Rådhuspladsen

Metro Cityring Project

KBM 3827, Vestervold Kvarter, Københavns Sogn
Sokkelund Herred, Københavns Amt

Kulturstyrelsen j.nr.: 2010-7.24.02/KBM-0015

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Cover picture: The Rådhuspladsen excavation, with Area 4 (foreground) and Area 5 open. Taken from the fourth floor of Politikens Hus (with kind permission), July 13th 2012

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Abstract

This is the excavation report for the archaeological work conducted at Rådhuspladsen, Copenhagen (KBM 3827) by the Museum of Copenhagen in 2011-2012. In association with the Metro Cityring Project and in advance of the construction of a new Metro station at Rådhuspladsen, a large program of archaeological excavation and watching brief work was carried out in and around Rådhuspladsen, commencing in January 2011 with a completion date for the main phase of work in August 2012. Further episodes of watching brief work were conducted on site over the subsequent two years as required, when the ongoing construction at the site was deemed likely to have further impacts on archaeological material. The developer was Metroselskabet I/S, responsible for the overall construction of the new metro line, Cityringen, which will link to the existing Metro in Copenhagen and is due to open in 2019.

It was known in advance that archaeological material was likely to be encountered at Rådhuspladsen in significant quantities, based both on historical and cartographic information and on some previous archaeological observations made in the area over the previous century or more. All this evidence suggested that part of the former city moat/moats from the medieval and post-medieval period would be seen, as well as elements of associated gates, and elements of a watermill. In particular, these structures had been documented to a degree in the 1940s during the construction of the underground toilet building, and the placement of air-raid shelters in various parts of the square.

During the main phase of work at Rådhuspladsen (from January 2011 to August 2012), it was estimated that a total of 2.662 m^3 would be archaeologically excavated, according to the single-context system. A further 2.211 m3 was to be observed and documented to a lesser degree in watching-brief conditions. The latter work was mainly conducted in areas considered to have less archaeological potential, and in essence the construction work took precedence, with the archaeologists mainly working as observers, documenting the archaeology encountered in a less thorough fashion. Where unexpected archaeology of a significant nature was encountered in watching briefs however, it was generally possible in consultation with the on-site contractor, to agree on a reasonable amount of time for appropriate documentation.

In general the archaeological remains encountered at Rådhuspladsen exceeded expectation, with an immense amount of material surviving, spanning a period from as early as c. 1000 A.D. up to the 20th century. As well as the anticipated features such as the moats and other defence-related structures (gates, bridges, fences etc) and the mill, a good deal of unexpected pre-fortification remains were seen, in the form of various pits, wells, surfaces and structural remains suggestive of urban activity in the area from as early as the early medieval period. Furthermore, an entirely unexpected discovery was made when part of a burial area was encountered in a watching brief trench at the edge of H.C. Andersen's Boulevard. There is no known historical documentation of this cemetery, and it had not been encountered archaeologically before. Some 20 individual burials were identified, and scientific dating of the remains suggests that the cemetery was in use in about the 11th century.

The archaeological remains at Rådhuspladsen had been impacted to quite a high degree by various acts of construction down the years, and indeed in many cases had been impacted by subsequent archaeological activity, such as the construction of the moats. This meant that the remains encountered were often

partial, and quite complex in nature. Nonetheless, using the single context excavation system coupled with the use of sections where appropriate, and aided by C14 dating, dendrochronological dating, and artefactual typology, it has been possible in most cases to establish the order of events and gain a good picture of what has gone on in this area down the centuries. The results of the excavation at Rådhuspladsen are very significant in scale and in importance, contributing greatly to our knowledge of the earliest years of the western part of the fledgling town, as well as the subsequent development of the city and its fortifications in that area. The results of this work, and the supporting analyses of various experts, will be discussed in the following report.

Archaeological periods:

Early Medieval, Medieval, Renaissance, Post-medieval, Late Post-medieval, 20th century

Feature types:

Graves, ditches, pits, wells, buildings, roads, moats, bastion, gates, bridges, levelling deposits, backfills, dumps, foundations, watermill, mill race, crafts, wooden water pipes, air raid shelters.

Key words:

Fortification, moat, bastion, city gate, watermill, Christian IV, Renaissance, cemetery, medieval Copenhagen, early medieval settlement, iron smithing, urban waste

1 Introduction

The excavation at Rådhuspladsen was undertaken in advance of the new Metro Cityring Project, which will provide a new transportation system in the city centre of Copenhagen and to the surrounding suburbs of the city. Where new Metro stations were to be constructed over archaeological material or sensitive remains, archaeological excavations were undertaken, in accordance with the Consolidated Act on Museums (see below). The Museum of Copenhagen (KBM) is responsible for the archaeological work carried out in the Copenhagen and Frederiksberg municipalities, and hence conducted the archaeological work on the project.

The excavation was planned to start in week 4, January 2011 and was scheduled to continue until the beginning of July 2012 (ARL-0-AK-AK-Rhp-TGN-300, ver. 4.0, dated 2010-10-01). Ultimately the excavation was completed in August 2012. The post-excavation work, analysis of the data, specialist work and report writing was conducted over the following three years, and was completed in September 2015.

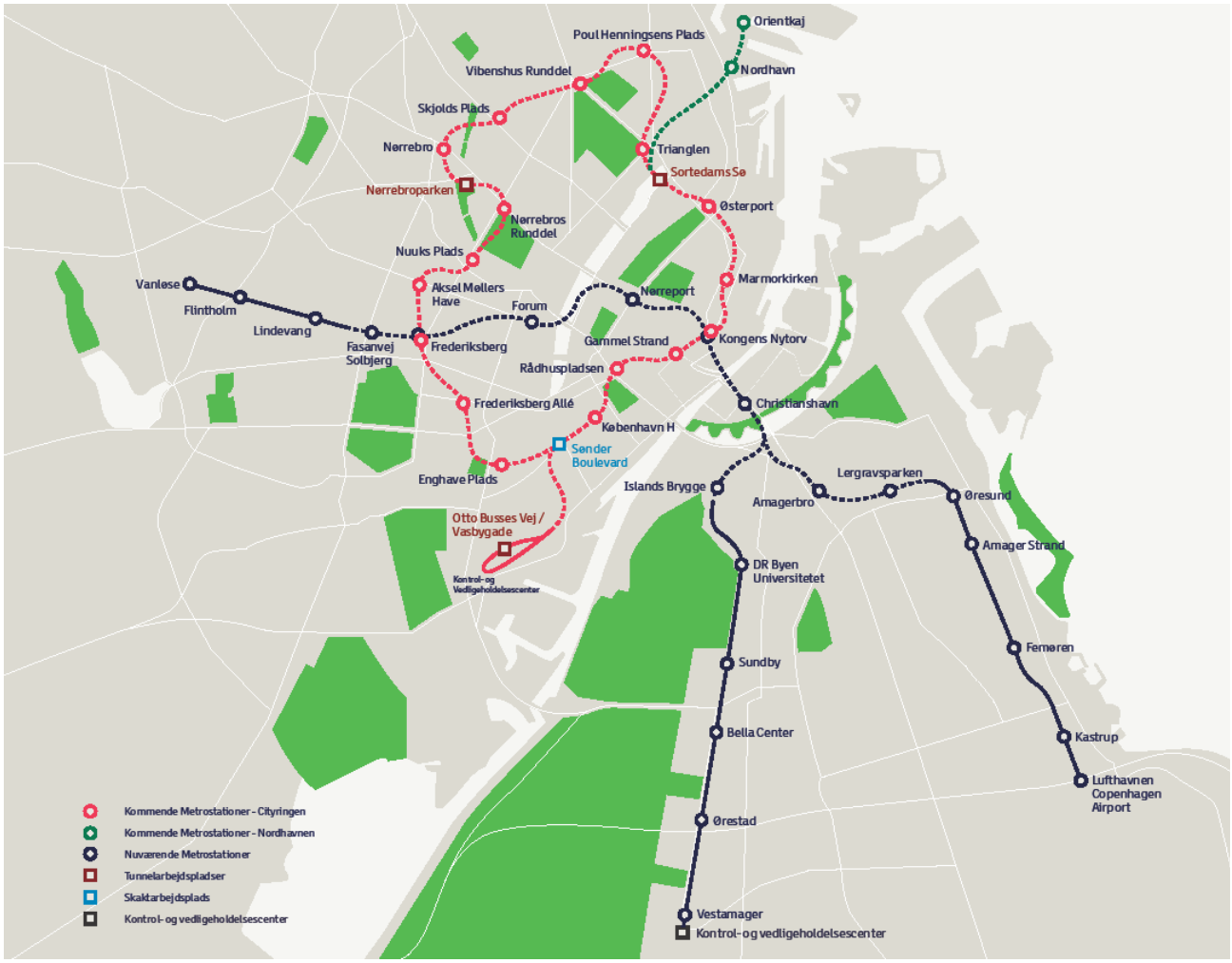

Figure 1 Central Copenhagen showing the Cityring with stations and its connection to the existing Metro. Map by Metroselskabet I/S.

Legislative framework

The archaeological excavations carried out in connection with the Metro Cityring Project were conducted under Part 8 of the Consolidated Act on Museums (2006), which in essence means that the developer in question must pay the costs of any archaeological mitigation required in association with a given construction project.

(http://www.kulturstyrelsen.dk/fileadmin/user_upload/kulturarv/english/dokumenter/Consolidated_Act_on_Museums_Executive_Order_No.1505.pdf) .

Of particular relevance are the following excerpts from the act:

24 - (1) The local council shall inform the cultural heritage museum concerned no later than at the time of granting a building permit, a permit to extract raw materials or an exemption from the rules on preservation of ancient relics or monuments under the Protection of Nature Act.

27 – (4) The costs of the archaeological investigation shall be defrayed by the person at whose expense the construction work, agriculture and forestry activities are to be carried out.

The location

Rådhuspladsen is today located on the western perimeter of the inner city of Copenhagen (Indre By), and on the boundary with the western inner suburb, Vesterbro (Figures 2, 3). It was formed as a square in the 19th century with the levelling of the fortifications in this area, and was chosen to be the location for the new townhall (Rådhus) around that time. Hence it is to this day the centre of administration for the city of Copenhagen. In the Middle Ages it was the location of the physical western boundary of the city, the moat and ramparts – in different forms, scales and precise placement. The city's westernmost street, Vester Voldgade, ran along the inside of the fortifications, and along the eastern edge of present day Rådhuspladsen. Many of the street and district names to this day tell us something about the former shape of the city; Vestergade (Western Street), Vester Voldgade (Western Rampart Street) and Vesterbro (Western Bridge).

Rådhuspladsen is therefore something of a border area, formerly separating the western part of the city from its hinterland, and now dividing the inner city area from its western suburb. The area has seen significant changes over the years, with various structures placed on and around the square at different times; the new Metro station is just the most recent significant change to occur, and will become a new feature of the Rådhuspladsen landscape.

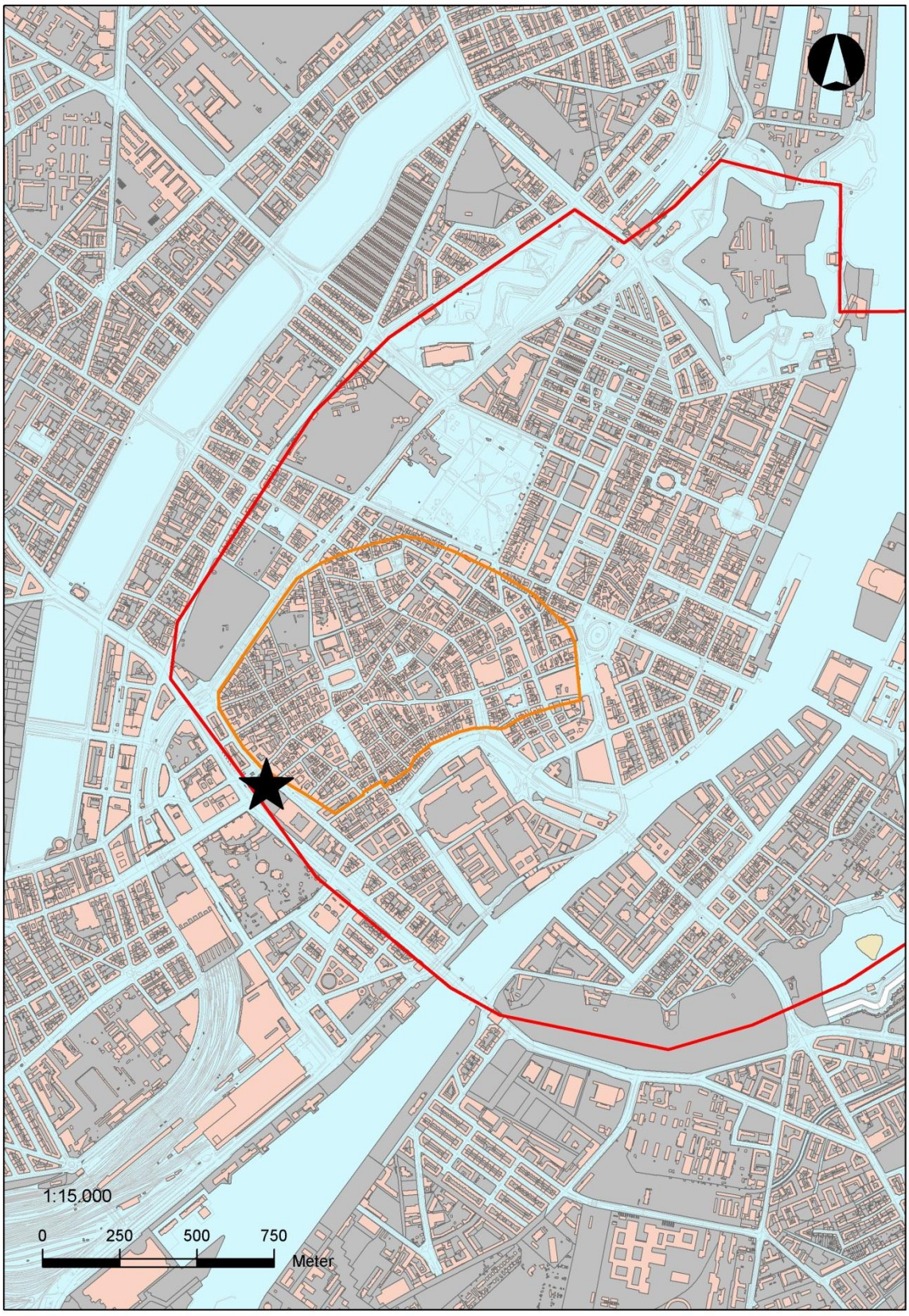

Figure 2 Site location. The medieval (yellow) and late 17th century (red) city limits also shown.

