NIKU OPPDRAGSRAPPORT 122/2012

THE BRYGGEN MONITORING PROJECT, PART 18

Report on the archaeological investigation of two monitoring-well boreholes, Rosenkrantzgate and Lodin Lepps gate, Bryggen, 2012

Dunlop, A.R.

NORSK INSTITUTT FOR KULTURMINNEFORSKNING

Norsk institutt for kulturminneforskning (NIKU)
Storgata 2, Postboks 736 Sentrum, 0105 Oslo
Telefon: 23 35 50 00
www.niku.no

Tittel	Rapporttype/nummer	Publiseringsdato
The Bryggen Monitoring Project, Part 18. Report on the archaeological investigation of two monitoring-well boreholes, Rosenkrantzgate and Lodin Lepps gate, Bryggen, 2012.	NIKU Oppdragsrapport 122/2012	30.6.2017
	Prosjektnummer 156132938	Oppdragstidspunkt 27.3.2012
	Forsidebilde Boring for MB44. Foto: Dunlop, NIKU, 2012	
Forfatter Dunlop, A.R.	Sider 21	Tilgjengelighet Åpen
	Avdeling Arkeologi	

Prosjektleder Dunlop, A. R.
Prosjektmedarbeider Lorvik, K.
Kvalitetssikrer Edvardsen, G.

Oppdragsgiver Statsbygg

Sammendrag
Rapporten beskriver resultatene fra den arkeologiske undersøkelsen av to grunnboringer foretatt i Rosenkrantzgate og Lodin Lepps gate på slutten av mars 2012. Grunnboringenes formål var kartlegging av gjenværende kulturlag samt anleggelsen av dype miljøbrønn for å overvåke bevaringsforholdene i den søndre delen av Bryggen. Begge boringene lå delvis innenfor byggegropen til de stående bygningene, slik at in-situ kulturlag ble funnet bare i de nedre delene av sekvensene. Kulturlagene var fra tidlig- og høymiddelalderen.

Emneord
Bryggen, Rosenkrantzgaten, Lodin Lepps gate, naverboring, registrering, karbondatering, tidlig middelalder

Avdelingsleder

Paasche, K.

Contents

NIKU prosjektnummer	156132938 (2012)
Berørt område	Bryggen: Rosenkrantzgate, Lodin Lepps gate
Gnr/Bnr	167/1581, 167/1586
Oppdragets art	Arkeologisk undersøkelse av naverboringer
Vedtaksdato; saksnummer	15.5.2012; 08/00262-102
Oppdragsgiver	Riksantikvaren Distriktskontor Vest
Oppdraget utført av	NIKU distriktskontor Bergen v/ R. Dunlop og K. Lorvik
Oppdraget utført dato	27.3.2012
Koordinater	Se i teksten
Overflate, dagens	Se i teksten
Tilstedeværelse av automatisk fredete kulturminner	Ja
Kulturhistorisk tolkning	Moderne fyllmasser, middelalderske bosetnings- og utfyllingslag
BRM-nre.	BRM 974 (MB43); BRM 975 (MB44)

1 Introduction

On 27th March 2012 two new monitoring wells – designated MB43 and MB44 – were installed in Rosenkrantzgate and Lodin Lepps gate respectively. These two locations are in the southern half of the Bryggen area, where the post-1702 wooden settlement was razed and replaced with masonry buildings in the early 20th century (archaeological observations at that time were conducted by Christian Koren-Wiberg, but the documentation is regrettably meagre). The work was undertaken in connection with the general monitoring project in the Bryggen area, and with particular regard to the mapping/modelling of the hydrogeology and geochemical make-up of the southern area, which has so far remained largely uncharted from this angle.

