Universitetets Kulturhistoriske Museer
Oldsakssamlingen
Fredriks gt 2
0164 Oslo

Deres ref; 99/5442

PRØVERESULTAT FRA UNDERSØKELSE AV AUTOMATISK FREDEDE KULTURMINNER.
GJELDER; Kjølstad,88/12,13, Kaggestad ,77/1 og Morud 145/1 Modum kommune,Buskerud.

Vedlagt prøveresultat av radiokarbondateringer fra overstående lokaliteter.

Vikersund 2408 2000

Med hilsen

Olav Sørensen

Kopi ; Buskerud fylkeskommune ,fylksekonservatoren.

Professor Arne Espelund

BETA ANALYTIC INC.

RADIOCARBON DATING SERVICES

Mr. DARDEN G. HOOD
Director

RONALD E. HATFIELD
Laboratory Manager

CHRISTOPHER PATRICK
TERESA A. ZILKO-MILLER
Associate Managers

ANALYTICAL PROCEDURES AND FINAL REPORT

FINAL REPORT

This package includes the final date report, this statement outlining our analytical procedures, a glossary of pretreatment terms, calendar calibration information, billing documents (containing balance/credit information and the number of samples submitted within the yearly discount period), and peripheral items to use with future submittals. The final report includes the individual analysis method, the delivery basis, the material type and the individual pretreatments applied. Please recall any correspondences or communications we may have had regarding sample integrity, size, special considerations or conversions from one analytical technique to another (e.g. radiometric to AMS). The final report has also been sent by fax or e-mail, where available.

PRETREATMENT

Results were obtained on the portion of suitable carbon remaining after any necessary chemical and mechanical pretreatments of the submitted material. Pretreatments were applied, where necessary, to isolate ^{14}C which may best represent the time event of interest. Individual pretreatments are listed on the report next to each result and are defined in the enclosed glossary. When interpreting the results, it is important to consider the pretreatments. Some samples cannot be fully pretreated making their ^{14}C ages more subjective than samples which can be fully pretreated. Some materials receive no pretreatments. Please read the pretreatment glossary.

ANALYSIS

Materials measured by the radiometric technique were analyzed by synthesizing sample carbon to benzene (92% C), measuring for ^{14}C content in a scintillation spectrometer, and then calculating for radiocarbon age. If the Extended Counting Service was used, the ^{14}C content was measured for a greatly extended period of time. AMS results were derived from reduction of sample carbon to graphite (100 %C), along with standards and backgrounds. The graphite was then sent for ^{14}C measurement in an accelerator-mass-spectrometer located at one of six collaborating research facilities, who return the results to us for verification, isotopic fractionation correction, calendar calibration, and reporting.

THE RADIOCARBON AGE AND CALENDAR CALIBRATION

The "Conventional C14 Age (*)" is the result after applying C13/C12 corrections to the measured age and is the most appropriate radiocarbon age (the "*" is discussed at the bottom of the final report). Applicable calendar calibrations are included for organic materials and fresh water carbonates between 0 and 10,000 BP and for marine carbonates between 0 and 8,300 BP. If certain calibrations are not included with this report, the results were either too young, too old, or inappropriate for calibration.

4985 S.W. 74 COURT, MIAMI, FL 33155 U.S.A.
TELEPHONE: 305-667-5167 / FAX: 305-663-0964 / INTERNET: beta@radiocarbon.com
WEB SITE: http://www.radiocarbon.com

BETA

BETA ANALYTIC INC.

DR. M.A. TAMERS and MR. D.G. HOOD

UNIVERSITY BRANCH
4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305/667-5167 FAX: 305/663-0964
E-MAIL: beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Mr. Sorensen Olav

Report Date: 5/31/2000

Modum Kommune

Material Received: 4/18/2000

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 142615	430 +/- 60 BP	-25.0* o/oo	430 +/- 60* BP
SAMPLE : IA KJOLSTAD NEDRE 88/12.13			
ANALYSIS : Radiometric-Standard delivery (with extended counting)			
MATERIAL/PRETREATMENT :	(charred material): acid/alkali/acid		
2 SIGMA CALIBRATION :	Cal AD 1410 to 1530 (Cal BP 540 to 420)	AND Cal AD 1545 to 1635 (Cal BP 405 to 315)	
Beta - 142616	1640 +/- 50 BP	-25.0* o/oo	1640 +/- 50* BP
SAMPLE : IIA MORUD 145/1			
ANALYSIS : Radiometric-Standard delivery (with extended counting)			
MATERIAL/PRETREATMENT :	(charred material): acid/alkali/acid		
2 SIGMA CALIBRATION :	Cal AD 265 to 290 (Cal BP 1685 to 1660)	AND Cal AD 325 to 540 (Cal BP 1625 to 1410)	
Beta - 142617	240 +/- 50 BP	-25.3 o/oo	240 +/- 50 BP
SAMPLE : IIB MORUD 145/1			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT :	(charred material): acid/alkali/acid		
2 SIGMA CALIBRATION :	Cal AD 1515 to 1590 (Cal BP 435 to 360)	AND Cal AD 1620 to 1685 (Cal BP 330 to 265)	
	Cal AD 1735 to 1810 (Cal BP 215 to 140)	AND Cal AD 1925 to 1950 (Cal BP 25 to 0)	
Beta - 142618	1190 +/- 120 BP	-25.0* o/oo	1190 +/- 120* BP
SAMPLE : IIIA MODUM BAD 77/1			
ANALYSIS : Radiometric-Standard delivery (with extended counting)			
MATERIAL/PRETREATMENT :	(charred material): acid/alkali/acid		
2 SIGMA CALIBRATION :	Cal AD 635 to 1040 (Cal BP 1315 to 910)		
Beta - 142619	1190 +/- 50 BP	-24.1 o/oo	1200 +/- 50 BP
SAMPLE : IIIC MODUM BAD 77/1			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT :	(charred material): acid/alkali/acid		
2 SIGMA CALIBRATION :	Cal AD 690 to 970 (Cal BP 1260 to 980)		

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By International convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

BETA

BETA ANALYTIC INC.