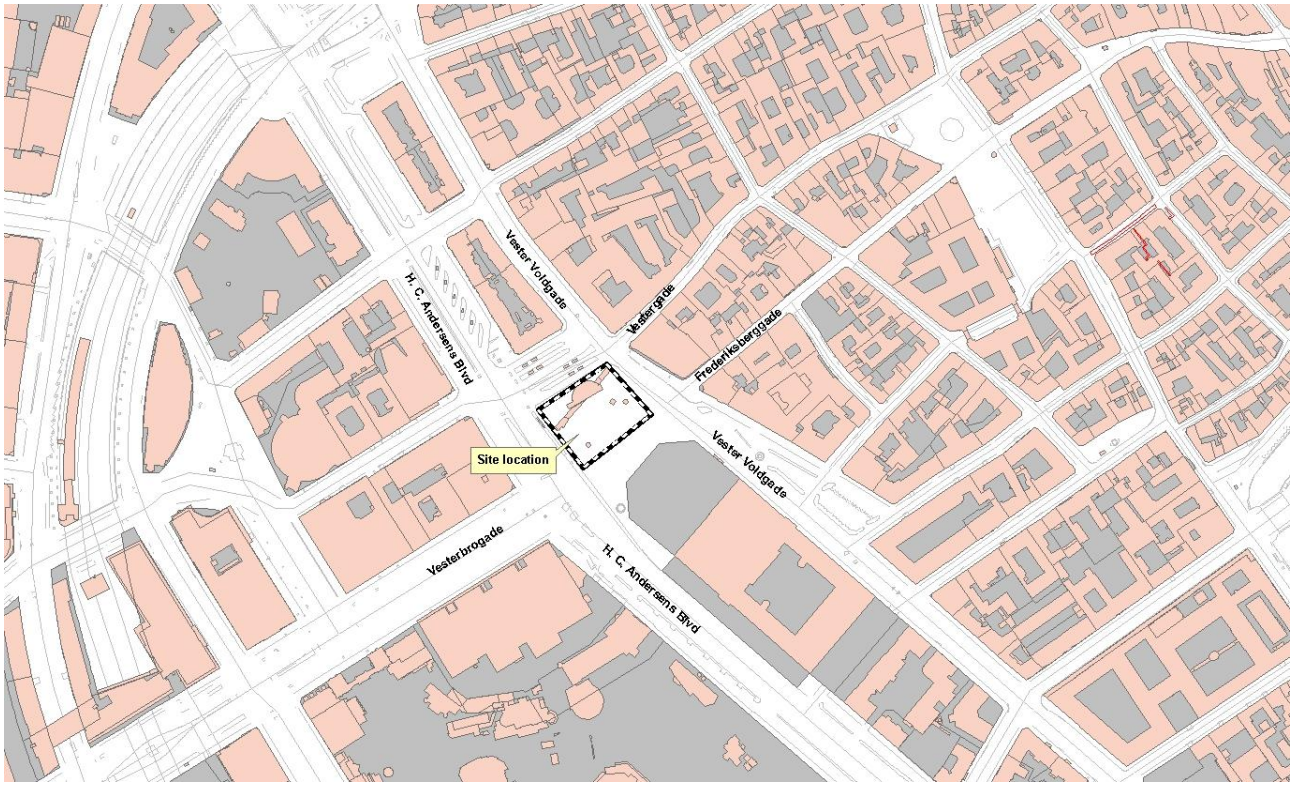

Figure 3 Location of development area with adjoining streets shown

Scope

The main part of the excavation area at Rådhuspladsen coincided with the future Metro station footprint, as well as the location of the associated underground public toilet building, with a range of smaller associated works outside of this area being the focus for some of the archaeological watching brief work carried out. The excavation was conducted in different areas and trenches at different times, generally according to the program that the on-site building contractor (Petri & Haugsted) needed to follow in preparing the area for the main construction phase.

During the main archaeological excavation phase at Rådhuspladsen, the on-site building contractor as well as some outside contractors conducted a series of tasks in advance of the actual Metro station construction project, many of which required archaeological work to be carried out. These tasks included the removal of the last parts of the HT bus terminal, and the removal or realignment of many services (district heating, water, gas, electricity etc.). In the year following the main archaeological excavation, further such tasks included the removal of the underground toilet building on the square, the removal of any air-raid shelter remains that still survived inside the construction area, the construction of the Metro station guidewall, and finally the excavation of the interior of the station shaft. In most cases these latter tasks required archaeological observation (watching-brief) only, with occasional small-scale documentation of surviving archaeological features.

In general the aim during the main fieldwork phase was to document and excavate all archaeological material that was to be impacted. The method of excavation varied depending on the type of archaeology

encountered, and the time available. For example much of the large dumps of material in the moat were excavated using a mini-digger, whereas smaller features such as pits and structural remains were excavated using hand tools only. The well-type features (of which there were several), were in the first instances excavated by hand, but towards the end of the excavation, in some cases they were half-sectioned with the aid of a machine, and documented in a more basic fashion. This was partially due to time concerns, but also due to the fact that digging these deep features by hand had proven to be something of a logistical and health and safety issue.

Areas of varying cultural historical potential

The excavation comprised of five main types or categories of excavation areas, placed in three different zones. The zones related to estimated cultural historical potential, and the area types mainly related to documentation conditions and preservations circumstances. The area types and zones were used as a tool when estimating staff resources and the time schedule.

Areas with major potential

These areas within the main excavation areas were expected to yield sensitive and very complex archaeology and to contain thick occupation and structural deposits. Since they were situated within the main excavation area they were fully excavated. They are hereafter referred to as *Type 1* areas. Each of these complex areas was to be fully excavated down to geological layers. The *Area 1* excavation area and the eastern parts of *Areas 3 and 4* all fell into this category. They were situated in Vester Voldgade and in the most north-eastern parts of Rådhuspladsen. These areas were situated just within the medieval city rampart or around the actual location of the gate. These parts of the excavation area were named *Zone A*.

Areas with high potential

These areas would also be fully excavated, however less time consuming and less complex features were anticipated, such as roads, large pits and sizeable structures (rampart, moat) that could be recorded and excavated relatively quickly. Less complex settlement structures could also be expected in these areas. Most parts of *excavation areas 2A, 2B, 3 and 4* were expected to fall into this category, *type 2* areas. They were situated in the north-eastern parts of Rådhuspladsen and were expected to have been in medieval times the location for the western gate, rampart, moat and bridge over the moat. Later on when the fortifications were moved towards the west, the areas became part of the town inside the walls. This part of the excavation was called *Zone B*.

Areas with major potential but limited documentation possibilities

Areas where significant archaeological deposits and complex stratigraphy was expected, but the excavations would be conducted under watching brief conditions, and therefore limited recording could be achieved, were named *type 3* areas. Much like Type 1 areas, they were situated in Vester Voldgade, Vestergade and the most north-eastern parts of Rådhuspladsen and were located just inside the medieval city walls (zone A).

Areas with high potential but limited documentation possibilities

Service trenches with less sensitive archaeological deposits were also to be excavated, and they were referred to as type *4* areas. These were expected to be less time consuming to investigate than type 3 areas but were still of high interest. They were located in zone B, the same as type 2 areas, which were within the north-eastern part of Rådhuspladsen.

Areas with moderate potential

In these areas, which were named *type 5*, the archaeological deposits were thought to be to a large extent disturbed or destroyed, and/or being of a less complex type which would be faster to investigate. In the medieval period this was an area outside the city walls and in this respect had the potential to be very interesting. However, when the new fortification was built in the 1600s the area was affected by the construction of the new moat, which it was thought might have destroyed previous deposits. The type 5 areas mostly comprised of watching briefs in H.C. Andersen's Boulevard in the north-western part of Rådhuspladsen. This area was called *zone C*.

Excavation Report

This excavation report conforms to specific KUAS guidelines concerning report writing. No research has been carried out on the results; only a working statement of the results and conclusions. This complies with statements in Danish Museum law (Bekendtgørelse af museumsloven nr. 1505). Therefore, when discussing the results in context, there is only limited reference to primary or secondary documentary sources or academic research on the subject. Full analysis and interpretation will rely on future academic projects of which this report provides the foundation.

The report is designed to provide a full statement concerning not just the results and archaeological interpretation of the work, but also to describe in detail the methods undertaken and some of the theoretical basis under which the archaeology was carried out. It also critically examines and assesses the processes and procedures created to deal with the archaeology. The aim of this report is to provide three main points of information: a guide to the data and documentation material, especially for the IntraSiS database which will provide access for interested users, an assessment of the results and an initial, basic cultural historical interpretation.

The main author of the report was Ed Lyne. Principal coordinating work for the report, including specialist reports, up to September 2014 was undertaken by Hanna Dahlström, and from September 2014 to September 2015 by Ed Lyne, who also compiled and edited the report.

A copy of this report has been distributed to the developer, Metroselskabet I/S. The documentary archive relating to the fieldwork is deposited at the Museum of Copenhagen. All digital records are filed in the IntraSiS program software.

Report Contributions

Report Management and Production:	Ed Lyne (main author) and Hanna Dahlström
Final Report Compilation:	Ed Lyne
Figure Production:	Camilla Haarby Hansen, Hanna Dahlström, Ed Lyne, Jacob Mosekilde
Final Report Editing:	Ed Lyne
External Editor:	Matthew Seaver
Contributions:	Camilla Haarby Hansen
Contextual Grouping and Matrix:	Terje Stafseth and Rachel Morgan
Photographs:	Museum of Copenhagen unless stated otherwise

Glossary of selected terms

CBM: Ceramic building material (brick, tile)

AMS: Accerator Mass Spectrometry (dating technique)

C14: Carbon 14 (isotope) (dating technique)

ICP: Inductively coupled plasma (using chemical analysis of clay to determine provenance for clay as raw material in pottery)

SD: Stratigraphical object (deposit)

Group/Subgroup: Combinations of related contexts (deposits, cuts, structures)

FO: Finds object

2 Administrative data

In the following chapter an outline will be given of the main details of how the excavation at Rådhuspladsen was organized and run. This will include information relating to dates, areas, staff, project organization, external and internal specialists, and on-site facilities.

Dates

The archaeological excavation commenced with some of the watching briefs (mainly connected with the moving of services) from January 17th 2011, while the first main excavation area (Area 1) was started on May 18th 2011. The main excavation was completed on August 14th 2012, with the conclusion of Area 4. A number of watching briefs were conducted intermittently over the following months, and further small watching briefs were conducted in 2013 and finally in August 2014, with small crews of archaeologists in attendance.

Area	Start of work on phase	End of work on phase
1	May 18th 2011	July 22nd 2011
2A	July 25th 2011	October 4th 2011
2B	October 6th 2011	November 21st 2011
3	November 15th 2011	June 8th 2012
4	April 13th 2012	August 14th 2012

Table 1 Main excavation dates

Size of excavation and watching brief areas

The excavation, as outlined in the introduction, was divided up into a series of different areas and trenches. The main excavation areas that were excavated fully by hand or occasionally using a mini-digger/digger were Areas 1 to 4. The remaining trenches including Area 5, were all excavated as watching briefs, meaning that for the most-part the archaeologists followed the work of the contractor, and documented archaeological material encountered in a less thorough way than in full excavation conditions.

The excavation areas 1 to 4 had an estimated area of c. 1.609 m^2, and were estimated to have 2.662 m^3 of cultural layers surviving within them.

The watching briefs had an area of 436 m^2 (area 5) + c. 995 m^2, and were estimated to have 2.211 m^3 + of cultural layers surviving within them.

In general the sterile underlying natural clay was encountered at a depth of c. 1 - 1.25 m below present ground level, with archaeological layers overlying this where they survived. However, many of the archaeological features were 'negative', meaning they were cut into the underlying clay, and in many cases this was to a substantial depth. The wells and pits were in many cases cut 2 m or more into the underlying clay, while the very substantial moat cuts had been dug as much as 5 m deep into the sterile geological clay.

Staff and project organization

The number of archaeological staff employed varied during the project, depending on which of the excavation areas were being worked on at the time. The excavation was managed and administered by excavation leader Hanna Dahlström, while the archaeological fieldwork was led by field leaders Ed Lyne (later in the post-excavation stage (from Sept. 1st 2014) Excavation Leader) and Camilla Haarby Hansen, and during certain phases Mette Kjelstrup and Gareth Dickinson. A further team of up to 20 archaeologists carried out the archaeological excavation and documentation, with some defined specific roles including IT (Fredrik Grehn), stratigraphy and contextual grouping (Terje Stafseth and Rachel Morgan) and health and safety (Jason Leech). Groups of student archaeologists from both Copenhagen University and Lund University were also given work experience during the excavation.

Overall the archaeological work of the museum across the project was overseen by the Metro Cityring project leader, Lene Høst Madsen, while methodological and documentation input was received at the outset from the then Antiquarian Section leader for the Museum of Copenhagen, Joakim Thomasson. The handling of finds material was carried out under the guidance of finds officer Stuart Whatley, by Olle Heimer (on site) and later by Charlotte Rimstad.

Grateful thanks and acknowledgements are made to all the archaeologists who worked on the excavation in sometimes difficult conditions, who provided the initial interpretations of the archaeological remains and created the foundation for this report through their documentation.

Figure 4 The archaeological crew on site in November 2011

Archaeologists taking part in the fieldwork over the course of the excavation included: Amanda Summerfield, Andreas Svensson, Anthony Ruter, Birgitte Ribert, Brendan Fagan, Camilla Haarby Hansen, Charlotte Rimstad, Chris Hawksworth, Claes Hadevik, Ed Lyne, Fredrik Grehn, Gareth Dickinson, Hanna Dahlström, Ingeborg Sæhle, Jason Leech, Jens Winther Johannsen, Joss Davis, John Howorth, Karen Bork Pedersen, Kasia Högström, Krister Kam Tayanin, Lars Haugesten, Lea Jeanica Madsen, Lilith Andersen, Lise Christensen, Louise Lund Johansen, Louise Melchior Rasmussen, Magdalena Lyne, Magnus Lindberg, Mette Kjelstrup, Mie Pedersen, Olle Heimer, Patrick Marsden, Per Jansson, Rachel Morgan, Rikke Isler, Rikke Simonsen, Sabina Lønskov, Sam Keenan, Signe Fog Mogensen, Tara Gullbrand, Terje Stafseth, Thomas Grane, Truls Månsson, Zenon Topcagic.