Rory Dunlop and Katharina Lorvik from the Bergen office of the Norwegian Institute for Cultural Heritage Research (NIKU) were responsible for the archaeological side of things, with the local firm of *Multiconsult ASA* doing the drilling work and monitoring-well installation. The purpose of the work was two-fold:

a) to install the monitoring wells, naturally with full archaeological investigation of the soil sequence in each of the boreholes; and

b) to obtain soil and wood samples from various depths in each borehole. These samples will be subjected to chemical analysis, which is the responsibility of Henning Matthiesen (from the Department of Conservation at the National Museum of Denmark). Analysis of a variety of parameters will provide a detailed picture of preservation conditions at different depths in the deposits, and the results can then be compared to the archaeological assessment – based on visual inspection – of the state of preservation.

MB43 and MB44 come under NIKU project number 156132938. The work was funded by *Statsbygg* and carried out on behalf of *Riksantikvaren* (the Norwegian Directorate for Cultural Heritage).

2 Background information

The two new drillings are located in the Bryggen area's southern part, where the early 20th century rebuilding entailed the removal of a considerable volume of the upper cultural deposits and their replacement with thick deposits of largely inorganic material. However, the full extent of this disturbance has remained mostly unknown hitherto.

The area immediately to the south-west of MB43 – now occupied by a multi-storey car park – was the site of Bergen's first proper Town Hall, identified and partially investigated by Koren-Wiberg in 1908 (Koren-Wiberg 1908), and subsequently excavated by first Lindh in 1978-79 (Lindh 1979) and finally Ekroll in 1981-83 (Ekroll 1990) in connection with the car park's construction.

