12 Phase 3 Early medieval activities 1050–1200 AD

12.1 Results

The presentation of the remains from Phase 3 will be given from two perspectives. First there will be an account of the different feature types – ditches, pits, buildings, postholes, stakeholes and different surfaces (Fig. 35-37 and Tab. 10). After the overall description the features are placed in a structural and historical context.

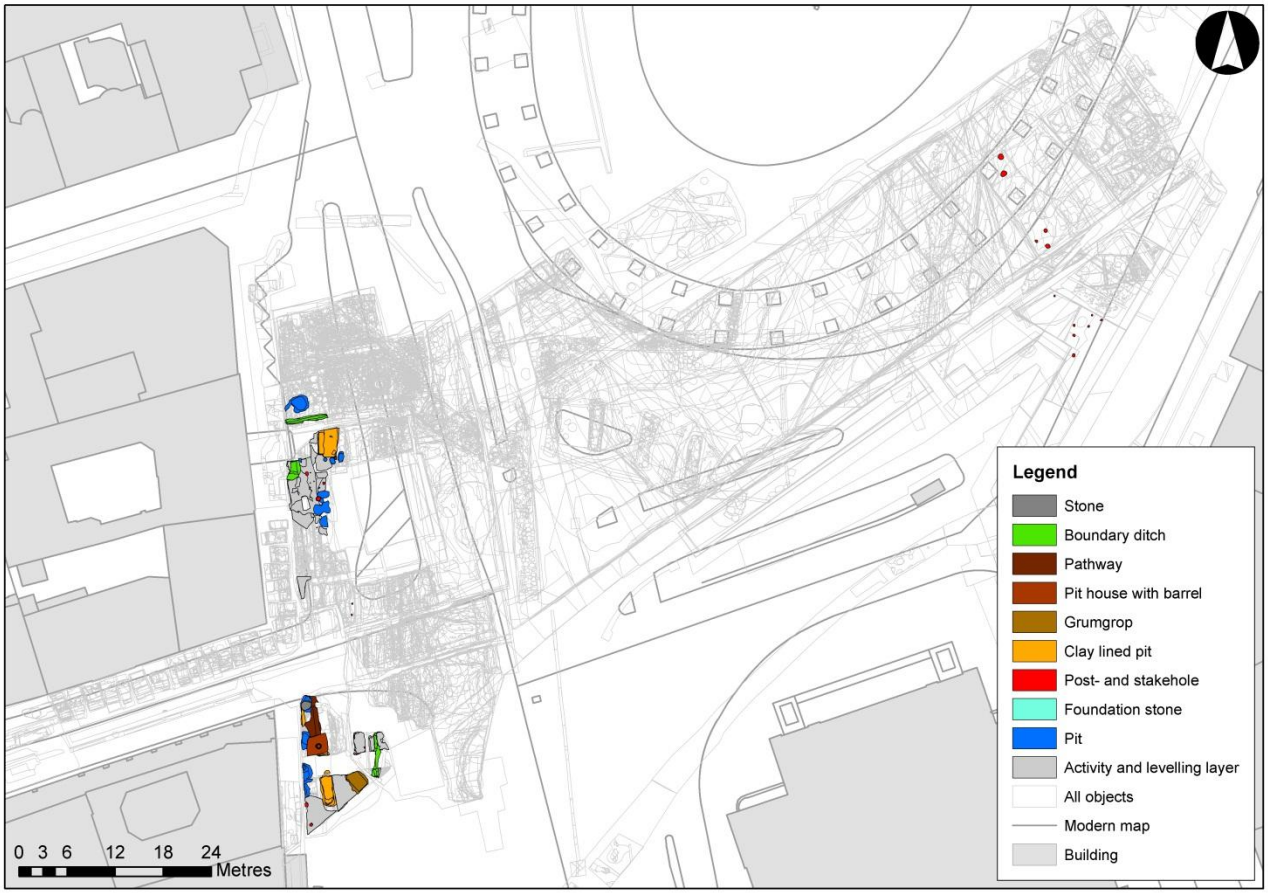

Fig. 35. Early medieval features at Kongens Nytorv.

Fig. 36. Early medieval features in the western part of Kongens Nytorv.

Fig. 37. Estimated Early medieval features in the eastern part of Kongens Nytorv.

All structures were documented as truncations in the natural moraine/transgression layers under the salt marshes, mixed with this or below features belonging to the medieval rampart or gate building from the early 13th century. Besides stratigraphical observations some of the deposits or features have been grouped in this phase based on finds and AMS-datings.

Group	Type of feature	Subarea	Basic interpretation
4077	Ditch	Phase 5B-2, 45A and 45B	Boundary ditches
185000	Pit	Phase 4B and 45B	Clay lined pits
656	Pit	Phase 4B	"*Grumbod*"
658	Pit	Phase 4B	Pit
659	Pit	Phase 4B	Pit
66857	Pit	Phase 45A and 45B	Pits
312	Pit	Phase 4B	Pit with barrel
330	Pit	Phase 4B	Pit house with barrel
353	Pit	Phase 4B	Pit with stone
827	Foundation stones	Phase 5B-2	Building?
507	Posthole	Phase 45B	Postholes
614	Posthole	Phase 45B	Posthole
169650	Posthole	Phase 5B-2	Postholes
500268	Posthole	Phase 4B	Postholes
500779	Posthole	Phase 4B	Postholes

943	Posthole	Station Box	Posthole
946	Posthole	Station Box	Posthole
947	Posthole	Station Box	Posthole
155991	Stakehole	Phase 45B	Stakeholes
648	Levelling layer	Phase 4B	Pathway
30076	Levelling layer	Phase 4B, 5B-2, 45B	Activity and levelling layers
500776	Activity layer	Phase 4B	Activity related to the "*Grumbod*"

Tab. 10. Early medieval features at Kongens Nytorv.

12.1.1 Ditches

The ditches were orientated as good as parallel with the current plot boundary on A'Porta's eastern facade (Fig. 36 and 38). Profiles of the sequences of ditches changed from being slightly rounded to the north, to wide to flat-bottomed with gently sloping sides in the south. North of the ditches a series of elongated pits were documented without further determination.

Fig. 38. Boundary ditch (SC142444) in the middle, facing west. Photo: Museum of Copenhagen.

The usage fill in the ditches consisted of decomposed buried soil representing a growth horizon and secondary natural moraine where the sedimentation must have happened incrementally. Inclusions of CBM in the latter could perhaps be connected to the construction of the gate building and/or the city wall (see Chapter 15 and 14 for further discussion). The mud deposition in one of the features showed that the ditches had been used over several years and regularly cleaned. The occurrence of silt and fresh/brackish water plants also shows that the ditches had not been

directly connected with the sea, but flooded at regular intervals. In relation to ditch SG-333 soil excavated from the ditch could be seen next to the ditch towards the east and may have represented some sort of boundary bank.

AMS-analysis of material from the deconstruction and usage phase dates the ditches to the Early Middle Ages (Tab. 11).[4]

Lab. No.	^{14}C year BP	Cal. 1 σ	Cal. 2 σ	Context No.	Negligible own age	Material
LuS 11359	865±35	1055–1225 AD	1040–1260 AD	SD131800	Y<?	Sheep, *O. aries*
LuS 11730	930±35	1040–1155 AD	1020–1185 AD	SD92194	Y<3	Hazel, *Corylus*

Tab.11|. ^{14}C results from SG-501017 and SG-503.

The features represent drainage and boundary ditches, to separate a certain area, and at the same time used the local topography. However, the structures were too small to judge the slope, etc.

12.1.2 Clay lined pits and a so-called Grumbod

A total of four clay lined pits and an interpreted *"Grumbod"* were investigated at Kongens Nytorv.

SG-332 represents a rectangular NW-SE orientated clay lined pit (c. 7.0 x 1.6 x 0.4 m) with straight, steep sides and a flat base (Fig. 39).

Fig. 39. Clay lined pit (SC157563) with modern truncation (removed concrete box) in the middle, facing NW. Photo: Museum of Copenhagen.

[4] All dating from the excavation has been calibrated using OxCal version 3.10.

The clay lining (SD150831) and (SD157637) following the construction cut, consisted of firm and uniform mid brownish grey and yellowish green clay with occasional inclusions of pebbles. The clay lining was approximately 0.05 m thick, at some places as much as 0.15 m, but it is unclear if this really belongs to the construction phase or is part of later activities/repair work within the pit.

The activity layers consisted of uniform dark greyish black clay with inclusions of fish bones (no further information about the bones), where the inclusions of stones, CBM and lime fragments in (SD157453) probably represent material from the deconstruction layers being pressed into the underlying layer (see below).

The deconstruction phase consisted of mixed sandy clay with inclusions of pebbles, charcoal, CBM and lime fragments. Thin deposit (SD157345) consisted of the exactly same material as the clay lining (SD157637), and might be remains of an attempt to repair the pit when still in use (= over activity layer (SD157453)).

For some reason only two samples were collected from one of the deconstruction layers (= not useful for C14-dating), but since the clay lined pit was stratigrapically above pit house (G-330) dated to 1214 AD this also constitutes a *terminus post quem* for the pit. The absolute dating is probably between 1214 AD and 1232 AD based on the later construction of the nearby High medieval rampart (see Chapter 13.1.1; Rampart).

SG-366 was a north-south orientated and rectangular clay lined pit (c. 3.4 x 2.0 m), 0.3 m deep with straight, steep sides and a flat base (Fig. 40). The southern and western parts were not as deep as the northern and eastern parts. The western part of the cut and particularly the northern part were a bit diffuse, where the feature was truncated by the modern shoring. The cut was dug through a second clay lined pit and it cut one of the rampart phases, but this latter interpretation has later been re-evaluated based on AMS-datings and other stratigraphical observations (see SG-370 below). In the middle and to the north the cut truncated salt marsh layer (SD210931).

Fig. 40. Clay lined pit (SG-366), facing north. Photo: Museum of Copenhagen.

The clay lining (SD89931) and (SD90557), following the construction cut, consisted of firm and uniform mid bluish yellow and light greenish yellow clay with frequent inclusions of fish bones and occasional inclusions of sand and charcoal (Fig. 41). At certain points it looked like the clay lining had been repaired with clay, since there were big clay lumps on top of the actual lining. The clay lining was thicker to the east than to the west; from 1.5 to 10.0 cm thick.

Fig. 41. Clay lining seen in section, facing south. Observe how the pit has cut through an older clay lined pit (SC92644, SG-370) to the west. Photo: Museum of Copenhagen.

Finds: Bones (horse, mammals unspecified, herring, plaice/flounder/dab and fish unspecified).

The activity layer consisted of a thin layer of uniform dark reddish brown and orange-blue organic and spongy material with frequent inclusions of fish bones and occasional inclusions of twig, covering most of the bottom of the pit. In a few places both the brown and the orange/blue layers were separated/layered by yellow clay.

Finds: Worked wood and bones (mammals unspecified, cod, herring and fish unspecified).

The deconstruction phase consisted of mid greyish blue and yellowish brown spongy sandy clay with occasional inclusions of pebbles, stones, bones, charcoal, twig and red brick fragments. Finds from these secondary backfills consisted of bones (cattle, pig, sheep, sheep/goat, mammals unspecified, common bream, gadid, herring and fish unspecified).

Many of the fish bones were collected from activity layers and also from the clay linings. However, the complete herrings and the accumulations of herring bones found in the clay linings are presumed to belong to the activity layer having been pressed down into the clay. The fish bones belong almost exclusively to herring.

Almost all the identified bones could be identified to herring, as only 10 out of 687 identified fish bones belong to other species such as bream, cod and plaice/flounder/dab. No bird bones and only 55 mammal bones constitute the remaining waste material. The mammal bones belong to domestic species.

The herrings recovered in a collected clay block (sample PO90621) seem to be represented by all the elements belonging to the herring skeleton. The herrings have thus not been processed. The herring bones in general represent all parts of the skeleton and complete individuals seem to be represented in the material. The small elements from the gills were not counted. Pelvic bones are small and might have been overlooked (Bødker Enghoff and Magnussen 2015).

On three fragments of fish bones, all from SD91700 (activity layer), cut marks have been recognized:

Atlantic herring with cut marks on two *præoperculum* and cod where marks are seen on one *præmaxillare*.

A total of 15 samples were collected in relation to the clay lined pit, but none of these had enough archaebotanical material or insects to show the character of the environment (beach meadows and/or salt marshes), the occurrence of domestic animals, other activities, etc.

SG-370 was a north-south orientated rectangular clay lined pit (c. 2.7 x 2.7 m), 0.2 m deep with straight, steep sides and a flat base (Fig. 41). The feature was truncated by the modern shoring to the north and by a later clay lined pit (SC92092) in the middle.

The easternmost side of the cut and backfills (SC211500, SD211544 and SD211545) was not as clear as the western part, without clay lining, and only documented in section. This is probably due to later activities in the area (medieval rampart), but the contexts could also represent remains of a third clay lined pit, although this can not be confirmed with certainty.

The clay lining (3 cm thick) consisted of uniform mid bluish grey clay, more brownish yellow at the sides and with moderate inclusions of charcoal specks.

The usage layer consisted of uniform dark brown sand, 1 cm thick. As in (SD91700; SG-366) there was a small area with a different crisp layer of other organic material underneath the brown deposit. Finds consists of bones (herring and fish unspecified).

The deconstruction phase consisted of mottled mid greenish grey clayish sand with inclusions of pebbles and charcoal. Deposit (SD90035) had been contaminated – hence glass and plastic were found during the later wet sieving. Finds from the backfill consisted of bones (cattle and sheep).

Unfortunately the retrieved material from this clay pit was too little for any elaborate discussions and conclusions. The bones seem to confirm the impression based on the much larger quantify of material found in SG-366, where herring bones were present in the activity layer, and the two bones found in the deconstruction fill seem to belong to some of the most commonly found domestic mammals (Bødker Enghoff and Magnussen 2015).

On site some of the interpreted rampart layers (SD89618, SD92895, SD92550 and SD211549) were recorded as cut by clay lined pit (G-370), but checking the heights of these built-up deposits and comparing these with the construction phase of the pit, it is clear that the truncation is older than the fortification layers. Added this is the fact that (SD211549) cannot be linked to the other rampart deposits and that the measurements to the west and SW up to the pit were highly uncertain due to machining.

A total of five samples were collected in relation to the clay lined pit. Three species were identified in the archaebotanical analysis; *Chenopodium sp*., *Raphanus raphanistrum capsule* and one indeterminate seed fragment.

Group (SG-657) represents a clay lined pit backfilled with dumped material. There seemed to be no usage deposition within the pit. Most of the north-south orientated pit had been heavily truncated by the modern piling, but the original shape was rectangular; c. 2.3 m long, 0.3 m deep with moderate, concave sides and an irregular base (Fig. 42).

Fig. 42. Clay lined pit (SG-657), facing south. Photo: Museum of Copenhagen.

The clay lining (SD158765), following the construction cut, consisted of firm and uniform mid greenish yellow clay with occasional inclusions of pebbles, stones, lime fragments and fish bones (herring), where the building material originated from the deconstruction layer. No plant remains were recovered from samples from the construction layer.

The deconstruction phase consisted of mid greyish brown clayish sand with occasional inclusions of pebbles, stones, bones, charcoal and red brick fragments. Finds from the secondary backfill consisted of ceramics (Baltic ware; 950–1250 AD) and bones (cattle, goat, pig, sheep/goat and unspecified).

All the animal bones collected in this subgroup belong to species which are commonly eaten. Only one element, a metacarpus, was identified to goat. It is not possible to conclude whether this element represents waste from a meal or waste from a workshop. Only one herring bone and no other fish bones were found – a result probably related to the fact that the fills were not wet sieved (Bødker Enghoff and Magnussen 2015).

None of the clay lined pits were complete due to later truncations or limits of the excavation, though recorded length vary from 2.3-7.0 m and width from 1.6-2.7 m (Fig. 43).