We also had teams of students on work placement from University of Copenhagen and Lund University contributing with work on site for longer periods: Asta Mønsted, Ivan Hedegaard, Jørn Bisgaard, Nynne Rose Sieling, Nanna Laksø, Christina Hildebrandt, Astrid Buus-Nielsen (KU 2011); Sophie McAulay, Stella Macheridis, Maria Köppe (LU 2012); Pia-Maria Wessberg Fuglsang, Sonni Petersen, Tina Casey, Jeppe Frølund, Sonja Dalsgaard Nolsøe, Elin Søborg (KU 2012).

Contractors and consultants

The on-site building contractor during the main phase of archaeological excavation work was Petri & Haugsted AS, under project leader Henrik Steffensen. There was a very good relationship between Petri & Haugsted and the archaeologists on site, and invariably solutions were found to the practical issues that arose from time to time in relation to the various logistics. Petri & Haugsted had machines available on site as needed, including one mini-digger and two larger excavators. These were used as appropriate for excavating (mainly the mini-digger) and for the moving of spoil and 'big bag' samples. Big bags are large synthetic cubic bags that can hold up to one ton of material. These were used both for the collection of spoil, and in order to take large samples for later off-site sieving, for the retrieval of artefactual remains including animal bones and environmental remains, in a systematic way. These were particularly useful during the excavation of large deposits such as existed in the former moat.

A series of specialists were involved in the project and in the post-excavation analyses of various material types. Their work was initially co-ordinated by Hoda El-Sharnouby and later by Ed Lyne. In particular, ongoing advice was received during excavation by Mette Marie Hald (National Museum of Denmark) and Håkan Ranheden (former Riksantikvarieämbetet, now Statens Historiska Museum) in relation to the environmental remains, Inge Enghoff (Statens Naturhistoriske Museum) in relation to the animal and fishbone remains, Arne Jouttijärvi (Heimdal-archaeometry) in relation to the metallurgical material and Hans Lindersson (Lunds Universitet) in relation to the dendrochronological material. The AMS C14 analyses were carried out by the Radiocarbon Dating Laboratory of the Department of Geology in Lund University, and isotope analysis by the AMS 14C Dating Centre, in the Department of Physics and Astronomy in Aarhus University. Human osteological analysis was conducted by Antropologisk Laboratorium, Københavns Universitet. Conservation work was conducted by Bevaring og Naturvidenskab, National Museum of Denmark.

Further specialist analyses and artefactual descriptions were carried out by: Anna Broström (former Riksantikvarieämbetet) on pollen analysis, Georg Haggren (University of Helsinki) on glass material, Michael Märcher (National Museum of Denmark) on coins, Jesper Langkilde (University of Copenhagen) on medieval ceramics, Steve Ashby (University of York) on medieval combs, Torbjörn Brorsson (Kontoret för Keramiska Studier) on ICP Analysis, Karl Magnus Melin (Knadriks Kulturbygg AB) on worked wood, and from the Museum of Copenhagen – Rikke Kristensen (post-medieval ceramics and wall tiles), Rikke Kristensen with Ole Kristiansen (stove tiles), Vivi Lena Andersen (leather), Charlotte Rimstad (textiles and ropes), Mie Pedersen (clay pipes), Ed Lyne (horse equipment), Stuart Whatley (cutlery, knives, security equipment and writing equipment), Hanna Dahlström (medieval combs), Claes Hadevik (household material, building material, trade items, tools, personal objects, post-medieval combs and unidentified objects), Karsten Skjold Petersen (arms and armour) Mia Toftdal (toys and games), Lars Haugesten and Jens Winther Johansen (flint objects), Hanne Marie Myrhøj (ships and fishing equipment) and Julie Størup (textile production tools and copper alloy pins).

Facilities

The onsite facilities included a large office space, a large canteen and two changing rooms. A storage container was also in place, for the on-site storage of tools, samples and finds.

The office included working stations for up to ten persons at a time. Five of these spaces were used on a rotation based system by the excavating archaeologists, in order to enter contextual information into the IntraSiS database. The remaining computers were used by the excavation leader, field leaders and the IT and stratigraphy/contextual grouping responsible persons. The office included stations for storing and charging digital equipment, and all relevant documentation material required.

Equipment available included all relevant digging equipment, barrows, shovels, trowels, mattocks etc., as well as two total stations, two cameras, one metal detector and all relevant sized plastic finds and sample bags and boxes. Drawing equipment was also used in certain situations, though archaeological features were mainly surveyed using the total station.

Kulturstyrelsen case ID	2010-7.24.02/KBM-0015
KBM	3827
County	København
District	Sokkelund
City	København
Area	Vestervold kvarter
Parish	Copenhagen
Duration of field work phase	2011-2014
Museum archaeologists	See paragraph below
Area (m^2) and % of estimation	1609 m^2 (excavation) + 1431 m^2 (watching brief; 100%)
Volume (m^3) and % of estimation	2662 m^3 (excavation) + 2211 m^3 (watching brief; 100%)

Coordinate system	DKTM 3
Height system	DVR 90
X-coordinates	1172644-1172771
Y-coordinates	651416-651538
Meters above sea level	0,3 – 6 m a s l
Construction work by	Petri & Haugsted AS
Developer	Metroselskabet I/S (Metro company)

Table 2 Site details

3 Topography and Cultural historical background

In this chapter an outline will be given of the topographical and historical background information relevant for the Rådhuspladsen area. This will include a discussion about the general ideas that exist regarding Copenhagen's topography in the past, as well as information regarding what the recent excavation has revealed of the topography locally. An outline will also be given of the relevant historical background of the early medieval to post-medieval city and the Rådhuspladsen area in particular, based mainly on the historical and cartographic sources.

Natural topography and geology

The landscape around Copenhagen has risen since the last Ice Age leaving the area as flat and low lying moraine with scattered hills. In the Middle Ages the area consisted of a natural coastal bay sheltered by the island of Amager and the islets of Slotsholmen and Bremerholm.

The shoreline of the Early Middle Ages has not been completely identified as hardly any excavations have revealed information on this matter. The early 13th century shoreline has been ascertained from Løngangsstræde in the west end to Højbro Plads in the east (Skaarup 1999a: 81). It is generally thought that marshy, shallow areas existed in many parts of Copenhagen in these centuries, and that these may have flooded frequently, resulting in a fluctuating shoreline.

The present-day area of Rådhuspladsen is situated about 6 metres above sea level. The ground level in the Middle Ages and following centuries is not known for certain, though it seems likely that sea level would not have changed very much in that time. Some information has been revealed during this excavation that suggests that ground level at Rådhuspladsen was only a little lower in the middle ages than today, perhaps being c. 1 m to 1,25 m lower than present day street-level across much of the Rådhuspladsen area. It would also appear, based on the original topsoil seen in some areas, that this, contrary to earlier accounts (El-Sharnouby & Høst Madsen 2008), was not a particularly wet or marshy area, but instead consisted of areas of grassland over a thin layer of topsoil, which in turn rested on hard compact sterile glacial clay.

Topography

Copenhagen's topography has changed much through the past centuries as a result of human influence. Domestic refuse as well as waste from livestock and production have been used to raise and level the terrain. After the big fires of 1728, 1795 and 1807, the resulting ruins are believed to have been partially levelled out to provide room for new buildings, and thereby contributed to the construction of thick cultural deposits. Furthermore, these deposits in some cases resulted in positive preservation for older stratigraphy. Also, islets and small bays have been capped and filled over the centuries, and the town has extended far beyond the original shoreline (Rosenkjær 1906:18; Ramsing 1940, Vol. I; Christophersen 1985:69; El-Sharnouby & Høst-Madsen 2008:147).

Little was known of the original topography of the area around Rådhuspladsen prior to the recent excavations. Three test-bores conducted in advance of the archaeological excavation indicated that the

cultural deposits extended to a depth of between 2.7 m and 5.2 m below the street surface (El-Sharnouby 2007:10-12). As a result, it was expected prior to excavation that the average depth from present street level to natural geology was likely to fall somewhere between 3 m and 5 m. It was thought that the latest moat from the late 17th century would contain deposits up to 4 m deep. Truncations such as sewer, water, electricity and district heating in the main excavation area, made it hard to assess the extent of the preservation of cultural deposits prior to the commencement of the excavation (cf. Kristiansen 1998:33 et seq.; 1999a:106; 1999b:158; 1999c:186), while it was assumed however that the underground toilet building from 1941 (measuring c.25 m (E-W) x c.25 m (N-S) to a depth of c.6 m to 7 m) would have resulted in the removal of a volume of at least 3.500m³ of potentially cultural material.

In reality, it was seen during excavation that the moats were as much as 5 m deep from the surface of the sterile clay geology (c. 6 m deep from present ground level). Furthermore, it was clear that where the original surface of the underlying post-glacial clay was intact, it actually occurred as little as 1 m below present day street level, with c. 0,5 m of archaeology surviving between this and modern layers, in those areas where neither archaeological or modern cuts had been made into the clay. The establishment of numerous air raid shelters in 1944 clearly had a major impact on the stratigraphy at Rådhuspladsen, having a depth of between 3 m to 4 m below present ground level.

Cultural historical background

Prior to the Metro excavation at Rådhuspladsen, little was known about the earliest activities in this area of Copenhagen. This was partly due to the fact that only a small number of systematic archaeological excavations were undertaken in this locale and that few written sources describing the area are available. Likewise the historical material involving maps of this area is limited.

An account of previous archaeological observations – or what was interpreted from them – is presented in the next chapter. Many geological and archaeological observations in Copenhagen were made in the first half of the 20th century by amateur archaeologists Hans Nielsen Rosenkjær and Holger Utke Ramsing respectively. The observations are of value to the investigations of the early topography of Copenhagen, but must be used with caution, as the documentation of the presented observations is often insufficient and written sources are used without much reflection or source criticism (Gabrielsen 1999: 21, Frederiksen 1979: 35).

A number of excavations as well as archaeological observations were also carried out by museum curators from the National Museum and the then Rådhusmuseet/Bymuseet in the first decades of the 20th century, but even these are not very well documented by today's standards and the written reports, if present, often lack argumentation for the interpretations made.

Contemporary written sources about the activities in the Middle Ages and the Renaissance in the area around present day Rådhuspladsen are scarce. Particularly valuable is the collection of letters and documents concerning Copenhagen, Københavns Diplomatarium (KD), collected and summarized by former city archivist Oluf Nielsen in the late 19th century. This has recently been digitized and is available in a

searchable form on the internet at www.eremit.dk (Wiene 2010). Maps and copper plate engravings are more numerous, but will also have to be used with care, as the purpose of their production is not always clear and the level of detail and accuracy can be doubted.

From the Middle Ages and until the 1860s the Rådhuspladsen area was the location of the town's western limits. According to historical sources from the 13th century to the middle of the 17th century these limitations consisted of a largely semi-circular bank and moat structure extended over time to consist of towers as well as small "roundels" and ravelines (rounded or bastion-like islands) in front of the gates. Inside the town limits the Copenhageners lived and worked. There have only been a few archaeological excavations of medieval houses and workshops, but some information about these aspects can be retrieved from written records (see below).

Prior to the excavation at Rådhuspladsen, little was known about the landscape and the settlement activities outside the town limits before and during the Middle Ages. On the oldest map of Copenhagen, from around 1600 (Lorentzen 1930), there is no indication of what was outside the town's western edge. On the so-called spy map from 1624, made by the Swedish engineer, Heinrich Thomé, houses and gardens are shown along the road to the western gate (Lorentzen 1930). As Vesterport was an entrance into the town, it is clear that there would have been roads running to and from the gate, but these had not been documented prior to 2011.

During the 17th century the bank and moat structure was changed considerably into a substantial bastion fortification, consisting of large ramparts and bastions. These changes are indicated in the written sources and contemporary maps but were also visible in the archaeological record prior to the work at Rådhuspladsen – see list of archaeological observations below.

The ramparts and bastions were demolished in the 1850s and 1860s and the area where the western gate and the large bastions – Schacks Bastion and Gyldenløves Bastion – once were situated turned into an exhibition area for large-scale arts and craft exhibitions in the 1880s. In the 1890s the city hall building (Rådhuset) was built in the southern part of the area and the present day Rådhuspladsen was established north of this (Jørgensen 1990:79ff).

Prehistory and early history of the location

The Copenhagen area is part of a rich cultural landscape; with traces of human activity and habitation dating back 12,000 years. The vast majority of the relevant early sites are located outside the old town and range in date from the Palaeolithic to the Bronze Age. Stone Age settlements, including settlements from the Kongemose Culture are known at Frihavnen and off the coast of Amager. There are also Ertebølle settlements at Vedbæk, in Ordrup Mose, which was a fjord at the time, outside Kastrup at Amager, at Frederiksberggade near Rådhuspladsden and at Frederiksholms Quarters at Sydhavnen (Ramsing 1940, Vol. I:38 et seq.; Christophersen 1985:12 et seq.).

Because of the extent of the Littorina Sea, the potential for Neolithic remains is extremely limited. Bronze and Iron Age remains have also been scarce, and mainly consist of destroyed graves (cf. Christophersen 1985:12 et seq.). The area around Utterslev, Brønshøjholm and Brønshøj is particularly rich in settlements

and barrows. The clearest archaeological evidence of Iron Age settlements and graves/burials is also found here.
Some scattered archaeological evidence of prehistoric settlements has been found within the old town area. Occasional unstratified prehistoric finds have also been unearthed in this area. Only a few finds indicate prehistoric human activities in the area around the present-day Rådhuspladsen. These consist of a number of flint artefacts excavated in connection with the establishment of air raid shelters in 1944 at the south end of Rådhuspladsen, where traces of the prehistoric shoreline were also seen.

At the corner of Frederiksberggade and Nytorv a Mesolithic settlement was previously documented – but the extent and character of this is largely unknown (Christophersen 1985: 14). In general it may be that further prehistoric evidence exists under the modern city, but with a millennium of urban activity in this location, such remains will frequently have been obscured, built over, or removed completely.

Life in the western parts of town

The Early and High Medieval Ages

During the 20th century scattered settlement evidence from the Early Middle Ages was archaeologically documented in the area between present day Rådhuspladsen and Gammeltorv/Nytorv, as well as in the area just west of Kongens Nytorv (Fabricius 2006: 16).

