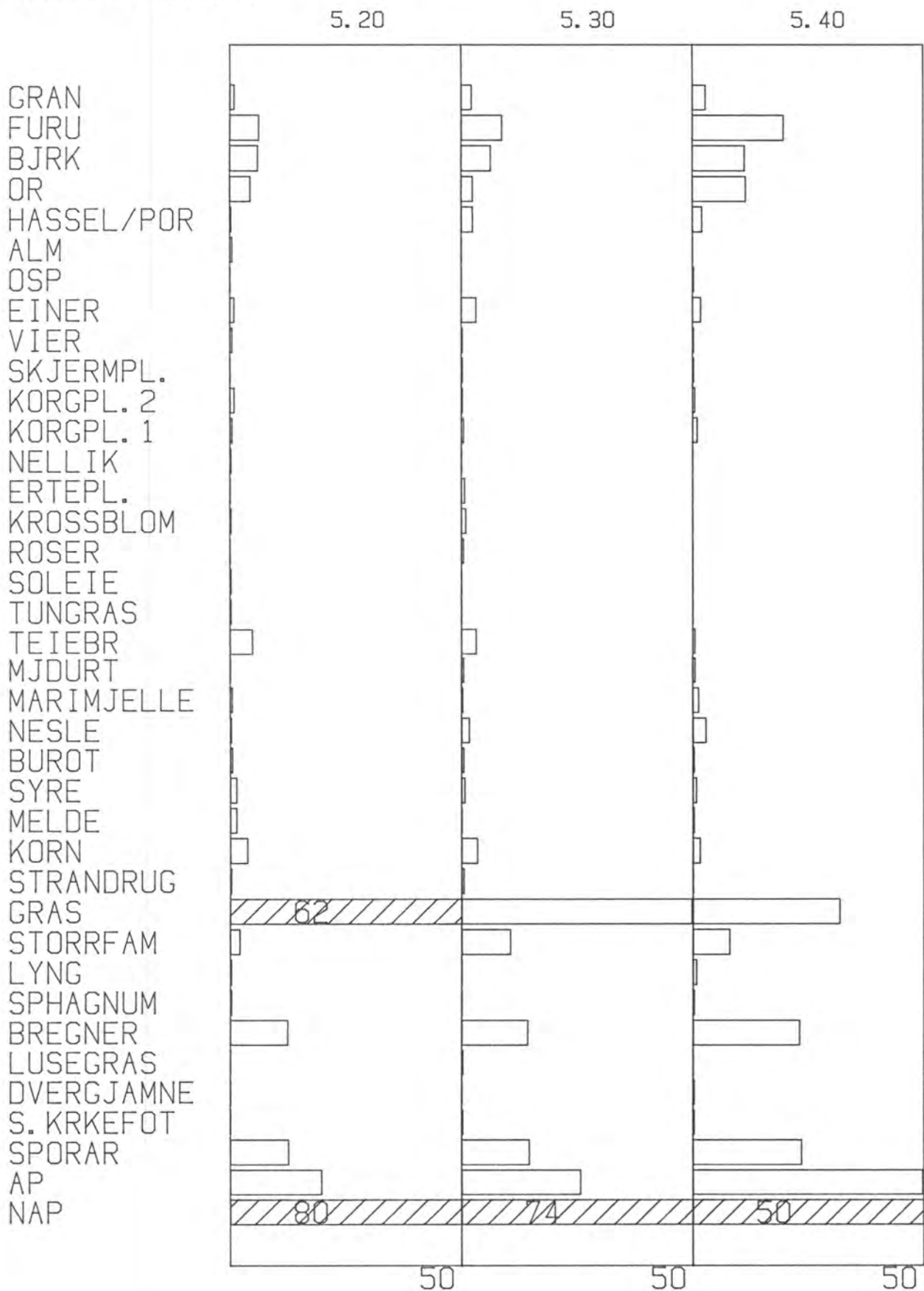


Fig. 89. Prosentvis fordeling av pollen- og sporetyper.

MELLAGRET SERIE 8

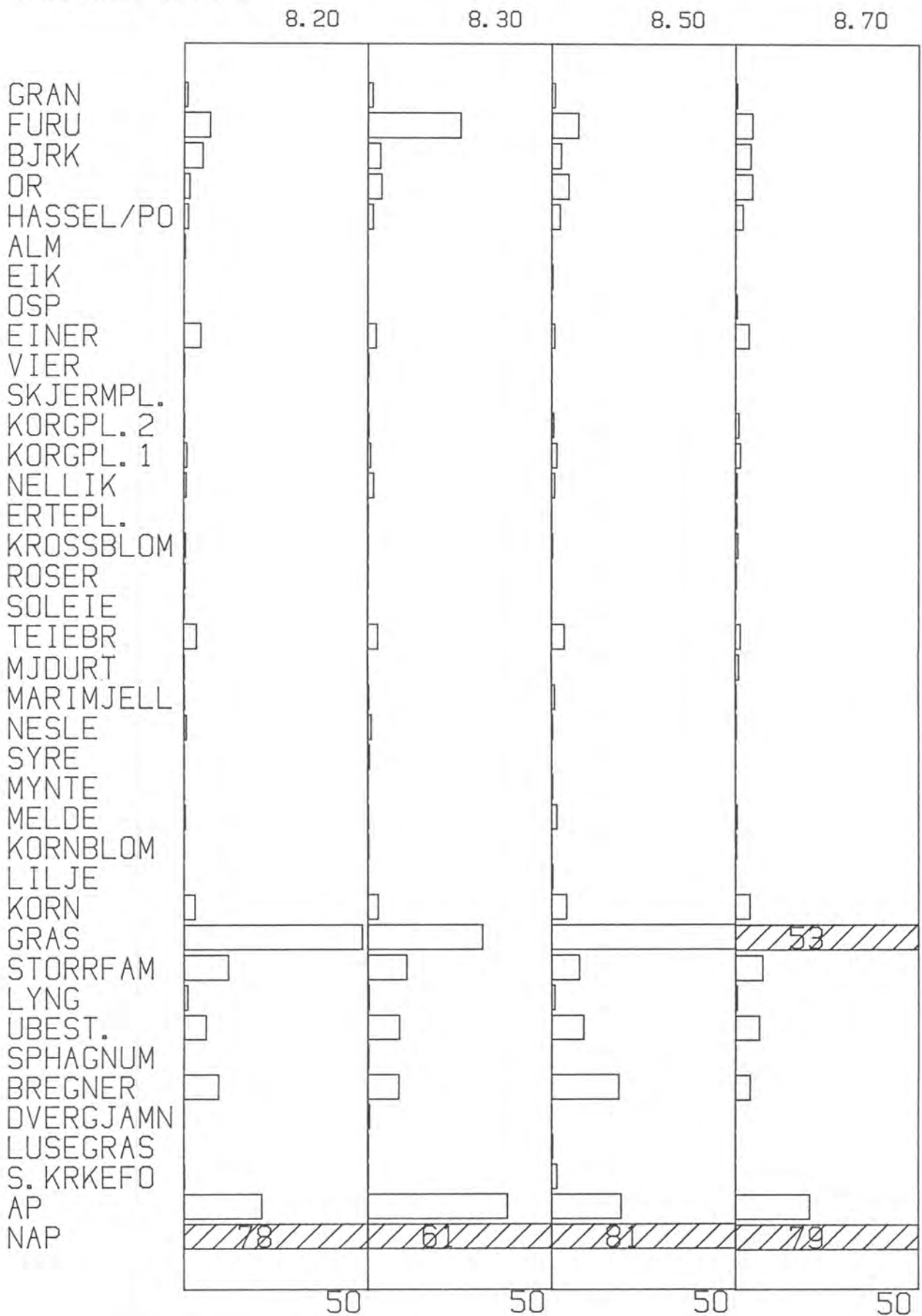


Fig. 90. Prosentvis fordeling av pollen- og sporetyper.

6. FINDS: A SURVEY OF MATERIAL FROM F-SITE AND TRENCH B (C. McLees)

6.1. Introduction.

A detailed tabulated survey of the finds material has not been produced. A provisional quantification of the number of the finds per category has been made and this is contained in the site archive.

In the meantime a brief summary of the range of medieval finds found on F-site and Trench B is presented as a means of introduction to the material. There are 6 binders of listed finds material for TA 1987/3.

6.2. Ceramics.

Pottery.

Ian Reed of Riksantikvarens kontor has examined this material. N.B. Some of these have been placed within the main phases; as follows (layer numbers in brackets):

Phase I : none

Phase II : none

Phase III : one sherd Paffrath blue-grey ware (557)
Dating: 12th century.

Phase IV : none

Phase V : one sherd Scandinavian blackware (836).
Dating: 12th-13th centuries.

Phase VI : three sherds of English shell-tempered ware (579, 759).
Dating: 12th-13th centuries.