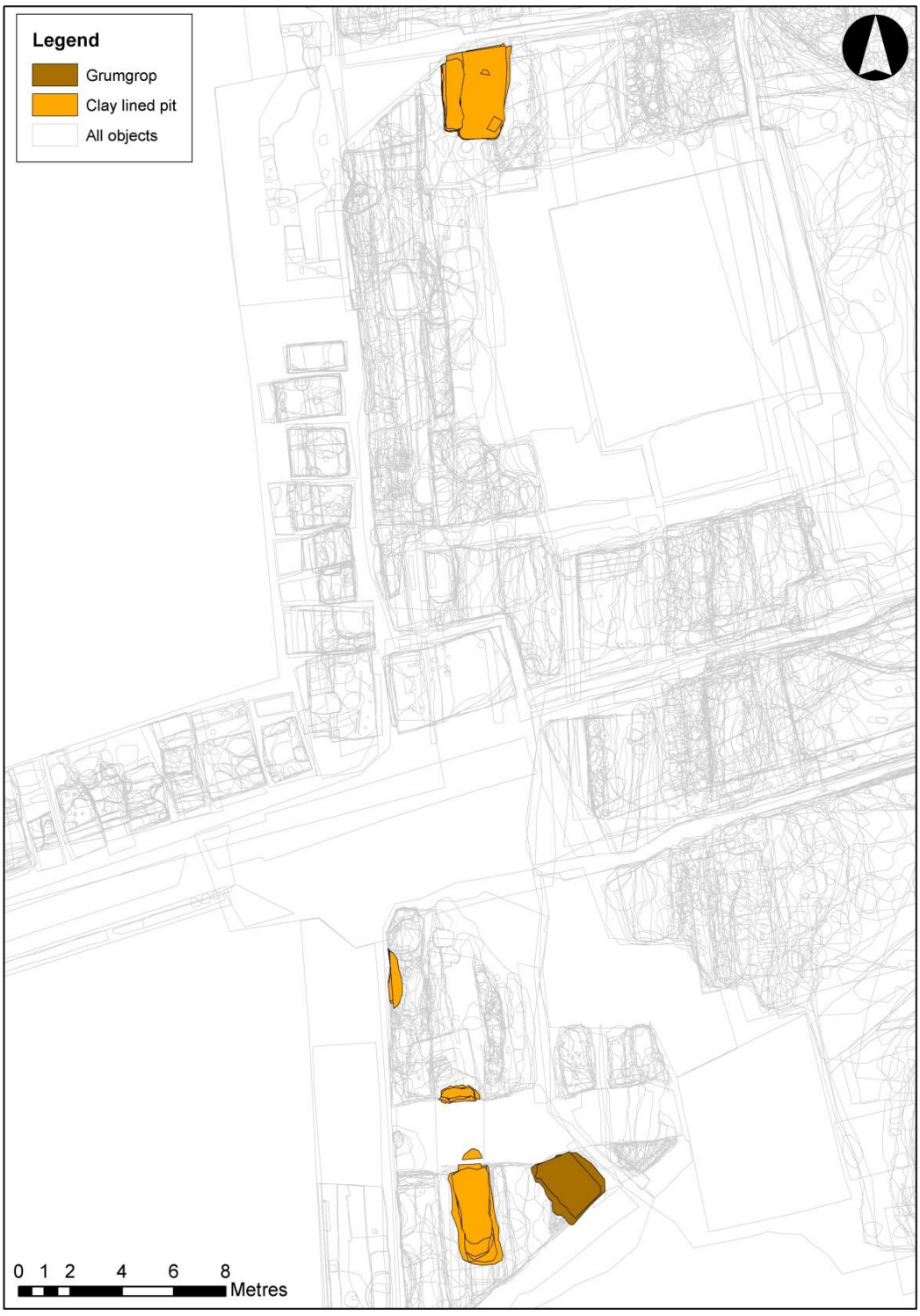

Fig. 43. Clay lined pits and interpreted so-called "*Grumbod*".

Usage layers with fish remains were observed in all pits with the exception of SG-657. Such organic layers occur in the clay lined pits where preservation conditions are favourable (cf. Balic et al. 2005; cf. Lundström 2008a:12 et seq.). However, no clear traces of planks, wooden lids, stake- or postholes were observed in connection to the pits, with the exception of worked wood in pit (SG-366). Nor were there any traces of robbed clay from the pits (cf. Balic et al. 2005;

Lundström 2008a:13 and 15), though traces of repair and reuse in pit (SG-332) were seen in section C150834/section drawing 211598 (Fig. 39).

The features were aligned fairly parallel (N-S and NW-SE) over a distance of 37 m. Based on the AMS-dates to the mid 12th century and early 13th century the pits represent two generations of clay lined pits in the area – an argument that is also proved by the fact that SG-366 was overlapping clay lined pit G-370. These two phases also correspond well with earlier age determinations for the pits (cf. Cardell 1995; 2005; Ersgård 2006) and two of the fishing periods mentioned in the written sources (see Chapter 12.2.3 below). The pits did not contain any repair work in the form of complementary clay layers or lenses of eroded material (cf. Lundström 2008a:12 et seq.; 2008b:8 et seq.; 2008c:12).

Not all material from the activity layers was sieved in the clay lined pits, but in SG-366 c. 26 litres and in G-370 c. 1.5 litres were fine sieved through mesh sizes 2.8 mm, 2 mm and 1 mm. This must be taken into account when discussing the osteological results and presence of different fish bones (cf. Cardell 2001 and discussion below).

In clay lined pit SG-366 in general all parts of the herring skeleton seem to be represented (Bødker Enghoff and Magnussen 2015) (Fig. 44). Since there are elements from the *hyoid arch* and *pectoral girdle*, it is possible to conclude that the herrings had not been gilled (cf. Bødker Enghoff 1996; 1999). However, some of the nine accumulations of fish bones studied separately include no *vertebrae*, and it cannot be excluded that some of the herring accumulations represent only heads of herrings. This interpretation is supported by the finds of two *præoperculae* showing cutmarks which might indicate cutting off the heads. Another explanation of the missing *vertebrae* might be that the small *vertebrae* lying behind the head bones were overlooked during the excavation and only parts of the accumulations were sampled. Many scales have also been found pressed firmly together in cakelike aggregations. Herring scales very easily detach, and the many scales might just indicate that herrings have been lying in the pit.

Fig. 44. Preserved herrings from clay lined pit, SG-366. Photo: Museum of Copenhagen.

The few fish bones (n=10) belonging to species other than herring (common bream, cod and plaice/flounder/dab), show that the pit had not exclusively been used for herring, but it is important to notice that seven of these bones were found in the secondary backfill. The backfill represents waste thrown into the pit after it went out of use, where only a few bones from mammals and no bird bones were collected.

Thin section and ICP-analysis (Inductively Coupled Plasma) from SG-366 and SG-370 show sorted coarse clays with high levels of both sand and silt, which were not fine enough to hold different types of liquids, etc. Neither was there salt in the pits and the content of Na was normal in the analysed samples (Brorsson 2012). These results correspond well with other clay lined pits investigated in Malmö, Scania (cf. Brorsson 2006).

Five chemical samples from both clay lining and usage layers show no traces of lipids (Glanstrup 2013) – a fact that is explained by refuse degraded into water-soluble products which later have diffused into the soil (Christensen 2015a; 2015b). Another theory is that most of the herring were removed quickly from the pits after sorting during which no lipids were deposited (cf. Cardell 2015b). This argument can also be seen in connection with the fact that some of the clay lined pits investigated do not contain any fish bones (cf. Cardell 2005:102).

AMS-analysis on material from the clay lined pits dates the activities to the 12th century and early 13th century (Tab. 12).

Lab. No.	^{14}C year BP	Cal. 1 σ	Cal. 2 σ	Context No.	Negligible own age	Material
LuS 11365	1220±35*	-	-	SD90557	Y<1	Atlantic herring, *Clupea harengus*
LuS 11364	890±35	1045–1210 AD	1035–1220 AD	SD90557	Y<?	Horse, *Equus caballus*
LuS 11363	815±35	1190–1265 AD	1160–1270 AD	SD90035	Y<?	Sheep, *O. aries*

*The uncalibrated dating of herring is caused by the marine reservoir effect resulting in an age that is several hundred years too old (Heinemeier 2014).

Tab. 12. ^{14}C results from SG-366 and SG-370.

The irregular shallow pit (G-656; approximately 4.0 m^2 and 0.26 m deep) was recorded below the High medieval rampart and had been truncated on three sides by the modern piling. The sides were sharp/steep with an almost 90 degree angle between side and base. The base was flat (Fig. 36 and 45).

Fig. 45. Construction cut (SC157249) of the "*Grumbod*", facing north. Photo: Museum of Copenhagen.

A lot of fish bones were observed in the pit during excavation (though not collected) and the feature has been interpreted as part of a "*Grumbod*" – a type of booth mentioned in the written sources.

According to Late medieval sources it was forbidden to throw the waste into the sea and it had to be removed within two days (Eriksson 1980:37). After the herring had been gilled the fish waste was brought to specific booths in Falsterbo (*Grumhöjebackarna*) where fish oil was separated from the rotten fish to be used as fuel in oil lamps, etc. Since no "*Grumbod"* has ever been excavated (Ersgård 2015) this suggestion is very tentative.

A small assemblage of animal bones was found in the fill of this pit. They seem to be a random selection of elements from commonly eaten species of fish and a few bones from dog, pig and cattle (Bødker Enghoff and Magnussen 2015).

12.1.3 Pits

The larger pits were between 2.5 m and 2.0 m in diameter and up to 1.5 m deep (Fig. 36). Since the original edge of the cut rarely was preserved, it is difficult to know the true depth of the pits. The sides of the pits were typically vertical or concave and the base was flat. The basal deposits were typically quite "clean", and contained little or no finds, while the secondary backfills generally were mottled and rich in finds. This suggests that the usage of the pits did not leave many material traces, while the later backfills show they were used for disposing of household and production waste. Some pits contained deposits which indicated that they could have been left open for some time before the backfilling continued (or in between usage and backfilling?).

Due to most material from the pits being related to their backfilling phase, their original function(s) is not quite clear. The regular shape of most of them could suggest they have been used for storage purposes. Also the inclusions from the backfill deposits point to the area being a combined household/production environment – with bones, slag, clay spots, charcoal and chalk mixed with the soil. In the Early medieval household, pits were generally used as storage for food, and they could be placed outside houses or inside, dug into the floor. They could also have been functioning as containers for something which needed a controlled atmosphere, perhaps in connection with craft or production (see discussion for clay lined pits below and Karg and Lafuente 2007:188 et seq.).

Among the larger pits G-451 should be mentioned. The feature consisted of a cesspit and an SW-NE running ditch (Fig. 36 and 46). The two parts (ditch and pit) were interpreted as being part of the same feature.

Fig. 46. Post-excavation of pit (SC131365) south of High medieval annex (SG-248), facing NW. Photo: Museum of Copenhagen.

The pit might originally have been dug to extract clay, as the substrate here in places was quite clayish (bluish green clay), or used for some specialized craft, etc., and secondarily used over a period of time to deposit domestic, organic waste (bones). The small, linear ditch truncated by the modern piling, seemed to have been cut to lead either waste material (liquid?) into the pit or perhaps functioned as some sort of air channel. No traces of burning were documented in relation to the feature, nor any flax in the completed archeobotanical analysis. AMS-analysis of material from the deconstruction fill dates the pit to the Early Middle Ages (Tab. 13).

Lab. No.	^{14}C year BP	Cal. 1 σ	Cal. 2 σ	Context No.	Negligible own age	Material
LuS 11358	860±35	1055–1225 AD	1045–1260 AD	SD131411	Y<?	Sheep/goat, *O. aries/C. hircus*

Tab. 13. ^{14}C results from SG-451.

Some of the other pits were dated to the Viking Age and the 12th century, where the oldest pit probably is Early medieval based on the surrounding activities and material analysed (Tab. 14).

Lab. No.	^{14}C year BP	Cal. 1 σ	Cal. 2 σ	Context No.	Old-wood effect and negligible own age	Material
LuS 11732	1200±35	770–880 AD	690–945 AD	SD93172	Y<40	Hazel, *Corylus*
LuS 11361	910±35	1040–1165 AD	1030–1210 AD	SD93201	Y<?	Sheep/goat, *O. aries/C. hircus*
LuS 11351	785±50	1210–1280 AD	1150–1295 AD	SD90715	Y<1	Goosefoot, *Chenopodium sp.*

Tab. 14. ^{14}C results from SG-516, SG-517 and SG-608.

12.1.4 Pit house

Group G-330 represents a square pit with a stepped cut, vertical sides and flat base together with a barrel casing in the bottom of the cut (Fig. 47). The barrel (ST158499) was resting on horizontal planks (ST159464), which in turn were resting on the basal deposit of the well cut.

Fig. 47. Pit house. Upper and base of construction cut with top of barrel, facing north. Photo: Museum of Copenhagen.

The barrel consisted of 15 staves with the remains of wooden hoops. The planks were from 0.08-0.13 m wide and 0.60-0.70 m long. All the staves in the barrel had survived, but the bottom was missing (Fig. 48).

Fig. 48. Recording and removing barrel (ST158499), facing west. And of course – always avoid disturbing things such as white big bags and colleague's feet in the picture! Photo: Museum of Copenhagen.

Underlying timber (ST159464) consisted of nine horizontal planks; six oriented NE-SW and three oriented NW-SE (Fig. 49). The latter could be part of the missing base or a lid, but were not placed directly under the barrel. The wood had probably been used as "stepping planks" to avoid sinking into the mud, alternatively the planks had been used for stabilization while the barrel was positioned.

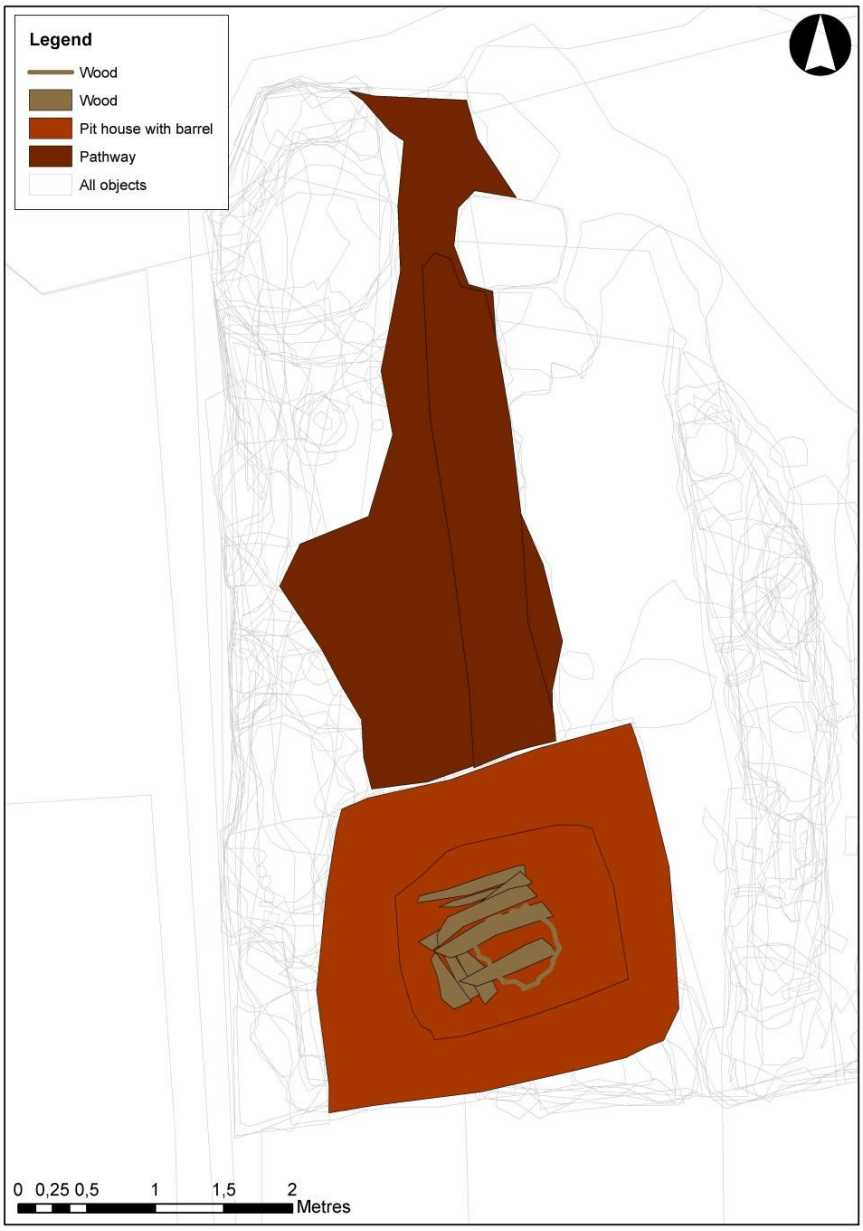

Fig. 49. Interpreted pit house with barrel and a N-S running pathway.

Deposits (SD159267, SD158995 and SD159603) were backfills around and below the barrel for stabilization consisting of sandy clays of different colour with inclusions of stones and pebbles (Fig. 47 and 49).

Fill (SD158534) in the barrel and deposit (SD158448) above were both rapidly deposited backfills of dumped material of light reddish grey clayish sand and mid brownish grey clayish sand with some bones. No dating or environmental material was recovered from the deposits, although the barrel can be dated to 1213–1215 AD based on dendrochronological analysis (Tab. 15), and underlying clay lined pit (G-332) and was probably connected to the fishing activities on site. Though no postholes were recorded in the connection with the larger cut the structure could be part of a pit house with a sump in the middle and contemporary with pit G-353 placed to the north, as they were both sealed by the same deposit. Nothing indicates that the backfills represent excrement – so the barrel had not been used as a latrine, nor for storing liquid since the base was missing.

The pit house is dated to 1214 AD and should be connected to the fishing activities on site represented by the clay lined pits. Since the barrel had no proper bottom the function could be a simple sump, etc.

CATRAS No.	PD No.	Species	Years	Character (Sp) Sapwood (W) Wane (B) Bark	Dating	Tree felling (V) Winter (E) After	Remark
60215	220888*	Beech	66	No W	Z***	-	-
60216	220889**	Pine	69	W	Undated	-	-
60217	220888*	Beech	119	No W	Undated	-	Correlate with 60222, might be 1252 AD
60218	220888*	Beech	113	No W	1185 AD	E 1185 AD	Local or South Sweden
60219	220888*	Beech	45	No W	Z-4***	-	-
60220	220888*	Beech	43	No W	Undated	-	-
60221	220888*	Beech	189	Close to W	1213 AD	1214±1 AD	Local or South Sweden
60222	220888*	Beech	149	No W	Undated	-	Correlate with 60217, might be 1285 AD

*PD-number = 211620. **PD-number = 211621. ***The samples fit together, but are undated. Z is a fixed year, but is undated.

Tab. 15. Dendrochronological date of beech planks (ST159464) under barrel.

12.1.5 Post- and stakeholes

The postholes did not form any clear structure and further interpretations are difficult, but these probably represent part of a roof bearing construction of temporary character in connection to N-S running fence line(s) SG-508 (Fig. 36, 37 and 50).

Fig. 50. Post-excavation. Concentration of stakeholes (SG-508), facing north. Photo: Museum of Copenhagen.