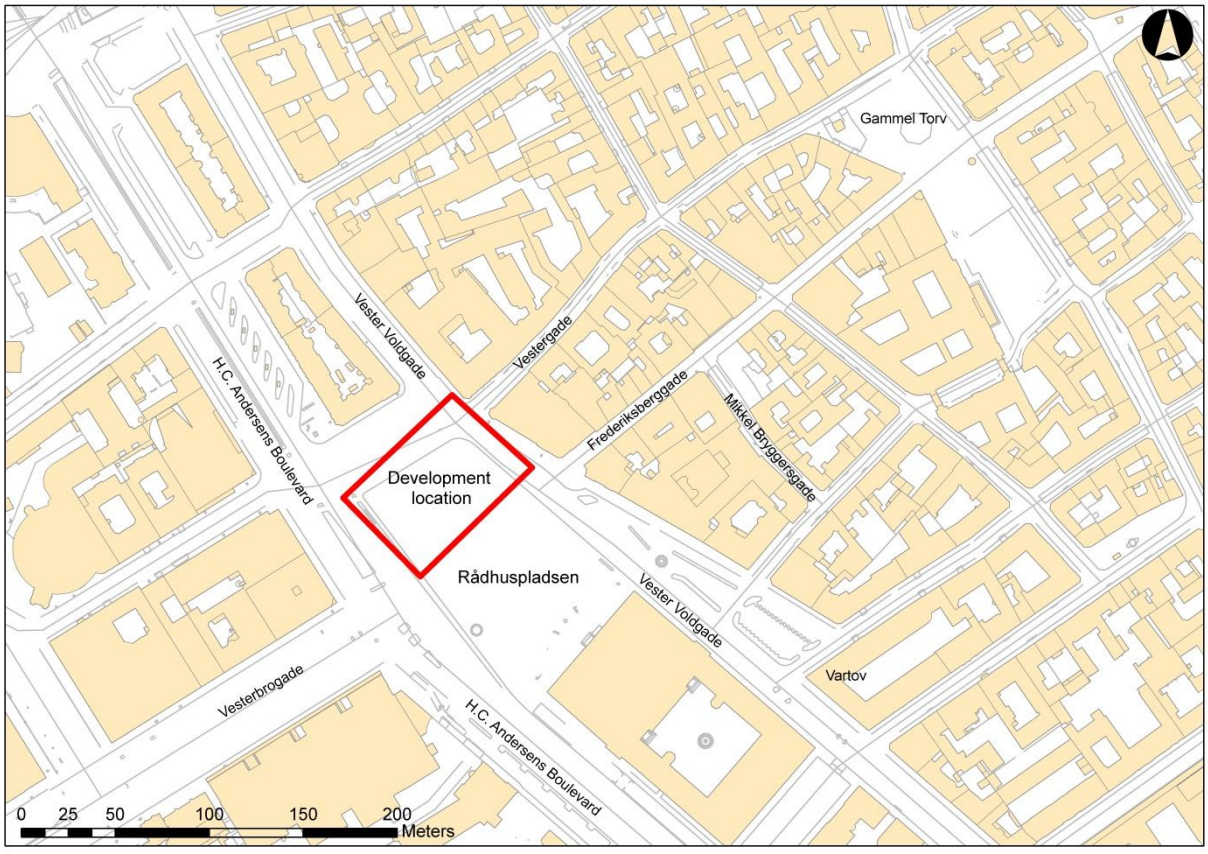

Figure 5 The location of Rådhuspladsen seen in relation to streets in the western part of the medieval town.

In the western end of this area a roughly horseshoe-shaped ditch and bank structure were found to have enclosed a smaller area of approximately 2 hectares (Skaarup 1996a: 168). Parts of this structure has been archaeologically investigated on a few occasions – primarily at the beginning of the 20th century: Ramsing observed a ditch (which he interpreted as a system of ditches for watermills) at three plots in Vestergade, at Mikkel Bryggersgade 2, Vester Voldgade 57 and at Frederiksberggade 1 on the corner of Gammeltorv, where the ditch was seen over a length of approximately 30 metres. On the last occasion it was also observed that the soil dug up from the ditch formed a bank on the west side of the ditch (Christophersen 1985: 77). In 1987 excavations in Vestergade 7 revealed parts of a bank and ditch – interpreted as a rampart and moat – as well as older settlement traces under the bank (Skaarup 1988a: 29, 1999b: 95f). The bank and ditch structure appears to have been running north-west from the coast, along the western side of the present-day Mikkel Bryggersgade, turning east just south of Vestergade and then south again along the western side of Gammeltorv-Nytorv (Fabricius 1999, Frederiksen 1979). Where the bank was identified it was approximately 8-10 m wide and 1.5 m high, while the ditch on the outside of this was of approximately the same or slightly smaller dimensions. On the inside of the bank there seems to be traces of a parade (voldgade) of which today's Mikkel Bryggersgade may be a remnant (Skaarup 1996b: 30, Skaarup 1988a). Inside the structure quantities of fish bones have been interpreted as traces of fish processing or trade (Skaarup 1996a: 167, El-Sharnouby & Høst-Madsen 2008: 148).

14C-analyses suggest a date to the late 11th century (Wozniak 2009). This early bank and ditch structure has never been mentioned clearly in any written sources, but the interpretation has for long been that it represents a type of fortification marking the borders of the early medieval settlement in Copenhagen (eg. Frederiksen 1979, Skaarup 1988a, Fabricius 1996 and El-Sharnouby & Høst-Madsen 2008).

The medieval church of St. Clemens, allegedly placed outside of the western part of Ramsing's interpretation of the oldest town "Clemensstaden", between present-day Gammeltorv and Rådhuspladsen, is first mentioned with certainty in 1304 in the testament of a man named Hinze Bagge (Rørdam 1859-63: 234 and supplement 2: 4). Parts of what have been interpreted as the foundations for the church have been observed several times during the late 19th and early 20th century in and around Frederiksberggade, and speculation about an earlier, wood-built church has been made, but this has never been confirmed (Christophersen 1985: 75). Burials related to the churchyard have been recovered on several occasions, dating back to the early medieval period (Christophersen 1985: 75, Jark Jensen & Dahlström 2009). It is unknown when the church was built, but it was taken out of use in the middle of the 16th century as a result of the Reformation (Jark Jensen & Dahlström 2009: 14). This church was allegedly located just 50 m to the east of Area 1 of the Rådhuspladsen excavation, but no evidence was seen in this area indicating any part of the churchyard had extended this far west.

The modern Vestergade-Vimmelskaftet-Amagertorv route and the eastern stretch of Østergade running parallel to the coastline is probably the oldest of the streets that the medieval town was built around (Christophersen 1985: 71). Some of the medieval streets in the western end of town disappeared after the fire in 1728, but are mentioned in earlier written records. Among these were: Vombadstuestræde, Store Skt. Clemensstræde, Lille Skt. Clemensstræde, Hellig Korsgade and Antikstræde (Fabricius 2006: 28).

Vestergade is the oldest known street connected with Rådhuspladsen. It seems that throughout the Middle Ages a western entrance to the town was located at the west end of Vestergade, where travellers from the surrounding area as well as the market towns of Køge and Roskilde would enter. In the Roskilde bishop's land record (Roskildebispens Jordebog, RJ) from approximately 1377 Vestergade is mentioned as "the street by Vesterport" (Fabricius 2006: 51). Not much is known about the character of the population living in this area and which trades and crafts were undertaken in the Early and High Middle Ages, but from the Late Middle Ages we have written sources indicating such aspects. In 1373 it is mentioned that a part (presumably the eastern part of the then Antikstræde to Gammeltorv) of Vestergade is called Smedegade (Smith's street), indicating that smiths or smithies were or had been located nearby (Fabricius 2006: 51). Due to Vestergade being the street running from the western gate of the town, is can be assumed that the area would have had a number of guest houses and breweries, as is seen later in the written sources, where travellers from outside town could rest after arriving in Copenhagen (Fabricius 2006: 50).

South of Vestergade, running parallel to it, was Lille Skt. Clemensstræde. The street ran from the medieval rampart in west, towards the east to join up with Vombadstuestræde, which continued to Gammeltorv (Fabricius 2006: 29). It is not known when these streets came into being – but the name Lille Skt. Clemensstræde could suggest a medieval origin.

Late Medieval period and onwards

During the Late Middle Ages, most of the area within the town border had been developed, however with varying form and intensity. The south and western parts of the town were the most densely built-up areas of the medieval town (Christophersen 1985: 69).

Only a few archaeological observations of houses have been made in the area just east of Rådhuspladsen. In the early 20th century H. U. Ramsing observed remains of simple houses with clay floors and wattle walls in the area near Farvergade, southeast of Rådhuspladsen. These were dated by Ramsing to around 1400 A.D. (Christophersen 1985: 70). A similar picture is seen in Vestergade, where remains of lightly built structures were identified from clay floors and burnt daub in 1987 (Skaarup 1988a: 29).

The name Smedegade (Smith's street), sometimes used for the eastern part of Vestergade, corresponds well with the large number of smithies that were registered as being located in this street in the Late Middle Ages and in the Renaissance. Apart from these, it seems from the written sources of the late 16th century that the professions linked to Vestergade were brewers, writers, bakers, coopers, tailors, glaziers, horse millers and a master builder (Fabricius 2006: 50).

In the area between Vestergade and the harbour the professions were primarily linked to the sea and the navy. According to the register from around AD 1377 a ropemaker lived south of Vestergade (Fabricius 2006: 33). It has been documented also, that the streets were paved and maintained (at least after the Middle Ages) by the landowners of the area (Wiene 2010). Given the presence of smithies in this area, it may be relevant to consider the areas of street surface documented in this excavation that were made primarily of iron slag (see Chapter 7).

Town limits and fortifications

The fortifications in the Rådhuspladsen area were built, dismantled and rebuilt over approximately 500 years from the High Middle Ages to the 19th century, starting with a roughly semi-circular rampart and moat and later changing into a large bastion fortification in the 17th century. In the 1860s the bastions and ramparts were demolished as they were outdated and ineffective, and because the town's need for space had grown considerably.

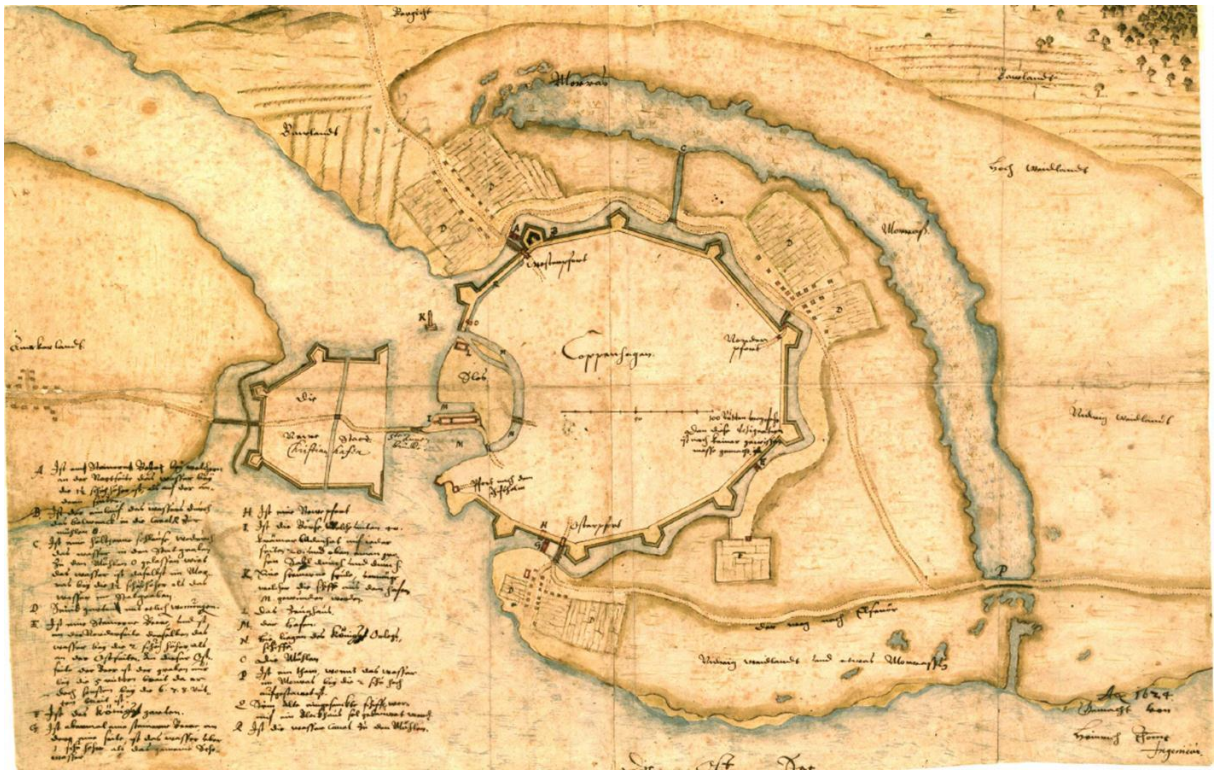

Figure 6 The Swedish Spy Map of 1624 drawn by Heinrich Thome (Det Kgl. Krigsarkiv, Stockholm)

High Medieval

The high medieval rampart is mentioned in the oldest town privileges (Jakob Erlandsen's Stadsret) from 1254 (KD I: 18) and therefore was apparently built in the first half of the 13th century. The rampart was 2400 metres long and enclosed an area of approximately 70 hectares (Frederiksen 1979: 27). The creation of this semi-circular rampart and moat structure is usually attributed to Archbishop Absalon around the year 1200, but it is uncertain whether it, in its full extent, derives from Absalon's time (Christophersen 1985:61). The course of the rampart appears to have been determined quite accurately on the basis of six different excavations, but details of the stretches in between the observations made in these areas are still not clear (Frederiksen 1979: 32f). It should be stated at the outset, that no evidence for this early defensive structure was identified during the Metro excavation at Rådhuspladsen, with the first dateable evidence for a fortification in the Rådhuspladsen area pointing to a construction date in the 1370s (see Chapter 7).

The western part of the rampart and moat structure; parts of the rampart and moat, as well as additions to these, were investigated at Vartov, south of Rådhuspladsen in 1927. It was shown that the oldest rampart was constructed on the original ground surface and was 11.5 m wide. The outer foot of the rampart was reinforced with a stone structure. At some point in time, the rampart was enlarged on the outside and

reinforced with a bulwark – possibly to keep the water in the moat from undermining the rampart. When the excavations were continued in Vester Voldgade outside of Vartov, the moat was shown to have been 15 m wide and the bottom level at 2 meters below sea level (Christophersen 1985: 64).