Phase VII : one sherd S. Scandinavian redware (92); one sherd Scandinavian? blackware (261); one sherd of Andenne or German whiteware (505); one sherd of Saintonge (604); one sherd of Scandinavian blackware (711); one sherd of French pot (714).
Dating: 12th-14th centuries.

Phase VIII: one sherd of Grimston (64); one sherd of York? white ware (473).
Dating: 13th- mid-14th centuries.

Phase IX : two sherds Scarborough ware, two sherds Dutch redware, one sherd Grimston (6).
Dating: 13th- mid-14th centuries.

Also a number of unphased potsherds:

Quadrant A: one sherd of Scarborough ware (286).

Quadrant B: one sherd Andenne (32/37); one sherd Siegburg (210); one sherd German proto-stoneware, one sherd Grimston (210b); one sherd German stoneware/crucible? (275).

Quadrant C: one sherd Bruges, one sherd Blue-grey ware (58); one sherd Grimston ?, one sherd German Duingen miniature (238); two sherds German Duingen miniature (293); one sherd German stoneware/crucible? (326); one sherd German Duingen miniature (355); one sherd German ? crucible ? (735).

Trench B : one sherd Grimston (cleaning)

Crucibles

Some 98 sherds of crucible found.

Clay moulds

47 identified mould fragments.

Diverse

A large number of items, predominantly fragments of burnt clay.

6.3. MetalCoins

F-site produced 8 coins of which only one has been identified as definitely medieval: a bracteate of ca. A.D. 1150-1200 (phase III - layer 522). Three others are possibly of 17th century date.

Nails and rivets

Numerous examples in these two categories were found. However, these must be re-examined to distinguish the true numbers in each category and also identify their constituent metal.

Diverse iron

A large number of fragmentary items. Also one hammerhead (with portion of wooden shaft surviving).

Metals other than iron.

A large number of items, including off-cuts, a pair of conjoined cast rings, a pair of small tweezers/pincers, a rounded length of wood with metal cladding, a finished object pointed at one end, flattened and grooved at the other, needles/pins, including a melon-headed example. Some have greenish patina and are probably of bronze or copper. Others are as yet unidentified.

Slag

A very large quantity of various slag types has been sampled and retained, including a number of plano-convex "furnace bottoms".

6.4. Stone.

A very large quantity of: weights, vessels, whetstones, baking plates, masonry fragments, various geological samples (chalk, sandstone etc.), various "pecked" and worked slabs and blocks, flints, a large stone ring, various diverse fragmentary objects, at least two ingot moulds.

6.5. Wood

Various worked objects, notably shaped wooden pins/stakes and a turned lid of a vessel.

6.6. BoneCombs

One fragment.

Samples

Various, including items with green-patina.

6.7. Glass

At least one possible example of window-glass.

6.8. Leather

Shoes

A small number of shoe fragments.

Diverse

A small number of thongs and off-cuts.

6.9. Textile

Various fragments of fibrous material, including string?

7. CONCLUSION: A SURVEY OF HUMAN ACTIVITY ON MELLAGER QUARTER (C. McLees).

7.1. The pre-metalworking period.

7.1.1. Earliest human activity.

The evidence from the lowest investigated stratigraphical levels (Phase I) is suggestive of SE shelving topography to the W of the river Nid near its mouth (a sandbank ?) comprising successive alluvial deposits which, to the NW of the F-site area, are of contaminated nature and bear two isolated campfire remains sealed within them. These campfires represent two separate episodes of activity in an occasionally exposed area. The lowest has been provisionally ¹⁴C-dated to A.D. 900-1027, though this and the other ¹⁴C samples await reappraisal. It is concluded provisionally that, at some time in the late Viking period, at least part of the area comprised intermittently - exposed beach on which there occurred occasional human visitations. The campfires lie at levels which, ca. A.D. 1000, would have lain just above and just below the postulated high-water mark at 5,70 m.a.s.l. (see 7.2.6. below). These camp-fires are the only features allotted securely to this first phase of human activity. On F-site there occur, in Quadrant A and Quadrant C, traces of ditches within the body of natural sands and gravels. That in Quadrant A probably relates to the metalworking period. Those in Quadrant C (a pair at right-angles to each other) are of rather more uncertain stratigraphical position. Their fills bear some isolated slags and the recorded topheights of the fills lie between the 5 and 5,50 metre levels, which suggests that at ca. A.D. 1000 they would have lain well under the high-water mark (for chronology and land-rise discussion see 7.2.6. below). Nevertheless they may represent evidence for one of the earliest structures on site, which may relate to the time of earliest metalworking activity. There is also some slight evidence from Trench B (see 3.12.2. above). (See also Pollenanalyse, 5.4.).

7.1.2. Øretinget.

The problem of the siting of Øretinget receives no unequivocal archaeological solution from the 1987 excavations. The historical problems associated with this Thing-place are complex and will not be gone into here. Suffice it to say that Øretingets siting within the industrial environment is self-evidently untenable and the character of the pre-metalworking period is as yet difficult to square with what anyway may well have left little physical traces. Phase I with its campfires within alluvial deposits appears to constitute a too insecure physical environment even for an intermittently-used gathering place. If the campfire dating is secure, this locality was still prone to flooding into the 11th century. The first evidence for more widespread human activity within a flood-free environment here is the extensive compacted grey gravelly horizon of Phase II. This is clearly a trampled surface sealing the alluvial deposits of Phase I. The ¹⁴C samples from this surface, when compared to that obtained from the Phase I campfire (at a lower stratigraphical level) produce earlier dates ie. we have an inverted chronology. Consequently, until these are further examined all ¹⁴C dating evidence must be regarded as insecure, including that previously cited from the campfire. The Phase II gravel surface has been allotted to the metalworking period (see below 7.2.1.) as, stratigraphically, there seems to be conformity and continuity between it and the first structural evidence for metalworking. The formation of the Phase II horizon as a result of annual

gatherings at Øreting prior to some later allocation of the site as an industrial centre cannot be demonstrated archaeologically. What may prove decisive in excluding this particular part of Mellager quarter from the list of candidates for the site of Øreting is that the Phase II horizon can be demonstrated to have not been formed until some time after A.D. 1100 (see Chronology, 7.2.6. below).

7.2. The metalworking period.

7.2.1. The gravel surface/primary occupation horizon.

This has been treated as an entity in itself and constitutes the Phase II level. It forms a broken horizon of compacted material encountered lying on the alluvial deposits over most of the excavated areas in the SW corner of Mellager quarter (it may also extend into Olav Tryggvasonsgt. - see Page 1980, p.3.). It is clearly man-made, the result of the trampling of the river-deposited sands and gravels at a time when the area became free of flooding. Its grey colouration may result from the downward filtration of staining elements from subsequent activity or the direct result of activities taking place upon it. It occupies the interface between the pre-metalworking period and the metalworking period proper, and its relationship to the former period has been discussed above. However, it is felt that this surface bears more relation to metalworking activity and represents the primary formation associated with the laying-out of the site as an industrial area. The Phase III deposits and features, clearly resulting from metalworking, may therefore be seen as one with the Phase II horizon which is suggestive of a clearance level for the primary activities within the metalworking period. This surface plays an important role in the chronological discussion (7.2.6.)

7.2.2. Spatial organization: buildings etc.

From Phase III, the earliest phase of deposition of metalworking debris, fragmentary structural evidence occurs which is suggestive of an organized structural pattern or lay-out. Fig. 45 is a generalized composite plan showing the general spatial arrangements and particular alignments observed throughout the metalworking period. Although composed of a number of stratigraphically separate elements, the pattern of development throughout Phases III to IX is consistent and there is little deviation in the arrangements through time.

The best-preserved sequence occurs in quadrants A and B to the W of F-site, with some additional information at the lowest metalworking levels from Trench B to the S. Quadrant C produced some complementary evidence, though this has not yet been phased internally or correlated to the rest of the site. Quadrant D produced only a little evidence.

In quadrants A and B correlating evidence suggests a series of at least 6 separate building phases following closely upon each other. The consistent and repeated alignments are represented by sequences of ditches, post-holes, pad-stones and lengths of timber. The general pattern is of an elongated NE-SW lay-out, perhaps comprising a range or row of closely-set buildings or one (or more) partitioned/compartmentalized building. The long-axis is represented by NNE-SWW aligned elements, the short-axis by WNW-ESE orientated elements. The surviving length of this range or row NE-SW is approximately 20 metres; the width is ca. 5 metres with possible extension to 5,75 metres to the S.

Some further outlying evidence in the form of post-holes occurs in the

NW of Quadrant A and to the middle of Trench B, though it is not certain whether these comprise traces of neighbouring house structures.

As stated it is not absolutely clear what the aligned row comprises in terms of number of separate structures. The WNW-ESE aligned elements are often at least as substantial as the long-axis elements and may argue for their function as main walls. However, juxtaposed walls are not immediately apparent though in Quadrant A some aligned burnt timbers (not plotted here) may relate thereto, but they may also constitute collapsed elements of walling above the surviving unburnt sections. The short-axis elements may therefore be the remains of internal partitions.