DR. M.A. TAMERS and MR. D.G. HOOD

UNIVERSITY BRANCH
4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305/667-5167 FAX: 305/663-0964
E-MAIL: beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Mr. Sorensen Olav

Report Date: 5/31/2000

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 142620	360 +/- 50 BP	-27.4 o/oo	320 +/- 50 BP

SAMPLE : IVA MODUM BAD 77/1
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 1450 to 1660 (Cal BP 500 to 290)

Dates are reported as RCYBP (radiocarbon years before present, "present" = 1950A.D.). By International convention, the modern reference standard was 95% of the C14 content of the National Bureau of Standards' Oxalic Acid & calculated using the Libby C14 half life (5568 years). Quoted errors represent 1 standard deviation statistics (68% probability) & are based on combined measurements of the sample, background, and modern reference standards.

Measured C13/C12 ratios were calculated relative to the PDB-1 international standard and the RCYBP ages were normalized to -25 per mil. If the ratio and age are accompanied by an (*), then the C13/C12 value was estimated, based on values typical of the material type. The quoted results are NOT calibrated to calendar years. Calibration to calendar years should be calculated using the Conventional C14 age.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: est. C13/C12=-25:lab. mult=1)

Laboratory number: **Beta-142616**

Conventional radiocarbon age[1]: **1640±50 BP**

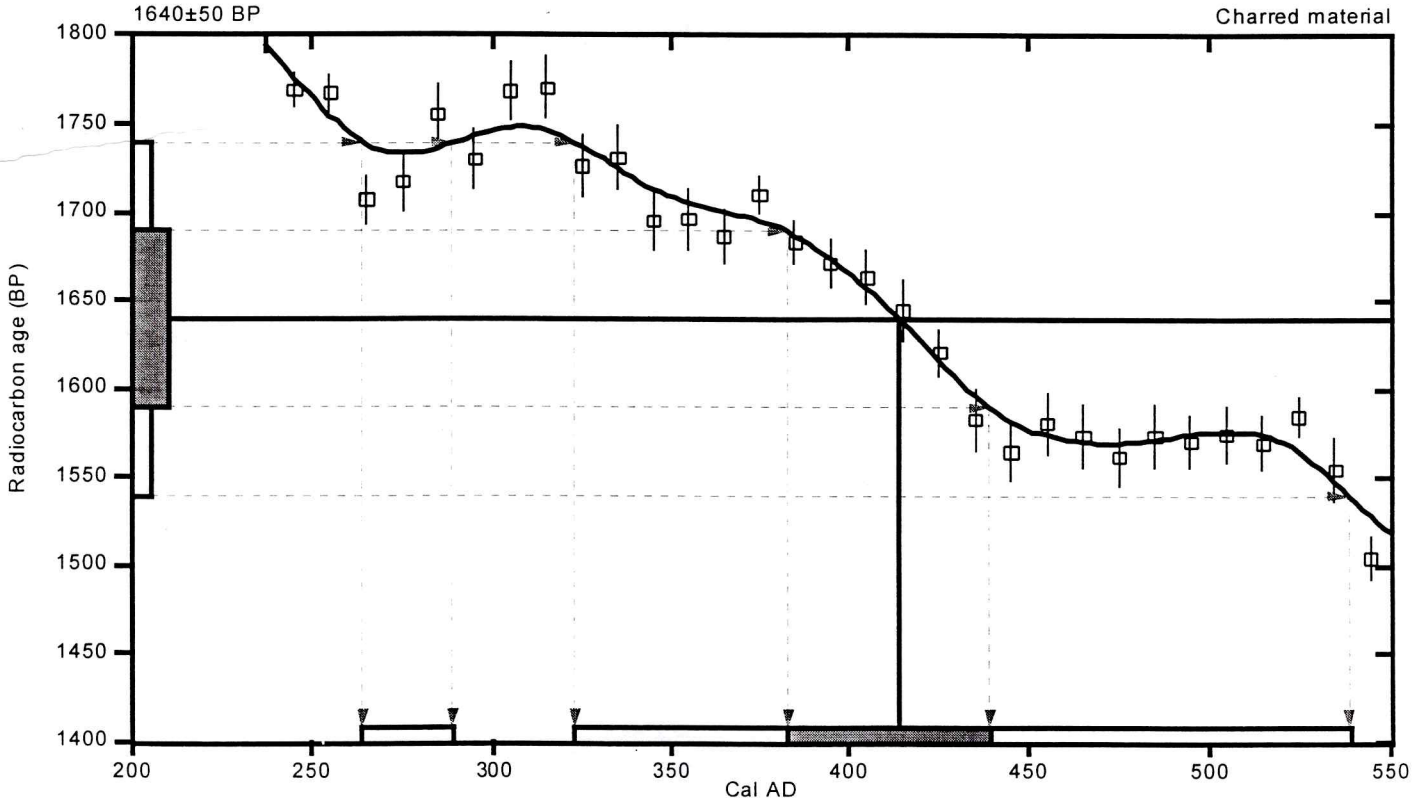
2 Sigma calibrated results: (95% probability) **Cal AD 265 to 290 (Cal BP 1685 to 1660) and Cal AD 325 to 540 (Cal BP 1625 to 1410)**