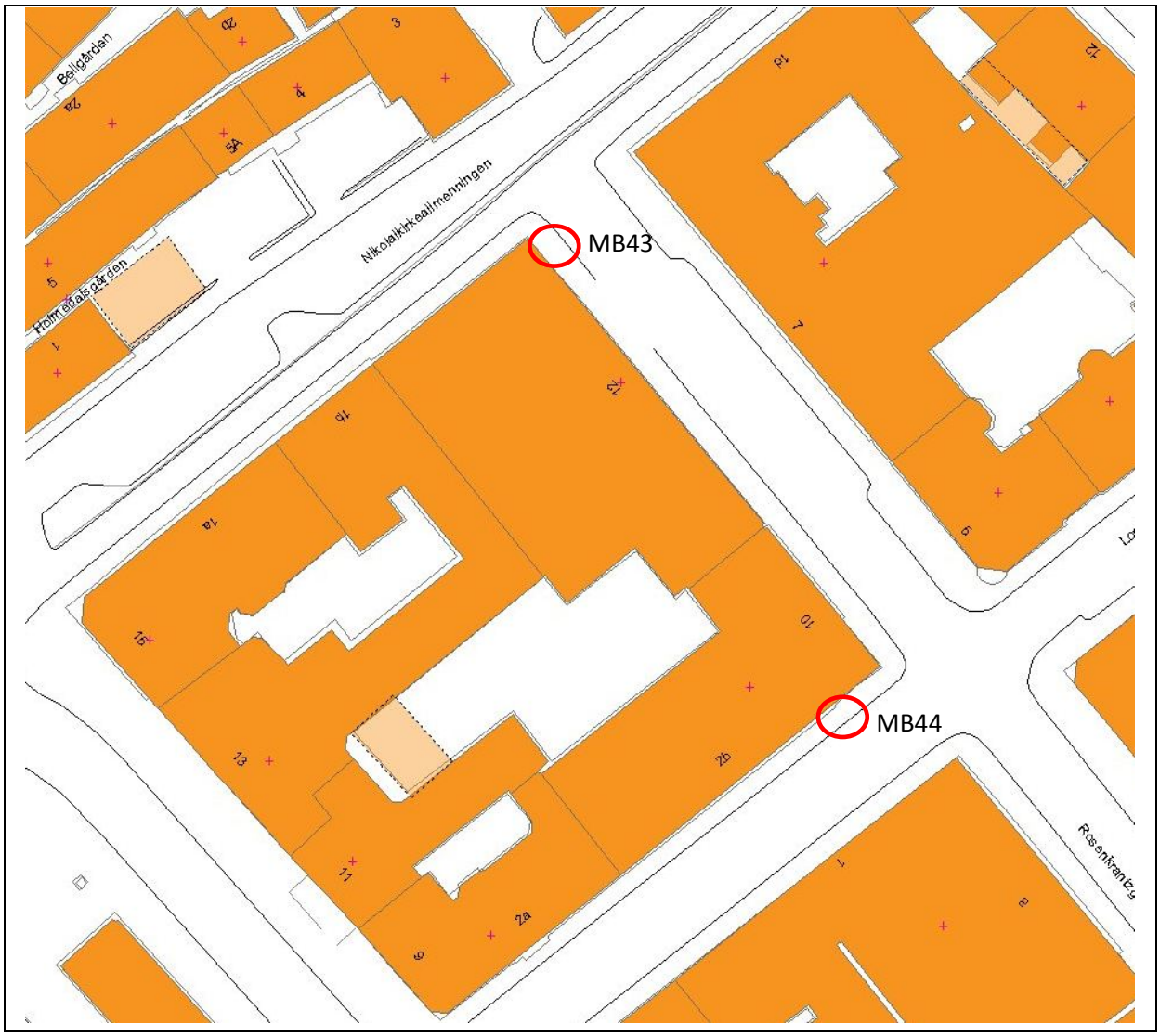

Figure 1. Map showing positions of monitoring wells MB43 and MB44.

3 Methods

As in most previous monitoring-well installations, the drilling was done using an auger, a rotary drill, whose total "thread" length was 1.0 metre. The auger was driven down under rotation one metre at a time, and then retracted without rotation so that the adhering soil could be inspected (after having scraped away the outermost material, which could readily become "contaminated" as a result of contact with higher strata).

Documentation/recording adhered to the standard procedures employed by NIKU, and all photography was done using a digital camera. Each borehole has been assigned its own reference number for identification purposes by Bergen Museum's *Middelaldersamlingen* (the Medieval Collections): «BRM 974» for MB43; and «BRM 975» for MB44.

4 Description of the archaeological sequences in the boreholes

4.1 General remarks

In this report, the stratigraphic sequence in each drilling is presented in tabular form. One of the columns is headed PC, which stands for Preservation Category, and the values in this column are in accordance with the State of Preservation Scale.

The various strata distinguished in the drillings have been numbered in the following way. First comes "MBXX" (for the monitoring well in question: MB stands for *miljøbrønn*, the Norwegian for "monitoring well") followed by sequential numbering of the individual stratum (from top to bottom). Thus "MB43-01" denotes the first archaeological stratum in monitoring well MB43.

The abbreviation "masl" stands for "metres above sea-level". Depths below sea-level are therefore prefixed with a minus sign.

4.2 Drilling MB43: sediment sequence (visual inspection)

This hole was on the south-western side of Rosenkrantzgaten, not far from the latter's intersection with the thoroughfare of Nikolaikirkeallmenningen. *Multiconsult ASA* determined its coordinates as N6701281.97/E297553.77 (UTM EUREF 32N), and the modern asphalt surface was at an elevation of ca. 7.10 masl (datum NN1954). Weather conditions during the investigation were good.

The grey shading indicates the strata that are more or less spanned by the monitoring well's filter.

Masl		Stratum number	Same as stratum no.	Samples/ ^{14}C-dating/ finds	Accession number	Per-iod	PC	Description
From	To							
7.10	4.90	MB43-01				Mod	D0	Asphalt pavement over sand, gravel and pebbles/small stones (No soil from 7.00 to 6.10 masl) Most of the stratum must represent back-fill in the construction pit from the early 20th century
4.90	3.40	MB43-02				Mod	D0	Grey/brown sand with some humus, slightly sticky, and some pebbles, a lot of stones, some rusty metal fragments, some mortar clumps and pieces of red brick/tile, a few animal bones, and some modern glass Higher mortar content from 3.80 to 3.40 masl – probably demolition material The stratum must represent back-fill in the construction pit from the early 20th century