The fence consisted of horizontal wicker, though no vertical poles were documented, so these had been drawn up when the structure went out of use. Disturbances made it impossible to reconstruct the height or width of the fence line.

AMS-analysis of material from one of the backfills dates the postholes to the 12th century (Tab. 16).

Lab. No.	^{14}C year BP	Cal. 1 σ	Cal. 2 σ	Context No.	Negligible own age	Material
LuS 11360	870±35	1055–1220 AD	1040–1255 AD	SD93137	Y<?	Cattle, *Bos taurus*

Tab. 16. ^{14}C results from SG-507.

12.1.6 Levelling and activity layers

The levelling and activity layers in this time phase probably represent some sort of water deposited sand together with very decomposed organic material of plant parts also documented at the Metro excavation in 1996–1997 (cf. Moltsen og Steen Henriksen 1998).

For some reason, unknown to the responsible Field Leaders, charcoal from one of the deposits (SD140652) in an activity layer was sent to Kiel for AMS-analysis. This is the reason why species and old-wood effect are missing in the Viking Age date below (Tab. 17).

Lab. No.	^{14}C year BP	Cal. 1 σ	Cal. 2 σ	Context No.	Old-wood effect	Material
KIA 45590	1245±15	695–778 AD	686–857 AD	SD140652	Unknown	Charcoal, species unknown

Tab. 17. ^{14}C result from SG-754.

Only a few finds were collected, consisting of iron nails, slag, leather, flint debitage and -tools together with ceramics (Undefined Greyware; 1000–1450 AD and Early redware; 1200–1350 AD).

The osteological material is varied, consisting of cat (?), cattle, pig, sheep, sheep/goat, mammals unspecified, domestic fowl, bird sp., amphibian unspecified, cod, cyprinids, eel, gadid, herring, perch, plaice/flounder/dab and fish unspecified. The bones mainly represent typical household waste and the fish is mainly represented by herring (Bødker Enghoff and Magnussen 2015).

Despite targeted sampling (both pollen and macrofossil samples) the archaeobotanical results from this time sequence are too limited to clarify anything about the local environment and the presence of beach meadow plants and/or grass swamps, and whether part of the area had been affected by flooding or any maritime material had washed up. No clear traces of human activity can be seen in the samples analysed.

12.2 Overall discussion and interpretation

The objectives of the Kongens Nytorv investigations were to clarify land use, at least the relationship between streets, plots and buildings. It was also important to clarify the oldest activity in the area and prove pre-urban remains. Settlement remains had until the excavation was initiated mostly been found in the western areas in conjunction with the medieval city (cf. Fabricius 1999). Former C14-datings and findings from Kongens Nytorv in relation to the so-called *"Clemensstaden"* date the activities in the area to the second half of the 11th century. This information is based on only one C14-dating to 1015–1150 AD from the fills in one boundary ditch and an antler handle with animal ornament from the 11th century (Kristiansen 1998:11 et seq.; 1999a:108 et seq.).

A key objective was also to define land use and pre-urban relics and buildings of non-rural character before the expansion of the city area during the 14th century. Had there been a pre-urban market settlement of a seasonal nature

or had the settlement consisted of freely situated booth buildings in the area together with structural features suggesting early urban planning such as the section and regulation of plots by drainage ditches and possible boundary banks?

This also implies buildings in terms of simpler houses and sunken feature buildings to fishing and agricultural activities, tracking pre-urban settlement in the form of building remains and other types of activities such as clay lined pits, clay extraction pits, peat digging, retting (preparing flax), etc. (cf. Thomasson 2008:289; Kristiansen 1998; 1999a:104 et seq.; Moltsen 1998:26 et seq.). In the discussion about the medieval city's eastern regions, Østergård's existence and location was an important question.

12.2.1 Boundary ditches and the establishment of plots within the eastern part of the city

Sometime in the early 1200s parts of the beach became regulated and developed. The implication of this is that the area was divided into plots with more permanent activities. The regular and irregular ditches represent boundaries between a property and the adjacent salt marshes (cf. Kristiansen 1998:42 et seq.; 1999a:104). One of the ditches in the former excavation was filled with blue-grey clay not naturally found in the local moraine, where the sedimentation must have happened incrementally and a clear boundary marks the subsequent intentional backfilling – a construction detail which was also seen in the later investigation at Kongens Nytorv (SG-500917). The mud deposition shows that the ditches had been used over several years and regularly cleaned. The occurrence of silt and stagnant brackish water also proved that the ditches had not been in direct connection with the sea, but flooded at regular intervals (cf. Moltsen 1998).

The boundary ditches can be seen with connection to other Early medieval activities in the area:

Investigations in 1998 identified peat layers, cultural layers and an east-west orientated and at least 7 meter wide drainage (?) ditch with High Medieval finds, C14-dated to 749±28 BP or 1223–1286 AD (cal 2 σ), another ditch, and postholes (Poulsen 2000; Moltsen 2001). The bottom layers contained large amounts of fish bones and one of these deposits was C14-dated to 775±36 BP or 1188–1285 AD (cal 2 σ). The High medieval cultural layers were observed directly over natural substrates. At the establishment of the tunnel between Magasin's basement and the Metro station, cultural layers, paving, foundations (?), ditches (?), a cellar (?) and other types of pits were recorded. The finds could be dated from the 13th–14th century onwards and elder (*Sanbucus sp. L*) from one of the features was C14-dated to 870±35 BP or 1044–1254 AD (cal 2 σ) (Jark Jensen 2001; Grootes 2002). In Østergade No. 13 a 5.5 m wide and 2.0 m deep north-south oriented ditch was documented. Saline affected peat was recorded and the bottom fill was C14-dated to 771±30 BP or 1217–1281 AD (cal 2 σ). Based on the finds the ditch went out of use in the 16th century (Poulsen 2005), so the radiocarbon dating must be regarded as uncertain.

The ditches and fence line can be interpreted as allotment fences for dividing the land behind the former rampart and a spatial continuation of the Metro investigations in 1996–1998 which revealed several north-south orientated boundary ditches in the northern and western parts of the excavation area and about 10 m east of Magasin's department store facade (see Fig. 51 and Kristiansen 1998:41 et seq.; 1999a). The oldest activities were three ditches that replaced each other and after disuse the latest ditch was followed by a wicker fence and a feature interpreted as some form of boundary bank. In the middle and southern part of the excavation area only one single ditch was documented (Kristiansen 1998:41-62; 1999a:101-108). The investigation at Kongens Nytorv shows that at least one of the boundary ditches recorded at the Metro investigations in 1996–1998 continues to the north. No evidence, due to modern truncations, could be put forward to determine if this consisted of several phases or was a single, broad boundary ditch (Fig. 51).

Fig. 51. Boundary ditches and pits at Kongens Nytorv; Metro excavations 1996–1998 and Metro Cityring 2010–2015.

Some of the ditches represent east-west cadastrals similar to the ones that were investigated in the basement of Magasin in 1996–1998, delimited by an east-west aligned ditch (cf. Kristiansen 1998:42 et seq.; 1999a:105). The former group includes ditches whose primarily purpose was to improve the growing conditions by redistributing the water, and also ditches whose primary function was to divert unwanted water from specific land areas, such as a house plot.

Fig. 52. North-south running ditch investigated at the Metro excavations in 1996–1998, facing SW. Photo: Museum of Copenhagen.

A total of 6 radiocarbon dates were completed dating the ditches and pits to 1020–1295 AD. These AMS-datings correspond well with earlier dates from the Metro investigations in 1996–1998 (cf. Kristiansen 1998; 1999a:113 and 114), where different types of material from fills in the ditches and pits were C14-dated to between 1024–1270 AD (cal 2 σ) (cf. Kristiansen 1998:65; 1999a:113 et seq.), with the exception of animal bones (*Ovies aries*) dated to 985±40 BP or 989–1155 AD (cal 2 σ). The collected ceramics were dated to 1100–1500 AD, 1225–1350 AD, 1315–1350 AD and as late as 1300–1700 AD and 1350–1800 AD. A later contamination could be the case since several of the ditch fills contained red bricks, but without further description or information.

The fence line is not AMS-dated based on the lack of datable wood and macrofossils, but a branch and wood from the wicker fence (species unknown) from the former Metro excavations were AMS-dated to 1185±45 BP or 694–971 AD (cal 2 σ) and 772±39 BP or 1185–1288 AD (cal 2 σ), where the latter dating is most likely. Twigs and wood chips in a layer of seaweed were dated to 930±50 BP or 1021–1212 AD (cal 2 σ) (cf. Kristiansen 1998:65 and C14-datings from KBM 1410. 2012).

The boundary ditches and the wicker fence were abandoned in the last decades of the 13th century, and then covered by salt marshes and a faeces layer from humans and animals, where wood (unknown species and old-wood effect) and twigs were AMS-dated to 550±35 BP or 1308–1436 AD (cal 2 σ), 685±45 BP or 1256–1398 AD (cal 2 σ), 765±45 BP or 1173–1295 AD (cal 2 σ) and 830±30 BP or 1160–1265 AD (cal 2 σ), however there is no explanation for these late dates and why they diverge so much in time. A handle made of deer antler with animal ornamentation recovered from this rubbish layer could be dated to the 11th century. After this the area was covered by the facilities of the city's fortification (cf. Kristiansen 1998:11, 43 et seq., 65, 86; 1999a:101 et seq.; 1999b:158 and 159; Rud og Heinemeier 1998b).

There is also an alternative interpretation for the boundary ditches and their function in this case should be seen in relation to the fishing activities in the area. The ditches could be compared with the ditches and clay lined pits at Kv. Liljan in Malmö (cf. Larsson & Balic 2006:124-125), which like Kongens Nytorv had a clear regulation of the area in terms of several ditches located together, perpendicular to the beach and parallel with the pits lengthwise. All the pits at Kongens Nytorv are located west of these boundary markings. Pits east of this marker can unfortunately not be determined with certainty, since the natural subsoil here largely was destroyed by the Late medieval moat and the later fortification from the 1600s. However, these ditches do not represent a "*fit-area*" since this division of the beach zone is first dated to the 14th century by when the clay lined pits had disappeared as construction type (cf. Eriksson 1980:75; Ersgård 2016).

No clear traces of Early Middle Age settlement in the area west of the boundary ditches were recorded as probably had been seen at the former Metro excavations. Here some layers and observations in the NW part of the excavation could be interpreted as remains of buildings consisting of floor layers and imprints from a north-south orientated foundation belonging to a building dated to 1200–1300s, a north-south orientated base plate, a fireplace, pits and trenches. Three of these pits were interpreted either as postholes, board- or erosion holes (?) (cf. Kristiansen 1998:48 and 55; 1999a:109 and 110). Activity layers recorded against Magasin's facade in the same way as the levelling and rubbish layers over the boundary ditches, indicated different types of activities from the 11th century, perhaps as early as the first half of the century (cf. Kristiansen 1998:11).

The simplest unit in the towns was the plot (*area*) unlike the villages' bol (*mansus*). Property division was primarily made by the original city the plan, secondarily by widening the property area. The plots seem to have been set out as strips extending from the main street across the quarters to a demarcated alley, arable land or beach.

In Early medieval Lund in Scania boundaries consisting of wickerwork, poles and planks have been investigated (Andrén 1976:21 et seq.). Similar facilities have most likely existed in other Danish cities as provided for in the Danish provincial laws. Among the mentioned ditches there are those which are interpreted as boundaries for cabbage farms or enclosures, limits of "activity areas" and plots within the city. The fences were of course necessary for practical reasons, for example to prevent domestic animals from entering the cabbage- and apple farms, etc. (Jönsson & Kockum 2005:9 et seq.).

Palle Siemen's investigations in the Esbjerg area have shown that thwart ditches can be traced back to the 11th century (Siemen 1994:52 et seq.). In connection with investigations in Tårnby, south of Copenhagen, regulation of plots in the form of trenches can be seen from the 1100s, although older, but indistinct boundary markers were excavated in the form of single trenches (Kristiansen 1999d:105).

Also, in the rest of Europe the plots were manifested through trenches. In England it became common in the 13th century to limit the plot with dug trenches, sometimes supplemented by embankments and hedges, stone walls or simple palisades of standing timber. One reason may have been that they wanted to keep the animals away from the thwart, but were also used to protect the farm against theft and burglary (Astill 1988:51 et seq.).

12.2.2 Østergård and Byens Tårn

One of the objectives in the Method Statement was to clarify whether any traces survived of an Early medieval property, entitled Østergård, reputedly located in close proximity to the excavation site at Kongens Nytorv. No traces of this farm, through high-status buildings or activities possibly affiliated to the bishops' estate were recorded in the excavation and the existence of Østergård is therefore still questionable since it is not firmly located (cf. Frederickson 1999:64). Though one archaeological observation should be mentioned: the fact that the High medieval rampart is placed on the same N-S line as the boundary ditches (Fig. 51 and 73), could indicate an already existing boundary and plot either specified by the king or his bailiff responsible for the fishing activities in the area.

The same argument applies for the existence, location and dating of the so-called *"Byens Tårn"* and Kringelen. Freestanding towers are already known in the 12th century, in Denmark, Scania and Gotland (cf. Sprogø, Aose in Åhus, Flynderborg in Helsingør and Malmö (?) and Kruttårnet in Visby). Before Archbishop Absalon fortified Slotsholmen there is information about a tower at the harbour, built on the shore near the old ferry landing on the islet of Bremerholm. A tower near the shoreline is also mentioned in Johannes Krags Stadsret from 1294 and from two later sources – in 1343 as *"turrim ville"* and in 1380 (KD I:84; Christophersen 1985:70). The tower should have been on Østergård's plot (see Østergård above), reputedly located on the corner of Vingårdsstræde and Holmens Kanal.

In 1496 a tower called Kringelen is mentioned lying south of Østerport and east of the big ground where department store Magasin is today or *"paa det Hjørne sønden for Østerport og østen for Her Benediktes Gaard"* (on the corner south of East Gate and east of Mr. Benedict's farm) (Vingården) (KD I:234 and 334).

Ramsing suggest that *"turrim ville"*, the tower, which lay on the beach, and Kringelen are one and the same tower (cf. Ramsing 1940, Vol. III:19). Fabricius argues that the Late medieval tower Kringelen may have been placed south of Vingårdsstræde (cf. Fabricius 1999:126).

Both investigated a feature which he interpreted as a tower found under the current Magasin's south-eastern corner in 1873. The foundations were 120 degrees of a circle lying on the moraine and had an estimated diameter of 32.5 m. The wall thickness was of 0.6-0.7 m (Both 1873:4 et seq.). Ramsing writes that on the corner of Laxegade/ Vingårdsstræde he observed the outer part of a circular grave outside this so-called tower, which continued through Vingårdsstræde (Ramsing 1940, Vol. III:12). Hans Stiesdal, museum inspector at the National Museum, has since rejected the structure as a tower, and suggests that the masonry stems from a mantle wall around a core tower which theoretically may be older (Stiesdal 1975:2).

The circular construction encountered by archaeological investigations under Magasin could not verify Both's observations, lacking traces of masonry, stone foundations and ditches in the sub-surface. In connection with the excavation in the same area of possible looting pits destroying this structure, boulders, peat layers and 0.8-1.0 m thick rubbish and cultural layers dated to the 13th and 14th century were documented (Skaarup 1997). It should be noted that only one of the archeological trenches (No. 4) affected the curtain wall's interpreted location. Further investigations in 1998 identified a foundation of boulders at the location and a curvature interpreted as Both's curtain wall, however dated to the 17th or 18th century, and thus not of medieval origin. High medieval cultural layers were observed directly over the natural substrate (Poulsen 2000; Moltsen 2001).

Considering the limited excavations conducted with their uncertain interpretations the question of *"Byens Tårn's"* existence and the significance of Østergård is still unanswered, but one should nevertheless not disregard the fact that there may have been a freestanding tower in the area with an accommodated bailiff, whose task was to control and tax the seasonal fishery activities on the beach for the king's purse.

12.2.3 Clay lined pits

The clay lined pits recorded at Kongens Nytorv and other coastal localities are connected to this extensive herring fishery. These pits were usually between 0.2 to 0.4 m deep, and had a layer of clay up to 3.5 cm thick as an impermeable lining. Often this clay layer continued over the lip of the pit, and formed a clear edge. In plan, the shape varied significantly – they could be oval, long and narrow, or more rectangular. The size of the structures varied significantly, from 1 m^2 to 15 m^2. In certain cases remains of planks and wooden lids have been recorded in conjunction with the pits, the presence of stake- and postholes close to the pits indicate some form of superstructure. Marks in the clay from stake tools could be connected to the pit's primary function (cf. Kling och Lindgren-Hertz 1990:18; cf. Balic et al. 2005).

A review of the published material shows that clay lined pits are a Scandinavian construction type represented mainly on Zealand, Scania, Blekinge, Halland and the islands of Öland and Gotland (Stenholm 1981). All features are either directly linked to the coast or are linked to a river which has its outlet into the ocean.

This type of structure has never before been investigated in the Copenhagen area – but in retrospect there are indications that this type of pit was in fact documented at the Metro investigations in 1996–1998 (Roland 2016), though nothing in the materials with the exception of a waste deposit and layers in a ditch dated from c. 1000–1400 AD, indicates any traces of herring fishing in a larger scope in the area (cf. Vebæk Gelskov 1998; Moltsen 1998) and the pits also differ in size compared with the clay lined pits to the north (Fig. 51).

Some of the features that Ramsing recorded as clay floors just north of Farvegade could based on size and orientation be reinterpreted as clay lined pits due to the fact that they are placed along the High medieval beach line (cf. Ramsing 1910:490 and Fig. 1). Perhaps a similar reinterpretation can be done for the smaller clay extraction pits south of Frederiksbergsgade 1 og 5 (Ramsing 1910:497 and Fig. 2), but this can not be clarified based on the archival material.