The term "the town's planks" (byens planker) is mentioned in written sources, indicating that parts of the defences consisted of a palisade, or that palisades or planks were placed on top of the rampart – eg. in the town's privileges from 1294 (Biskop Johannes Krags stadsret) (KD I: 33). Such planks have never been demonstrated archaeologically. It is possible that this term – as well as the term "the town's walls" (byens mure) – are fixed terms imported from town privileges elsewhere, and thus do not describe the actual situation in Copenhagen at the time (Skaarup 1996c: 12f). However, it is also plausible that such planks once existed, but have just not been preserved or found in the archaeological excavations of the rampart areas. It should be borne in mind, that the rampart, , scarcely survives at all, having been deliberately levelled out in the past. Hence any structure that might have stood on top of it could not possibly be preserved.

The western gate (Vesterport) is first mentioned in Roskildebispens Jordebog from the 1370s (Frederiksen 1979: 27, KD I: 97) and what seems to be a gate building is also depicted on some copper plate engravings as well as maps (Jensen 1938: 218ff). However there are no actual descriptions of the gate building itself, and as a second western gate was built in the early 16th century (see below), it is not clear which one is being referred to when a gate is mentioned in the written sources.

Changes toward the end of the medieval period

During the 16th and 17th centuries, the fortification seems to have undergone a large number of changes and renewals.

At the western side of town a small, round or semi-circular inlet (roundel/demi-lune) was built outside the western gate. This was thought to have been done in the first half of the 16th century (Jensen 1938: 215f). Written sources from the 1520s mention that some men were paid to build an earthwork outside Vesterport (KD I: 334-37). A new gate building was established, and prior to the recent excavation this was thought by some to have been placed on this roundel/demi-lune; in the Museum's archives this is called the second Vesterport.

On the plan drawing from 1865 a semi-circular line of stones or boulders is seen north of where the outer gate building is located. This structure was later interpreted as the inner foot of the rampart on the roundel/ravelin (Jensen 1938: 218, note 1). In 1543 A.D. the roundel/demi-lune seems to have been rebuilt or extended, based on written records (KD II: 271f). However the nature of this work is not described in detail, and it may relate to minor changes to the demi-lune, rather than to the building of the outer gate or establishment of the bastion.

The gate building on the ravelin was thought to have been rebuilt in one or more stages. A brick structure, interpreted as a secondary façade on the south side of the building, was excavated in 1931. At this time it was thought that the façade was placed on the outside of an earlier façade (Jensen 1938: 212f) and that the changes might have related to Christian IV's redecoration of the gate house beginning in 1618-19, as

described in written sources (Lassen 1855, Jensen 1938: 221). Later discussions centred on whether the inner or the outer gate was redecorated (see Dahl 1996: 124), concluding that it was likely to have been the outer gate by that date.

The bastion fortification A.D. 1668

In the late 1660s the western fortifications (Vestervold) were changed considerably, and pushed further west, placed over parts of present day H.C. Andersens Blvd and into the area now occupied by Tivoli. The old rampart was replaced by a more extensive structure comprising large, five-sided bastions, with wide curtains in between, while a large moat called Stadsgraven was established on the outside. Vesterport's bastion was replaced by Schack's bastion in 1671. South of this another bastion was established – Gyldenløve's bastion, situated where the present day city hall building was later built.

A new western gate was established on the line of the curtain between Schack's and Gyldenløve's bastion, outside present day Frederiksberggade. As mentioned earlier, the gate led into the square named Halmtorvet (the hay market). The substantial boulder foundations for the gate building were encountered in 1931, when a tunnel running north-south across Rådhuspladsen was dug to facilitate safe passage for pedestrians (Jensen 1938: 209).

West of the gate a bridge spanned part of the moat and ended at a large ravelin called Vesterports Ravelin. The ravelin was a five-cornered island situated where Industriens Hus was later built. A toll booth was placed on this ravelin (Dahl 1996: 127). Before or during the construction of this larger fortification, the previous moats were filled up, both the moat associated with the outer (second) gate, and the medieval moat which had been in use as a millrace for the previous 70 years or so. It was material from this backfilling that was unearthed in 1941, when a lot of well preserved finds were found in the trench for the underground toilets. Much more of this material would be encountered during the Metro excavation (see Chapter 7).

Outside the town limits

Prior to the Metro excavation at Rådhuspladsen, very little was known about the activities outside the western town limits during the Middle Ages. In Jordebogen from 1581 (KD I: 495) there is a long record of gardens outside the gates, but there are no details of how many buildings were associated with them. The recent excavation has thrown some light on this subject (see Chapter 7), but only in relation to an area quite close to the town boundary. The late 17th century moat removed any possible evidence for a wide span beyond this area, and outside that, little evidence has come to light to date. It is possible that future excavations in the inner Vesterbro area may shed some light on how this area looked in the Middle Ages and after.

Water supply

The drinking water supply to the town in the Middle Ages was provided by local wells. However, from the late 16th century the technique of bringing in water from outside the urban area using wooden waterpipes was piloted. This was initiated after King Frederik II in the 1560s had a water line built to facilitate a fountain at the castle of Copenhagen. The water supply for this consisted of 1500 wooden pipes or "drains"

running presumably from Emdrup Lake, about 5 km north-west of Copenhagen, to the castle (Skaarup 1988b: 6). After AD 1600 a number of farms and houses inside the town had water pipes connected to the well (vandpost) on Gammeltorv and soon more main water pipes were established from Emdrup to the town.

From written sources a sluice-like structure is believed to have been placed between the inner and the outer Vesterport gate buildings: Christopher Valkendorff was King Frederik II's "rentemester" (Minister for Finance) and also a very enterprising man, according to the written sources. In 1583 he established "a vault in Vesterport between the two gates and sat with carved stones which the water and the sluice run under" (KD I: 542). The channel was probably to provide water for the moat which otherwise would dry out. The date of the construction of the sluice – and its character are not mentioned in the written sources.

4 Archaeological background

Previous archaeological observations

Over the past century or more, a large number of archaeological observations have been made in the Rådhuspladsen area, even as far back as the late 19th century. Most of these observations were made in connection with developments of the area or the placement of smaller service trenches, and in very few cases were the observations well documented. Most were only mentioned as interpretations of what was encountered in newspaper articles or similar, while just a few of the observations are well recorded with drawings and descriptive reports.

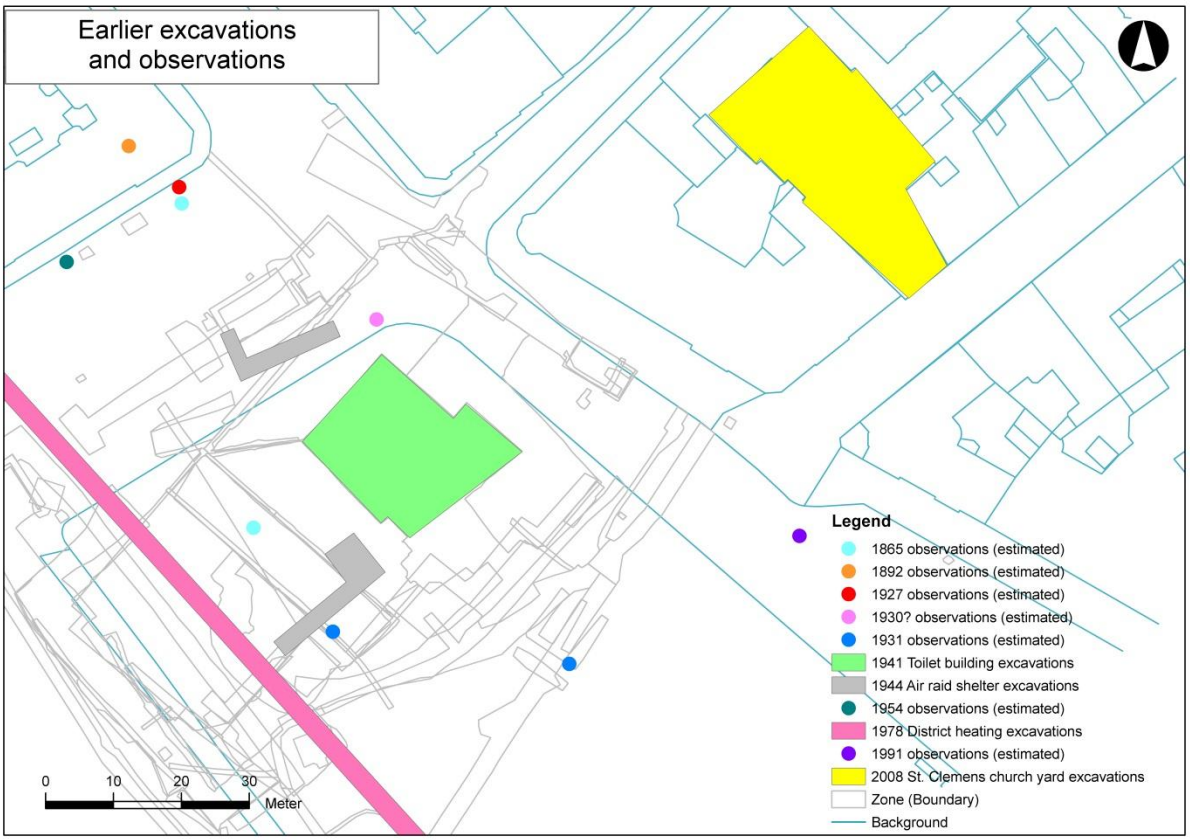

Figure 7 Location of previous archaeological excavations/observations around Rådhuspladsen

The largest excavations on Rådhuspladsen were undertaken in 1941 to establish the underground public toilet in the square and in 1944 when several air-raid shelters were built in various parts of the square. The excavations in the 1940s involved only a small amount of professional archaeological surveillance however, and primarily uncovered what was interpreted as remains of the town's medieval and renaissance fortification as well as a water channel, interpreted at the time as “Valkendorf’s water channel”.

A number of original drawings and photographs of some of the unearthed stone and brick structures are in the museum’s archives and as a result it was possible during the recent Rådhuspladsen excavation to compare these images with structures seen in 2011 and 2012, and to establish conclusively what the structures were.

The past excavations, however scantily documented, provided some useful information about what kinds of structures might be encountered during the Metro excavation. It was known for example, that several stone and brick structures from the different phases of gates and bridges could be expected – albeit with considerable uncertainty regarding what the level of preservation might be. It was also known from the "toilet excavation" that the moat fills likely to be seen in Areas 3 and 4 were likely to contain a large amount of well preserved finds, including organic items. This kind of information was useful in informing excavation and finds strategies in advance of commencing the Metro excavation.

The excavations in 1941

In the autumn of 1941 a large area in the north-eastern part of Rådhuspladsen was excavated to facilitate the establishment of the underground toilets which opened to the public in 1943 (File number AA13 (National Museum) (see Figure 8 below). The excavations were undertaken with limited archaeological supervision. There was no actual report made of the archaeological findings, but notes and a handwritten manuscript for a presentation of the findings held at Rådhuset in December 1941 are in the museum's archives, along with a limited number of photos, some plans and sketches. These – together with the numerous newspaper articles about the excavations – give a somewhat fragmented picture of what was found, and where. No publication was made, but the excavations were mentioned in a book about Rådhuspladsen though time (Linvald 1950:15ff).

The interpretations made from the excavations were heavily influenced by historical records and what had previously been excavated in 1865 and the beginning of the 20th century and put together in an article written by Chr. Ax. Jensen in 1938 (Jensen 1938). In the north end of the trench a brickwork pillar was seen and recorded. This had a foundation of large boulders.

North of the pillar part of a larger brick structure on boulder foundation stones was recorded. It seemed to be three sides of a square shaped structure of brick walls – the western part was apparently not excavated or was not preserved. The structure was interpreted as being part of the bridge running between the inner, medieval gate and the outer gate built in the beginning of the 16th century (Linvald 1950: 15). Based on what was seen during the Metro excavation, this interpretation was correct.

Figure 8 The toilet building construction site in 1941, seen from southwest

The area excavated in 1941 was approximately 25 x 25 m (measured from a recent plan of the area) and the trench was dug to a depth of at least 5 metres. However, it seems that some excavation work was done outside the area where the toilets are now located – the trench may have been extended to the north to investigate the brick structure that was seen in the northern, south facing section.

A large amount of finds material was retrieved, consisting of pottery, metal and very well preserved organic material. These finds would have been placed here during the filling up of the medieval and renaissance moat in the 1670s or so, when the large bastion fortification was built. As no stratigraphic observations were made, it is also possible that some of the finds may have derived from the primary use of the moat. On the other hand, a few finds recovered (beer bottles) appear to be of a later date than the 17th century (Thorén & Otfors 2009: 10).

One photo from 1941 shows the trench after several metres of fill have been dug out. In the bottom a long north-south oriented line of transverse large wooden beams is seen. What seems to be the same structure is depicted in plan and section drawings, showing that the beams must have been placed on a long row of naturally-shaped boulders, as well as some which had been worked. A brick wall is indicated in connection with this, but the section drawing leaves doubt as to the location of this. From a series of plan drawings it is obvious that a wooden channel is running north-south above the transverse beams. The structures depicted must represent elements of the mill and millrace which were removed at the time in question.