Immediately to the E of this long range lies an isolated area of compacted dumped material (including much organic material) marked "D" on the plan, within Quadrant B. (For discussion hereof, and possible extension of this dumping area, see Ch. 3.9. above). This seems to have been used continuously as a dumping area and perhaps signifies an open area lying to the E of this row of buildings just described. However, it is limited in extent and does not definitely extend N into Quadrant A where, in the SE corner, further metalworking within a more structural context is observable. The dumped deposits may occur also to the middle of Quadrant B. It seems reasonable to suggest an open area or backyard lying in this locality.

To the SE in Quadrant C the WNW-ESE orientation of probable structural elements occurs again, though in what sequence and chronological/phased context this building activity takes place is not yet certain. Again, ditches and aligned timbers and post-holes delimit the structural activity, though it is not yet demonstrable that this began at the same stage or was repeated synchronously with the building activity to the W. The indications are, however, that these aligned elements are not fortuitous and can be compared favourably with those to the W to allow their interpretation as the surviving components of a further row or range of structures lying to the E of the structures in quadrants A and B, separated therefrom, at least to the S of F-site, by the open space or back-yard.

In Quadrant D there is some slight evidence indicative of metalworking conducted within structural limits, and perhaps further successions of buildings stood here.

As a whole, the structural remains comprise a succession of repeated alignments, stable and regulated through space and time, and probably covering, at successive periods, most of the area of F-site. Judging from their related deposits and features these are workshop structures, and F-site clearly consists of an extensive area of intensive metalworking activities taking place within a large, structured, industrialized environment, each workshop being a nucleus within a composite whole.

As a footnote it is interesting to see what Theophilus, a German craftsman writing in the 12th century, has to say about the laying out of a metalworkers workshop:

"Build for yourself a spacious and lofty building extending in length towards the east. In its southern wall you make as many windows as you want and can accommodate, setting them five feet apart. With a wall reaching to the top, separate off a half of the building for the work of making castings and for working copper, tin and lead. Again divide the remaining half in two with a wall - one part for working gold and the other for silver. The windows should not be higher than one foot from the ground, and should be three feet high and two feet in width." (Dodwell 1961, pp 64-5).

This provides complementary evidence to the physical arrangements on Mellager though in certain specific details the Mellager evidence cannot yet be said to be directly comparable. The alignment suggested above, with the long wall facing S to catch the light, does not seem to have been adopted on Mel-

lageret, where the demands of the sloping topography may have required the NE-SW orientation of the range(s) of structures. Also we are not yet certain of the specific activities conducted within these structures or even if there was differentiation in activities across the complex within partitioned rooms as described by Theophilus.

7.2.3. The workshops: structural evidence.

The main pattern of spatial arrangements has been detailed above. This section discusses some of the evidence relating to the methods of construction of the workshop structures.

Firstly, the surviving evidence is extremely fragmentary, and only tentative observations can be made.

One obvious generalization is that wood seems to be the major structural material. The aligned timbers that survive are, for the most part, unburnt and appear to comprise the lowest structural/walling components. Their survival may be due to the failure of destructive episodes of fire to reach to the base of the standing structures (though clear widespread fire-horizons are not demonstrable), or may be indicative of intentional dismantling and rebuilding of structures (?). Where burnt timbers occur these have been interpreted provisionally as collapsed higher elements of walling.

The precise construction method (or methods) utilized is not easy to discern. In Quadrant A a number of deep post-holes seem to align well with the orientated timbers and, although never clearly demonstrated, it seems reasonable to assess their function as housing posts (some survive in situ) bearing longitudinal sill-beams. Corner junctions did not survive, so indications of "lafting" are not apparent. Only one post in Quadrant A lies at a demonstrable junction point (K48-FA phase 6). One of the timbers possibly associated with this (K46-FA phase 6) was of rebated or stepped form, which may suggest its function as a slotted component in some form of vertical plank structure. More emphatic, though fragmentary, evidence for vertical plank construction lies in the isolated timber in Quadrant C (477) which is clearly grooved and bears a portion of vertically-standing planking therein. It is also pointed at one end which is reminiscent of the end of a pointed sill-beam shaped to slot into a corner post (though none survived here apparently). In this context the medieval Bergen town statutes (1276) state that the goldsmiths' stalls should be of boarding - vertical timbers (ie. "bordkledning" - see Helle 1982, p 223).

Further work on this aspect may provide more insight into building techniques. Other elements observed in the structural alignments comprise ditches (K12 - FA phases 2 and 3 and 828 and 855 in FC) at the lowest levels, apparently dug down into natural. These may have housed structural components. Pad-stones survive, most notably in FA's phase 4 spaced row (K27) and possibly in FA's phase 8 (K78). The aligned timbers are often associated with spreads of gravelly sand which acted as a means of covering the old wall-lines and as a foundation medium for the replacement structure.

The Bergen Town Law of 1276 prescribed that the goldsmiths' stalls (boder) should consist of a single-storied structure with an earth floor (Helle 1982, pp 223 and 434). It is not possible to verify the former requirement from the Mellageret evidence, though the impression gained is of rather insubstantial, easily replaceable structures. As regards evidence for flooring: no unequivocal traces of wooden floors survived within the interiors of these structures - in fact it seems that activity took place either directly on earth deposits containing various waste materials or on possible clay floors. Evidence for the latter occurs in the frequently-encountered patchy spreads of compacted clay within the workshop interiors. These are occasionally laminated with

charcoal and are usually of dark grey colouration, though some spreads of cleaner blue-grey clay also occur (note the long sequence of clays sealing sandy waste-bearing materials in FA's phase 6.). However, these patches may also comprise spreads of waste material from some process, though their compaction suggests that they have been trampled at some stage.

Regarded as a whole, the structural evidence is suggestive of a complex of sound but comparatively insubstantial structures, with some indication that they are of vertical-plank construction and of one storey with clay or earth flooring. As such they fit the requirements as stipulated in the Bergen town laws. Certainly, the close proximity to fire must have been a constant limiting factor in the adopted form of construction for these booth- or stall-like buildings.

7.2.4. Industrial features.

Only a general introductory survey of features can be attempted at this stage. There is much room for further analysis to determine particular forms and functions. A problem arising from the early state of analysis is that regarding terminology: for instance it is not certain whether the surviving remains of various negative features comprise parts of formerly enclosed *furnaces* or whether they represent open structures i.e. *hearths*. These are classified under the following general heading in anticipation of future differentiation.

Hearths/furnaces.

On the composite plan (Fig. 45) the locations of repeated hearth/furnace activity are marked "H". At these points (that in Quadrant D is highly speculative) successions of hearths/furnaces occur throughout the sequence of building phases, and as with the walling components a notable locational continuity is in evidence through time.

The best-preserved sequences lie in Quadrant A's FA4 sub-area and in Quadrant B's FB5.

In FA4 a variety of superimposed structures occur. A number of possible forms emerge:

In FA phase 3 K20 comprises a number of ovoid hollows. K21 is a possibly rectangular, partly timber-built, structure and K22 the probable collapsed remains of a similar structure which included wood in its construction. Timber-built hearths are not uncommon in medieval Scandinavian contexts. With particular reference to medieval metalworking arrangements, it is interesting to refer to Theophilus who describes the construction of a timber-built work furnace, using a perforated board, pegs and clay, all of which are found in relation to K21 and K22 (Theophilus: *De Diversis Artibus* Ed. C.R. Dodwell, 1961 pp. 65-66). From FA phase 4 onwards here the hearths/furnaces comprise concentrations of collapsed stones and clay (e.g. K39 and K53) and also ovoid hollows with flat-laid stones and occasionally one vertically-set slab of stone (e.g. K58). This latter ovoid form is encountered across the excavated areas, usually filled with waste debris. In some cases such rounded hollows bear evidence of burnt clay lining or linings e.g. K88 (FA phase 3) and K86 (FA phase 8). These hollows are usually between 50-70 cm in diameter, and some survive to a depth of ca. 30 cm. In most cases they appear to have been filled with waste debris as they fell into disuse and only rarely do internal components survive intact.

One of the earliest hearths/furnaces found on F-site lay in Quadrant B's FB2 sub-area. This is FB phase 3:2's K3 (see Fig. 39), a pair of pits, the one to the W bearing a collapsed array of stone slabs formerly set on edge to form the furnace core, while to the E lay a sand-filled pit in which the bellows may

have stood or in which crucibles were set. A spread of burnt clay possibly represents the collapsed remains of a clay superstructure.

From this brief survey it is clear that a number of forms of hearths/furnaces occur, though their precise functions within the context of metalworking processes await clarification. That they represent remains of an intensive series of processes involving the use of fire within the walls of the workshops in established "work areas" seems quite clear.