At the Metro-investigations at Rådhuspladesen (KBM 3827) there are three Early medieval pits that could be interpreted as clay lined pits (Fig. 53). Group 174 consisted of a quite large pit (1.45 x 1.20 x 0.48 m). The shape was sub-circular, with straight sides and flat base. Also lower fills, with a thin lens of usage followed by a clay lining, points to the pit being used for "clean" purposes and the need for creating a new phase of clean usage. Bottom layers had finds of household and production character including fish bones and a fairly thick (0.1 m) deposit of "oily" material. C14-dating of seed gives a date to one of the lower, very "oily" refuse layers 1045–1275 AD (2 σ) (Lyne and Dahlström 2015:96).

Sub-circular pit (G-176) consisted of a partially preserved pit with clay lining in the bottom on the sides. In one of the fills there were a few pieces of furnace lining. Part of the lining in the bottom was heat affected. Finds consisted of animal bones, fish bones and slag. The truncation was dated to the Early medieval period based on stratigraphy and similarities with surrounding Early medieval features. A clay lined pit suggestion could also be used for pit (G-183) containing large amounts of fish bones and interpreted by the authors as a container for fish waiting to be used in the household, later re-used as a refuse pit. In all, 13 species of fish were present in the samples, and herring, gadids and eel were predominant. Osteological analysis showed no signs of fish processing in the fills, since all parts of the fish were present. A seed from one of the lower fills was AMS-dated to 1154–1232 AD (2 σ) (Lyne and Dahlström 2015:96-98).

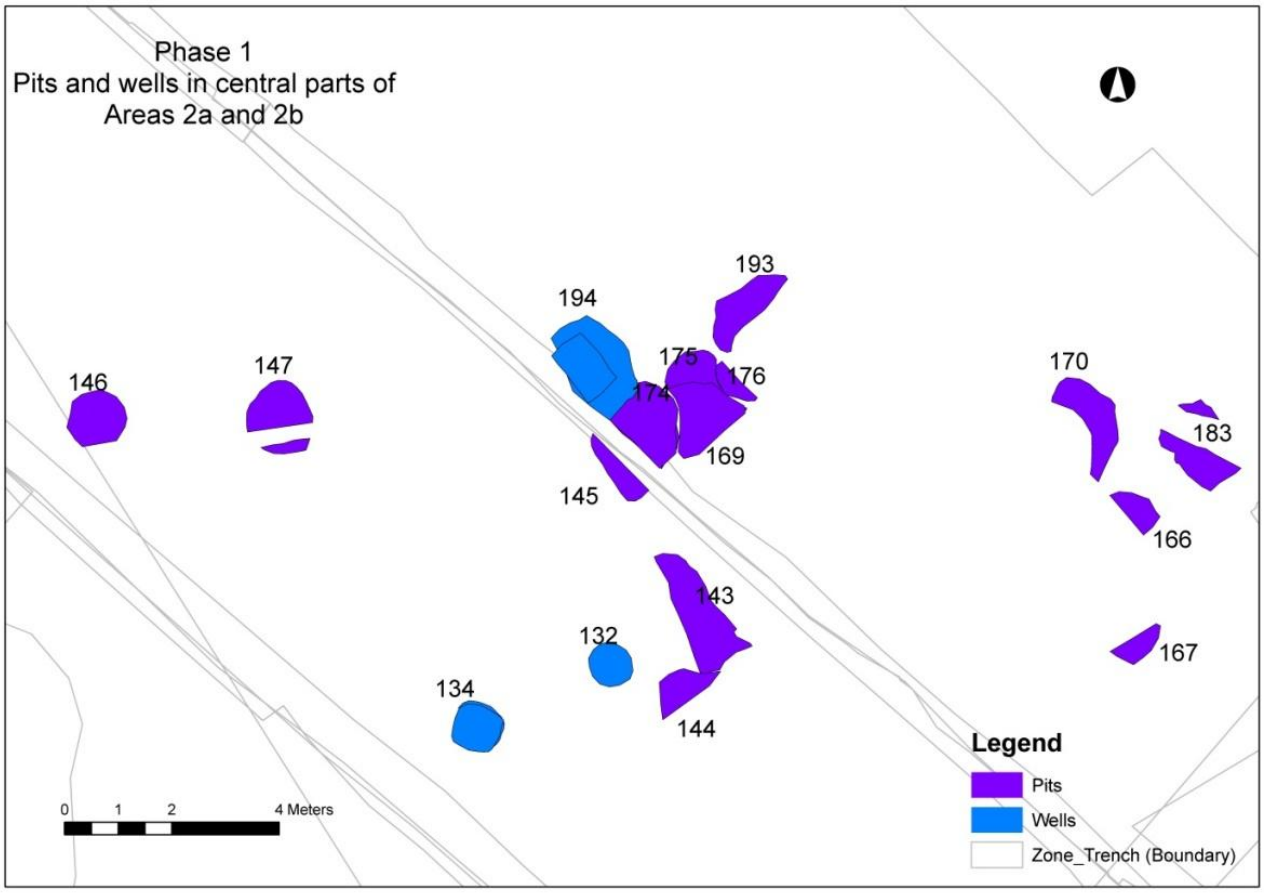

Fig. 53. Potential clay lined pits at Rådhuspladsen (KBM 3827) represented by G-174, G-176 and G-183. From Lyne and Dahlström 2015.

The pits often overlie or intersect each other in a manner that creates the impression that they represent seasonal activity. In thin horizons within these pits, compressed herringbone and even whole fish were recorded.

Regarding their precise function there are a range of opinions. Previously the clay lined pits were interpreted as flooring in simpler shelters or huts, used during the fishing season (Rydbeck 1935). In more recent years, the features have been studied again and several interpretations have been proposed; production of fish liver oil or brine, as a symbolic tax receipt for the fishermen; storage or sorting of the fish by size and quality for the later salting and packing in barrels or fermentation of herring (cf. Stenholm 1981; Tesch 1981; 2014; Ersgård 1989; 2006; Cardell 2005; 2015a; Eriksson 2015). Analysis of the clay lined pits has shown high phosphate values which are the result of decomposed organic material (Löfgren 1989:125).

Common for the herring remains both from Kongens Nytorv and Malmö is that the *Cleithrum* is not present (Bødker Enghoff and Magnussen 2015:21; Cardell 2005:102) and cut marks on *Præoperculum* show that the fish has been gilled and represent fat autumn herring. Herring has always been eaten whole and the stomach content was not removed (Cardell 2005:103). The presence of other species like cod and plaice/flounder/dab among the fishbone material is not unusual (cf. Cardell 1995:5) and can be explained as by-catch in the nets due to small size, etc. (Cardell 2005:105).

Analysis conducted on material from pits in Copenhagen and Malmö has shown that the lining consisted of coarse clay, and was not chosen to keep liquid in. Several samples from the clay have also shown that it does not contain fatty acids and that the content of sodium (salt) is not higher than normal, which contradicts the theory that the pits

had been a production place for brine or oil. The production of brine in the pits would also have dissolved some of the fish bones present in the pits at Kongens Nytorv (cf. Cardell 1995:7).

As herring is a relativly fat fish, not that suitable for drying during the winter months and too time consuming for smoking in large quantities, it did not become part of the staple diet before about 1200 AD, when German merchants, especially from the Hanseatic League began to supply Scandinavia with salt, which competed with the local production from seaweed or seawater (cf. Vellev 1996), and barrels for transportation.

Over time, the Hanseatic League became a political and economic superpower that came to dominate the trade. Progress lay partly in its organization and capital, and its control of salt. A prerequisite for herring gaining a greater economic significance was the ability to preserve or prepare the fish so that it could be stored and transported. Since the main Hanseatic city Lübeck controlled the salt mines of Lüneburg and Oldsloe in northern Germany, and ships that could take up to 100 tons of cargo, it was possible to transport large amounts of salt to the markets.

13 Phase 4a High medieval fortification 1200–1350 AD

13.1 Results

The presentation of the remains from Phase 4a will be given from two perspectives. Firstly there will be an account of the different feature types – rampart, stockade, posts, fence lines and moat (Fig. 54 and Tab. 18). After the overall description the features are placed in a structural and historical context.

The Late medieval rampart is presented in this chapter (cf. Chapter 16; Phase 4d Late medieval and Renaissance fortification 1350–1600 AD), since it was difficult to separate the various phases consisting of the same type of building material – though at least two later additions to the rampart have been proven. An attempt has later been made by renewing stratigraphic relationships with the city wall, investigating the inclusion of CBM in the deposits, set in relation to previous archaeological research and written sources. Besides stratigraphical observations some of the deposits and features have been grouped to this phase based on finds and AMS-dates.

Fig. 54. Rampart, moat and other structures related to the High medieval fortification. The lack of rampart layers north and south of the Transformer Station is due to excavation conditions (below kote 0) and the later city wall truncation which had removed the deposits.

Group	Type of feature	Subarea	Basic interpretation
310150	Deposits	Phase 4B, 5B-1, 5B-2, 45A and 45B	Rampart
184015	Timber structure	Phase 5B-1, 5B-2 and 45B	Bulwark
190690	Postholes and stake	Phase 45B	Bulwark
542	Posthole	Phase 45B	Part of bulwark?
764	Post	Phase 5B-1	Part of bulwark?
750	Postholes	Phase 5B-1	Stockade/"*Byens Planker*"
717	Posthole	Phase 5B-1	Isolated post. Part of G-750?
193905	Posthole	Phase 45B	Isolated post
200140	Stake and stakeholes	Phase 45B	Fence line
328	Stakeholes	Phase 45B	Fence line
460	Moat	Phase 5B-1, 5B-2 and 45B	Moat, construction
389	Wattle and twigs	Phase 45B	Fence/part of bulwark
195196	Sedimentation	Phase 5B-2 and 45B	Moat, usage
200139	Deposits/backfills	Phase 5B-1, 5B-2 and 45B	Moat, destruction

Tab. 18. High medieval fortification.

13.1.1 Rampart

On site it was difficult to separate the High medieval rampart from the later additions in the 14th century, since the building material consisted of the same type of mixed brown, grey and yellow moraine with lenses and inclusions of sandy peat and topsoil. No clear separation was done in the grouping phase of the post-excavation work and to separate these two construction phases all deposits cut by the city wall have been related to the original core rampart, while later and on site recorded additions to the west and outside the wall foundation to the east have been grouped as part of the High and/or Late medieval rampart. The latter embankment was constructed to strengthen and stabilize the structure in relation to the water bearing moat. This also includes most of the deposits covering the 13th century bulwark (see Chapter 13.1.2; Bulwark – building material and construction details).

Based on these assumptions the High medieval rampart could be documented with a width of 3.8 m and at the most with a height of 0.8 m, where these maximum measurements must be seen by the fact that the structure was heavily truncated to the west and the rampart crown had been destroyed by later activities. The angle of the slope varied from 30-45 degrees based on information from different sections drawings; C209039, C211560 and C211562.

The rampart was very simple in its design. One started with the natural salt marshes and dug a hole for the moat. The first excavated earth from the moat was then placed at the opposite end of the rampart, which would then have lifted it to the desired width and height. The soil was placed systematically in layers to achieve the best possible compactness, where peat probably was used to stabilize the structure.

No further analysis of the particle size was made to compare the embankment material with the underlying moraine (cf. Steen Henriksen 1998:6), but one has to assume that the building material was taken from the surrounding subsoil when digging out the moat.

The proportion of peat within the structure was probably represented by material from the nearby salt marshes which are characterized by narrow strips of sand deposited as a result of flooding from the sea (cf. Moltsen 1998:24), though there were no indications that the foot of the rampart had been protected by peat (cf. Fraes Rasmussen 2005:112).

The height of the High medieval rampart was measured to c. 1.5 m, where the width at the foot was estimated to c. 7.6 m. Similar to the former Metro investigations (1.7 m) the rampart crown had been dug away and truncated by later building activities (cf. Kristiansen 1998:12), so the original height is unclear. The construction of the rampart had taken place gradually with an inclination of 10 degrees up to the later city wall. Based on the width and the

documented angle, the rampart must have reached the wall just below the brick structure. After the Late medieval addition the height was between 2.0-3.0 m and the width between 10.0-14.3 m. To make the fortification stronger an embankment was created behind the city wall which was 16 cubits wide (1 cubit = 62.8 cm) and approximately the same height as the city wall itself (cf. Lassen 1855). Similar additions can also be seen in the section drawings for Vartov's gård in Farvergade No. 27 where the rampart was made 1.7 m wider (cf. Jensen 1934:Fig. 2).

The oldest rampart consisted of mixed brown, grey and yellow moraine with lenses and inclusions of peat and topsoil. Thin dark brown layers seen in different sections of the rampart could indicate grass growing on top of the rampart crown at some point, but these organic lenses probably represent mixed material including natural peat layers from the salt marshes used in constructing the feature (Fig. 55).

An attempt was made to separate the different phases based on composition and homogeneity without any clear results. Some of the layers had inclusions of CBM which should represent waste from the construction phase(s) of the city wall, though these layers were concentrated to the area just south of the gate building and in an area in phase 4B which could represent contamination from establishing the later rampart street. Certain layers grouped to the rampart also contain fish and animal bones, despite the fact that this type of construction should be free of waste material –however this does not affect the interpretation of the structure as a whole.

Fig. 55. Section through the High medieval rampart showing a possible core rampart (SD210411) as a lighter deposit above the dark salt marsh layer, facing south. To the left is construction cut for the city wall with boulders and to the right the possible Late medieval additions to the existing rampart appears as several dark grey-brown deposits separated by a thin and darker layer (SD210410). Photo: Museum of Copenhagen.

13.1.1.1 Dating

A few datable finds were collected from the rampart layers. These consist of two pieces of pottery (Late greyware; 1200–1450 AD), however one of the sherds was probably collected from a rampart street layer.

Several samples were collected from different parts of the rampart, but only a few of these contained macrofossils usable for AMS-dating, set in relation to the obvious source critical aspects that exist when dating deposits from this type of complex structure. AMS-analysis of charcoal (root/branch) from one of the deposits dates the rampart to the late 11th century or early 12th century (using the 2 sigma result and a maximum old-wood effect of 30 years) and probably represents secondary and older material. This interpretation also includes analysed buttercup with a dating to the early 12th century, using 2 sigma values (Tab. 19).

Lab. No.	^{14}C year BP	Cal. 1 σ	Cal. 2 σ	Context No.	Old-wood effect and negligible own age	Material
Lus 11725	780±35	1020–1155 AD	995–1165 AD	SD88983	Y<30	Hazel, *Corylus*
Lus 11347	915±35	1040–1165 AD	1025–1205 AD	SD70341	Y<1	Buttercup, *Ranuculus sceleratus*

Tab. 19. ^{14}C results from SG-390 and SG-618.

The third sample from a deposit (kote = +1.6-1.8) in the western part of the rampart dates the structure to the early 13th century and represents the oldest and first construction phase of the fortification (Tab. 20).

Lab. No.	^{14}C year BP	Cal. 1 σ	Cal. 2 σ	Context No.	Negligible own age	Material
Lus 11347	780±35	1220–1270 AD	1190–1285 AD	SD82806	Y<1	Barley, *Hordeum*

Tab. 20. ^{14}C results from SG-624.

No finds were collected from the interpreted usage phase of the High medieval moat. Within the destruction phases there are indications that this can be dated to the early 16th century, but later inclusions among the finds makes this assumption uncertain (see SG-194979 below).

13.1.2 Bulwark – building material and construction details

The bulwark was documented in connection with the rampart and former moat and consisted of the remains of about 200 pieces of planks/wood were about half of them where preserved well enough to be collected. A total of 50-60 pieces have been kept to complete analysis before discarding. In addition, the National Museum has fully conserved about 60 pieces of the structure.