Masl		Stratum number	Same as stratum no.	Samples/ ^{14}C-dating/ finds	Accession number	Per-iod	PC	Description
From	To							
3.40	3.30	MB43-03				Mod	D0	Brown/yellow, moist sand The stratum must represent back-fill in the construction pit from the early 20th century
3.30	3.10	MB43-04				Mod	D0	Sticky, slightly moist, dark-brown sand with some humus and a few pebbles and some pieces of red brick/tile The stratum must represent back-fill in the construction pit from the early 20th century
3.10	1.90	MB43-05				Mod	D0	Diverse demolition material (pieces of brick/tile, plaster) interspersed with thin lenses of purer sand; some pebbles The stratum must represent back-fill in the construction pit from the early 20th century
1.90	1.10	MB43-06		Samples: MB43-01 (from whole stratum) ^{14}C-sample (animal bone) from 1.50 masl AD 1425-1445	BRM 974/1	Med	A2 B2	(Not much soil adhered to the auger) Dark-brown, sandy humus with some small pieces of soft, badly preserved wood, and one animal bone Sherd of Delft ware at 1.30 masl (likely contamination) Earthy odour No darkening Poor preservation Groundwater-level at 1.2 masl (as recorded 11.6.2012)
1.10	0.0	MB43-07		Samples: MB43-02 from 0.50 to 0.30 masl		Med	C2	Very loose, wet, dark-grey/-brown, sand, gravel, pebbles and numerous water-abraded stones, a little humus, a few very soft, poorly preserved woodchips, and a couple of small fragments of animal bone Pieces of red brick/tile present down to 0.60 masl (must be contamination) Earthy odour No darkening Poor preservation
0.0	-0.30	MB43-08		Sample: Treprøve 1 from -0.10 masl		Med	C3	(Not much soil adhered to the auger) Organic cultural deposit with some sand: mostly pieces of wood (possibly a churned-up timber?) and hazelnut shells Medium preservation

Masl		Stratum number	Same as stratum no.	Samples/ ^{14}C-dating/ finds	Accession number	Per-iod	PC	Description
From	To							
-0.30	-0.40	MB43-09		Sample: MB43-03		Med	C4	Semi-compact, brown, small woodchips and larger wood pieces, twigs and hazelnut shells Strong H_2S odour Fast darkening Good preservation
-0.40	-0.40	MB43-10				Med	C0	Thin strip of sand
-0.40	-0.90	MB43-11		Samples: MB43-04 from -0.70 to -0.80 masl ^{14}C-sample (hazelnuts) from -0.40 masl AD 880-895	BRM 974/2	Med	C4	Loose, brown, small wood-chips and larger wood pieces, twigs, hazelnut shells, some laminated vegetable matter and a few fish bones Strong H_2S odour Fast darkening Good preservation
-0.90	-1.50	MB43-12		Samples: MB43-05 from -0.90 to -1.20 masl ^{14}C-sample (hazelnuts) from -1.10 masl AD 1040-1165	BRM 974/3	Med	C3	Loose, brown, small wood-chips and larger wood pieces, twigs, many hazelnut shells and some laminated vegetable matter, including moss Somewhat more compact from -0.90 to -1.00 masl Proportion of sand increased with increasing depth Medium H_2S odour Uncertain darkening Medium preservation
								Rotary drilling abandoned at -1.50 masl

The original thickness of the archaeological deposits, likewise the original thickness of the medieval deposits, cannot be determined in the case of this drilling. It is also difficult to provide a meaningful culture-historical interpretation of the observations (we can, of course, disregard the strata deposited as back-fill in the construction pit from the early 20th century), but most of the organic strata very likely represent deposits of mainly household refuse, with the nethermost stratum, MB43-12, probably dumped as part of the early medieval infilling of the original harbour area.