Pits

Various forms of pits were encountered ranging from small hollows filled with charcoal to large rounded pits and subsquare internally-revetted pits filled with waste debris from metalworking. An examination of the FA and FB phases in chapter 3 will provide details. It can be observed, however, that the digging of the larger pits, particularly in Quadrant A, as with other structural elements here, follows a pattern of continuity in location. Some of these pits may have been only used secondarily for the dumping of waste material, their original function uncertain. One large pit contains a laminated series of clays (burnt) and charcoal (K 55-FA phase 6).

Stake-holes

Numerous stake-holes, isolated and in scatters, were found, though only rarely could they be related directly to hearths/furnaces or pits. They occasionally appeared as voids, or were filled with waste debris, or were full of charcoal or the fragmentary remains of wooden stakes.

The only distinct formations noted so far are occasional arcs of stake-holes (see K61, FA phase 6 for example). Their precise functions remain to be investigated. The greatest frequency occurs in relation to the compacted clay spreads, which may comprise flooring media or spreads of clay utilized in the metalworking processes.

7.2.5. The nature of the metalworking: the archaeological evidence.

This section serves by way of a selective summary of the range of material discovered on F-site and Trench B relating to metalworking practises. This material awaits future analysis, and for a closer assessment of the metallurgical implications see Ch.4.

The use of hearths/furnaces is a feature of workshop activity on Mellageret. These may relate to a single process being carried out, or perhaps a number of diverse operations requiring the facilitation of high temperatures. Some evidence for clay superstructures and provision for the placement of bellows (for side-draught?) occur (see Fig. 39). Their use for processes other than casting is a possibility, and refining of copper, for example, might be in operation. The use of charcoal for the inducement of high temperatures is testified by the large quantities encountered on excavation (one charcoal sample so far analysed has been identified as fir).

The volume of waste material produced here has not yet been estimated, though an impressionistic view (based on the 1 metre + thick by potentially 400+m² area of the metalworking deposits as traced by excavation) testifies to a significant accumulation through time, and of course the bulk of waste material might well have been dumped elsewhere.

Within this body of material very few finished metal objects were retrieved. Also few tools (a hammer-head and pair of tweezers most notably), and only two identified ingot moulds. Some evidence for casting and perhaps alloying exists in the 98 crucible sherds and ca. 40 clay mould fragments. Fragments of burnt clay, a common find, may derive from burnt furnace lining.

Off-cuts of metal (including bronze and copper) were also frequently found. The large quantity of slags awaits detailed analysis - most notable among these are the furnace bottoms of fayalite type (see Ch.4).

7.2.6. Chronology: Dating of the workshop activity: ca. A.D. 1150 - ca. A.D.1350.

Evidence from a number of sources combines to provide the temporal context in which the metalworking area was established, in operation and fell into disuse. It must be stated that this postulated time-scale is provisional, and must be cross-checked. Before outlining the proposed dating it must be pointed out that a) the land-rise evidence which constitutes a major component of the following discussion is still rather tentative and b) any discussion relating to that must bear in mind the effect of human agency in the deposition and removal of materials. In this context the pollen analysis (see 5.4.4. above) may suggest the planing-off of pre-Phase II deposits in antiquity thereby removing pollen-bearing strata, and of course, affecting any estimation of the date of the Phase II horizon in relation to land-rise and high-water marks. Nevertheless, the assembled evidence is presented as follows:

If the Phase II gravel horizon constitutes the first metalworking phase, in effect the occupation *de novo* of an area previously uninhabitable due to flooding, then its dating is of great importance. Heights taken on this surface during excavation range from ca. 5,30 m.a.s.l. to the S and ca. 6,00 m.a.s.l. to the N of F-site. To assess the approximate date at which the whole of the area covered by this homogeneous horizon would have become dry and habitable, the lowest height must be related to the postulated high-water levels, descending as the land rose (some 4 meters since A.D. 1000). At A.D. 1000 the high-water mark may well have lain at the present 5,70 m.a.s.l. contour (see Meddelelser 13, p.68ff.) and therefore the Phase II horizon would, for the most part, have lain under water. Presuming a constant land-rise rate of ca. 40 cm per century the present 5,30 m.a.s.l. level would have constituted the high-water mark at around A.D. 1100. At A.D. 1150 the 5,30 m.a.s.l. level would have lain some 20 cm above high-water, by 1200 some 40 cm and so on. On this evidence the Phase II horizon must have been formed at some point after A.D. 1100, and if the land were to be relatively secure from flooding, it is proposed that ca. A.D. 1150 must mark the practical base-limit (see Fig. 3).

All the ¹⁴C dates derived from sampled contexts on F-site must be treated with caution as yet. However, it is felt that these should be discussed in relation to this provisional dating scenario.

From the alluvial deposits some 30 cm below the Phase II horizon a burnt bone sample from the lowest of the Phase I campfires yielded a calibrated date of A.D. 900-1027. This lay at 5,60 m.a.s.l., which, on the land-rise evidence, places it on the high-water mark at ca. A.D. 1025. There appears to be reasonable correlation here. If verified, this date, derived from a stratigraphically lower context, provides a *terminus post quem* for the formation of the higher Phase II horizon.

From the Phase II horizon itself two ¹⁴C dates were obtained from charcoal samples, their combined calibrated range being A.D. 660-894. These samples await re-evaluation as they produced earlier dates than the stratigraphically earlier Phase I campfire sample.

From the succeeding Phase III contexts two forms of dating evidence were found: a bracteate coin of A.D. 1150-1200 currency and a sherd of 12th century pot.

From the Phase IV contexts one ¹⁴C date from charcoal in hearth/furnace 151 produced the calibrated date A.D. 689-886. Again, this awaits re-

assessment. A check-test run on the same sample by Trondheim R/C laboratory produced a different calibrated date of A.D. 1020-1160.

In summary, the Phase II horizon is reasonably well bracketed by dating evidence, and the ^{14}C dates, the coin, pottery and land-rise evidence form a complementary body of indicators narrowing the probable date of primary occupation on this part of Mellager quarter to the 12th century, and probably within the second half thereof.

Complementary evidence from written sources for metalworking activity in the vicinity of "Ørene" in the 12th century exists in Sverres Saga (see 1.3. above).

Medieval potsherds from the metalworking deposits point to activity here from the 12th century to at least A.D. 1350. No medieval pottery later than 1350 was found in sealed metalworking contexts, and it may be that the industry fell victim to the ravages of the Black Death in the middle of 14th century.

7.2.7. The former extent of the medieval metalworking area.

This is a difficult factor to assess, due mainly to the effects of post-medieval intrusions, the removal of potential medieval layers in building operations in 1987, and the sloping topography on Mellager quarter.

For details of the extent and character of post-medieval activity over the quarter as examined in the 1987 and earlier investigations see Ch. 3 above. In summary, it is clear that medieval deposits were not present in the investigated areas in the N half of Mellager quarter (see Fig. 2). Cellar disturbance in the middle and SE portions of the quarter was significant, though some medieval (?) organic and slag-bearing layers were observed in the area intervening between F-site and the back of Kjøpmannsgata 44. These were removed wholesale by a deep piling trench during building operations. These deposits lay in the proximity of x735,00/y320,00. The S limit of metalworking deposits investigated in 1987 lay against Olav Tryggvasonsgt. (Profiles I), while to the W deposits were observed in Krabugata (Profiles H.). Excavations in 1980 (see Page, 1980) in Olav Tryggvasonsgt. produced no metalworking evidence, though a compacted grey sand (the Phase II horizon??) was noted to the N of the street towards Krabugt.

In conclusion, if a circle with a diameter of 40 meters is drawn with its centre on F-site and including the outlying slag-bearing areas at its circumference, an area of some 1256 m^2 is obtained, much of which may potentially have been covered by the medieval metalworking site, which of course, may also have extended beyond these limits (N.B. see TA 1988/7 excavation report for possible extension of medieval metalworking to the NW.).

7.3. The site in relation to the rest of medieval Trondheim.

7.3.1. Location (Figs. 4 and 92).

F-site and Trench B lie some 50 meters to the N. of the presumed northerly limit of the medieval town (approximately along the line of present-day Thomas Angells gate). As an industrial centre its isolation from the main domestic concentration is a logical recourse, and may well have been prescribed by law as in Bergen where all handicrafts which constituted a direct fire-threat were to be placed beyond the built-up area. In fact, the 1276 Town Law here probably formalizes pre-existing arrangements, smithies being placed beyond Bergen's built-up area from at least A.D. 1155 (see Helle 1982, p. 432).

The riverside location may well have arisen for practical and logistical reasons: Water is used in metalworking processes and the freighting in and out of raw materials and finished products by water-borne transport could be readily facilitated.

7.3.2. Krampungata (Figs. 4 and 92).

The presumed northerly extension of medieval Krampungata (on the line of the present Krampungata) was not discovered on excavation. In fact the Phase II compacted horizon and some slag-bearing deposits were revealed in two profiles cut across the line of the street thus suggesting its absence at this point at least (see profiles H, 3.14.) and the extension of the metalworking area into the line of the present street.