[1] C13/C12 ratio estimated

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 415 (Cal BP 1535)

1 Sigma calibrated result: (68% probability) Cal AD 385 to 440 (Cal BP 1565 to 1510)



References:

Database used
INTCAL98
Calibration Database
Editorial Comment
Stuiver, M., van der Plicht, H., 1998, Radiocarbon 40(3), pxii-xiii
INTCAL98 Radiocarbon Age Calibration
Stuiver, M., et. al., 1998, Radiocarbon 40(3), p1041-1083
Mathematics
A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

Beta Analytic Radiocarbon Dating Laboratory

4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • E-Mail: beta@radiocarbon.com

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: est. C13/C12=-25:lab. mult=1)

Laboratory number: **Beta-142616**

Conventional radiocarbon age[1]: **1640±50 BP**

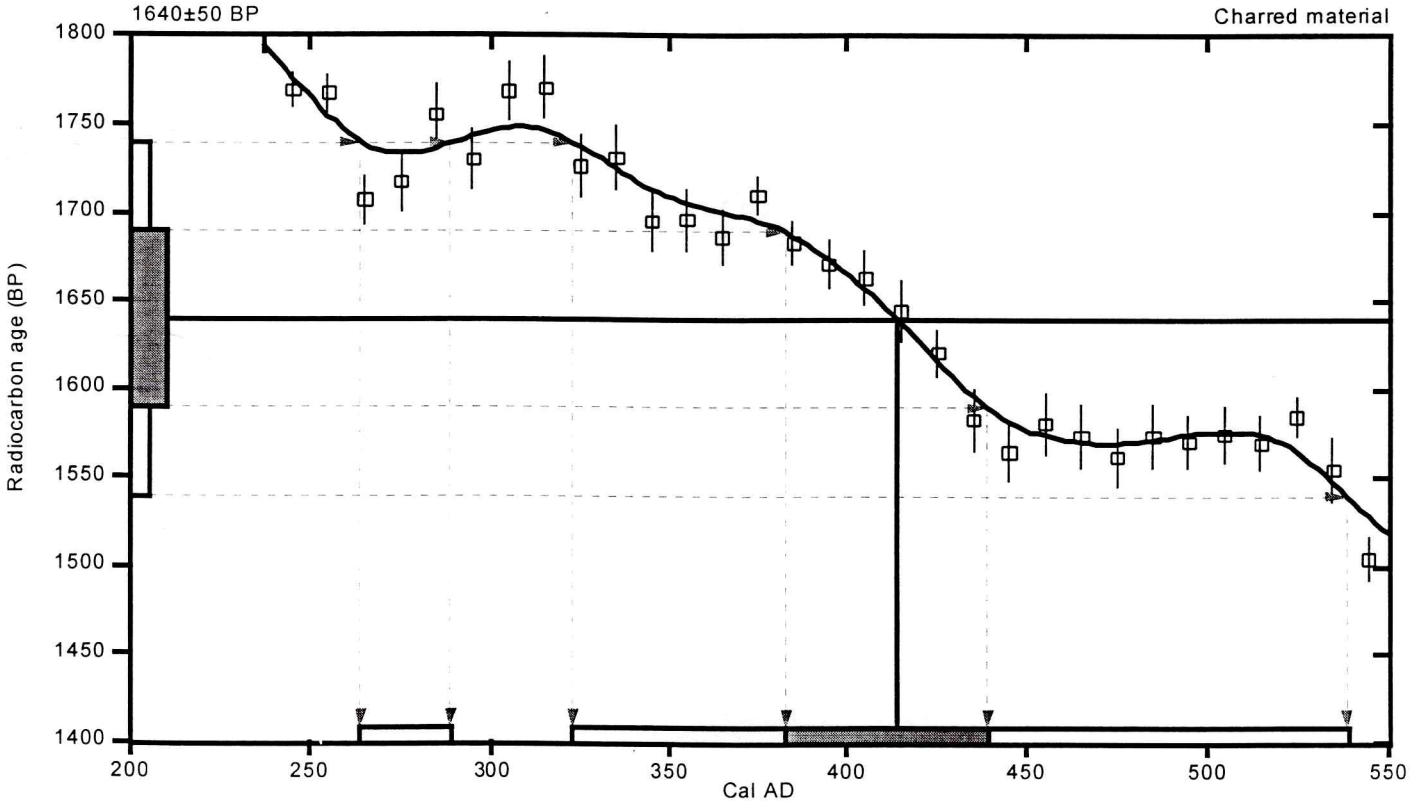
2 Sigma calibrated results: (95% probability) **Cal AD 265 to 290 (Cal BP 1685 to 1660) and Cal AD 325 to 540 (Cal BP 1625 to 1410)**

[1] C13/C12 ratio estimated

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 415 (Cal BP 1535)

1 Sigma calibrated result: (68% probability) Cal AD 385 to 440 (Cal BP 1565 to 1510)



References:

Database used
INTCAL98
Calibration Database
Editorial Comment
Stuiver, M., van der Plicht, H., 1998, Radiocarbon 40(3), pxii-xiii
INTCAL98 Radiocarbon Age Calibration
Stuiver, M., et. al., 1998, Radiocarbon 40(3), p1041-1083
Mathematics
A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

Beta Analytic Radiocarbon Dating Laboratory

4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • E-Mail: beta@radiocarbon.com

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: est. C13/C12=-25:lab. mult=1)

Laboratory number: **Beta-142618**

Conventional radiocarbon age[1]: **1190±120 BP**

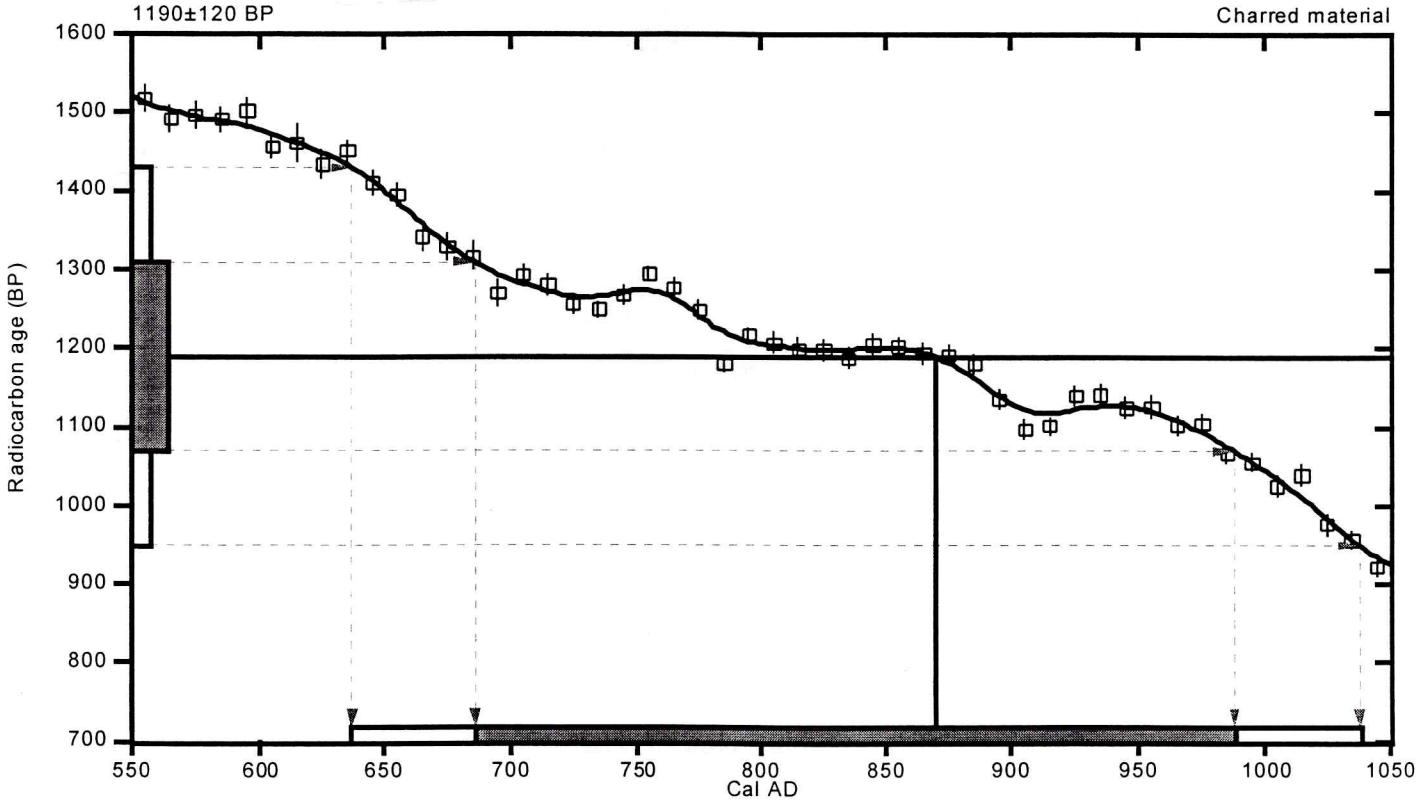
2 Sigma calibrated result: (95% probability) **Cal AD 635 to 1040 (Cal BP 1315 to 910)**

[1] C13/C12 ratio estimated

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 870 (Cal BP 1080)

1 Sigma calibrated result: (68% probability) Cal AD 685 to 990 (Cal BP 1265 to 960)



References:

Database used
INTCAL98
Calibration Database
Editorial Comment
Stuiver, M., van der Plicht, H., 1998, Radiocarbon 40(3), pxii-xiii
INTCAL98 Radiocarbon Age Calibration
Stuiver, M., et. al., 1998, Radiocarbon 40(3), p1041-1083
Mathematics
A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

Beta Analytic Radiocarbon Dating Laboratory

4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • E-Mail: beta@radiocarbon.com

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-24.1:lab. mult=1)