4.3 Drilling MB44: sediment sequence (visual inspection)

This hole was just a few metres to the south-west of the eastern corner of Lodin Lepps gate 2B. *Multiconsult ASA* determined its coordinates as N6701231.65/E297586.08 (UTM EUREF89 32N), and the modern pavement surface was at an elevation of ca. 6.85 masl (datum NN1954). Weather conditions during the investigation were good.

The grey shading indicates the strata that are more or less spanned by the monitoring well's filter.

Masl		Stratum number	Same as stratum no.	Samples/ ^{14}C-dating/ finds	Accession number	Per-iod	PC	Description
From	To							
6.85	5.65	MB44-01				Mod	D0	Concrete pavement slabs over pebbles/small stones
5.65	3.65 (ca.)	MB44-02				Mod	D0	Mixed fill: a lot of sand/gravel along with demolition material (crushed brick/tile, mortar, some charcoal) Loose, dry Components were inclined at all angles Sherd of modern porcelain from 3.95 masl The stratum must represent back-fill in the construction pit from the early 20th century
3.65 (ca.)	2.25	MB44-03				Mod	D0	Grey, somewhat sticky soil (more fine particles) with a lot of gravel, pebbles and stones Less demolition material than in stratum MB44-02, apart from between 2.85 and 2.25 masl Sherd of modern glass from 3.25 masl The stratum must represent back-fill in the construction pit from the early 20th century
2.25	2.05					-	-	Transition to cultural deposits, but not enough soil on auger to be sure what the upper-most stratum consisted of
2.05	1.95	MB44-04		Sample: Treprøve 1		Med	A2	Timber, poor colour No odour of wood Poor preservation
1.95	1.85	MB44-05				Med	-	Quite compact, homogeneous, dark-grey humus Preservation indefinable
1.85	1.65					-	-	No soil adhered to auger (probably due to a timber that crumbled)
1.65	1.55	MB44-06		Sample: Treprøve 2		Med	A3	Timber, relatively fresh colour, but quite crumbly Somewhat sourish odour of pinewood Medium preservation

Masl		Stratum number	Same as stratum no.	Samples/ ^{14}C-dating/ finds	Accession number	Per-iod	PC	Description
From	To							
1.55	1.30	MB44-07		Sample: MB44-01 from 1.45 to 1.35 masl		Med	A3 B3	Compact, dark-grey, dry, very fine-particled (silt rather than fine sand), homogeneous soil that most resembled a kind of "gyttja", with some medium-well to well-preserved woodchips (inclined parallel to plane of deposition) and a couple of hazelnut shells Strong H2S odour No darkening Medium preservation
1.30	1.25	MB44-08				Med	-	Pocket of light-grey silt/fine sand with very little gravel and a couple of hazelnut shells Preservation indefinable
1.25	0.60 (ca.)	MB44-09		Samples: MB44-02 from 1.05 to 0.95 masl (+ sample for freezer) ^{14}C-sample (hazelnuts) from 1.05 to 0.95 masl AD 1055-1180	BRM 975/1	Med	B4 C4	Loose, wet, brown, well-preserved saw chips/small woodchips (inclined at all angles), a good number of hazelnut shells, some small twigs, a couple of pieces of birch-bark, several animal bones and one fishbone, small concentrations of crushed mussel shells, and a little fine sand in between Somewhat sourish H_2S odour No darkening Good preservation Groundwater-level at 1.2 masl (as recorded 11.6.2012)
								The quality of the drill length from 0.85 to 0.15 masl was poor; little soil adhered to the auger due to juddering caused by stones becoming wedged as the auger was withdrawn
0.60 (ca.)	0.50	MB44-10		Sample: MB44-03		Med	C4	Semi-compact, wet, brown, well-preserved saw chips/small woodchips (inclined at all angles), quite of lot of moss, numerous hazelnut shells, some small twigs, a couple of pieces of birch-bark, and a little fine sand in between Medium H_2S odour No darkening Good preservation