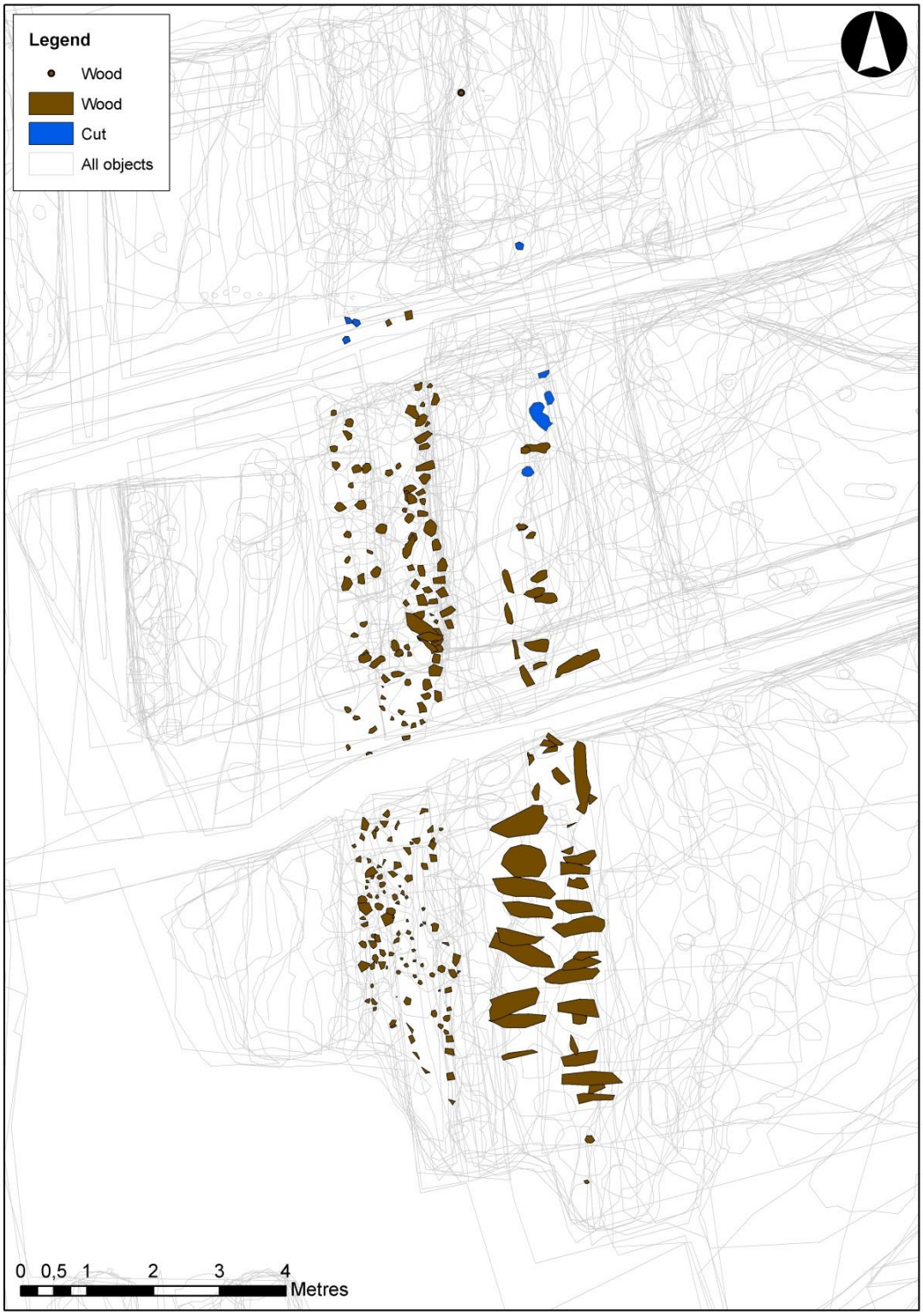

Fig. 56. Bulwark recorded in connection with the 13th century rampart.

The bulwark was located under the rampart, west and partly within the construction cut of the High medieval moat and consisted of two rows or lines of wooden posts and planks (Fig. 56 and 58). The feature consisted of vertical and tilting posts, stakes and planks orientated in a north-south direction. The length of the timbers differed from 0.09 m to

1.30 m, the width varied between 0.05-0.55 m. Set into natural the depth varied from 0.01 to 0.54 m. The bulwark was several posts deep and on average the structure was 1.5 m thick and c. 17.0 m long.

Fig. 57. Part of timber structure exposed after removing rampart layer (SD70838), facing north. Photo: Museum of Copenhagen.

Most of the posts had been sharpened to a point with an axe and driven into the ground where the tip length varied from 0.06 to 0.43 m. Some of the timbers were decayed and heavily decomposed; others pushed and bent by the pressure from the backfills of the concurrent or later rampart.

Fig. 58. Exposed bulwark with vertical and tilting timbers, rampart layer (SD70838) and moat cut (SC71871), facing west. Photo: Museum of Copenhagen.

As the timbers stretched along the construction cut to the west their condition deteriorated and the westernmost posts had become soft brown stains on the sloping moat cut. In subarea phase 5B-2 the posts were located more into the base of the moat cut and nearly all timbers survived as solid pieces, although preservation was still best on the eastern edge of the structure (Fig. 58).

The bulwark face formed quite a straight line orientated north-south, however in phase 5B-2 one part of the structure appeared to have been damaged or removed; in this area there was a recess in the face. The bulwark appeared to end in phase 5B-2 and phase 45B.

The timbers were tilting in different directions due to pressure from the backfills of the rampart from above (Fig. 59). Since the outermost posts were tilting to the east it was suggested that the planks could represent some kind of storm piles, however, this interpretation must be reconsidered since the wood mainly consisted of wider planks, probably pushed down either by subsequent maintenance work or by the pressure of the rampart lying behind the structure.

Fig. 59. Bulwark with tilting planks, facing north with section C71275 in the background. Photo: Museum of Copenhagen.

It was clear that the moat fills were deposited up against the bulwark (especially clear at the northern end). It was also apparent that water had been acting on the backfill material behind the timber structure in the middle and southern zones coalescing with the backfilled sand, of which some had been washed out into the moat since sand lenses were seen in the moat next to the posts.

As well as being slightly higher in level the timbers in subarea phase 5B-1 were more tightly packed on the front face. This would prevent heavy erosion of fill the behind the bulwark. In the northern half of phase 5B-2 the front face appeared to have been damaged. The appearance was of a recessed break in the face of the bulwark. Perhaps this

part was poorly built or that some timbers were removed during the usage phase of the timber structure. This had allowed the water in the moat to erode the construction backfill and replace it with moat sediments.

Some of the posts/stakes had not been driven into natural. At the southern end of SG-443 approximately 20 posts were recorded driven into the lowest moat deposit. These could be interpreted as repairs in an area where the moat fill penetrated the timber structure. It would probably not be visible around the posts if they had been driven through soft waterlogged moat fills, as any visible signs of disturbance of the fills would very quickly disappear as the moat fills resettled around the posts.

The method used to demolish the bulwark was obvious on several timbers, where there were visible signs that the planks had been snapped off by pushing them to the east.

13.1.2.1 Dating

The bulwark can be dated to the early 13th century (1214–1232 AD) based on dendrochronological analysis of the primary (and not reused) timber belonging to group B (Tab. 21). Group A consists of reused, imported timber from different structures, where the tree felling took place in the first and second halves of the 12th century (1123–1175 AD). The dendrochronological results match with two AMS-datings of alder from the same structure placing the bulwark to the late 12th century and second half of the 13th century (Tab. 21 and 22). The somewhat later date for one of the C14-determinations can be due to the minimum and maximum old-wood effect, which varies between 40-50 years. There is no information of the timber being reused as seen for the oak.

CATRAS No.	PD No.	Species	Years	Character (Sp) Sapwood (W) Wane (B) Bark	Dating	Tree felling (V) Winter (E) After	Min Old-wood effect	Max Old-wood effect	Group	Remarks
60119	207603	Oak	106	Close to Sp	1157	E 1167	150	200	A	Denmark/N Germany, Probably 1174±7 AD
60120	207602	Oak	160	No Sp	913	E 923	190	250		SW Sweden
60121	207604	Oak	103	No Sp	1154	E 1164	130	260	A	Denmark/N Germany
60122	207605	Oak	86	Sp 3	1214	1228±7	100	140	B	SW Sweden
60123	207606	Oak	136	Sp 2	1173	1188±7	150	190	A	Denmark/N Germany
60124	207607	Oak	143	Close to Sp	1175	1195±10	160	190	A	Denmark/N Germany
60125	207608	Oak	89	No Sp	1123	E 1133	100	200	A	Denmark/N Germany
60126	207609	Oak	109	No Sp	1136	E 1146	130	200	A	Denmark/N Germany
60127	207610	Oak	95	Sp 17	1232	1236±4	110	130	B	SW Sweden
60129	207612	Beech	325	W	1227	V 1227/28	330	350	E	SW Sweden
60145	207605	Oak	88	Sp 5	1216	1228±7			B	SW Sweden
60146	220886	Oak	122	Sp 16, W	1225	V 1225/26			B	SW Sweden
60151	209083	Oak	126	No Sp	1176	After 1186			(D)	Local/W Denmark
60152	209084	Oak	172	Close to Sp	1157	After 1167	210	300	F	Likely 1170–1190 AD, SW Sweden
60153	209088	Oak	103	No Sp	1137	After 1147	130	250	(D)	Local/W Denmark
60158	209093	Beech	352	W	1227	V 1227/28	370	410	E, J	S Scandinavia
60159	209094	Beech	204	W	1227	V 1227/28	250	300	E, J	S Scandinavia

60160	209095	Oak	117	No Sp	1160	After 1170	160	250	F	Prob. close to SP, and felling 1170–1200 AD, SW Sweden
60161	209096	Oak	132	No Sp	1153	After 1163	180	300	F	SW Sweden
60162	209097	Oak	157	No Sp	1151	After 1161	200	300	(F)	SW Sweden
60163	209098	Oak	122	No Sp	1148	After 1158	150	250	F	SW Sweden
60164	209099	Oak	57	No Sp	1046	After 1056	80	150	F	SW Sweden
60167	209102	Oak	71	No Sp	1104	After 1114	90	150	(D)	Local/W Denmark
60168	209103	Oak	98	No Sp	1139	After 1149	120	200	(D)	Local/W Denmark
60170	209105	Oak	118	No Sp	1089	After 1099	140	250	F	SW Sweden
60171	209106	Beech	266	W	1227	V 1227/28	290	330	E, J	S Scandinavia
60173	209108	Beech	242	W	1227	V 1227/28	290	340	E, J	S Scandinavia
60180	209085	Alder	25	W		*	30	40		*Alnus sp.,* AMS-dating
60181	209086	Alder	29	W		*	40	50		*Alnus sp.,* AMS-dating

*CATRAS No. 60180 and 60181: Timbers chosen for radiocarbon dating (LuS 9701 and LuS 9702). See Tab. 22 below for results.

E = after (*terminus post quem*). Note that the entry may mean "a lot later" than the specified year. However, it is unusual that there are more than 100 annual rings missing.

V = winter, which refers to the trees' dormancy time (about August-May).

Group A. Oak from Denmark or northern Germany. If they were felled at the same time the date is 1185–1195 AD.

Group B. Oak from SW Sweden. If they were felled at the same time the date is 1232–1235 AD, which excludes CATRAS No. 60146 which was felled winter 1225/1226 AD.

Group D. Oak from Denmark, probably Zealand, but the western and southern part cannot be excluded. The correlation within the group is not that high. They are all dated between "after 1114 AD" and "after 1186 AD".

Group E. Sub-group in Group J. Beech felled the winter 1227/1228 AD in southern Scandinavia.

Group F. Oak from SW Sweden (Halland, SW Småland and Scania). Seven samples, five dates: "after 1158 AD", "after 1170 AD", two dates "after 1056 AD" and "after 1099 AD". In the latter samples there are no indications of how many tree-rings could be missing, but the other five show a more uniform picture, where the outermost ring only differs by 12 years. Furthermore, indications suggest that sample CATRAS No. 60160 shows tree-rings adjacent to sapwood border, thus the tree was felled between 1170–1200 AD. It is most likely that the felling year of the other four samples, CATRAS No. 60152, 60161, 60162 and 60163 had the same dates.

Group J. As Group E, but two more samples, CATRAS No. 60218 and 60221, which gives an earlier but *terminus post quem* date. They are probably from another unit of beech-trees. Beech from South Scandinavia. The wood shows narrow tree-rings with almost no disturbance. The diameter of the trunk is not very big although they are 300-400 years in age; the oldest started to grow in the beginning of the 9th century. It must have been a dense, marvellous forest. The timbers were probably collected from one limited area and may be from the same stand.

All are primary handled by axe in a similar way which means that the outermost part of the wood is missing (Swedish: bilat, skrätt), secondary decay plays much less a part. It is not likely that the carpenter/forest worker cut away much of the valuable heart wood in all tree trunks but some could have needed to cut deeper in the heart wood in order to get the timber straighter. Thus, some samples could get an apparent age a bit older than the others, like sample CATRAS No. 60167. Furthermore the internal dendrochronological correlation is not very high and the guidance for a single date is thereby weak. They could all have been felled

at different times, although two samples, CATRAS No. 60153 and 60168, indicate a felling year 1150s or 1160s. Eventually also sample CATRAS No. 60167 might be felled during that period.

Tab. 21. Dendrochronological data and dates of the bulwark. From Linderson 2012.

The dating of groups E and J from southern Scandinavia shows that this wood also represents primary timber (winter 1227/1228 AD), on the other hand groups D and F represent reused timber with another origin (Zealand, Scania, SW Småland and Halland) dated to 1046–1176 AD.

Lab. No.	^{14}C year BP	Cal. 1 σ	Cal. 2 σ	Context No.	Old-wood effect	Material
Lus 9701	835 ± 50	1160–1255 AD	1045–1280 AD	ST149274	Y<30-40	Alder, *Alnus sp.*
LuS 9702	775 ± 50	1215–1280 AD	1155–1295 AD	ST149694	Y<40-50	Alder, *Alnus sp.*

Tab. 22. ^{14}C results from bulwark, SG-443.

Looking at the spatial spread of the timber and datings there is nothing suggesting various construction phases, and the rows of piles have been buried at the same time (Fig. 60).

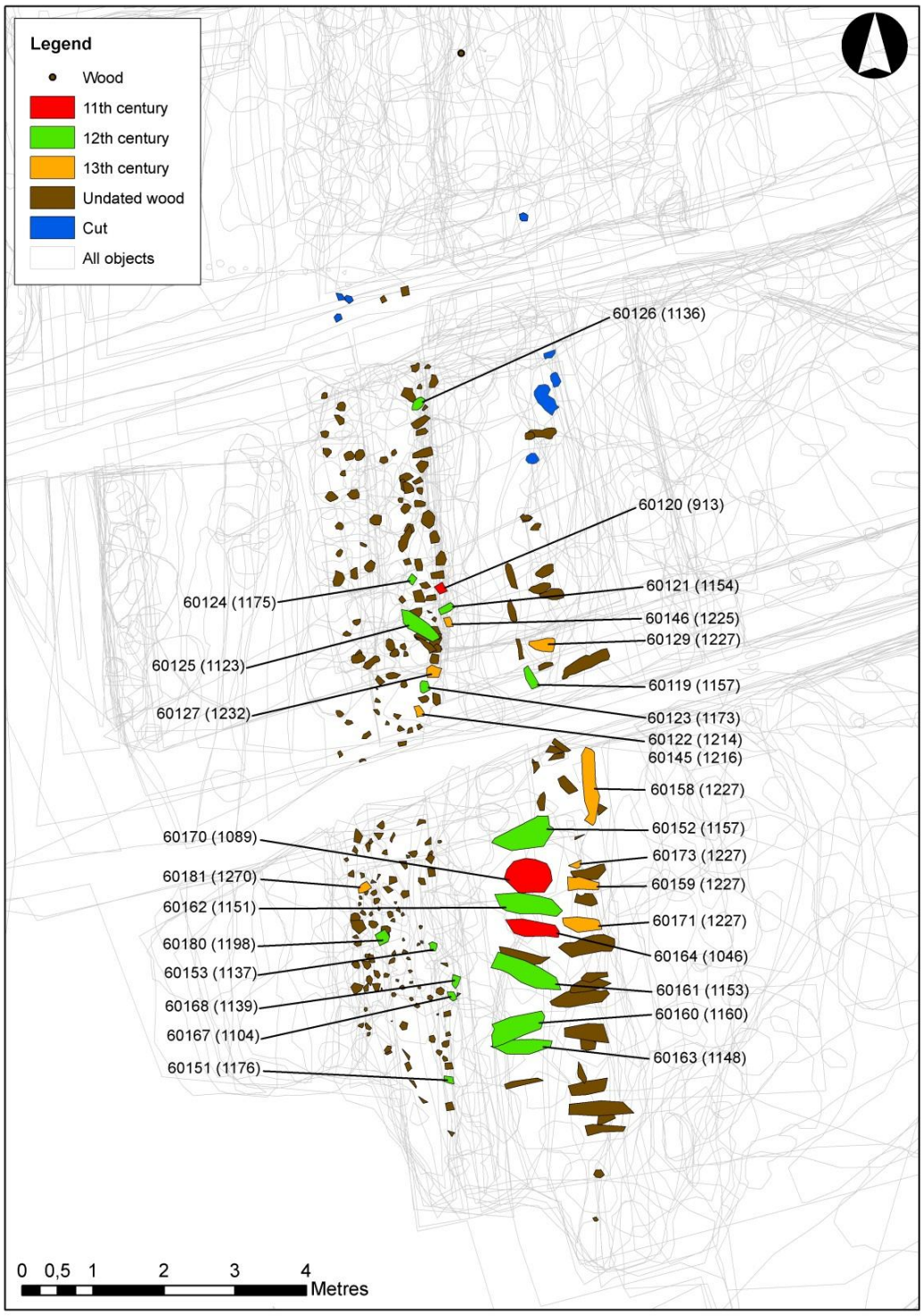

Fig. 60. Spatial spread and datings (AD) of the timber in the bulwark.

The timbers consisted of alder (*Alnus sp.),* beech (*Fagus*), birch (*Betula*) and oak (*Quercus*) whereas most of the wood behind the face to the west was circular alder trunks with bark still present (Fig. 61). The material used was a mix of new and used timber. Some of the oak pieces used on the front face of the structure had fixings that suggested they were reused. Moreover, many of the oak pieces without obvious signs of reworking could have been reused, as only the bottom part of the posts had survived.

Fig. 61. The different species in combination with reused timber in the bulwark. Red: oak, reused, turquoise: oak, green: alder and yellow: beech. Brown: not analysed. Data based on results from the dendrochronological analysis (Linderson 2012).

13.1.2.2 Use of wood and woodworking techniques

Several timbers from the bulwark were saved and are under conservation at the National Museum of Denmark's Conservation Department in Brede. Before final conservation all material was examined for tool marks and woodworking techniques in cooperation with lumberjack Karl-Magnus Melin at Knadriks Kulturbygg AB, Sweden (Fig. 62).

Fig. 62. Documentation of timbers at the National Museum of Denmark's Conservation Department in Brede. Photo: Museum of Copenhagen.