Laboratory number: **Beta-142619**

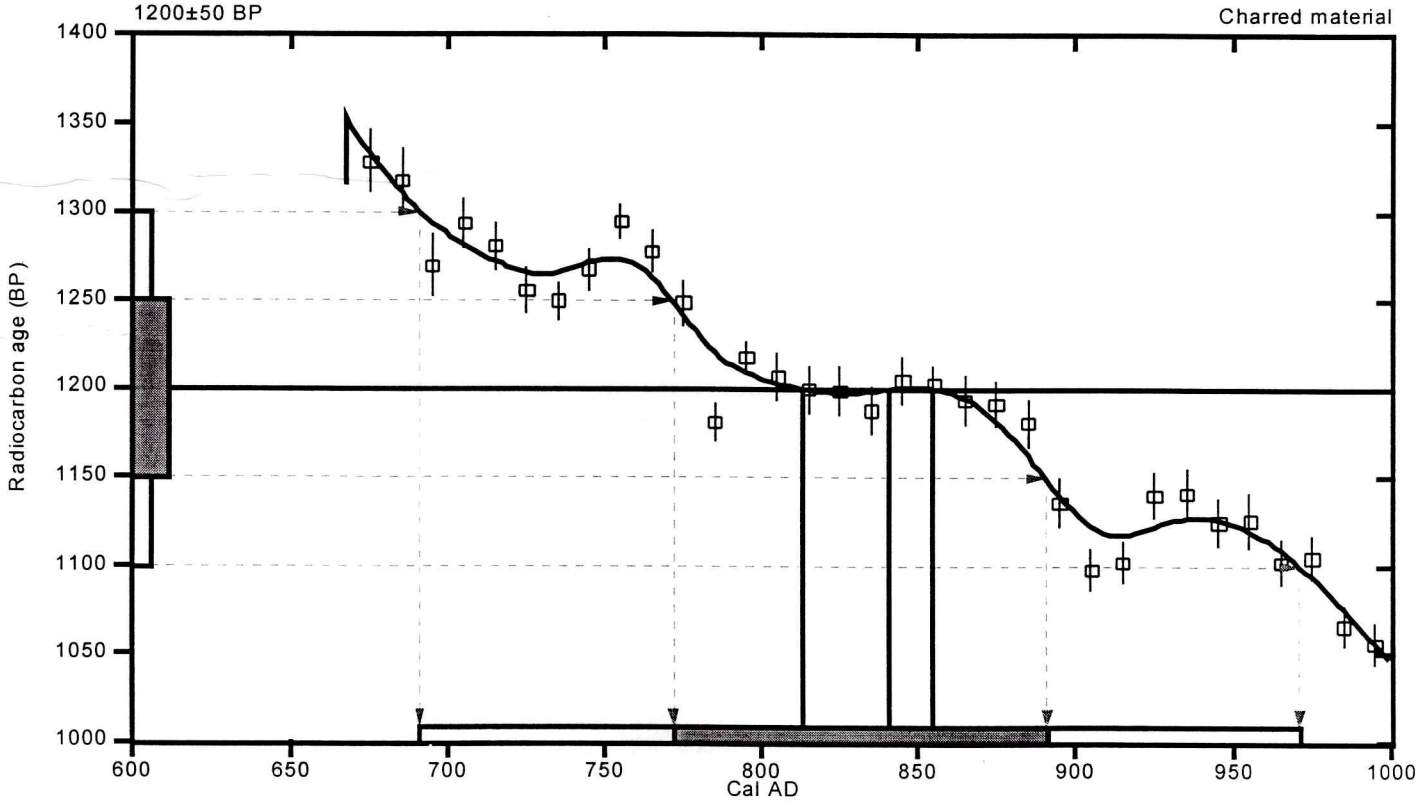
Conventional radiocarbon age: **1200±50 BP**

2 Sigma calibrated result: (95% probability) **Cal AD 690 to 970 (Cal BP 1260 to 980)**

Intercept data

Intercepts of radiocarbon age with calibration curve: Cal AD 815 (Cal BP 1135) and
Cal AD 840 (Cal BP 1110) and
Cal AD 855 (Cal BP 1095)

1 Sigma calibrated result: (68% probability) Cal AD 770 to 890 (Cal BP 1180 to 1060)



References:

Database used
INTCAL98
Calibration Database
Editorial Comment
Stuiver, M., van der Plicht, H., 1998, Radiocarbon 40(3), pxii-xiii
INTCAL98 Radiocarbon Age Calibration
Stuiver, M., et. al., 1998, Radiocarbon 40(3), p1041-1083
Mathematics
A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

Beta Analytic Radiocarbon Dating Laboratory

4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • E-Mail: beta@radiocarbon.com

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-27.4:lab. mult=1)