Masl		Stratum number	Same as stratum no.	Samples/ ^{14}C-dating/ finds	Accession number	Per-iod	PC	Description
From	To							
0.50	0.20	MB44-11		Sample: ^{14}C-sample (hazelnuts) from 0.45 masl AD 1045-1165	BRM 975/2	Med	C4	Not much soil adhered to the auger, but what there was most resembled stratum MB44-09
0.20	↓	MB44-12					-	(Top of the natural) Dark-grey, hard moraine
								Rotary drilling abandoned at 0.15 masl

The original thickness of the archaeological deposits, likewise the original thickness of the medieval deposits, cannot be determined in the case of this drilling. It is also difficult to provide a meaningful culture-historical interpretation of the observations (we can, of course, disregard the strata deposited as back-fill in the construction pit from the early 20th century), but most of the organic strata are very likely deposits of mainly household refuse.

5 Finds & dating

5.1 MB43

Three samples were taken for ^{14}C-dating. A fragment of animal bone (accession no. BRM 974/1) from 1.50 masl in stratum MB43-06 has been dated to 480±25 BP, calibrated to AD 1425-1445. Hazelnuts (accession no. BRM 974/2) from -0.40 masl in stratum MB43-11 have been dated to 1165±25 BP, calibrated to AD 880-895. And hazelnuts (accession no. BRM 974/3) from -1.10 masl in stratum MB43-12 have been dated to 925±25 BP, calibrated to AD 1040-1165.

5.2 MB44

Two samples were taken for ^{14}C-dating. Hazelnuts (accession no. BRM 975/1) from between 1.05 and 0.95 masl in stratum MB44-09 have been dated to 905±25 BP, calibrated to AD 1055-1180. And hazelnuts (accession no. BRM 975/2) from 0.45 masl in stratum MB44-11 have been dated to 915±20 BP, calibrated to AD 1045-1165.

5.3 Dating: conclusions

Owing to the removal of a great thickness of original deposits sometime around 1900, there is really no way of determining precisely at what elevation the transition from post-medieval to medieval deposits occurred in these two drillings, though in MB43 we know – thanks to the dating from stratum MB43-06 – that the transition must have occurred at a level somewhat higher than 1.5 masl.

The dating from stratum MB43-11 is much too old for the stratigraphic situation, and we must conclude that the dated hazelnuts must have been redeposited from some older context. But the dating does neatly demonstrate the existence of Viking Age settlement somewhere in the vicinity.

The other datings fit very well with the established picture of Bryggen's development. And one may make special note of the excellent agreement between the datings from the two boreholes' nethermost strata.

6 State of preservation assessments

Assessments of the "health" of the archaeological sequences are presented in table 1 below. Generally, the situation in the two boreholes can be characterized as no more than satisfactory at best – though it must be pointed out, as always, that archaeological assessments of the state of preservation of strata in boreholes cannot provide a sure determination as to whether, in the case of remains exhibiting poor preservation, the observed decomposition is due to on-going processes, or took place at the time of, or even prior to, the layer's deposition instead.

Having said that, however, the uppermost organic strata in both MB43 and MB44 would seem to have been negatively impacted by the excavation of the construction pit in the early 20th century.

Table 1. Schematic comparative presentation of state of preservation (archaeological assessment) of the deposits in MB43 and MB44. Each individual symbol represents a length of about 20 centimetres, and depth from the surface increases from left to right. Grey shading indicates the approximate position of the individual monitoring well's filter.