If it indeed extended this far north at all, Krampungata may have curved off to the W. prior to reaching this locality, or may not have been constructed of wood as in the town area but rather consisted of a simple dirttrack linking the metalworking area to the wood-paved street to the S. Consequently, little trace would have been left in the archaeological deposits.

7.3.3. Structural alignments (Fig. 45).

The characteristic WNW-ESE alignment of wall-lines in the Mellageret workshops compares favourably to the similar general trend in orientation noted to the E of Folkebibliotekstomta, where the buildings and properties lie at right-angles to the line of the river. However, on Mellageret the long-axis of the buildings appears to lie NE-SW rather than WNW-ESE, as seen to the S. It seems reasonable to suggest (on evidence so far) that F-site was not divided up into properties along the lines seen on Folkebibliotekstomta, but rather represents a more expansive single property on which a regulated complex of workshops was laid out with regard to topography and/or a different set of planning criteria (ie. not rooted in an 11th century regulating pattern as on Folkebibliotekstomta?). (For details of Folkebibliotekstomta see Meddelelser 13, 1988.)

7.3.4. Metalworking within the town.

Evidence for metalworking activities within the built-up area of the medieval town occurs on various sites. The Folkebibliotekstomta material is currently being researched. Provisional analysis suggests that metalworking, predominantly casting, took place within workshops here from the site's Phases 2 to 6 (ca. A.D. 1025 to A.D. 1275). After Phase 6 the evidence for specific workshops is not so apparent, though slags do occur in all the later phases (U. Bergquist, pers. comm.).

The Folkebibliotekstomta activity is on a relatively small scale (at least compared to the volume of surviving material on Mellageret). As yet no firm statement can be made regarding actual processes occurring on Mellageret, and future research may disallow direct comparison of these two areas in these terms. However, the final definite workshop phase on Folkebibliotekstomta occurs within the A.D.1125-1275 date-range. When compared to the proposed dating of the establishment of the Mellageret metalworking centre in the second half of the 12th century, the possibility may exist that the end of workshop activity on Folkebibliotekstomta coincides with the establishment of

workshops on Mellageret, the former being abandoned in favour of a large-scale centralized metalworking site removed to the northern edge of the town.

7.4. Economic and social perspectives.

The Mellageret metalworking site represents a so far unique find in a medieval urban context in Europe and Scandinavia. It is unique in terms of size and surviving structural and material evidence, offering great potential for archaeometallurgical research into a phenomenon only glimpsed rarely before.

However, whether Mellageret in *absolute* terms represents a unique phenomenon - a centre of large-scale metalworking, clearly involving the working of copper and iron (and other metals?), in close relation to a centre of urban population - is only one of the questions arising from its discovery. The lack of similar finds elsewhere in Scandinavia and Europe does not rule out the presence of similar centres of production in close proximity to other medieval towns (e.g. the smithies beyond Øvrestretet in Bergen; Helle 1982, p. 432).

How did Mellageret come into being? Is it the product of centralized authority? Certainly the well-regulated lay-out of the workshops from the start and through some possible 200 years of activity bears the thumbprint of organization. If the provisional dating for the establishment of the centre holds at some point in the second-half of the 12th century, two major historical figures, of great importance to the social and economic development of Nidaros, immediately leap to mind, namely Archbishop Øystein, who became the first archbishop of Nidaros in 1152, and King Sverre who was crowned in 1177. It would be rash in the extreme at this stage to identify either of these figures with the establishment of this centre, though they represent the foci of power at this time of apparent economic up-turn, following on a period of less consolidated power.

Might the establishment of Mellageret reflect some impulse of self-organization among the metalworkers themselves? At a nominal rent from the landowner, or on some other economic (tax?) arrangement, the area may have been adopted by several "bergslag" or metalworking communities from the surrounding area as a centre for refining activities, for example. However, with regard to Bergen (Helle 1982, pp. 456-7), the first real fraternities of craftsmen did not appear until the late medieval period, and earlier attempts (from at least the end of the 13th century) to organize professions into guilds were stifled by legislation; for example a law amendment of 1293/94 forbade craftsmen, including goldsmiths and blacksmiths, to form any kind of association. To argue for special status among the Trøndelag metalworkers in view of this might be rather difficult.

A whole host of questions arises relating to the economic and social implications of Mellageret.

What was the precise nature of production and the volume thereof? What are the implications for local and international trade? Was Mellageret a major catalyst initiating economic impetus or was it itself a symptom thereof? What particular influence did it have on the town's economy? What effect did it have on other craft industries, for example comb-makers?

The list is considerable, and only when the results of future interdisciplinary research can be assembled will the picture become clearer.

7.5. Future work and research potential.

The unique standing of Mellageret site has already been noted. The site has great potential impact in the archaeometallurgical area in particular, and much is dependent on establishing a thorough programme of metallurgical analyses to elucidate the nature and scale of processes conducted here. The archaeological information detailed in this report provides the framework in which such research can be conducted and any sampling strategy can be correlated with the sequence of structures and deposits here presented within a chronological context. Particular areas remaining to be thoroughly researched include the structural evidence - buildings, flooring, hearths/furnaces and other structural arrangements and features.

The quadrants FD and, in particular FC, are under-researched and require further stratigraphical work.

The vast body of finds material provides a corpus of great potential on all research fronts.

Further documentary research may well prove fruitless in assessing the historical context of Mellageret, though much remains to be done to reconstruct the social, economic and cultural status of this major medieval metal-working centre.

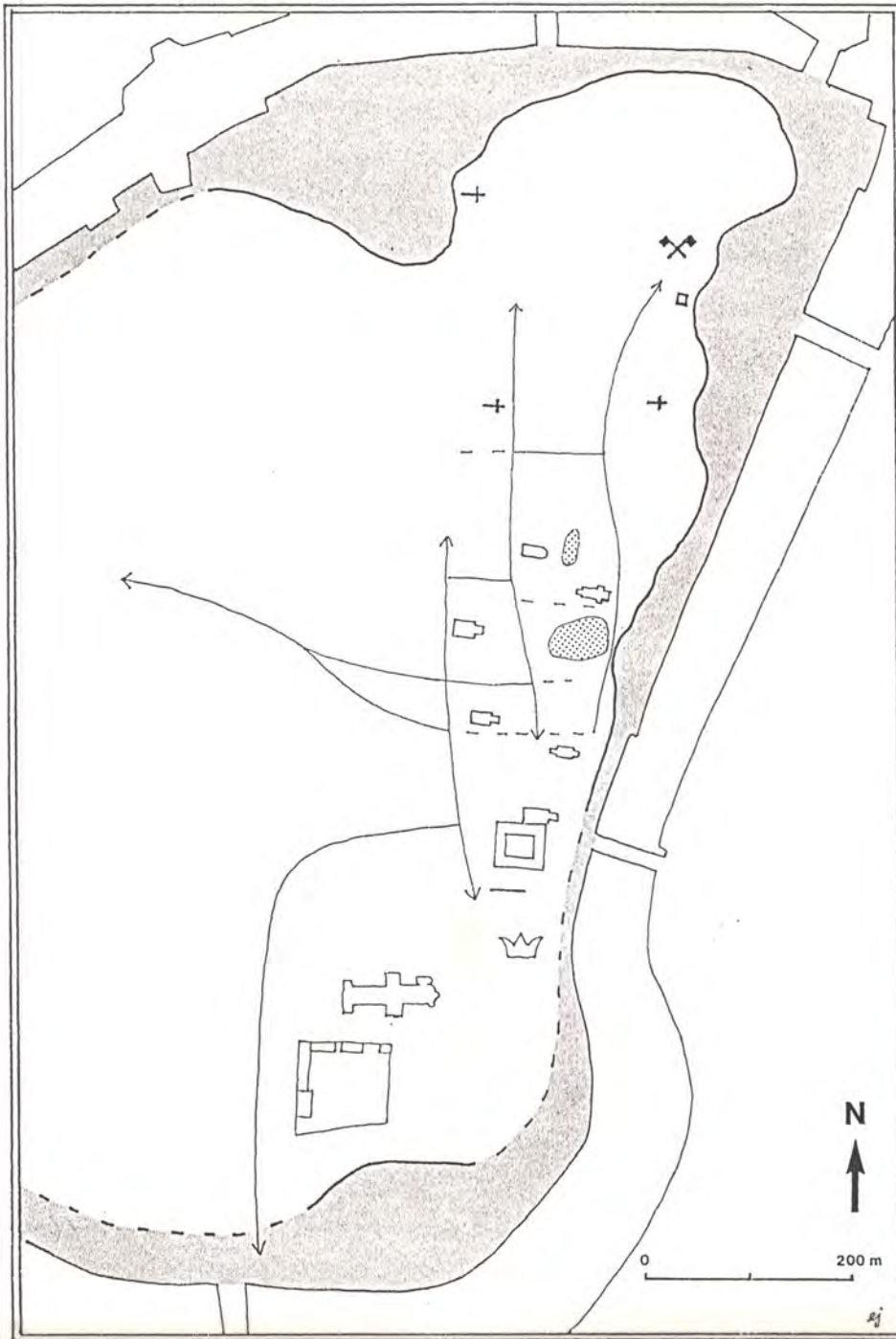


Fig. 92. Plan showing the shoreline and the major urban elements and communications network ca. A.D. 1300. Industry area to NE, various churches, streets (including Krambugata), the King's estate, the Cathedral and the Archbishop's Palace to S. (Drawn by E. Jondell.)