Laboratory number: **Beta-142620**

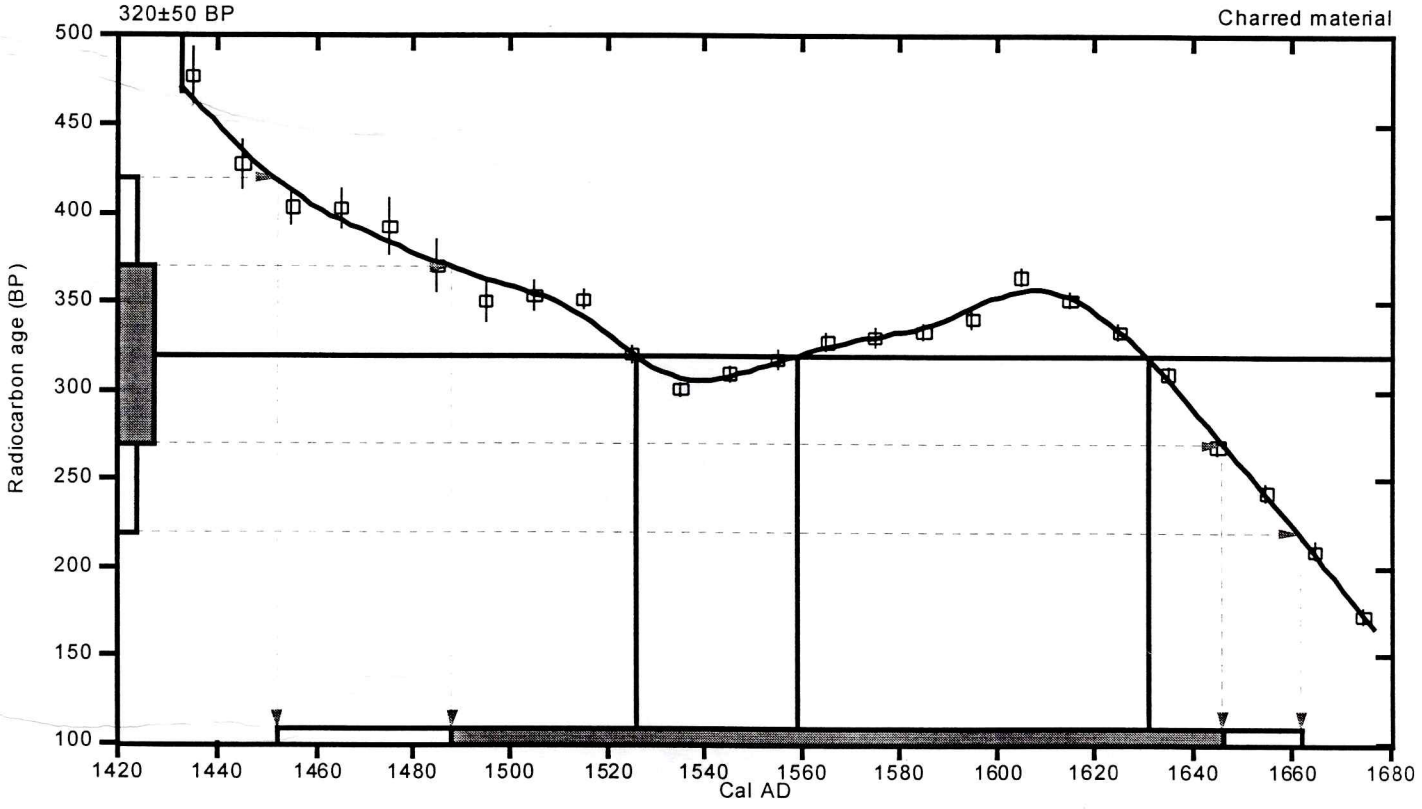
Conventional radiocarbon age: **320±50 BP**

2 Sigma calibrated result: (95% probability) **Cal AD 1450 to 1660 (Cal BP 500 to 290)**

Intercept data

Intercepts of radiocarbon age with calibration curve: Cal AD 1525 (Cal BP 425) and
Cal AD 1560 (Cal BP 390) and
Cal AD 1630 (Cal BP 320)