MB43	MB44	Masl
§§§§§	§§§§	7.0 – 6.0
§§§§§	§§§§§	6.0 – 5.0
§§§§§	§§§§§	5.0 – 4.0
§§§§§	§§§§§	4.0 – 3.0
§§§§§	§§§§0	3.0 – 2.0
XXXXX	X0XXX	2.0 – 1.0
XXXXX	XXXXN	1.0 – 0.0
XXXXX		0.0 – -1.0
XXA		-1.0 – -2.0

SYMBOLS	
X - VERY POOR	? - INDEFINABLE
X - POOR	0 - NO SOIL RECOVERED
X - MEDIUM	N - NATURAL
X - GOOD	A - DRILLING ABANDONED
X - VERY GOOD	§ - INORGANIC
	F - BEDROCK

7 Concluding remarks

All in all, the prognosis for most of the organic deposits seems uncertain, and their long-term survival is by no means guaranteed. It is reasonable to suppose that the construction pit from the early 20th century is still having a harmful effect on at least the uppermost organic deposits, but it is difficult to see how this might be remedied. And the fact that the remaining cultural deposits in MB44 are only two metres thick means that they may be especially vulnerable to accelerated decomposition.

Lastly, it is somewhat surprising that the level of the transition from cultural to natural deposits should be so much deeper in MB43 than in MB44 – the difference is at least 1.7 metres (one should recall that drilling in MB43 was abandoned before reaching natural deposits). There must be some hitherto unknown topographic feature in this area; perhaps something about it might be found in

Koren-Wiberg's notes. Be that as it may, the two pieces of information should make a useful contribution to Hans de Beer's hydrogeological model of Bryggen and the surrounding area.

8 References

Ekroll, Ø., 1990. «Byens herlighed» – Riksantikvarens Skrifter Nr. 6.

Koren-Wiberg, C., (1908) Undersøgelser af Bergens Tomte og Grunde 1908. – Protokoll. Bergen Byarkiv.

Lindh, J., 1979. Rapport från utgravningen i Rosenkrantzgt. 4 i 1978-79. – Toparkiv, Historisk Museum, Middelaldersamlingen.

9 Documentation (NIKU)

- Sequences noted down in *Boreprøvebok* (drilling logbook) 7 and in NIKU's FEDOBA
- 24 digital photos (14 for MB43, 10 for MB44)
- Finds/samples information entered into *Gjenstandsbasen*, Bergen Museum

Fotoliste

Bilde nr.	Undersøkelsestype	Motiv
niku_ark_103545	MOV brønnboring (naverboring)	MB44: lengde 4,85 til 3,85 moh
niku_ark_103546	MOV brønnboring (naverboring)	MB44: lengde 3,85 til 2,85 moh
niku_ark_103547	MOV brønnboring (naverboring)	MB44: lengde 2,85 til 1,85 moh
niku_ark_103548	MOV brønnboring (naverboring)	MB44: lengde 2,25 til 1,85 moh
niku_ark_103549	MOV brønnboring (naverboring)	MB44: lengde 1,85 til 0,85 moh
niku_ark_103550	MOV brønnboring (naverboring)	MB44: lengde 1,85 til 1,35 moh
niku_ark_103551	MOV brønnboring (naverboring)	MB44: lengde 1,35 til 0,85 moh
niku_ark_103552	MOV brønnboring (naverboring)	MB44: lengde 0,85 til 0,15 moh
niku_ark_103553	MOV brønnboring (naverboring)	MB44: lengde 0,55 til 0,15 moh
niku_ark_103554	MOV brønnboring (naverboring)	MB44: oversiktsbilde plassering
niku_ark_103555	MOV brønnboring (naverboring)	MB43: lengde 6,1 til 5,1 moh
niku_ark_103556	MOV brønnboring (naverboring)	MB43: lengde 5,1 til 4,1 moh
niku_ark_103557	MOV brønnboring (naverboring)	MB43: lengde 4,1 til 3,1 moh
niku_ark_103558	MOV brønnboring (naverboring)	MB43: lengde 3,1 til 2,1 moh
niku_ark_103559	MOV brønnboring (naverboring)	MB43: lengde 2,1 til 1,1 moh
niku_ark_103560	MOV brønnboring (naverboring)	MB43: lengde 2,1 til 1,5 moh
niku_ark_103561	MOV brønnboring (naverboring)	MB43: lengde 1,7 til 1,1 moh
niku_ark_103562	MOV brønnboring (naverboring)	MB43: lengde 1,1 til 0,1 moh
niku_ark_103563	MOV brønnboring (naverboring)	MB43: lengde 1,1 til 0,5 moh
niku_ark_103564	MOV brønnboring (naverboring)	MB43: lengde 0,7 til 0,1 moh
niku_ark_103565	MOV brønnboring (naverboring)	MB43: lengde 0,1 til -0,9 moh
niku_ark_103566	MOV brønnboring (naverboring)	MB43: lengde 0,1 til -0,5 moh
niku_ark_103567	MOV brønnboring (naverboring)	MB43: lengde -0,3 til -0,9 moh
niku_ark_103568	MOV brønnboring (naverboring)	MB43: lengde -0,9 til -1,5 moh