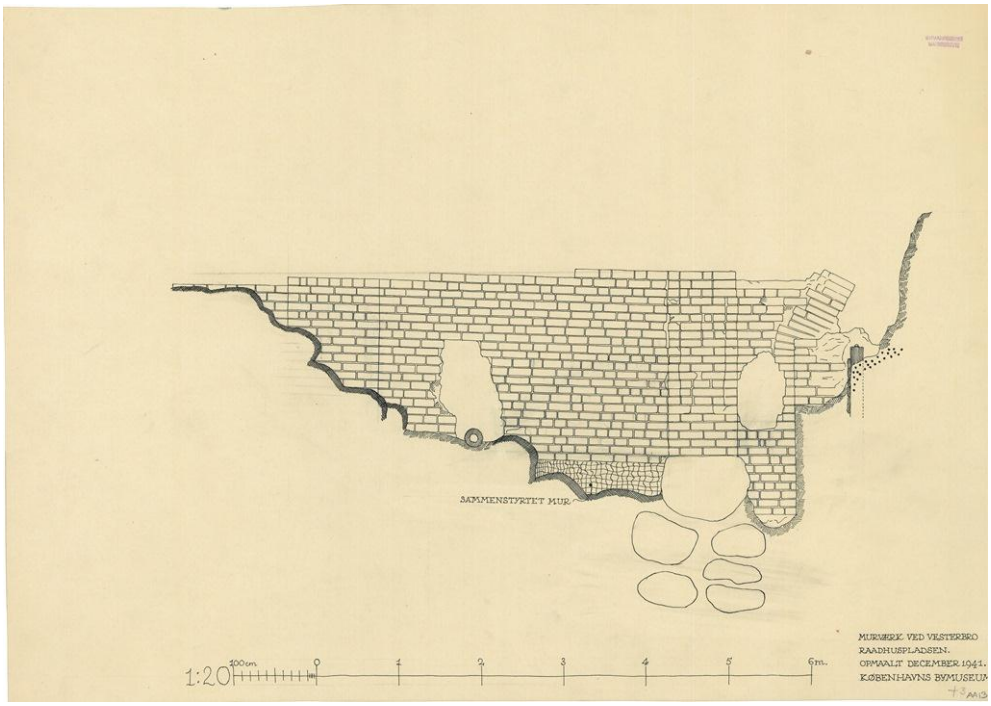

Figure 9 An elevation drawing of part of the brick bridge over the medieval moat made in 1941 during the toilet building construction.

The excavations in 1944

In 1944 a large number of air raid shelters were established on Rådhuspladsen. The majority of the shelters were placed on the southern part of the square, south of the current excavation area. However, some were placed within the area affected by the establishment of the Metro station. Most of the shelters were round/dome shaped concrete structures either placed singularly or in groups of two or three sharing an access stairway, and three of the shelters appear to have been rectangular and tunnel shaped with the access/entrance at one end.

Like the excavations in 1941, this work was not carried out by archaeologists, but instead monitored by museum staff. One typed report was made, describing a complex structure with references to some plans found in the museum's archive. Only a few photos were taken, and there was hardly any information as to where the photos were taken from. However, the location of some can be established. A number of large format plan and section drawings of brick and stone structures was in the Museum's archives and it was possible to digitise and geo reference the plans in order to relate them to the 2011 observations.

Two photos were taken in 1944 when a tunnel-shaped bomb shelter in the middle of the square was built almost in line with Frederiksberggade (Strøget) and Vesterbrogade. On this occasion a brick and boulder structure was seen. It would be seen during the Metro excavation that the structure encountered was in fact the outer gate, built in the late 1500s.

A tunnel-shaped air raid shelter was also established in the north end of the area. On this occasion several brick and wooden structures were encountered and documented to a degree, and during the recent excavation it was possible to link new findings with these older observations.

Other archaeological observations

- 1865, northern part of Rådhuspladsen. When Schack's Bastion was demolished, stone and brick structures were seen and partly recorded. Part of a semi-circular ring of stones or boulders was seen, but not described in great detail – so neither character nor level of stones was documented. The stone structure was later interpreted as the inner foot or lining of the rampart on the small ravelin (Jensen 1938: 218, note 1). Based on the recent excavations, it is now considered more likely that the stones represented the outer edge of the small ravelin/demi-lune rampart. A stone structure interpreted (probably correctly) as the foundations of the outer gate building (the second Vesterport) were also recorded. There were also parts of a brick built vault with internal pillars running north-west-south-east in the northernmost end. In the southeast end of the vault, it seemed to change into a wood and stone structure, but as there is no written report, the details are not known (National Museum file number AA9). It is likely to have been part of the millrace.

- 1892, northern end of Rådhuspladsen. Part of the same area as above was developed further in 1892 when the foundations for Helmershus/Utrechthuset (Rådhuspladsen 2-4) were laid. On this occasion the long brick-vaulted channel was seen again and the recordings were extended to include a slight turn towards the west in the north-western end. The survey was undertaken in plan as well as section (National Museum file number AA11).

- 1892, south end of Rådhuspladsen. The building of Rådhuset (the Town Hall building) was also initiated in 1892, unearthing a large number of finds. These must be considered stray finds, as they were collected by different people and later given as gifts to the museum without any details about find contexts (Kristensen 2009: 4-6; National Museum file number AA11).

- 1927, north end of Rådhuspladsen. Outside Politikens Hus (probably outside Rådhuspladsen 4), a telephone box was placed or moved. On this occasion the brick vault was found again and interpreted as Valkendorff's Vault (Kristensen 2009: 14; National Museum file number 456/27; Peter Linde 1927).

- 1927, at Vartov Grønnegård, south east of Rådhuspladsen. A structure interpreted as the high medieval fortification, as well as later additions to this, was investigated (Christophersen 1985: 64).

- 1930(?), Vester Voldgade, outside Vestergade. Part of a stone and brick structure was seen, consisting of a boulder foundation with a 75 cm wide wall of monk bricks in medieval coursing on top. On the northern side a soil or clay floor was seen but the full extent was not investigated, as it seemed to be heavily truncated in the north end. The structure was interpreted as the gate tower or building for the oldest western gate and the floor as a basement floor inside the gate building

(Jensen 1938: 214, Ramsing 1940c: 27; no file number, no case number). Based on the recent Metro excavation, it now appears that they in fact had encountered part of the inner side of the masonry brick from c. 1500 A.D.

- 1931, centre of Rådhuspladsen. When Rådhuspladsen was reorganised and furnished with an underground tunnel, running NNW-SSE, small-scale excavations were carried out. Foundations of the latest Vesterport (1668-1857) were encountered in the middle of the square outside Frederiksberggade and north of this the foundations of the second Vesterport (the outer gate) surveyed in 1865 were re-surveyed (Kristensen 2009: 14, Jensen 1938: 15ff), (National Museum file number AA12, no case number).

- 1948, Vester Voldgade, east of Rådhuspladsen. A large-scale district heating project was carried out in Vester Voldgade in the stretch between Rådhuspladsen and Stormgade. On this occasion lots of finds were recovered. These were interpreted as deriving from the fill of the moat (presumably the inner moat, filled up in the late 1600s). Furthermore the bulwarks from an open water canal, still present in the 19th century were registered. The finds are described in the finds protocol, but are only roughly dated 17th -19th century (Kristensen 2009: 12-13; National Museum file number AA24, case number 1948:120 – 1948:474).

- 1951, Rådhuspladsen (?). A find of a dagger (nyredolk) with a wooden handle, dated 1450-1550, was listed as found in connection with the some construction work at Rådhuspladsen (Kristensen 2009: 13; case number KBM 1406).

- 1954, north-western end of Rådhuspladsen. In the museum's archive there is a file indicating that human bones and some cast plaster "for a column base" were found in 1954 in the northern part of Rådhuspladsen, outside Helmershus. The bones were handed over to the Police (Kriminalpolitiet), and "nothing further of interest" is listed in the record. It has not been possible to detect what happened to these bones afterwards, but they were apparently assumed to have been historical by the police, as no murder cases were investigated in Rådhuspladsen in 1954 (personal comment F. Bøgh, Politihistorisk Museum). Whether these remains date from the same time as those seen in the Metro excavation (see Chapter 7) is unclear.

- 1978, western side of Rådhuspladsen. A trench was excavated running north-south more or less from the "Dragon fountain" in the south end to the statue of "The little horn blower" in the north end. On this occasion, several stone and brick structures were encountered and registered. Unfortunately the overall plan of the excavations is a reconstruction and therefore not very accurate. The structures were interpreted as being parts of the Vesterport established in 1668 outside Frederiksberggade (probably too far west to have been part of this gate) as well as bridge pillars from one of the building phases of the ravelin outside Vestergade in the 1620s, when a new bridge was supposedly built (mentioned in written sources). The northernmost brickwork was interpreted as part of the roundel/ravelin – either from the 16th century or a later building phase (Engberg 1978; National Museum file number 63/79). This latter brickwork was in fact probably

part of the bastion from about 1600 A.D, based on what was seen in the Metro excavations, where of course a much bigger area was opened up.

- 1991, eastern side of Rådhuspladsen. Outside Frederiksberggade (Strøget) on Rådhuspladsen, a brick-built vault was seen and partly documented. The structure was then interpreted as a "fourth Vesterport" from after the 1660s, leading the road over the moat or a part of this – this interpretation however seems unlikely, and the Metro excavation has provided no new information to help resolve what this structure may have been (Case number KBM 721, sb. nr: 020306-106). If it was leading over a moat, then it would have to be the medieval moat/mill race, meaning that it was in use no later than the 1670s. Consequently, given its position, it could relate to a hypothetical gate that preceded the final Vesterport, but post-dated the outer gate. While mapping evidence (such as the Swedish spy map) could be interpreted in a way to support this idea, in the absence of further physical evidence it must remain only a possibility.

- 1995, north (and west?) end of Rådhuspladsen. In 1995 several holes were dug in the northern part of Rådhuspladsen, but no report was made at the time and there is no overall plan in the museum's archives. In 2004 an attempt was made to reconstruct parts of the excavation's results, but the report is very fragmentary due to a lack of documentation. Parts of a brick-built vault were seen outside Rådhuspladsen 4 (under the steps to Alm. Brand as well as south of this), probably the same vaulted structure as recorded in 1865, 1892 and 1927 and hence relating to the millrace from c. 1600 A.D.. From the photos it can be seen that a trench or trenches were also dug in the area of western Rådhuspladsen, and a trench was dug through a brick wall/foundation (case number KBM 1369). It is not clear what structure this was.

- 2006, west side of Rådhuspladsen. A trench running along H.C. Andersens Boulevard (probably the trench established in 1978) was renewed and replaced and the excavations were overseen by archaeologists. Deposits were recorded, but no finds or structures were documented, apart from the end of an air-raid shelter (File numbers 1242 and 1300, case numbers KBM 3335 and KBM 3434).

- 2008, east of Rådhuspladsen: An excavation was carried out of parts of a cemetery in the plot by Vestergade 33. The excavations revealed approximately 1200 burials dating from the late 11th to 16th centuries, belonging to the church of St. Clemens. The limits of the cemetery were not found. In the north end of the excavation, close to the south side of Vestergade, indications of metal-/iron working were found along with one or two wells (Jensen & Dahlström 2009, case number KBM 3621).

The excavations at Rådhuspladsen in connection with the Metro Cityring was, to varying degrees, informed by these past excavations, while it also provided huge amounts of new evidence that in many cases either confirmed or contradicted earlier interpretations. Furthermore it must be hoped, that given the more modern techniques employed in the 2011 to 2012 excavation, it also leaves behind an archive that will more easily lend itself to future re-analysis, allowing future generations to re-interpret what was unearthed during this substantial archaeological project, as well as to use the evidence for research purposes.

5 Objectives and aims

The objective of this excavation was a site specific application of the overall aims defined in the Metro Project design (Thomasson & Høst Madsen 2009). The aims were connected to the following three themes:

- The urbanisation of Copenhagen
- Health and living conditions in the city
- City life in Copenhagen

In this chapter the specific location of the site of Rådhuspladsen is considered and our ability to answer questions relating to the overall themes is assessed. Specific questions connected to the site and the expected archaeological remains were formulated prior to commencing the excavation. These were then related to the overall project aims.

Site questions

The questions to be addressed by the excavation were divided into different themes, related to functions and activities in or outside the town area. Former topography, prehistoric and early medieval activities were however areas of interest that did not necessarily directly relate to the town area as we know it, and are therefore dealt with here in a separate sub-chapter.

Topography, prehistoric and early medieval activities

Considering the relative lack of knowledge regarding activities in the area during the earliest phase of settlement, it was considered vital to learn more about the topography from prehistoric periods and early medieval times – this would help establish which kind of activities might have taken place in the area in question. This was important in order to understand the urbanisation process.

Due to its regional geographical placement, t is likely that Copenhagen started as a trading place, perhaps of seasonal character. In such a place it would be expected that remains of craft and trade activities, roads, seasonal habitation and animal husbandry might be found.

From the high medieval period, the town's western border was located passing through the area at Rådhuspladsen. It was in the form of a rampart and moat, with a gate placed outside Vestergade. The earlier character and location of the town boundaries, had there been any, was unknown. It was hoped that the Metro excavation might help to shed light on the development of the town's boundaries. The boundary functioned not only as a line of defence, but also would have had a strong symbolic value defining the area with town privileges connected to trade and market peace, and it would have been an important and very visible symbol of power for the town government.

The area in prehistoric periods

Although it was not anticipated that significant remains of prehistoric date would have survived in the immediate area, it was considered possible that low levels of activity in the form of residual artefacts might be recognised. It was also considered possible that there might be evidence of prehistoric habitation as the site lay near former wetlands/ marshlands. Locations like this would be valued during the prehistoric

period, as they provide resources for hunting, fishing and foraging. It was thought that the Metro excavation might provide information about the area during this period, and help to clarify its usage prior to the establishment of Copenhagen.

Examples of specific questions posed (if relevant):

- Could the topography from prehistoric periods be established? Where was the coastline situated?
- Could prehistoric activities be identified? If so, what kind of activities? Could any such remains be dated?

Viking Age and Early Middle Ages

Remains of trade and craft activities are known from many Viking Age coastal sites in Denmark and southern Sweden (Ulriksen 1998). Later on, from the 12th century to the 14th century, shallow clay-lined pits are evidence for fish processing on the beaches, which is related to the very important herring markets in the Øresund and southern Baltic Sea area (Ersgård 1988). Further discoveries dating to this period, from the Viking Age to Early Middle Ages, would provide opportunities to understand if there had been market activities on the beach near Copenhagen (Thomasson 2008) and how this might be related to the settlement in what was to become the town area. Vital to this however, would be to understand the existing topography of the area.

Examples of specific questions posed (if relevant):

- Could the topography from Viking Age and Early Middle Ages be further established? Where was the coastline situated?
- Could settlement and/or grave remains from the Viking Age and Early Middle Ages be identified? If so, how would this have related to the previously known settlement/burial areas from this period? How would this have related to land use?
- What circumstances could have led to the formation of the town? Did it happen in different stages – seasonal activities -> permanent settlement?
- Was there any evidence of ditches, walls or other structures which could mark the town border from this period? If so, how would these correlate to later boundaries such as walls, rampart and moat?

Settlement areas within the town walls

It was considered possible that medieval settlement areas would be found in the north-eastern end of the excavation area, in conjunction with the medieval town. Investigations inside the town limits would provide opportunities to explore the development of the town settlement, from its earliest stages. The objective of the investigations was also to contribute new knowledge relating to the nature of everyday life, building culture, craft and trade and their changes over time. The aims were focussed on periods when the area was emerging as part of the town; i.e. from the Middle Ages onwards.