1 Sigma calibrated result: (68% probability) Cal AD 1490 to 1645 (Cal BP 460 to 305)

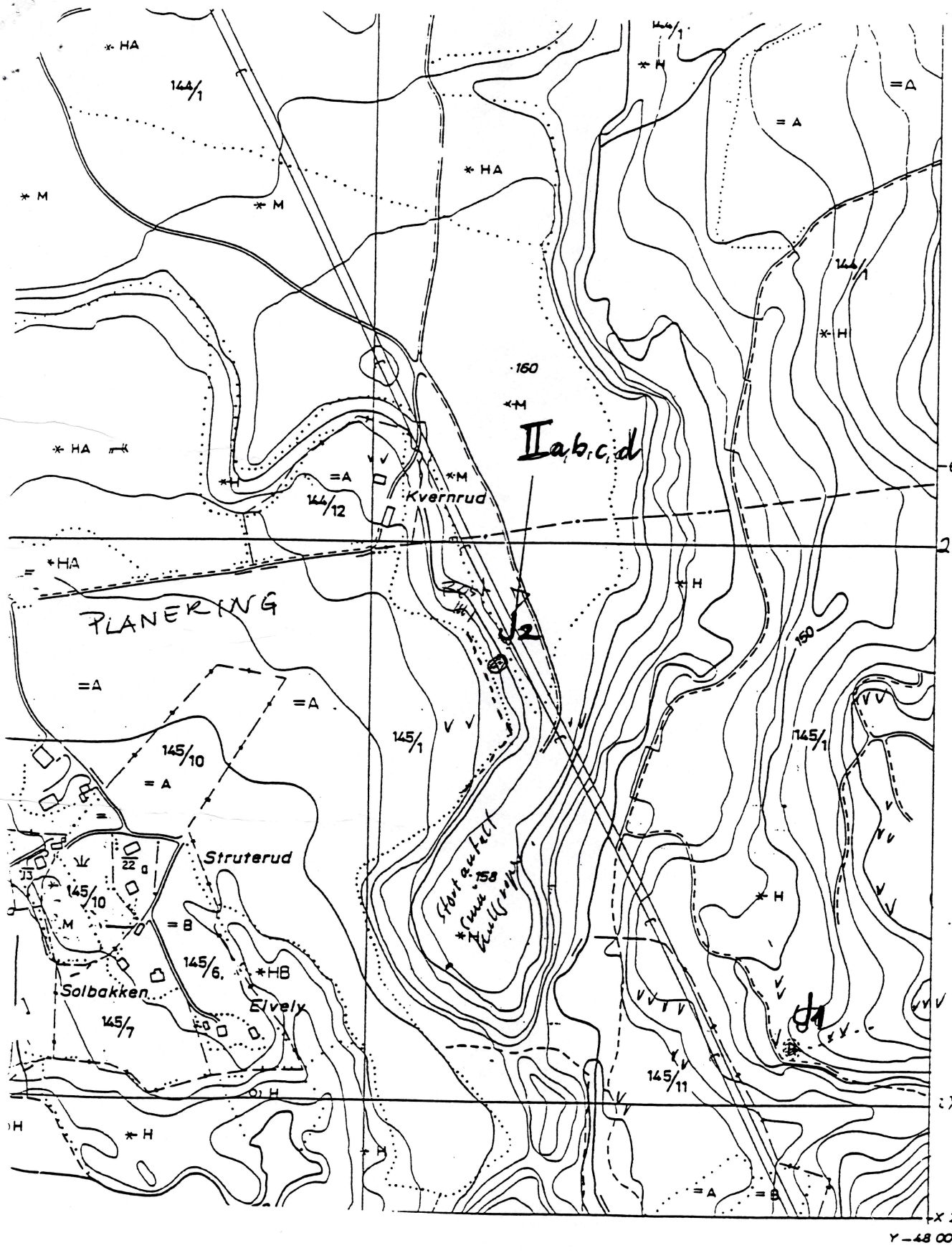


References:

Database used
INTCAL98
Calibration Database
Editorial Comment
Stuiver, M., van der Plicht, H., 1998, Radiocarbon 40(3), pxii-xiii
INTCAL98 Radiocarbon Age Calibration
Stuiver, M., et. al., 1998, Radiocarbon 40(3), p1041-1083
Mathematics
A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

Beta Analytic Radiocarbon Dating Laboratory

4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • E-Mail: beta@radiocarbon.com



MORUD 145/1 MODUM BUSKERUD.