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CONTEXT LISTS

Introduction

Context numbers were used on both F-site and Trench B. The following lists, one for each site, are intended to facilitate easy access to the individual layers and structures for future researchers.

The F-site list is structured as follows: Each context is numbered, placed within its site quadrant (FA, FB, FC, FD), and, if phased therein, the quadrant phase number is given (e.g. FA:1, or FB:2 etc.). If the context is related to a construction, the "K" number thereof is given (K8 etc.); in some cases K numbers have not been assigned to contexts associated with structures, though the fact that it is a "structural" context is denoted thus: K(-). Where a context has not been phased (in FC and FD mainly), the context is nevertheless ascribed to its quadrant and area therein: e.g. FC - (Area 3) etc.

F-site: Context List.

<u>CONTEXT NO.</u>	<u>LOCATION (AREA - PHASE)</u>	<u>CONTEXT NO.</u>	<u>LOCATION (AREA - PHASE)</u>	<u>CONTEXT NO.</u>	<u>LOCATION (AREA - PHASE)</u>
1	FA:(Area 4)	38	FC-(Area 1)	74	FB:4 K(-)
2	FA:(Area 4)	39	FC-(Area 1)	75	FB:4? 3.5?
3	FA:(Area 4)	40	FC-(Area 1)	76	FB:5
4	FA:(Area 4)	41	FC-(Areas 1-2)	77	FB:5
5	FA:8	41a	FC-(Areas 1-2)	78	FB:4 K(-)
6	FB:4	42	FC-(Area 1)	79	FB:4 K8
7	FB:4	43	FC-(Area 1)	80	FB:4
8	FB:5	44	FC-(Area 2)	81	FB:4
9	FB:5	45	FC-(Area 1)	82	FB:4
10	FB:5	46	FB:3.5	83	FC-(Area 1)
11	FA:8	47	FB:3.5	84	FC-(Area 1)
12	FA:8	48	FB:3.5 K(-)	85	FC-(Area 1)
13	FA:5	49	FB:3.5 K2	86	FC-(Area 1)
14	FB:?	50	FB:4	87	FC-(Area 1)
15	FA:8 K87	51	FB:4	88	FB:4
16	FB:4	52	FB:5	89	FB:4
17	FA:8	53	FB:4 K(-)	90	FB:3.4
18	FA:8	54	FB:(Area 7)	91	FB:4 K8
19	FA:8	55	FB:(Area 7)	92	FB:3.4
20	FA:8 K87	56	FB:4	92a+b	FB:3.4 K2
21a+b	FA:7 K70	57	FB: K(-)	93	FB:3.4? K(-)
22	FA:7	58	FC-(Area 1)	94	FC-(Area 1)
23	FA:8	59	FB:4	95	FB:3.5
24	FB:4	60	FB:3.5 K(-)	96	FB:3.5
24a	FB:4 K8	61	FB:3.5 K(-)	97	FC-(Areas 1+2)
25	FA: K(-)	62	FB:3.5	98	FC-(Areas 1+2)
26	DELETED	62b	FB:3.5	99	FB:3.5 K(-)
27	FB:4	63	FB:4	100	FB:3.5
28	FB:4	64	FB:4?	101	FB:3.5
29	FB:5 K(-)	65	FB:4	102	FB:3.5
30	FB:5	66	FB:(Area 7)	103	FB:3.5 K(-)
31	FB:5	67	FB:(Area 7)	104	FB:3.5 K(-)
32	FB:5	68	FB:2?	105	FB:3.5
33	FB:4	69	FB:1	106	FB:3.5
34	FB:4 K(-)	70	FB:3.5	107	FB:3.5
35	FB:4? K(-)	71	FB:3.5	108	FB:3.4
36	FB:3.5	72	FB:3.5	109	FB:3.4 K6
37	FB:3.5	73	FB:4 K(-)	110	FB:3.4

<u>CONTEXT NO.</u>	<u>LOCATION (AREA - PHASE)</u>	<u>CONTEXT NO.</u>	<u>LOCATION (AREA - PHASE)</u>	<u>CONTEXT NO.</u>	<u>LOCATION (AREA - PHASE)</u>
111	FB:3.4 K2	167	FB:3.3	222	FC-(Area 3)
112	FB:3.4	168	FB:3.3?	223	FC-(Area 3)
113	FB:3.4	169	DELETED	224	FC-(Area 3)
114	FB:3.4	170	FB:2 K1	225	FC-(Area 4)
115	FB:3.5	171	FB:3.3/3.4? K(-)	226	FC-(Area 4)
116	FB:3.4	172	FB:3.4	227	FC-(Area 4)
117	FB:3.5	173	FB:3.4	228	FC-(Area 3)
118	FB:3.5	174	FB:3.4	229	FC-(Area 3)
119	FC-(Area 2)	175	FB:3.3?	230	FC-(Area 3)
120	FC-(Area 1)	176	FB:3.3?	231	FC-(Area 4)
121	FC-(Area 1)	177	FB:3.3?	232	FC-(Area 4)
122	FC-(Area 1)	178	FB:3.3	233	FB:3.2
123	FC-(Area 1)	179	FB:3.4? K(-)	234	FB:3.2
124	FC-(Area 1)	180	FB:3.4? K(-)	235	FB:3.1
125	FB:3.4	181	FB:2	236	FB:3.1 K2
126	FB:3.5	182	FB:3.3/4? K(-)	237	FB:3.1 K2
127	FB:3.5	183	FB:3.3/4? K(-)	238	FC-(Area 3)
128	FB:3.5 K(-)	184	FB:3.3/4? K(-)	239	FC-(Area 3)
129	FB:3.5	185	FB:3.3 K2	240	FC-(Area 4)
130	FB:3.3 K2	186	FB:3.3	241	FC-(Area 4)
131	FB:3.3	187	FB:3.3	242	FC-(Area 4)
132	FB:3.3/4	188	FB:3.5	243	FC-(Area 4)
133	FB:3.3	189	FB:3.4	244	FB:3.3
134	FB:3.3 K2	190	FB-(Area 5)	245	FB:3.1 K2
135	FB:3.1 K2	191	FB:3.4	246	FB:3.1 K2
136	FB:3.3	192	FB:3.4	247	FB:2 K1
137	FB:3.3 K2	193	FB:3.5	248	FC-(Area 3)
138	FB:3.3/4	194	FB:3.4	249	FB:3.4 K7
139	FB:3.2	195	FB:3.5	250	FB:3.3
140	FB:3.4	196	FB:3.2	251	FC-(Area 3)
141	FB:3.4	197	FB:3.1 K2	252	FC-(Area 3)
142	FB:3.4	198	FB:3.5	253	FB:3.3
143	FB:3.2	199	FB:3.5	254	FB:3.3
144	FB:3.4	200	FB:3.4	255	FB:3.3
145	FB:3.3	201	FB:3.4? K(-)	256	FB:3.3/4?
146	FB:3.4 K(-)	202	FB:3.4	257	FB:3.4 K7
147	FB:3.5 K(-)	203	FB:3.1 K2	258	FC-(Area 3)
148	FB:3.4 K(-)	204	FB:3.1 K2	259	FA-(Area 6)
149	FB:3.2	205	FB:3.1/2?	260	FA-(Area 6)
150	FB:3.1 K2	206	FB:1	261	FB:3.4 K7
151	FB:3.2 K3	207	FB:2	262	FB:3.4
152	FB:3.2 K3	208	FB:3.4	263	FB:3.4
153	FB:3.2	209	FB:3.4	264	FB:3.4
154	FB:3.1? K(-)	210	FB-(Area 6)	265	FB:3.4
155	FB:3.1 K2	211	FB:3.4	266	FB:3.4
156	FB:3.3 K2	212	FB:3.4	267	FB:3.4?
157	FB:3.3	213	FB:3.4	268	FC-(Area 3)
158	FB:3.3	214	FB:3.4 K(-)	269	FA-(Area 6)
159	FB:3.1 K2	215	FC-(Area 3)	270	FA-(Area 6)
160	FB:3.1 K3?	216	FC-(Area 3)	271	FA-(Area 6)
161	FB:3.2 K3?	216a	FC-(Area 3)	272	FA:?
162	FB:(Area 5)	217	FB:3.4	273	FA-(Area 6)
163	FB:(Area 5)	218	FB:3.4	274	FA-(Area 6)
164	FB:3.4	219	FC-(Area 3)	275	FB-(Area 6)
165	FB:3.5	220	FC-(Area 3)	276	FA-(Area 6)
166	FB:3.1 K2	221	FC-(Area 3)	277	FA-(Area 6)