It was observed that several of the posts were reused from an older structure and the investigated timbers had different types of auger, axe, chisel, compass, knife, positioning, saw, square and wedge marks made from symmetrical broad- and felling axes, conical and spoon chisels, an awl, a grooving iron, a chalk line and iron dogs (Fig. 63-65). If the tool marks on the timber actually are left by the latter this might be the oldest documented evidence of iron dogs so far in Scandinavia (cf. Melin 2013:11).

Fig. 63. The finger points at a tool mark on timber (ST70676) that might have been done with an iron dog. From Melin 2013:11.

Based on the results the oak timber from the bulwark can be divided into two main groups:

Group A represents timber from an earlier structure that has been split and reused. Most of the timbers in this group are ¼ splits. The hewing technique used on this group of timber is hewing against the grain with an asymmetrical broad axe. The wood originates from Germany and the tool marks correspond with medieval illustrations from Germany. The timber in group A was felled around 1187±7 AD and 1195±10 AD. It´s not possible to say much about the construction the timbers were reused from, but the best guess is that the structure was some kind of open framework, perhaps a bridge. Similar tool marks can also be seen in Scanian churches from the mid 11th century (Melin 2013:6).

Fig. 64. A possible positioning mark (”Iv”) on timber (ST70895). From Melin 2013:12.

Group B only consists of six timbers. They are produced with a different hewing technique, so-called “spretteljning”, in Norwegian, where the axe hits the timber in direction with the grain. The results can be very different and thereby the technique can be divided into subgroups, but here it can clarify that group B shows a “spretteljning” made by an experienced carpenter or carpenters. The timbers do not show traces of scoring, the first procedure done when the timber is roughly shaped. Even though the surface is rather smooth it does not show the extremely well done fishbone pattern that can be seen at some of the stave churches in Norway (Melin 2013:12).

The grooves and dimensions of post (ST70409; SG-714) indicate that this was a corner post from a weather boarded house or other walled structure, containing either vertical or horizontal timber boards. This kind of “post and plank” technique is common in wells and similar examples are known from Lund, Scania. The dating stretches from the 11th to the 19th century (Melin 2013:17 et seq.).

Some of the collected wood in group B also had wear marks, being used as “chopping blocks” (Melin 2013:13).

The timbers in group B were felled between 1225–1235 AD and they originate from the southwest of current Sweden. The timbers are not split and do not have any joints that indicate that they have been reused. Since it is customary to split wood when it is newly felled, it is not unlikely that the timbers in group B are found in their primary use. This indicates that the construction was erected during the 1230s.

Fig. 65. Plank (ST70434) from SG-714 belonging to group B. The compass mark is visible in the middle of the blue lines. From Melin 2013:20.

13.1.3 Fence lines

In connection with the medieval rampart two lines of stakeholes (G-328) were recorded running N-S along the western limit of the deposits and one row aligned east-west down the slope of the rampart into the moat (G-460), where there is a spatial presumption that the structure could have been connected to the bulwark (G-540) (Fig. 66). Both SG-317 and G-328 are stratigrapically between different rampart deposits which suggests that the structures belong to a later building phase of the rampart.

Fig. 66. Stakeholes belonging to a N-S and E-W running fence line related to one of the rampart phases and remains of a wattle fence in the High medieval moat.

It seemed that the stakes were driven in given the shape of the base and sides, and that no packing was present. The stakeholes consisted of circular and rectangular cuts with a diameter of between 0.05 m and 0.10 m (Fig. 67). The depth varied from 0.06-0.32 m, and there was no distinct difference between the eastern and western parts. The stakeholes had tapered points with a sloping base. There could have been branches between the stakes, although no traces of such wattle was documented on site.

Fig. 67. Row of 9 stakeholes (SC84042-SC84100) belonging to SG-317 aligned up the slope of the rampart, facing north. The easternmost stakehole (SC84092) had truncated the underlying natural salt marshes seen as a darker stripe to the right in the picture. Photo: Museum of Copenhagen.

The feature is interpreted to represent some sort of fence on top of the rampart and in connection with the rampart street to the west.

13.1.4 Wattle fence in the 13th century moat

Remains of an upright wattle fence consisting of a line of stakes and a wooden structure composed of intertwining twigs and small branches was recorded in the transition between the rampart and the moat (Fig. 68). The stakes had a length at maximum of 0.5 m. Some points were broken off, but there was still evidence of tapering – probably made with an axe. The small branches still had bark and some of the smaller twigs had thorns. The fence had probably been pushed flat from west to east when it went out of use (Fig. 68).

The structure is interpreted as a defensive feature next to the moat designed to reinforce the High medieval rampart as a continuation of the bulwark to the south. With one exception (oak) – all stakes comprised alder (*Alnus sp*.), a species often used as building material in wet environments.

Fig. 68. Remains of wattle fence, facing west. Photo: Museum of Copenhagen.

13.1.5 Stockade or part of Byens Planker

The structure consisted of five small and two large postholes running in a north-south direction at a distance of 3.2 m west of the city wall (G-750) (Fig. 69). The size of the postholes (d = 0.2-0.6 m and depth 0.05-0.50 m) together with the straight/vertical sides suggest that these truncations represent a larger and more complex structure. The feature was recorded between two rampart phases (SG-716) and (SG-838), where the latter could represent a Late medieval addition to the rampart.

There are two possible interpretations: either the stockade represented two separate phases of a palisade on top of the rampart crown, possibly representing part of the so-called "*Byens Planker*" mentioned several times in the written

sources in connection with the medieval fortification (see Fig. 78 and Chapter 13.2.3 for further discussion), or the concentration of postholes represented part of scaffolding (in connection with the city wall?).

Fig. 69. Feature on top of the rampart consisting of two rows of postholes either representing a stockade or a palisade.

13.1.6 The High medieval moat

Parts of the High medieval moat were documented under the Late medieval additions to the east (Fig. 54). The feature could be followed in a limited area of c. 25 m, and was cut by the Late medieval moat to the east. The depth of the construction cut was estimated to be 1.45 m at the most (based on the z-values between the undisturbed surface (salt marshes) and the base of the measured construction cut. At about the same place where the bulwark ended to the north (see Chapter 13.1.2) there was a clear, secondary cut which could represent the original terminus for the 13th century moat, but further interpretation is uncertain (Fig. 70).

The width varied from 3.90-5.80 m and the exact form of the construction cut changed from north to south. In the north the cut had a sharp break of slope at the top, with slightly irregular, but largely straight sides approximately 45-60 degrees to the horizontal. At the base there was a sharp and a gradual break of the slope. At the south end the cut was a little wider, with a slightly irregular, but mostly straight cut approximately 35-40 degrees to the horizontal. The flat base of the moat was measured at 0.30 m to 0.45 m below sea level.

The High medieval moat was heavily truncated by the Late medieval moat, but one should assume that the 13th century moat was not as deep as the latter. Based on measured heights (sedimentations and later backfills) the depth

must have been at least 1.0 m. The Late medieval moat was estimated to have been between 10.0-13.0 m wide and 2.0 m to 2.5 m deep. The base was mostly flat, however there was an irregular ridge running N-S in the moat.

Fig. 70. Interpreted construction cut (SC93401) of the oldest 13th century moat seen in section, facing south. The bulwark (SG-540) was probably rammed into the base of the cut after the moat was dug, whereupon moat deposits silted up around the timbers as indicated in the section. Photo: Museum of Copenhagen.

13.1.6.1 Natural accumulation in the High medieval moat

The sedimentation in the High medieval moat was recorded between kote 0 and +0.6 m (= c. 0.6 m thick) and consisted of very uniform organic layers of dark brown and light brown-yellow sand with inclusions of pebbles, stones and twigs. Finer particles and thin sand lenses in the mud show that the flow conditions must have been limited. There were no clear traces of peat formation or growth of plants or roots and rhizomes – though this information from the context sheets must be seen in relation to the fact that none of the macrofossil samples (3) were analysed and this observation could be incorrect (see also archaeobotanical results from the deconstruction phase below).

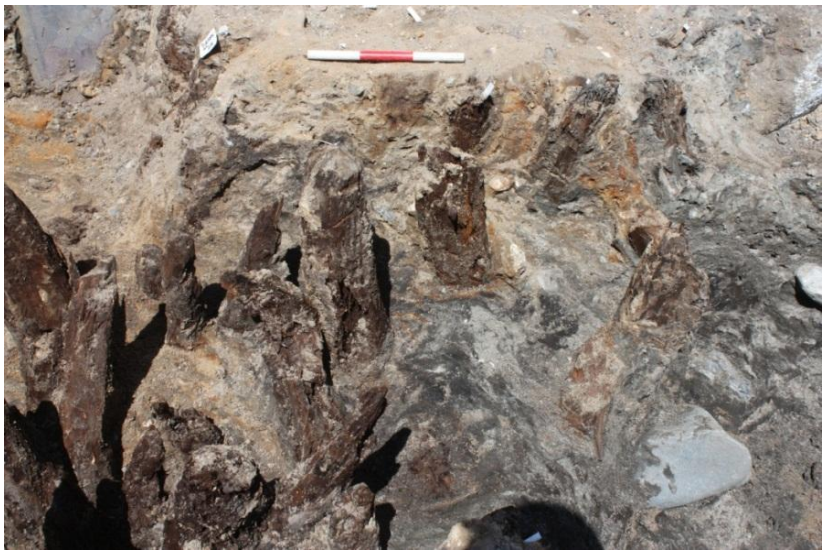

Fig. 71. Dark alluvial and natural sedimentation surrounding the bulwark (G-184015), facing south. Photo: Museum of Copenhagen.

The lack of sedimentation could suggest a regular cleanout of the moat when in use – or this could have resulted when preparing the area for the later city wall.

Finds consisted of typical household waste and rubbish; ceramics (Jydepot, Late greyware; 1200–1400 AD, Porcelain and modern pottery), ceramic marble, bricks, wall tile, CBM, a flint blade, fragment of slate, Norwegian schist (an off-cut from a whetstone?), iron nails, window glass, leather shoes, a wooden stake, wood, bones (cat, cattle, dog, horse, pig, rat unspecified, sheep, sheep/goat, mammals unspecified, domestic duck, bird sp., bull-rout, cod, Atlantic cod, eel, gadids, gadids unspecified, garfish, herring, perch, plaice/flounder/dab, three-spined stickleback, whiting and fish unspecified), shells, a coprolite and hazelnuts.

The amount and variation of finds is probably due to contamination with material from the backfilling of the Late medieval moat. The inclusions of modern finds in the medieval deposits can be explained by modern truncations in the area which have "polluted" the original sedimentations when being exposed on site.

13.1.6.2 The backfilling and destruction of the High medieval moat

The backfilling and destruction of the High medieval moat was represented by mixed deposits of lensed dark to mid brownish grey sandy silt with occasional inclusions of stones, pebbles, straw, twigs, bark, small angular stones, mortar, limestone- and small brick fragments. The deposits were recorded along the fortification line for approximately 18.5 m and at a width of 2.0 m, where several layers had been truncated by the Late medieval moat in the 16th century.

Finds consisted of typical household waste and rubbish; ceramics (Late greyware and grey-/whiteware; 1100–1400 AD), bricks, CBM, a coin/button, a pilgrim badge (Santiago de Compostela), leather, leather production waste, leather shoes, a wooden toy (possible small boat, hollowed out edge of a tree), plank fragments, tree bark, a long-toothed bone comb and bones (cat, cattle, dog, pig, sheep, sheep/goat, mammals unspecified, rat sp., domestic hen, passeriformes, bird sp., European green toad, bull-rout, cod, cod unspecified, cyprinid sp., eel, European perch, flatfish, flounder, gadids, gadids unspecified, garfish, herring, Atlantic herring, perch, plaice/flounder/dab, plaice sp., sculpin, three-spined stickleback, whiting, fish sp. and fish unspecified), hazelnuts, fruit stones and seeds.

13.1.6.3 Archaeobotanical observations and analysis

Several archaeobotanical and pollen samples were collected from the usage layers and layers later interpreted as part of the deconstruction phase in the moat, to confirm its environment based on the occurrence of fresh, brackish and/or salt water species. One must always be aware that an open environment, as the moat in fact represents, will include several source critical circumstances when dealing with and reconstructing its function considering clean out activities and that the original sediments have been "polluted" by later backfill material pressed into the underlying, soft deposits. The aim has therefore been to separate these deposits based on stratigraphical observations and internal relations and the presence and inclusions of typical waste.

For some reason none of the five samples collected from the interpreted usage layers in the moat was selected for further analysis, though information from the Metro investigations in 1996–1998 showed no traces of peat formation or growth of plants in the form of roots or rhizomes. This suggests an open pond, though a large percentage of water plants growing in salt affected water together with blue- and heart clams show that the 13th century moat had been in direct contact with the sea (cf. Moltsen og Steen Henriksen 1998). Over sea level the proportion of fallow and fresh water species increased. There had been a fresh or slightly brackish environment, with mud layers formed at low water. Against the edges of the moat it had gradually moved to a more swamp peat-like structure with gradual growth. However, there were also transition zones between fresh, brackish and salt water. Swamp plants require low water or a water-saturated environment, however, not in water that is deeper than 0.5 m.

In the deposits belonging to the deconstruction phase there is no indication of saltwater connections among the species, although there is a marine Influence for the determinations that only relates to family name*; Apiaceae sp.,*

Carex sp., Juncus sp., Eleocharis sp., Potamogeton sp. Within these, there are a few species that have a marine character, but the absolute majority of the species in these genera/families indicates that the genera families should not be interpreted as indicating marine conditions (Ranheden 2016).

Contexts	**Species**
SD71226	*Apiaceae indet.*
SD71184; SD148498	*Cannabis sativa*
SD71184; SD71226; SD148354; SD148498	*Carex sp.*
SD148498	*Caryophyllaceae indet.*
SD71130; SD71184; SD71226; SD148279; SD148354; SD148498	*Chenopodium album*
SD71184; SD71226	*Chenopodium glaucum/rubrum*
SD71184; SD148498	*Chenopodium sp.*
SD148354	*Cirsium vulgare*
SD148354	*Corrgiola litoralis*
SD71130; SD71184; SD148279; SD148354; SD148498	*Corylus avellana*
SD71184	*Daphnia sp.*
SD71184	*Eleocharis palustris/uniglumis*
SD71184	*Eleocharis sp.*
SD71184	*Ficus carica*
SD148498	*Hyoscyamus niger*
SD71184; SD148498	*Juncus sp.*
SD148354	*Persicaria sp.*
SD71184; SD71226	*Poa sp.*
SD71130; SD71184; SD71226; SD148279; SD148498	*Polygonum aviculare*
SD148354	*Polygonum sp.*
SD71184	*Potamogeton sp.*
SD71184; SD71226; SD148279; SD148354; SD148498	*Potentilla anserina*
SD148279; SD148498	*Potentilla sp.*
SD148354	*Prunus cerasifera*
SD148498	*Prunus domestica ssp. domestica*
SD148354	*Prunus domestica ssp. insititia*
SD148354; SD148498	*Prunus spinosa*
SD71130; SD148498	*Punella vulgaris*
SD71184	*Ranunculus acris*
SD71184; SD148279; SD148354; SD148498	*Ranunculus sceleratus*
SD71226; SD148354	*Ranunculus sp.*
SD148498	*Raphanus raphanistrum*
SD71226	*Rumex cf. acetosa*
SD71184	*Rumex cf. maritimus*
SD71184; SD71226	*Rumex crispus*
SD71184	*Rumex sp.*
SD71130; SD71184; SD148498	*Solanum dulcamara*
SD148498	*Stellaria sp.*
SD148354	*Thlaspi arvense*
SD71130; SD71184	*Urtica urens*
SD71130; SD71184; SD148354; SD148498	*Xanthium strumarium*

Tab. 23. Species represented in the deconstruction phase of the High medieval moat.

Most of the plants were weeds growing in wet, disturbed areas, though *Raphanus raphanistrum* (wild radish) in particular grows on drier soil, and may have come with the eroded soil from the rampart. There was no certain information to be gained on salinity, as many of the plants encountered can grow along banks of both salt and fresh water (*Coorgiola litoralis, Eleocharis sp., Potentilla anserina, Ranunculus sceleratus and Solanum dulcamara*), but the presence of *Daphnia sp.* in some of the samples clearly indicates the presence of fresh water. Indications of human activity are represented since many of the plants like growing in disturbed areas; finds of Hemp (*Cannabis sativa*) and

Henbane (*Hyoscyamus niger*) may indicate human activities, but they are also ruderal plants that may have grown naturally around the moat.

13.2 Overall discussion and interpretation

13.2.1 Rampart

The medieval fortification can be followed at a length of 2.4 km from the beach at Løngangsstræde along the mill grave past Vesterport to Jarmers Plads, further along Boulevarden to Nørreport at the end of Nørregade, thence to St. Gertrudsstræde and Aabenraa to Landemærket, along with Gothersgade and further to Østerport at the current Kongens Nytorv where it reached the beach again at Vingårdsstræde. The only visible remains of the northern embankment today is the raised level seen in Tornebuskegade outside Nos. 8-10 (Christophersen 1985:61).

Through archaeological studies the medieval rampart has been proven between Vartov Grønnegård, Nørreport and Kongens Nytorv (Jensen 1934; Ramsing 1940, Vol. III;4; Kristiansen 1998:63 et seq.; Skaarup 1998a:39; Fabricius 1999:117 et seq.). The fortification has at several occasions been identified at Løngangsstræde (Thorsen 1926:205) and at an excavation in 1992 a rampart or dam was recorded along the older beach in Lille Kirkestræde and dated to the 1220s (KBM 775). At its eastern end the medieval fortification has been demonstrated at several archaeological sites along Kongens Nytorv's south-western part. The rampart could be followed in front of the Hotel D'Angleterre facade, past Østergade and further to the front facade of Magasin to Vingårdsstræde (Fabricius 1999:177 et seq.).