Bilder: MB44

niku_ark_103548

niku_ark_103550

niku_ark_103551

niku_ark_103552

niku_ark_103553

Bilder: MB43

niku_ark_103563

niku_ark_103564

niku_ark_103566

niku_ark_103567

niku_ark_103568

Norsk institutt for kulturminneforskning er et uavhengig forsknings- og kompetansemiljø med kunnskap om norske og internasjonale kulturminner.

Instituttet driver forskning og oppdragsvirksomhet for offentlig forvaltning og private aktører på felter som by- og landskapsplanlegging, arkeologi, konservering og bygningsvern.

Våre ansatte er konservatorer, arkeologer, arkitekter, ingeniører, geografer, etnologer, samfunnsvitere, kunsthistorikere, forskere og rådgivere med spesiell kompetanse på kulturarv og kulturminner.

www.niku.no

NIKU Oppdragsrapport 122/2012

NIKU hovedkontor
Storgata 2
Postboks 736 Sentrum
0105 OSLO
Telefon: 23 35 50 00

NIKU Tønsberg
Farmannsveien 30
3111 TØNSBERG
Telefon: 934 66 230

NIKU Bergen
Dreggsallmenningen 3
Postboks 4112 Sandviken
5835 BERGEN
Telefon: 922 89 252

NIKU Trondheim
Kjøpmannsgata 25
7013 TRONDHEIM
Telefon: 922 66 779 /
405 50 126

NIKU Tromsø
Framsenteret
Hjalmar Johansens gt. 14
9296 TROMSØ
Telefon: 77 75 04 00

LABORATORIET FOR RADIOLOGISK DATERING

Adr.: NTNU – Gløshaugen, Sem Sælandsv. 5, 7491 Trondheim
Telefon 73593310 Telefax 73593383

DATERINGSRAPPORT

Oppdragsgiver: Dunlop, Rory
NIKU, Bergen
Dreggsalm. 3, Postboks 4112, 5835 Bergen

DF-4582

Lab. ref.	Oppdragsgivers ref.	Materiale	Datert del	^{14}C alder før nåtid	Kalibrert alder	δ^{13}C ‰
TRa-4142	BRM974/1 Rosenkrantzgate, Bryggen Bergen, Hordaland	Bein		480 ± 25	AD1425-1445	-20.2
TRa-4143	BRM974/2 Rosenkrantzgate, Bryggen Bergen, Hordaland	Nøtteskall Hassel		1165 ± 25	AD880-895	-29.4
TRa-4144	BRM974/3 Rosenkrantzgate, Bryggen Bergen, Hordaland	Nøtteskall Hassel		925 ± 25	AD1040-1165	-26.2
TRa-4145	BRM975/1 Lodin Lepps gate,Bryggen Bergen, Hordaland	Nøtteskall Hassel		905 ± 25	AD1055-1180	-28.4
TRa-4146	BRM975/2 Lodin Lepps gate,Bryggen Bergen, Hordaland	Nøtteskall Hassel		915 ± 20	AD1045-1165	-27.4

Dato: 13 AUG 2012

Laboratoriet for Radiologisk Datering

Sølvi Stene

Helene Svarva