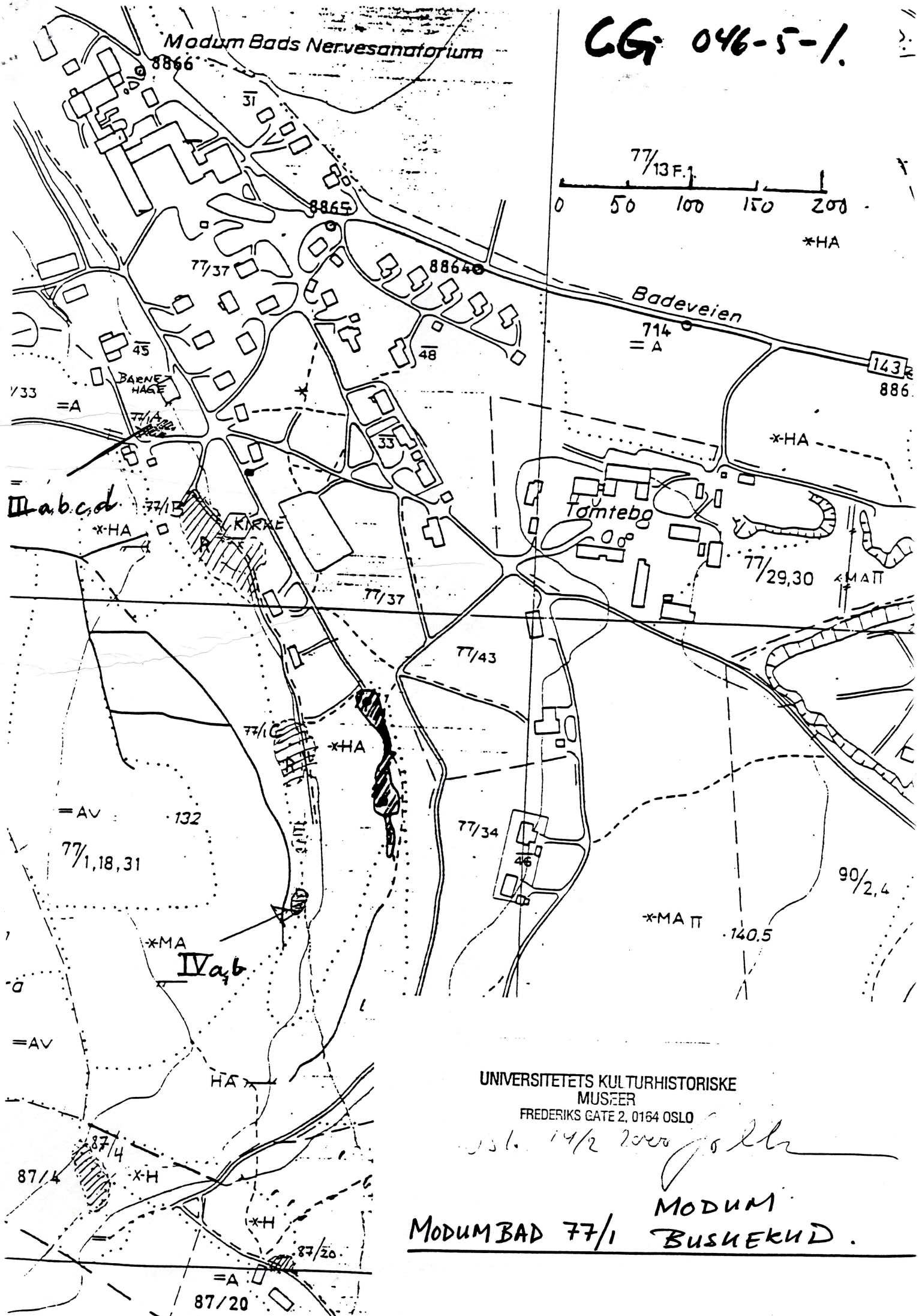
UNIVERSITETETS KULTURHISTORISKE MUSEER
FREDERIKS GATE 2, 0164 OSLO

Oslo 14/2 2001

E049-5-2	CF049-5-1	CF049-5-2
E049-5-4	CF049-5-3	CF049-5-4
E048-5-2	CF048-5-1	CF048-5-2

MODUM BUSKERUD

CF 049 - 5 - 3

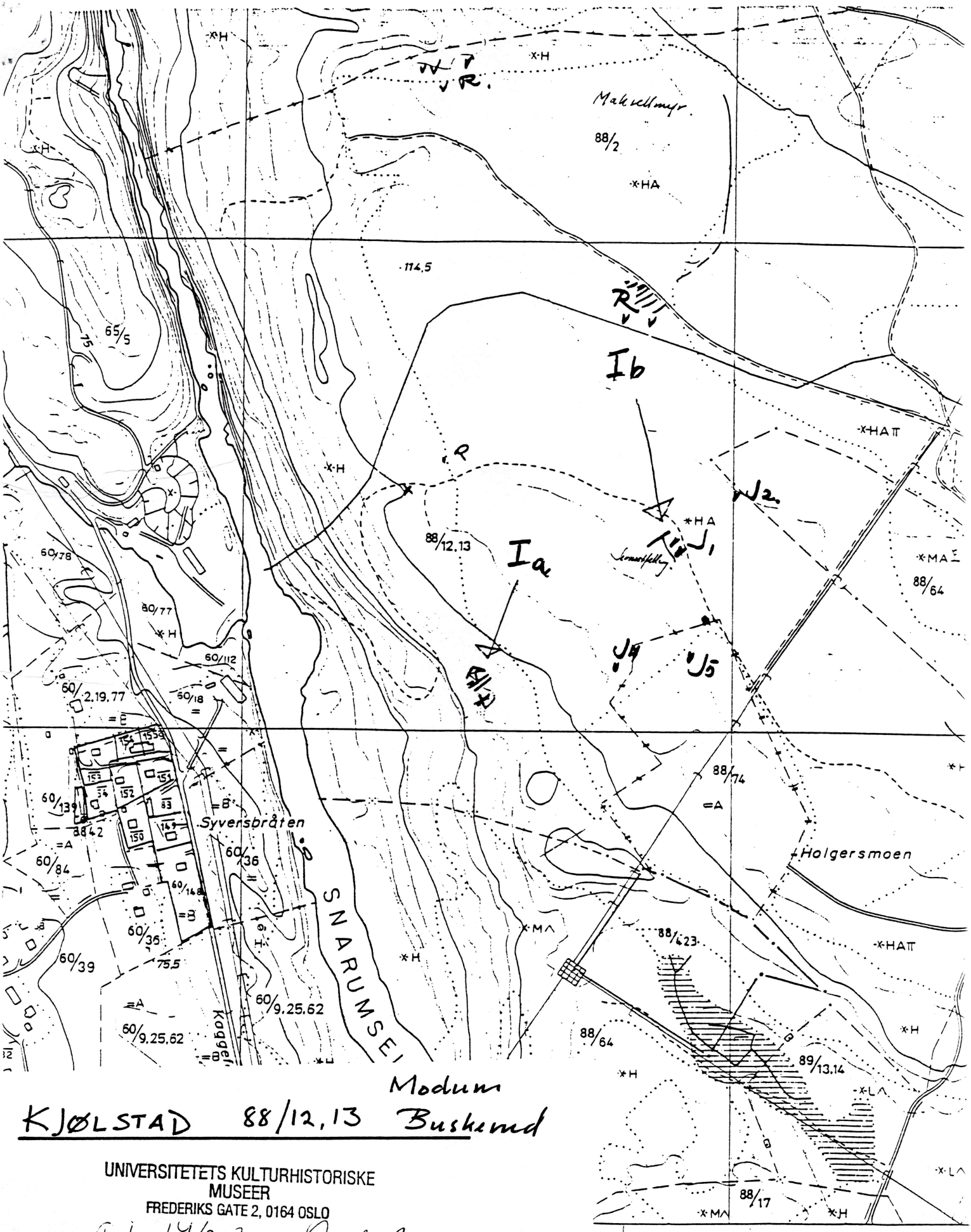


UNIVERSITETETS KULTURHISTORISKE MUSEER
FREDERIKS GATE 2, 0164 OSLO

Oslo 14/2 2000

MODUM

MODUMBAD 77/1 BUSKERUD.



Modum

KJØLSTAD 88/12,13 Buskerud

UNIVERSITETETS KULTURHISTORISKE
MUSEER
FREDERIKS GATE 2, 0164 OSLO

Oslo 14/2 2000