A reconstruction of the medieval rampart has been made based on these earlier archaeological investigations together with the written sources. The Late medieval rampart width seemed to have been standardized to 10-12 m and the height between 1.5-3.5 m, while the moat has been between 12.0-14.5 m wide with a depth of 2.0-2.5 m. The size varies between the different locations, but the building material is always natural moraine probably dug out of the moat in front of the embankment and placed directly on top of the natural salt marshes, and finally covered with topsoil and/or turf. The outer limit has at some places been strengthened with a wooden bulwark or stone settings (Fabricius 1999:101 et seq.). In connection with the removal of the earthwork at Nørreport two different ramparts were recorded –one 5 cubits high and another 7 cubits high. It is uncertain if the latter represents additions in the mid 1500s (cf. Thorsen 1926:240).

The medieval rampart's range was documented in the western part of the Metro excavation area, approximately 10.5-11.0 m east of the current facades (Fig. 73).

Due to the orientation of the excavation in 1996–1998 the rampart and city wall were predominantly documented using profiles where the different and interpreted phases and construction details were compared. Only smaller areas were excavated contextually (cf. Kristiansen 1998:63 et seq.; 1999b).

During fieldwork the rampart was suggested to consist of a “core rampart” 2.20 m wide and 0.30-0.35 m high (cf. Kristiansen 1998:66 et seq.), but this suggestion was later reinterpreted as part of the same High medieval rampart. No reliable growth horizons were recorded either archaeologically or through macrofossil analysis and the building material consisted of sub-surface material (moraine) mixed with organic material (peat and topsoil), with the exception of some layers that to a greater extent consisted of brick rubble (Kristiansen 1998:66 et seq.; Kristiansen 1999b:160).

Fig. 72. Medieval rampart and moat in 1996, facing north. In the righthand corner – part of the interpreted city wall foundation. Photo: Museum of Copenhagen.

The rampart was divided into 14 more or less identical and chronologically contemporary sequences and could be followed for at least 75 m with a minimum height of 1.7 m, where the top had been dug away by modern truncations (Fig. 72 and 73). The foot of the structure was recorded from 4.5 m to 6.0 m west of the foundation of the city wall, to the east the distance was 2.6 m to 3.6 m to the edge of the moat, which made the width approximately 7.0-8.5 m (Kristiansen 1998:12 and 66 et seq.; Kristiansen 1999b:156, 157, 160 and 162).

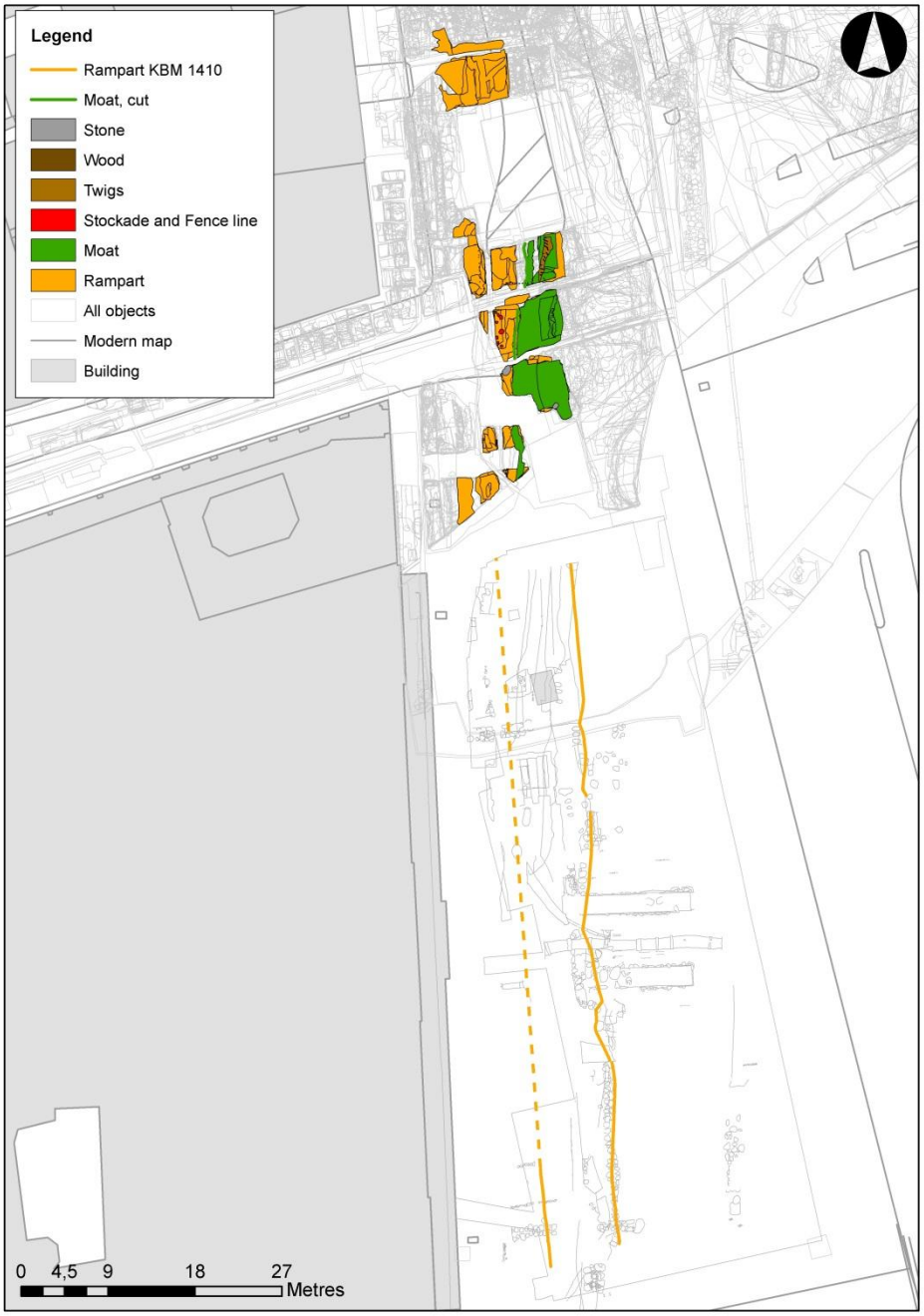

Fig. 73. The medieval rampart at Kongens Nytorv based on present and earlier excavations for the Metro in 1996–1998.

The High and Late medieval moat could be followed over the entire length of the excavation area immediately east of the city wall foundation (Kristiansen 1998:82 et seq.; 1999b:156, 168 and 169). This could, however only with certainty be separated from a later moat phase in the moat's westerly part located under the Late medieval earthwork additions. The moat had been cleaned out throughout the Middle Ages and the edge could from the south to the north be recorded from kote c. +2.6 m – +3.6 m – +3.0 m – +2.6 m from the western extent of the city wall foundation. Based on the heights the moat had been at least 1.4 m deep (Kristiansen 1998:82 and 83).

Preservation conditions and lack of analysed samples has made it impossible to clarify whether the oldest moat was filled with water or not, but silting around the bulwark suggests the presence of flowing water to a certain degree. In

that case the water had probably been collected from the surroundings or from the existing north-south running stream seen on later illustrations and maps of the area (cf. Fabricius 1999:Fig. 27).

At the former Metro excavation the bottom and the western edge of the moat consisted of a layer of sandy and sterile fill. East of this the sedimentation consisted of different mud layers ("gyttje") of varying thickness (0.2-0.6 m). It could not be clarified if the erosion and the mud layers were the result of long-term sedimentation or a late stage in the moat's life. No datable finds were collected. A layer consisting of clean mud ("gyttje") without inclusions of peat suggests that there had been at least 0.5 m of water in the moat providing a water level at kote 0 or upwards (Kristiansen 1998:83 and 84; 1999b:168 and 169) comparable with the new results indicating a water depth of c. 1.0 m (comparing height of transgression layer SD149704, moat cut SC148669; see Fig. 74 with other moat cuts). Archaeobotanical analysis showed that the environment had consisted of brackish, stagnant water. A weak salt effect indicates that the mud ("gyttje") had been formed before the filling up of "*Dybet*" between the coast and Bremerholm in the 1530–1540s (Kristiansen 1998:83 et seq.; 1999b:169).

Construction details, material and measurements	**Metro 1996–1998**	**Metro 2010**
Reusing soil digging moat	X	X
Rampart placed directly on the salt marshes	X	X
Reinforcement using bulwark and/or boulders	X	X
Traces of a core rampart		X
Turf covering High medieval rampart	X	
Turf covering Late medieval rampart	X?	
Traces of maintenance work		X
Traces of "*Byens Planker*"		X?
Wattle fence	X	X
Other structures on top of rampart		X
Cleaning/maintenance work High medieval moat		X
Cleaning/maintenance work Late medieval moat		

Tab. 24. Similarities and differences. High medieval fortification Metro excavation 1996–1998 and 2010.

13.2.1.1 Dating

At the former Metro investigations only a few finds were collected from the rampart, consisting of ceramics with dates to late 13th century, 13th–15th century and 14th (15th)–17th century (Kristiansen 1998:66, 67 and 73). The rampart in this stretch was suggested to be dated to the last decades of the 13th century.

The construction of the rampart is normally attributed to Archbishop Absalon, but it is uncertain whether it in its full extent stems from Absalon's time. In Pope Alexander IV's papal bull from 1258 the city is mentioned as *castri de Copmamnæhafn*, which can be translated as the fortified city of Copenhagen. It is therefore possible that the bishop's gift was closely related to the construction of the fortification – and thus the urban area – in this part of the city, something which may explain Bishop Ingvard's letter from 1289 where he thanks the city's citizens for their loyalty to the church and their aim to fortify the city as part of their indulgences (KD I:30).

The new and fixed dendrochronological dates of the bulwark, including one of the AMS-dates from the rampart, show that the construction of the fortification started in the early 13th century. This date coincides well with the written sources where the fortification is mentioned both in Jacob Erlandsen's town law from 1254 and Johannes Krag's town law from 1294, describing the city walls, moat, planks, bridges and fences (DD 1:2 No. 138, KD I:18 and 56). We also know that Copenhagen's citizens relinquished pieces of land to the moat in 1296 (KD I:63).

13.2.1.2 Initiators

The question is whether the bishop was the driving force, or whether he dependent on other stakeholders' preferences in this matter. The key player in this regard must have been the dominant bourgeoisie. Its defence objective has of course played an important role, but the basic purpose was probably the citizens striving to physically delineate the city from the surrounding countryside. It was a manifest demarcation that was both actual and symbolic. This created two separate zones; the world within the fortification and the world beyond. The fortification was the physical demarcation between the town and the country, between city court and the land rights, between citizens and farmers. It served as protection and defence against certain enemies and robber bands, but primarily as a control tool for the city's internal operations. Through the city gates the council controlled all movements in and out of the city, over supply and troop transports, over taxes and customs. The urban population was thus in the council's power over all the various operations that took place in the city.

Building activities were in a high degree financed in the 13th century through a *fabrica* (building fund) and presumably foremost performed as waged work. An important aspect to the building activities may be related to the more personally anchored religiousness with sacrificial deeds and penance, which could be channelled through various building activities.

13.2.1.3 Maintenance and rebuilding

The varying dimensions of the rampart appear to be dependent on how many times it was reinforced with superimposed clay and topsoil (cf. Christophersen 1985:61), and at Kongens Nytorv this hypothesis can be verified by at least three rebuilding phases.

Section C145012 (Fig. 74) shows that the medieval rampart was reinforced at least three times between 1200 AD and 1600 AD, of which SG-709 (SD148192, SD148207 and SD148236) and SG-770 (SD148419) represent a middle phase before the rampart was further extended in connection with the new city wall in the mid 14th century.

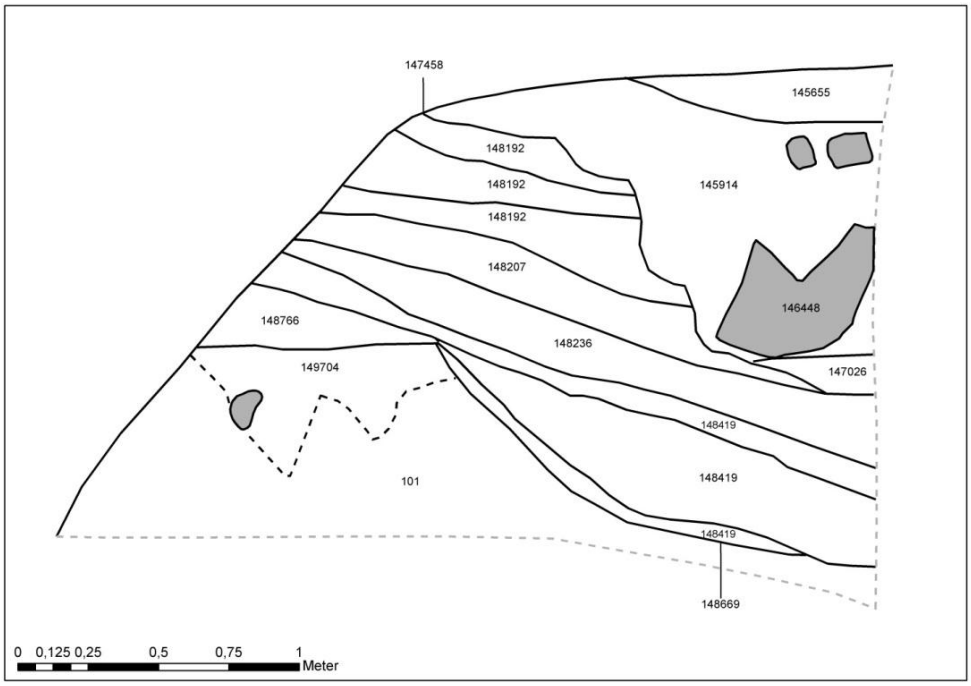

Fig. 74. Section C145012, facing north. The interpreted and oldest phase of the rampart is placed on top of post-glacial sediment (SD149704). To the right – construction cut of the 13th century moat (SC148669) and later construction cut to the city wall (SC147458) with foundation stones and backfills.

One should also assume that the rebuilt embankment outside the city wall belonged to the Late medieval work on the fortification, which includes, for example part of the SG-502978. For construction elements such as the stockade (G-750) and the isolated posthole (G-716) it is unclear if these represented later supplementary phases of the rampart, as these were only superimposed by a highly uncertain, interpreted rampart layer represented by SG-838. That G-750 is stratgraphically younger than G-446; a 17th century bridge in Late medieval moat (see Chapter 18.1.6) can not be explained otherwise than by certain erroneous observation in the field.

Fence line (G-328 and G-200140) represented part of the oldest rampart phase, which means that both SG-624, SG 626 and SG-863 constitute later additions, an interpretation also indicated by a single find of Late redware – though this finding might well derive from one of the nearby rampart street phases and spatially these deposits do not differ from the High medieval embankment.

Three building phases could also be seen in Gothersgade south of Lønporten and south of Møntergade (Ramsing 1924 No. 103:5). An interesting observation is that no additions to the moat were recorded at this place as were seen at Kongens Nytorv and Vartov's yard.

The rampart was not fully developed before about the Reformation (Christophersen 1985:61 and 67). It is mentioned in royal letters from 1524 and 1526 that the rampart was maintained by soil and peat (Lassen 1855:7 and 90). Especially in the period from the late 15th century up to Christian 3rd's siege in 1535–1536, major construction work took place covering the moat, bulwarks, dam- like other earthworks and wall and tower constructions (Christophersen 1985:109).

A bigger structure (named /ABH and AHO) was recorded orientated across the rampart and consisting of two to three courses of foundation stones and a 6.7 m long, 1.0 m wide and 1.7 m high double faced wall of edge set courses, coated with lime mortar and with intermediate fill of mortar. Mortar from the northern side was C14-dated to 655±35 BP or 1276–1396 AD (cal 2 σ), bricks from the lower course, TL-dated to 1140±70 AD and animal bones (*species unknown*) from the same context C14-dated to 910±45 BP or 1028–1213 AD (cal 2 σ) (Kristiansen 1998:85-87; 1999b:156, 157, 169, 170 and 177; cf. Rud og Heinemeier 1998c). The construction could not be statigraphically related to the rampart and it is unknown if this was contemporary with the medieval fortification or a later structure. The feature was, however interpreted as part of a medieval tower called Smørhætten, described in written sources in 1496 and 1523.

13.2.2 Bulwark

The timber structure was when exposed on site interpreted as part of the so-called "*Byens Planker*" mentioned in both the town privileges from 1254 and 1294 (KD I:33 and 56), but this suggestion must be rejected since the planks consisted of a palisade on top of the rampart crown.

The structure must therefore be seen as a bulwark where the basic construction method was to drive timbers into the lower parts of the moat cut, then moraine (from digging the moat) was backfilled behind the bulwark to support the rampart and to prevent erosion back into the moat. There is no clear explanation for the 1 m gap between the eastern and western row of timbers – either these represent different building phases or the appearance would have been of vertical and tilting planks rising out of the water having had a twofold function; acting both as a delineation of the moat's edge, but also possibly acting as an additional barrier to movement/access.

The timbers also represent a continuation of a similar wooden structure recorded at the Metro investigations in 1996–1998 approximately 30 m to the south. At this excavation a north-south orientated palisade or alternative rampart reinforcement at the western edge of the moat was documented (Fig. 75). This consisted of several pits and postholes in a row with a length of 42.0 m, but could also be as long as 64.5 m (cf. Kristiansen 1998:84 and 85; 1999b:156-158 and 168).