Constitution and changes of everyday life

The excavated remains might clarify how the area just within the town gate was used in different periods (land use), for instance in the dynamics between streets and public space on the one hand, versus private

space consisting of blocks, plots and buildings on the other. If provided with a rich archaeological source material, it might be possible to investigate changes in the relationship between public and private space in the city, as well as changes in movement patterns in terms of access and separation (cf. Larsson 2000). Another aspect that might be investigated is whether there were specific activities which were placed in the outer limits of the town.

Examples of more detailed questions to be posed (if relevant):

- What types of activities could be identified just inside the town walls?
- Would it be possible to distinguish public spaces from private?
- Would there be traces of plot boundaries? In what shape? If so, would changes in plot structure be detectable?
- How might buildings have been organised on plots? Would there be differences in various parts of the area and over time? How might buildings have been oriented toward public spaces?
- How might open areas in the plots have been used? Could paths and yards be identified? How would they have been constructed? Could gardens be identified? What was cultivated?
- Even if not found in situ, finds material from the moat nearby might include objects reflecting everyday life. What might the material culture tell us about the households?

The nature of the buildings

It was considered a possibility that there would be opportunities to examine the construction and design of buildings.

Typical urban structures would be booths or stalls. These were buildings or part of buildings which had a special legislative status as rentable facilities (Fenger, et. al. 1982). They might have functioned as dwellings as well as workshops and shops, and could range in construction type from prestigious stone architecture to petty construction for poor people. In other medieval towns such as Lund and Trondheim, booths have been identified as one room houses, situated toward the street (Christophersen 1990; Carelli 2001). In Malmö, booths have also been found as poorly built constructions on the actual market street (Thomasson 2009). Booths were also a term for constructions added on to house façades, alongside the most important public spaces in towns (Bager 1971).

Generally speaking the most common building remains encountered are foundation and floor layers, sill stones, postholes which sometimes are complemented by sill beams or beam slots, threshold stones and floor paving. Also deconstruction- and levelling deposits are important in this respect, in the way that small inclusions of charcoal, burnt clay, lime etc. in the deposits can give information on wall and roof constructions.

Examples of more detailed questions to be posed (if relevant):

- Which kind of house types (in relation to construction, design and layout) might be identified? Would changes be evident over time?
- Would it be possible to identify houses with different functions (dwellings and economic buildings)? Would recognisable differences which might have related to different social groups such as merchants and craftsmen be seen?
- Were there buildings alongside the town wall?
- Could booths be identified? If so, where were they situated and how were they constructed?

Craft and trade

During the Middle Ages, towns were the allocated spaces for trade and craft. Special legislation applied to the towns, which was not applicable in the countryside, making them judicial enclaves.
Examples of more detailed questions to be posed (if relevant):

- Might workshops be identified in the area? Which kinds of crafts are represented? How was production organized (spatially and socially)? Were there differences over time?
- The moat was expected to be rich in finds material, related to everyday life of the people of Copenhagen. Which kinds of goods were imported? To which places and/or areas were there connections? Were there differences over time?
- Could usage of money be identified? Were there identifiable differences in the areas, spatially or socially, in how money was handled? Were there differences over time?

The area of the town limits

A large proportion of the excavation area encompassed some of the different phases of the former town boundary. Therefore it would be possible to investigate a vital part of the town boundary in a long-term perspective. There would be an opportunity to examine relevant issues in medieval and historical archaeology regarding the symbolism and status of a town boundary (compare discussion in Carelli 2001). Because of the extensive fill layers in the different moat phases, large quantities of finds material, deposited as rubbish, would also be encountered. This would be a vital source of knowledge regarding everyday life of the town citizens.
Examples of more detailed questions to be posed (if relevant):

- Could a chronology and morphology of the western part of the town boundary be established? What evidence would this give, regarding dating, activities, source of power/initiative in the formation and evolution of the town? Were differences apparent between the construction of the town boundary when Copenhagen was governed by the bishop of Roskilde and later on when the town became the seat of the king (from the 15th century onwards)?
- Were there primary deposits within the rampart or moat which could be evidence of attacks or defence (battle)?
- What were the dynamics between areas and activities inside the town limits and outside during different time periods?
- Could the construction type of the fortification in different time periods be compared to other contemporary Danish or European towns? What could that tell us about the contacts, status and function of the town?
- Could the different contents of the deposits in the moat be related to the settlement? Which kinds of finds material were deposited as rubbish in the fill? Could these be related to living conditions in the neighbouring plots? Would it be possible to use stratigraphy to identify different phases of backfill or finds material?

The medieval town limits

Copenhagen is one of a few Danish medieval market towns fortified with town walls and towers. The town walls are mentioned as early as 1254 in Copenhagen's first town privileges, but it is possible that this is a fixed expression which means fortification rather than actual wall (KD I:18; Skaarup 1996c: 26). Small parts of the medieval fortification have been demonstrated at different archaeological sites around Copenhagen.

Rampart and moat

Examples of more detailed questions to be posed (if relevant):

- Could different phases be defined? Could previously unknown phases, sub-phases or structures related to the rampart and moat be identified? One of the objectives of the investigations was to establish a more accurate dating of the fortifications through stratigraphic observations, finds and scientific analyses.
- From previous archaeological observations as well as maps from the period, we know about re-designs in the fortifications at Vestervold and Vesterport during the early 16th century. Would there be evidence of the bridge and the road between the inner gate and the late 16th century outer gate on the ravelin/bastion? How were they constructed? How was the ravelin/bastion constructed?
- Would there be any evidence of brick walls or palisades which could correspond to “Byens Planker” or “Bymuren”, town limitations mentioned in written sources?

Town gates

The medieval Vesterport, probably a tower gate, was supposed to have been situated outside Vestergade, within the excavation area. Town gates were also customs points, where the council and the king claimed customs for goods entering the town.
Examples of more detailed questions to be posed (if relevant):

- Vesterport's exact location: could a city gate be identified? How old is it?
- The design of the gate was unknown, but it was allegedly walled in brick. How was it constructed? Could different phases be established? Could function and usage be established?
- Would there be other structures which could be related to a city gate? What functions could they have had?
- Vesterport is likely to have been one of the most used and the most important entrances into the town. Would this be visible in its design or in activities or finds related to the gate area?
- What would be left of the outer gate on the rounded ravelin, built in the 16th century, and rediscovered in an excavation in 1931? How was it constructed?

Town limits from the 1600´s and onwards

The fortification had by the mid 1620's been renovated and turned into a rampart with twelve bastions. Vesterport, situated between Schacks Bastion to the north and Gyldenlöwes Bastion to the south, was built in 1667-1670, as a solid earthwork (Dahl 1996).
Examples of more detailed questions to be posed (if relevant):

- Could the remains of Vestervold's curtain and bulwark (stronghold) with different phases be detected?
- Could the gate of the fortification from 1667-1670 be identified? If so how would it compare to earlier phases of town gates?

Roads, channels and public spaces

Knowledge of older streets in Copenhagen has mainly been based on limited written source material, including maps. Archaeological evidence has generally shown a clear chronological division regarding the type of street surface, from the tightly packed small stones and branches in older levels and stone- and cobbles in the later examples. Previous archaeological surveys in Malmö have shown up to six street levels (cf. Heimer et al. 2007:24; Thomasson 2009:5). Street foundation layers can vary with elements of both manure and demolition components in the form of bricks and waste such as animal bones, pottery, etc.
Examples of more detailed questions to be posed (if relevant):

- When were the streets established? Has their spatial extension varied? Could patterns be established (i.e. from narrow to wider streets, etc.)?
- Where were streets established? What was the previous land use?
- How had the streets been constructed, relating both to degree of foundation layers and type of pavements? Were there differences in time?
- Could Vestergade be interpreted archaeologically as a former market street in terms of its location leading to Gammel Torv?
- How was the layout of streets or importance of streets affected by the relocation of Vesterport in the 17th century, away from Vestergade? How was the immediate area affected as a whole?
- Would there be evidence of streets outside the town limits? Would they be different compared to streets inside town?
- Would there be any traces of water channels connected to the moat or otherwise?
- Would there be wooden waterpipes within the area? Would it be possible to see if some were contemporary or could a sequence be established?

Cemeteries and burials

The proximity to the previously excavated part of St Clemens cemetery raised the possibility of encountering graves or other features related to the cemetery within the easternmost part of excavation area. Also, in the vicinity of town outskirts and ramparts, burials are quite often encountered. This is known from other towns, Malmö amongst others (Joakim Thomasson, personal comment). Plague cemeteries or burials of executed individuals were often placed in this type of area. There is a lot of evidence of plague cemeteries all over Copenhagen (i.e. Mosekilde 2012) and it was considered a possibility that plague burials might be found at Rådhuspladsen.
Examples of more detailed questions (if relevant):

- Would there be any evidence encountered of graves or boundary ditches which could be related to the cemetery of St. Clemens? If so, how old are they?

- Would any other burials or areas with concentrations of unstratified bones be identified, which could be evidence for plague cemeteries, executions or war victims?

Outside the town walls – activities along the town limit

The archaeological investigations carried out beyond the town limit would potentially provide opportunities for finding archaeological evidence of settlements, craft or industrial areas, trade, suburban housing, older fields and country roads. Such activities and buildings would likely be associated with people rarely mentioned in the written sources, and to whom little attention is given in historical accounts. This type of area might also have served as a temporary dwelling space for visitors waiting to pass through Vesterport and get inside the town limitations.

Suburban activities

There was very little information about settlement and other activities outside medieval Copenhagen in archaeological sources, written records or older maps. This is a fact that not only applies to Copenhagen, but also to other hanseatic towns in the Baltic Sea area. No previous archaeological investigations carried out in close proximity to Rådhuspladsen had focussed on these questions, or revealed any information on this subject. It was thought likely however, that evidence of infrastructure such as roads, and scattered buildings might be found during the Metro excavation; buildings inhabited by the occasional visiting or waged workers, especially with regard to the periods of large capital investment in infrastructure and the big fires in 1728 and 1795. It was considered possible that there might have been settlement outside Vesterport before the 17th century. It was also thought likely that contaminating, flammable, inconvenient and space-intensive activities would have been located in more sparsely settled or peripheral areas; e.g. outside the town gates or in the very outskirts of the settlement.
Examples of more detailed questions to be posed (if relevant):

- Could settlement remains in this area be identified and dated? If so, would it be possible to determine the residents professional and social status? Had the area been used as a habitation area for poor people who were not town citizens?
- What had characterized the land use? Had dangerous and inconvenient activities been placed in this area? When?
- Were there other traces of activity? If so, how might they have related to the extent of the town and fortifications in different periods of time?
- Was there any time-period with more well-preserved finds? If so, what was the reason for this?
- Were there any traces of the fires in the 18th century, directly or indirectly (for instance an increase in level of activity)?
- Could roads to and from the older Vesterport be identified and dated?
- Could changes in road pattern be established? Older roads might be used indirectly to prove the location of the oldest entrance into town.

Objectives of the project

The previously mentioned site specific questions connected to the area of Rådhuspladsen, would contribute to the overall project aims for the Metro Cityring (Thomasson & Høst Madsen 2009). These aims relate to standard urban historical questions, but were designed in order to be able to use the results from the metro excavations as a case study and thereafter compare the specific town of Copenhagen to the regional urban characteristics and development in general. The following text describes how the site specific questions would contribute to the overall project aims. Of great interest would be to compare the findings from Rådhuspladsen with those from Kongens Nytorv, excavated as a part of the Metro Cityring project in 2010-2015 (Steineke & Jensen forthcoming), where similar types of features and themes were investigated.

It is not within the scope of this report, which is developer funded and cannot extend to research, to address the various site specific questions in depth. That task, it is hoped, will instead be addressed in various research projects and Doctoral and post Doctoral studies, which will use the new source material created during the Metro project. Nonetheless, in the following section, some of the potential of the evidence from Rådhuspladsen will be outlined.

Background, organisation, direction and characterization of urbanisation

This first of the three themes outlined in the beginning of this chapter refer to the emergence and development of urban structures in long-term and landscape perspectives. Of interest was the landscape of Copenhagen and its surroundings, from prehistoric to early modern times. Urban structures were in this respect defined in close connection to the town concept (compare Thomasson 2008); i.e. presence of:

- Spatially denoted, densely built up settlement, which is clearly divided in public and private space (plots vs. roads and squares).
- Activities showing some degree of centralised organisation
- Activities/production and infrastructure related to non-agrarian production.

The more general questions regarding topography and prehistoric land use would of course contribute to the investigation of this theme. Knowledge of the physical conditions, under which the urban structures and the town grew and developed, would be vital. In addition, to understand the chronological depth of the site and surrounding landscape, as well as the characteristics of activities present in this area, would be fundamental for the understanding of why the place that came to be Copenhagen was an obvious place to establish and invest in urban structures.

In the type 1 and 3 areas (see chapter 1), it was expected that there would be great possibilities to explore establishment and changes of plots and roads, which would in turn contribute to knowledge about public and private space. Excavations of predecessors to Vester Voldgade, Vestergade etc. (type 3 area), together with possible unknown and unexpected roads, could for example yield information about maintenance, construction types, if there were differences between the roads, and thereby also contribute to a more in depth understanding of the organisation of public space.

Rådhuspladsen is situated in an area that was once a border zone. The town wall marked the boundary in jurisdiction and production. This would offer great possibilities to explore the establishment and development of the demarcation of the town, a key theme in medieval and early modern urbanism. It was considered especially interesting to be able to fill in the gaps of knowledge regarding chronology and morphology of later versions of the town limits. Of interest in this respect would be to investigate the construction and development of the fortifications, not least relating to the making of Copenhagen as a capital.

Even if the documentation possibilities would not be optimal (type 4-5 areas), there would surely be opportunities to establish what the land use was outside the town wall. Prior to the Metro excavation at Rådhuspladsen, there was only limited knowledge about how these areas were used. In other comparable towns, areas just outside town gates were used for market activities, settlement and agriculture. Knowledge about areas just outside the town can contribute to the understanding of how the town structures reacted to demographic and economic fluctuations (compare below), as well as social stress.

Economic and demographic fluctuations

The essence of this second project aim related to economics and demographics. Whereas the first project aim (discussed above) was to establish the presence of non-agrarian production, the focus of the second aim was on change over time.