CONTEXT NO.	LOCATION (AREA - PHASE)	CONTEXT NO.	LOCATION (AREA - PHASE)	CONTEXT NO.	LOCATION (AREA - PHASE)
278	FA-(Area 6)	334	FB-(Area 6)	390	FA:6 K62
279	FA-(Area 6)	335	FB-(Area 6)	391a+b	FA:6
280	FA:7 K74	336	FB-(Area 6)	392	FA:6/7?
281	FA:8	337	FD:3	393	FA:6/7?
282	FA-(Area 6)	338	FA:8?	394	FA:6?
283	FA-(Area 6)	339	FD:2	395	FA:6 K58
284	FA-(Area 6)	340	FB:1	396	FA:7
285	FA:8 K82	341	FB:1	397	FA:6
286	FA- (Area 6)	342	FB:1	398	FB:3.4
287	FA-(Area 6)	343	FD:2	399	FB:3.4
288	FA-(Area 6)	344	FD:3	400	FB:3.3
289	FB-(Area 6)	345	FA:8 K82	401	FB:3.3
290	FB-(Area 6)	346	FC-(Area 3)	402	FB:3.3
291	FA:7	347	FC-(Area 3)	403	FB:3.3
292	FA-(Area 6)	348a+b	FC-(Area 3)	404	FB:3.3
293	FC-(Area 3)	349	FC-(Area 3)	405	FB:3.3
294	FC-(Area 3)	350	FD:2	406	FA:8
295	FC-(Area 3)	351	FD-(Area 1)	407	FA:7 K72
296	FC-(Area 3)	352	FA:6?	408	FA:7 K72
297	FC-(Area 3)	353	FA:7	409	FA:8
298	FB:3.4	354abc	FC-(Area 3)	410	FA:7 K72
299	FA:8	355	FC-(Area 3)	410g	FA:7 K72
300	FA:7	356	FD:2	411	FA:6
301	FA-(Area 6)	357	FD:2	412	FA:?
302	FA-(Area 6)	358	FC-(Area 3)	413	FA:8
303	FA-(Area 6)	359	FA:8	414	FA:8 K79
304	FA:2	360	FA:8	415	FA:8?
305	FA-(Area 6)	361	FA:8? K(-)	416	FA:6
306	FA-(Area 6)	362	FA:7 K73	417	FA:6
307	FA:8 K80	363	FA:8	418	FA:?
308	FA:8 K80	364	FA:7	419	FA:8
309	FC-(Area 3)	365	FA:7	420	FC-(Area 3)
310	FC-(Area 3)	366	FA:7	421	FC-(Area 3)
311	FA:8	367	FA:6	422	FC-(Area 3)
312	FA:8	368	FA:6?	423	FC-(Area 3)
313	FA:8	369	FA:8 K85	424	FC-(Area 3)
314	FA:8	370	FA:7? K(-)	425	FA:8
315	FA:8	371	FD:2	426	FA:8
316	FC-(Area 3)	372	FD:2	427	FA:6
317	FC-(Area 3)	373	FD:1	428	FA:6 K61
318	FB:3.4	374	FA:8 K85	429	FC-(Area 3)
319	FB:3.4	375	FA:7? K(-)	430	FC-(Area 3)
320	FC-(Area 3)	376	FA:8 K80	431	FC-(Area 3)
321	FB-(Area 6)	377	FD:1 K(-)	432	FB:3.3? K(-)
322	FB:3.4	378	FD:1	433	FB:3.3
323	FA:8	379	FA:8	434	FB:3.4? K(-)
324	FC-(Area 3)	380	FA:7	435	FB:3.3
325	FC-(Area 3)	381	FC-(Area 3)	436	FA:8 K77
326abc	FC-(Area 3)	382	FA:8 K82	437	FA:6 K63
327	FC-(Area 3)	383	FA:8	438	FB:3.2
328	FA:8 K84	384	FA:8	439	FB:3.2
329	FC-(Area 3)	385	FA:8	440	FB:3.2
330	FA:8 K83	386	FA:8	441	FB:3.2/3?
331	FD:3	387	FC-(Area 3)	442	FB:3.2
332	FC-(Area 3)	388	FC-(Area 3)	443	FB:3.2
333	FC-(Area 3)	389	FC-(Area 3)	444	FB:3.2?

<u>CONTEXT NO.</u>	<u>LOCATION (AREA - PHASE)</u>	<u>CONTEXT NO.</u>	<u>LOCATION (AREA - PHASE)</u>	<u>CONTEXT NO.</u>	<u>LOCATION (AREA - PHASE)</u>
445	FB:3.2?	500	FA:8	556	FC-(Area 3)
446	FA:8	501	FA:8	557	FB:2 K1
447	FA:8 K78	502	FA:8	558	FA:8
448	FA:7 K72	503	FC-(Area 3)	559	FA:6 K56
449	FA:7 K72	504	FC-(Area 3)	560	FA:6
450a	FA:6 K69	505	FA:6	561	FA:6
450b	FA:6 K68	506	FA:8 K81	562	FA:6
451	FA:8	507	FA:8 K81	563	FA:6? K(-)
452	FA:7 K72	508	FA:6	564	FA:6
453	FA:7 K72	509	FA:6	565	FA:6
454	FA:8 K81	510	FA:6	566	FA:6 K46
455	FB:3.1/2?	511	FA:6 K47	567	FA:7 K70
456	FB:3.2?	512	FA:6 K47	568	FB:2
457	FB:3.1 K2	513	FA:6	569	FB:2 K1
458	FB:3.1 K2	514	FA:6	570	FB:2 K1
459	FB:3.1 K2	515	FC-(Area 3)	571	FA:6 K66
460	FB:3.1 K2	516	FA:8	572	FA:6 K66
461	FA:8 K81	517	FA:8	573a+b	FA:6
462	FA:8 K86	518	FA:8	574	FA:6
463	FA:8	519	FA:8	575	FA:6
464	FA:7 K70	520	FA:6 K56	576	FA:6/7?
465	FA:7	521	FA:6 K56	577	FA:7 K71
466	FA:7?	522	FB:2	578	FA:6
467	FA:7?	523	FB:2	579	FA:5
468	FA:7	524	FB:2 K1	580	FA:6
469	FA:7	525	FB:1	581	FA:3 K15
470	FC-(Area 3)	526	FC-(Area 3)	582	FA:6/7?
471	FC-(Area 3)	527	FC-(Area 3)	583	FA:7
472	FC-(Area 3)	528	FC-(Area 3)	584	FC:(Area 3?)
473	FA:7	529	FC-(Area 3)	585	FA:6 K53
474	FA:6	530	FA:8 K81	586	FA:7
475	FA:8?	531	FA:8	587	FA:7
476	FA:8	532	FA:6 K64	588	FC-(Area 3)
477	FC-(Area 3)	533	FA:8?	589	FA:6
478	FA:6 K55	534	FA:8	590	FA:7 K70
479	FA:6 K59	535	FA:8	591	FA:6
480	FA:6	536	FA:8?	592	FC-(Area 3)
481	FB:3.1?	537	FA:?	593	FA:7 K70
482	FB:2	538	FA:6	594	FA:6 K48
483	FB:2	539	FA:6	595	FA:?
484	FB:2	540	FA:6	596	FC-(Area 3)
485	FB:2	541	FC-(Area 3)	597	FC-(Area 3)
486	FA:/ K70	542	FC-(Area 3)	598	FC-(Area 3)
487	FA:6	543	FC-(Area 3)	599	FC-(Area 3)
488	FA:7 K75	544	FA:6	600	FC-(Area 3)
489	FA:6	545	FC-(Area 3)	601	FC-(Area 3)
490	FA:6	546	FC-(Area 3)	602	FC-(Area 3)
491	FA:6 K56	547	FC-(Area 3)	603	FC-(Area 3)
492	FA:6 K60	548	FA:8	604	FA:6
493	FA:6 K56	549	FA:8	605	FA:6
494	FA:7 K70	550	FA:7	606	FA:6 K57
495	FA:8	551	FA:6	607	FA:6
496	FA:8 K81	552	FA:6	608	FA:6
497	FA:8?	553	FC-(Area 3)	609a+b	FA:6
498	FA:8 K76	554	FC-(Area 3)	610	FA:6
499	FA:8	555	FC-(Area 3)	611	FA:6