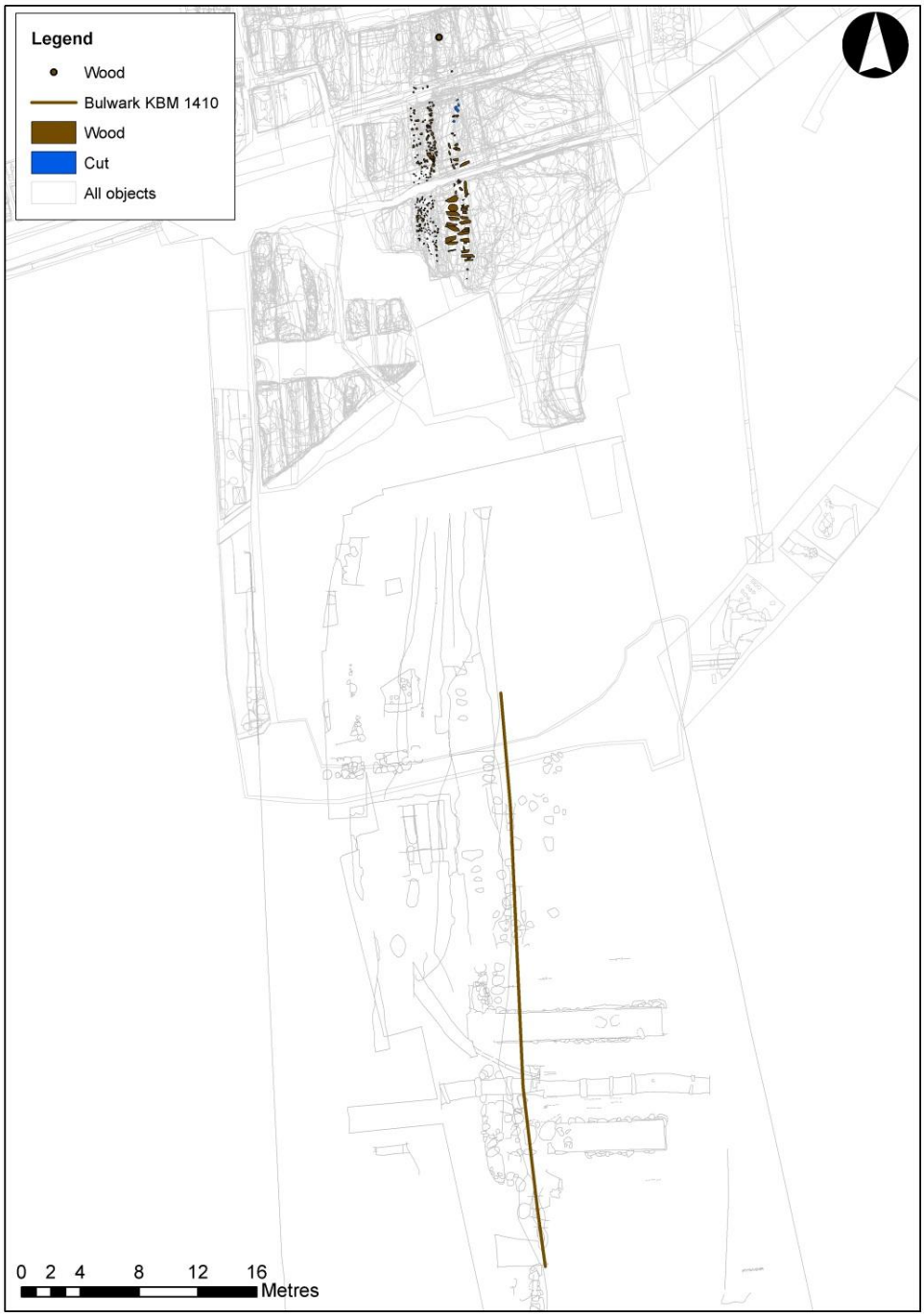

Fig. 75. Bulwark and estimated line for a timber structure investigated at the Metro investigations in 1996–1998. The location of the latter is based on information from Kristiansen 1999b:156.

Similar reinforcement of the rampart can be seen at other places in Copenhagen. In Løngangsstræde a row of oak posts with a distance of 1.5-2.0 m (Rosenkjær 1906:272 et seq. and Thorsen 1926:205), may represent a bulwark connected to the High medieval fortification close to the former beach. A bulwark has also been recorded in connection with the rampart at Vartov Grønnegård. Beneath the city wall foundation several posts (d: 0.20-0.25 m) were documented following the fortification line. At the edge of the rampart more boulders were recorded and in front of these pillars of oak together with planks of pine formed a bulwark (Jensen 1934:48 et seq.).

Similar bulwark reinforcement has also been documented in Malmö. Piles in Norra Vallgatan No. 90 (Kv Skepparen) consisted of four-sided and round oak posts including one outer row of oblique piles (cf. Kalling 1954a; 1954b:103-104 and Fig. 76).

Fig. 76. Reinforcement of the embankment in the form of pile work in natural substrate along Norra Vallgatan in Malmö (Kv Skepparen). In the background – presumably remains of the rebuilt rampart alternatively former salt marshes (darker layers in the section; cf. Kling och Lindgren Hertz 1990: Fig. 10). From Malmö Museum, Rapport 33:03.

A possible bulwark and a wattle fence can also be seen north of and parallel to "*Byens Planker*" elsewhere in medieval Malmö (cf. Lindgren Hertz 1985:55; Kling och Lindgren Hertz 1990:35-36) and a reinforcement of the rampart in the form of pointed oak sticks has been registered in the moat at Østerport (cf. Reisnert 1998:Fig. 4).

In Hjelmerstald in Aalborg a number of vertical and slanting piles have been recorded along with the embankment. These piles can either be interpreted as a reinforcement of the rampart or supporting plank work on the rampart crown. The area up to the embankment foot had been a wide, wet and flooded area, where the excavation exposed some random pile works, boat parts and loose wood (Møller Knudsen and Kock 1992:180).

Also from other Danish medieval towns this type of reinforcements is known: from Nyborg on Funen there are records and descriptions of bulwarks in connection with the moat's edge (Sørensen 2016) and bulwark/edging has also been recorded in connection with the rampart in Halmstad dated to the early 14th century (cf. Bjuggner 2014:13 et seq.).

13.2.2.1 Bulwark – tools and woodworking techniques

There is no doubt that the carpenters that built the bulwark were familiar with the various qualities of different woods. It is also evident that the well hewn oak timbers had a higher value than the beech timbers that were not debarked and only roughly split. Oak is a persistent wood and often used historically in swills, bridges and roof trusses. If any of the examined timbers from the bulwark construction were in contact with air it is most likely that this was the oak timbers (compare with Fig. 61 and discussion below). In medieval wells in for example Lund, Scania there are

several examples where the foundation timbers were made of alder or beech, while the rest of the wells were made of oak (cf. Melin 2011).

The timbers show different woodworking techniques from different regions. Investigations of two churches in the Diocese of Lund have tool marks similar to both group A and group B (cf. Melin 2013:30). In a larger context the results from Kongens Nytorv and the different techniques representing different origins can be used to understand Nordic- versus Continental carpentry. This information might be a helpful clue to answer the question if the first Scandinavian churches where built by local or by foreign carpenters or by a mix of both.

Medieval woodworkers used the properties of different woods to their advantage. Like their descendants, medieval woodworkers presumably used woods in highly specialized ways including the choice of wood in major building works such as houses, bridges and fortifications. Other archaeological and historical investigations show that much work remains to be done reviewing the literature and determining the kinds of wood used for different applications and how this has varied by region and over time (cf. Darrah 1982; Dahlberg et al. 1996).

As an example one can refer to work on medieval Novgorod where the timber analysed consisted of large quantities of native pine and spruce, although there was a significant amount of imported wood. Altogether, the woodworkers of Novgorod made use of 27 kinds of wood of which 19 were obtained locally and eight imported (McGrail 1982).

Tools have not changed much over the years. Roman tools recovered from Pompeii are not that different from those in use through to the late 19th century. A lot of what we see in the Middle Ages is the rediscovery or reintroduction of tools along with some minor modifications (cf. Goodman 1964; Walker 1982; Goodall 1990; Halstead 2003; Sands 2009).

The results from Kongens Nytorv show that tool marks can not only inform the archaeologist about the implement used, but also provide evidence of building and artifact construction methods and labour patterns. Based on a further investigation of the sampled wood it will in the future be possible to lead a discussion on what can be learned about medieval tools, crafts industry and everyday life from examining the marks the tools left on the wood and timber.

We also know that a considerable trade in timber existed at the beginning of the 13th century. Large amounts of wood in the form of both building timbers and sawn boards were shipped from the eastern Baltic to England, the Low Countries, and Northern France (cf. Morris 2000). A lot of the examined woodland was imported and one probable reason for this is that settlement expansion in the Early Middle Ages heavily reduced the woods in eastern Denmark and forced the inhabitants to import wood from more forested regions, but it can also be seen in connection with the Baltic Crusades in the early 13th century which gained many of the new Danish cities, both in terms of incomings and import of necessary building materials.

13.2.3 Byens Planker

Some postholes on top of the rampart behind the city wall could be part of this structure. Both the oldest rampart as well as the High Middle Age one were probably equipped with a parapet called "*Byens Planker*", mentioned in the city laws from 1254 and 1294 and as late as in Christoffer of Bayern's city laws from 1443 (Lassen 1855).

This structure has never been identified archaeologically – though there is information about a row of large oak posts with a distance of 1.5 m to 2.0 m c. 6 m north of Løngangstræde, where Ramsing suggested these wooden posts were the remains of the so-called "*Byens Planker*" (Rosenkjær 1906:272 et seq.; Ramsing 1910:521 et seq.).

Similar palisades or planks are also mentioned in other Danish cities during the medieval period. In Falster these were called Fælles virke; 1158 AD), Flensborg (*Plankemajen*), Haderslev (no name), Køge and Nyborg (*Bulværksstræde*), Malmö and Halmstad (*Byens Plank*) and Aalborg (*Bysens Planken*).

The city planks in Malmö are dated to the early 14th century stretching along Norra Vallgatan from Malmöhus to current Drottningatorget (Reisnert 1998:27 et seq.). Part of the feature has been documented in Kv Neptun consisting of a long row of piles in natural sand (Johansson 1976). Up against the posts' southern side there were three horizontal planks (about 4 m long and 0.25 m wide) in a row, partly overlapping and constructed of used boat parts (Fig. 77). On the northern side of the boards there was coarse sand and between the posts and south of these remains of a wattle fence were recorded (cf. wattle fence Kongens Nytorv below). On the southern side of the planks and along with these there was a compact layer of turf.

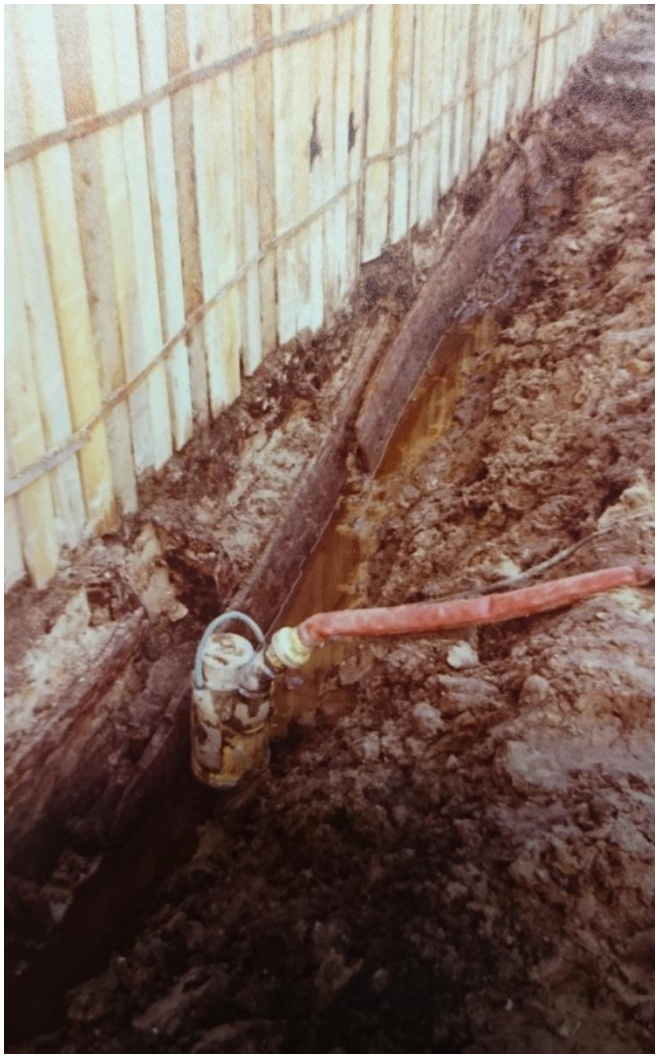

Fig. 77. Byens Planker investigated in Kv Neptun, Malmö. From Malmö Museum, Rapport 35:02.

Similar planks in Kv Fisken had been placed in a ditch in natural sand with five four-sided posts extending over a distance of about 1.5 m. On the southern side four boards had survived, vertically set up against the piles. A coin dated the structure to the early 1300s at the latest (Lindgren Hertz 1985:52-53; Nyberg 1985:69 et seq., Fig. 1 and Fig. 2; Kling och Lindgren Hertz 1990:24 et seq.). Looking at the original photos the interpreted planks in Kv Skepparen (cf. Kalling 1954b:103-104) constitute rather a bulwark to strengthen the rampart similar to which has been encountered at Kongens Nytorv, than planks (cf. Fig. 58 and 76 above).

In Aalborg the city planks have been dated to just after 1320 AD and consisted of double rows of four-sided oak posts dug into the rampart crown (Fig. 78), and at some places strengthened with boards (Møller Knudsen og Kock 1992:173 et seq.; Bergmann Møller 2016).

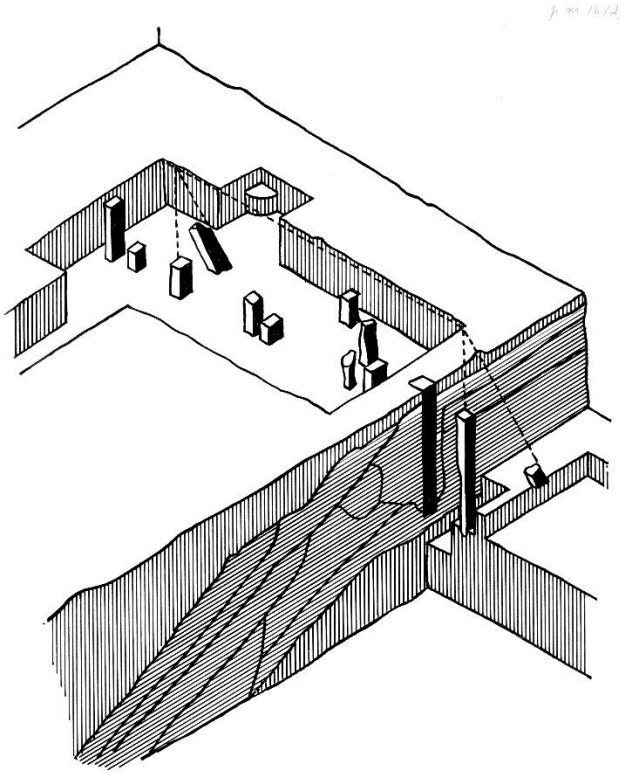

Fig. 78. Parts of Byens Planker in the SW part of the medieval rampart in Aalborg investigated 1969. Drawing Per Rolandsen. From Møller Knudsen og Kock 1992:173.

Remains of an interpreted palisade belonging to the fortification have also been investigated in Svendborg, consisting of two rows of oak logs set 40 cm apart, stabilized by cross tilt piles on which large oak logs were resting. The dating is uncertain, but believed to be from before 1300 AD (Reinholdt 1992:75 and Fig. 65-66).

The reason for this lack of evidence may be due to the fact that the rampart crown had been destroyed or eroded when it went out of use. Based on other archaeological investigations of older Viking Age ramparts we know that these had wooden palisades of inset and radially split logs, but it is far from certain that such a work-intensive construction technique was used in the 2.4 hectare large fortification of Copenhagen. One conceivable explanation is that wood-saving techniques had been used, for example stave wall- or post and plank technique that both use wooden sills placed directly on the ground or on rows of sill stones. The horizontal or vertical planks were later fitted onto these sills. These building techniques thus required no or few marked interventions which may explain the loss of archaeological evidence. The city law from 1294 mentions that one was fined for undercutting or loosening the "*Planks*" which argues for horizontal timbers in the palisade (cf. Lassen 1855), something which could explain the distance between the recorded posts of 1.5-2.0 m. Though studying older city illustrations (cf. Braun 1542–1622) revealed the city planks and similar structures mainly consisted of vertical planks.

13.2.4 Wattle fence

The wattle fence should be considered together with a similar fence investigated at the Metro excavations 1996–-1998. After disuse the latest ditch was followed by an at least 11.5 m long and 0.4-0.5 m high wicker fence and a feature interpreted as some form of boundary bank to the west, at least 0.6 m high and at maximum 5.0 m wide. The fence consisted of horizontal wicker and some of the vertical poles were still in place, but the majority had been drawn up and the fence tipped over to the east. The stratigraphical relations between these two features were unclear (cf. Kristiansen 1998:41-62; 1999a:101-108), but based on older descriptions and photos of the fence lines it is

clear that this so-called bank must have been part of the original High medieval rampart (see Fig. 10). A branch and wood from the wicker fence (*species unknown*) were C14-dated to 1185±45 BP or 694–971 AD (cal 2 σ) and 772±39 BP or 1185–1288 AD (cal 2 σ), where the latter date is most likely (Kristiansen 1998:65 and C14-datings from KBM 1410. 2012).