CONTEXT NO.	LOCATION (AREA - PHASE)	CONTEXT NO.	LOCATION (AREA - PHASE)	CONTEXT NO.	LOCATION (AREA - PHASE)
612	FB:3.4?	667	FA:5 K40	721	FA:4 K34
613	FB:3.4	668	FA:6	722	FA:4 K31
614	FB:3.3/4?	669	FA:6	723	FA:4
615	FB:3.4	670	FB:3.3	724	FA:4 K30
616	FB:3.4	671	FB:3.3	725	FA:4
617	FB:3.4	672	FB:3.1/2?	726	FA:3/4 K32
618	FA:6	673	FB:3.3	727	FB:3.2 K2
619	FA:6	674	FB:3.1/2?	728	FB:3.2
620	FC-(Area 3)	675	FB:3.1 K2	729	FB:3.1
621	FA:6	676	FC-(Area 2?)	730	FB:3.1 K5
622) SITE NUMBERING ERROR - THESE NOS. NOT USED	677	FA:6	731	FC-(Area 2)
623		678	FA:6	732	FC-(Area 2)
624		679	FA:?	733	FC-(Area 2)
625		680	FC-(Area 2?)	734	FC-(Area 2)
626		681	FA:5	735	FC-(Area 2)
627		682	FA:6	736	FC-(Area 2)
628		683	FA:6	737	FC-(Area 3)
629	684	FC-(Area 3)	738	FC-(Area 2?)	
630	FA:5 K36	685	FC-(Area 2?)	739	FA:4/5
631	FA:5 K36	686	FC-(Area 2?)	740	FA:5
632	FA:5? K(-)	687	FA:6	741	FA:6
633	FA:5 K37	688	FA:5	742	FA:6? K(-)
634	FA:5 K37	689	FA:3 K13	743	FA:6? K(-)
635	FA:5	690	FA:5	744	FB:3.2
636	FA:5? K(-)	691	FA:5	745	FB:3.2
637	FA:5	692	FA:5 K43	746	FB:3.1?
638	FA:6?	693	FA:5	747	FB:3.2 K5
639	FA:6 K54	694	FA:5	748	FB:3.2
640	FA:6 K56	695	FA:5	749	FA:2
641	FC-(Area 3)	696	FA:5	750	FC-(Area 2)
642	FA:6	697	FA:5 K39	751	FC-(Area 2)
643	FA:6	698	FA:5	752	FC-(Area 2)
644	FB:3.4	699	FA:6 K66	753	FA:5
645	FB:3.4	700	FA:6 K66	754	FA:5
646	FB:3.3 K2	700b	FA:3 K16	755	FA:5 K41
647	FB:3.3/4?	701	FA:6 K65	756	FA:6 K49
648	FB:3.4 K(-)	702	FA:3 K13	757	FA:6 K49
649	FB:3.3 K2	703	FB:3.2 K4	758	FA:5/6? K(-)
650	FB:3.3	704	FB:3.2	759a+b	FA:5 K37
651a	FA:6	705	FB:3.2 K4	760	FA:5? K(-)
651b	FA:5	706	FB:3.2	761	FA:5?
652	FA:6 K46	707	FB:3.2 K4	762	FA:4/5
653	FA:6	708	FB:3.2	763	FA:5
654	FC-(Area 3)	709	FB:3.2	764	FA:5
655	FC-(Area 2?)	710	FB:3.2 K4	765	FA:5 K44
656	FA:6	711	FA:6	766	FC-(Area 2)
657	FA:6	712	FC-(Area 2?)	767	FC-(Area 2)
658	FA:6	713	FC-(Area 2?)	768	FA:4?
659	FA:6 K67	714	FA:6 K69	769	FA:?
660	FC-(Area 2?)	715	FA:4/5	770a	FA:5 K38
661	FC-(Area 2?)	716	FA:5	770b	FA:5 K45
662	FC-(Area 3)	717a	FA:4	771	FA:3 K21
663	FA:6?	717b	FA:4	772	FA:3? K(-)
664	FC-(Area 2?)	718	FA:5	773	FA:1
665	FC-(Area 2?)	719	FA:4	774	FA:3 K23
666	FA:6	720	FA:4 K33	775	FA:5 K43

CONTEXT NO.	LOCATION (AREA - PHASE)	CONTEXT NO.	LOCATION (AREA - PHASE)	CONTEXT NO.	LOCATION (AREA - PHASE)
776	FA:5	828	FC-(Area 2)	883	FA3 K20
777	FA:5?	829	FC-(Area 2)	884	FA:6 K47
778	FA:1	830	FB:3.2 K5	885	FC-(Area 3)
779	FA:5	831	FB:3.2 K5?	886	FC-(Area 3)
780	FA:3	832	FA:2	887	FC-(Area 3)
781	FA:4	833	FA:4	888	FC-(Area 3)
781b	FA:3	834	FA:4	889	FA:3 K20
782	FA:3 K22	835a+b	FA:4 K27	890	FA:3 K20
783	FA:2	836	FA:4	891	FA:3 K20
784	FA:1	837	FA:3	892	FA:3 K18
785	FA:3	838	FA:5	893	FA:3
786	FA:3?	839	FA:5 K37	894	FA:3 K21
787	FA:3	840	FA:4 K35	895	FA:3 K20
788	FA:3	841	FA:?	896	FA:3 K20
789	FC-(Area 2)	842	FC-(Area 2)	897a	FA:3 K17
790	FC-(Area 2)	843	FC-(Area 2)	897b	FA:4 K29
791	FC-(Area 2)	844	FC-(Area 2)	898	FA:6 K52
792	FC-(Area 2)	845	FA:2	899	FA:2?
793	FC-(Area 2)	846	FA:?	900	FA:3 K14
794	FA:4?	847	FA:4	901	FA:3 K26
795	FA:4	848	DELETED	902	FA:1
796	FB:?	849a+b	FA:2	903	FA:3
797	FB:2	850a	FA:6	904	FA:3
798	FB:2 K(-)	850b	FA:5	905	FA:3
799	FB:3.1 K2	851	FA:3	906	FA:2/3?
800	FB:1	852	FA:?	907	FA:3 K88
800II	FB:1	853	FA:4 K28	908	FA:1-3 K12
801	FA:?	854	FA:4 K28	909	FA:3 K23
802	FA:5	855	FC-(Area 3)	910	FA:3 K23
803	FC-(Area 2)	856	FC-(Area 3)	911	FA:3 K23
804	FC-(Area 2)	857	FB:3.1 K2	912	FA:1
805	FC-(Area 2)	858	FB:3.1 K2	913	FA:1 K10
806a	FA:3 K20	859	FB:2 K1	914	FA:1 K11
806b+c	FA:3 K21	860	FB:2 K1	915	FA:1
806d	FA:3 K22	861	FA:3 K22	916	FA:1
807	FA:3 K24	862	FA:3	917	FA:1
808	FA:5 K43	863	FA:3 K18	918	FD-(Area 2)
809	FA:5 K44	864	FA:3 K20	919	FB:3.4
810	FA:6 K51	865	FA:3 K22	919a	FB:3.4 K2
811	FA:3?	866	FA:3 K21	920	FA:1
812	FA:2	867	FA:3 K21	921	FA:6 K50
813a	FA:3	868	FA:2		
814	FA:3 K21	869	FA:3 K(-)		
815	FA:3 K21	870	FA:3		
816	FA:5 K37	871	FA:3 K25		
817	FA:5 K37	872	FA:4?		
818	FA:5 K37	873	FA:3 K88		
819	FA:5 K37	874	FA:3 K20		
820	FA:5 K37	875	FA:3?		
821	FA:5 K37	876	FA:3		
822	FA:5 K37	877	FA:3 K19		
823	FA:5 K37	878	FA:5 K42		
824	FA:5	879	FA:3		
825	FA:3? K(-)	880a+b	FA:3 K21		
826	FA:3 K21	881	FA:3 K21		
827	FA:3/4	882	FA:6 K51		

Trench B: Context List.

<u>CONTEXT NO.</u>	<u>LOCATION (AREA - PHASE)</u>	<u>CONTEXT NO.</u>	<u>LOCATION (AREA - PHASE)</u>	<u>CONTEXT NO.</u>	<u>LOCATION (AREA - PHASE)</u>
1	B:4.2?	19	B:4.2	36	B:1?
2	B:4.2	20	B:2	37	B:4.1 K2
3	B:4.2	21	B:4.1 K9	38	B:4.1?
4	B:4.2 K(-)	22	B:4.1 K9	39	B:4.1 K2
5	B:4.2 K9	23	B:4.1 K9	40	B:1 K(-)
6	B:4.2 K9	24	B:4.1 K9	41	B:2/3? K(-)
7	B:4.1 K9	25	B:4.2 K(-)	42	B:4.2 K(-)
8	B:4.1 K9	26	B:4.2 K(-)	43	B:1
9	B:4.1 K9	27	B:4.1 K2	44	B:3 K(-)
10	B:4.1 K9	27b	B:4.2 K9	45	B:1
11	B:(Area 5) K(-)	28	B:2	46	B:1
12	B:4.1 K9	29	B:4.2	47	B:1
13	B:2	30	B:4.1 K9	48	B:1
14	B:4.2	31	B:4.1 K2	49	B:1 K(-)
15	B:4.2	32	B:4.1	50	B:1 K(-)
16	B:?	33	B:4.1 K2	51	B:4.2 K(-)
17	B:4.2	34	B:2	52	B:4.2 K(-)
18	B:4.1 K9	35	B:4.1 K2	53	B:4.2 K(-)