Regarding economics, it was considered vital to establish knowledge about the different kinds of crafts and crafts industries (including food producing crafts such as butchers, bakers etc.), organisation, infrastructure and their development. It would be equally important to study the means of exchange, whether it was based on redistributive gift economy, reciprocity or trade, and whether it was dependent upon a close connection with production. Of significance would be the development of consumer-orientated economy, as detected in several other Nordic towns (Christophersen 1990; Carelli 2001). In Copenhagen, it would be of special interest to focus upon the economic implications of the making of a capital;

- How did craft production change?
- Which new commodities and goods were produced?
- How did domestic production change when the merchants of Copenhagen during the early modern period became increasingly privileged in terms of trading conditions?

It was hoped that the excavations in the Rådhuspladsen area might contribute to these questions. In the type 1 and 3 areas it was hoped to find traces of workshops or trading facilities. Analysis of the finds material, as representative of consumed material culture, would produce vital information regarding domestic crafts industries as well as imports, both regarding identification and development. Finally, artefacts that could be understood as a means of trade, such as coins, scales and weights, would of course be vital objects for study. In this case, the existence and development of agriculture and grazing in the areas just outside the town limitations could be of importance. Through macrofossil and pollen analysis in type 2, 4 and 5 areas, it might be possible to establish such types of land use.

Regarding demographics, there are limitations in what kind of information which can be produced. Research on tendencies and fluctuations in population figures during late prehistory and the Middle Ages are traditionally made from excavations of cemeteries, often in relation to the written records. Had burials from St. Clemens cemetery been encountered, it is likely they would have been so few in number, that no statistical conclusions could be drawn from them (however, it would be an interesting objective in future research, to integrate the results regarding the medieval living environment in this part of the town, with the osteological information retrieved from the St Clemens excavation).

Information on demographics could possibly be derived from analysing the type and degree of activities just outside the town limits. The identification of building remains, and fluctuations in this over time, could be explained by demographic fluctuations.

Cultural and social implications and consequences of town life

The third project aim deals with how people related to the urban structures, and to the special circumstances of living in a town, i.e. urban culture. In relation to the economic and demographic aims, the focus has changed from establishing contents, toward studying social interaction and lifestyles.
Within the stipulated long-term perspective of the project, a vital subject is the creation and development of a new social order in society, the burghers. Agency relating to material culture is in this sense not just a matter for the individual, but also occurs in a collective framework where the cultural formation of the burghers is vital. At the same time, this class had a heterogeneous composition with social hierarchies and genders with completely different life conditions.

Lifestyle issues can be studied in connection with traditional archaeological themes relating to development of the buildings (construction, layout, spatial organisation of houses on the plots etc.), food, household items, personal equipment, and other kinds of material culture relating to consumption. Topics of great interest would be changes in lifestyle when the town changed from bishop's town to capital; which kind of changes might be identified, and their associations with the different urban social groups. While settlement remains would be most wide-ranging in the type 1 area, collection of finds material from all areas could contribute to knowledge regarding consumption in general. This would be true especially of finds from fills of the different phases of the moat. Using these topics, the aim would be to establish differences and development of social topography. It would in this capacity be interesting to compare structures and finds material from areas within the town walls and outside.

Towns were gathering places, for example during markets and religious festivals. This not only had great economic importance, but also meant that the urban centres were arenas of interaction between social orders and people from different places and with different backgrounds. The importance of public space in pre-industrial towns has been underlined by several scholars (ex. Tittler 1991; Magnusson Staaf et. al. 1995; Giles 2000). Studies of construction, development and maintenance of different types of infrastructural constructions, as well as the architecture of Vesterport as one of the town's most visible landmarks, can increase our knowledge regarding the importance of public space.

Also, there might be possibilities to study the social framework of production and trade. A first step is to try to identify where these kinds of activities occurred, and how these structures were represented

architecturally and spatially. A second step could be to investigate if there is different organisation relating to different crafts and their development over time.

Finally, through analysis of the finds material, it will be possible to trace trading contacts with other parts of Denmark and Europe in different time periods.

6 Methodology, documentation, organisation and procedures

The overall methodologies that were used for the Metro project are stated in the project design (Thomasson & Høst Madsen 2009). These specify the use of Museum standards for project management and museum policies on archaeological recording and finds handling (Projekthåndbog 2009). There are also strategy documents which describe the principles of finds management (Finds handbook 2010) and report management (Report management 2010) together with manuals covering how to use context sheets (Guidelines for contextual documentation 2011). A context typology was developed (Context typology 2010). These were working documents however, and were changed and improved as deemed appropriate or necessary. The methodologies were also adjusted as relevant to follow guidelines produced by KUAS.

Excavation and Documentation

Initial soil removal

Machine removal of upper levels of soil and modern overburden was necessary. An excavating machine from the contractors, with a toothless bucket, was used to facilitate this. The machine was supervised by Field Leaders or other appointed persons during this process, in accordance with the project methodology (similarly, the machine was sometimes used to remove larger archaeological layers and deposits, particularly within the moat, but also under strict archaeological supervision). It was anticipated that no contexts or deposits of archaeological interest would be uncovered in the top 1m below present ground level, however during the initial machining of Area 1, it was already apparent that in some areas this was not the case, with archaeology being encountered as little as 0,5 m below present ground level. In general, archaeology was encountered between ca. 0,5 m and 1,2 m below the modern street surface.

Excavation procedures

The physical act of excavating archaeological remains was conducted in different ways depending on what was appropriate for the remains in question. In some cases such as in watching brief areas or large moat deposits, machines (under supervision) did some of the work, but mostly the archaeology was dealt with by archaeologists using a variety of hand tools, from leaf trowel and brush to trowel, to shovel and mattock, or a combination of these tools as needed. A range of timber and stone and brick structures were also encountered, and once these were documented, it was sometimes necessary to use machinery or power tools to help in their removal, for example chainsaw for large timbers (also for sampling them), and power hammers or excavating machines to remove large masonry structures.

Documentation principles

All archaeological contexts were recorded according to the stratigraphical, single context method as described in Roskams (2001). Archaeological contexts were recorded and described down to the smallest visible event that could be identified by the archaeologist. These were then linked together to form a flow of events that happened through time on the site. They were documented in a reverse chronological order as the archaeologist excavated down, starting with the most recent remains first and working back in time. According to the single context methodology, this is considered the easiest and most efficient way to

interpret and recapture the activities that have taken place on a site, which is the overall aim on any archaeological investigation. It should be stated that in practice it was found that in features such as the moat, contexts that were very similar but separated by thin lenses of sand for example, were generally taken as being one context, but with the context description including details of how the lensing appeared. This was in part necessary due to the sheer scale of the moat; it was felt that the amount of individual contexts that would have been documented if this approach was not employed would have been so great as to be counter-productive, making a meaningful interpretation of the sequence all but impossible.

Once identified, the archaeological contexts were generally trowel cleaned and defined before being recorded and excavated. All archaeological contexts (cuts, structures, deposits, skeletons) were documented in written form on designated standard forms (context sheets) in the field, and the context was surveyed with a total station. Every context was given a unique identification number, generated by the total station. All information was then transferred and registered into IntraSiS Explorer and the contexts placed into an overall site matrix. The context sheets used on Rådhuspladsen were adjusted slightly from those used at Kongens Nytorv, as certain small improvements were seen to be possible, based on how the sheets were seen to work on what was a very similar excavation.

The form used for recording of archaeological contexts can be divided into three parts:

- The first part detailed overall information and primary identification such as data about position in the field, date of documentation and signature of excavator, as well as the identity of the context, what kind of context it was (grave cut, posthole, pit etc.), its dimensions and type and its nearest stratigraphical relations (later and earlier).
- The second part contained a description of the context which concentrated on the details of the types of cuts or details of soils present etc. It was descriptive, and mostly multiple choice.
- The third part of the form was the location for the archaeologist's interpretation of the context – e.g. what kind of cut or deposit it was and what could be suggested about its function. In this section, all the gathered information recorded in the first two sections was to be used as grounds for an interpretation. This would result in a basic interpretation expressed in a context type. These were pre-defined in IntraSiS, and described in a strategy document (Guidelines for contextual documentation 2011). In some cases, where new context types were encountered during the excavation, some new options had to be added in IntraSiS.

The contexts were divided into three main categories according to their stratigraphic properties: layer/deposit, cut or structure. Different data were assigned to, and were documented about the different categories. For layers and deposits, recording was done on colour and substance of the soil; the degree of organic contents was noted as well as the compactness and how easily the context could be identified from its surroundings. This information when put together helps us to interpret how the context has come to be. Was the soil deposited in one event or over several deposition periods; in which case, why? What kind of activity did it result from? Or, did the soil build up gradually over a longer period of time? What activities could explain that? What did the contents suggest about the nature of the activity? These questions related directly to the stated themes and specific questions within the project objectives.

The matrix was used as a tool for the grouping of the contexts and in the work of creating land use phases for the site. These consisted of assigning identities to groups of contexts, which could then be used to record the spatial and social use of the site. Land use phases of the area were identified where possible, and depending on available information assessed alongside the historical material, which might help to identify which parts of the site were used during which historical periods. This assisted in addressing some of the themes and specific questions concerning the development of the city throughout its use.

The photographic documentation was thorough, and where appropriate, included photogrammetry; where the geometric properties about objects are determined from photographic images of contexts and structures using fixed points surveyed by the total station. The recording process and results were quality controlled on a regular basis by the Field Leaders and Excavation Leader. All this work took place within the timeframe of fieldwork.

In addition to the excavation of cultural deposits, it was felt that some assessment of exposed 'naturally deposited' layers might be necessary, especially if these were organically preserved and laid down within archaeological timescales; for example alluvial deposits. Where deep cut contexts were found, such as pits and wells, they sometimes needed to be excavated to a greater depth than anticipated in the construction works, though within the bounds of health and safety, in order to adequately date and record such contexts.

The standard terms for recording were stated in the Excavation Manual (2011) and were available in the IntraSiS software; these were conformed to during the excavation to ensure compatibility of the data throughout the excavation and project. Particular attention was paid by the Field Leaders and Excavation Leader to the quality of recording and understanding of the stratigraphic sequence by the archaeologists.

Type 1 areas

These most complex areas were fully excavated and recorded using total station surveying according to the single context methods outlined above.

Type 2 areas

These areas of the excavation were recorded using the same high standard methods as outlined above, however in terms of scheduling they were expected to be less time-consuming. These areas were thought more likely to contain larger contexts such as roads, ditches, larger pits and fortification remains which could be excavated mainly using large hand tools (shovels, mattocks, spades etc.) meaning they could be recorded and removed relatively quickly. In reality however, the archaeology in these areas turned out to be more complex than anticipated, and so they were in many cases relatively time-consuming.

Type 3 areas

Watching brief conditions were applied to type 3 service trenches where there were limited documentation possibilities due to the rapid nature of excavation, but where the archaeological potential was nonetheless

high. Watching briefs were intended to cause minimal disruption to site construction works and would take place within agreed constraints.
While the methods of excavation were more rapid, generally by machine, the same high standards of single context recording were applied as far as was possible to these areas.

In areas of archaeologically high interest, the excavation and removal of deposits proceeded according to the advice and guidance given by the attending archaeologist. Archaeologists were allowed reasonable access to relevant areas of ground-works, so that deposits could be examined and recorded as fully as possible according to the above methodologies. In some cases, such as when human inhumations were identified, certain areas had to be recorded to the same standard and at a similar pace to Type 1 areas.

Trenches sometimes required temporary shoring if archaeological deposits were located below approximately 1.2 m, and ground-works sometimes had to be temporarily re-scheduled in order to provide a safe environment for archaeological recording. Provision was made, at the earliest stage of development programming, for specified blocks of time to be made available for unrestricted archaeological access to areas of ground works in high potential areas.

All service trenches were either documented with total station where possible or hand drawn and digitized where necessary, and registered in the IntraSiS database. If larger areas with well preserved remains were detected, these were excavated and recorded to the standards previously stated. In some such cases, remains were documented using section drawings of trench walls, in the place of full-scale single context excavation methodology.

Type 4 areas

The watching brief conditions under which these areas were excavated meant that a limited amount of recording could be carried out. At all times an archaeologist was present and any deposits of archaeological interest were investigated and recorded; however these deposits were generally less time consuming. These areas generally contained larger contexts such as roads, ditches, larger pits and fortification remains, which when seen in (generally shallow) watching brief trenches, could only be documented in a basic manner.
These areas were documented in the same manner as in Type 3 areas, but generally had simpler stratigraphy.

Type 5 areas

Type 5 areas consisted of watching briefs with moderate archaeological potential and limited documentary possibilities. These areas included the remains of the late post-medieval moat and embankment (from ca. 1670 A.D.), and areas where there has been extensive disturbance in the past. While archaeological material was in some cases present, it was generally large scale, stratigraphically simple, and relatively late in date; where encountered it was generally recorded in a similar fashion to Type 3 and Type 4 areas.

Documentation procedures

The context sheets were completed and the contexts were surveyed by the excavating archaeologist. This person also entered the data into IntraSiS Explorer. The attribute data was checked by the person

responsible for compiling the matrix and stratigraphy. The geometric data was imported to IntraSiS by the responsible person for totalstation and IntraSiS, who also checked the quality of the measurements.
Procedure: *Archaeologist ➔ measure and record context; Archaeologist ➔ attribute data IntraSiS; Matrix/stratigraphy person ➔ check attribute data; totalstation/IntraSiS person ➔ geodata IntraSiS*.

Basic contextual grouping (subgroups and groups) were initiated by the excavating archaeologist, but decided on by the person responsible for stratigraphy and/or field leader. The attribute data was recorded in IntraSiS by the field leader or the matrix/stratigraphy person. Templates (recording parameters as well as descriptive narratives) for recording subgroups and groups were developed during the course of the excavation and during post-excavation, though with a degree of flexibility, as rigid wordings were found to be restrictive in practice. These were decided by the excavation leader and field leaders. Groups, as will be seen in Chapter 7, would become part of the report structure.
Procedure: *Archaeologist ➔ suggests subgroups and groups; Field leader ➔ defines subgroups and groups; Field leader or matrix/stratigraphy person ➔ IntraSiS*

Other contextual groupings were done after the fieldwork phase, and were recorded in the IntraSiS database.

Photographic Procedures

The Excavation Leader and Field Leaders were responsible for ensuring that the methodologies listed below were employed. These methodologies were implemented and overseen by a person responsible for maintaining the photographic archive and managing the photography at Rådhuspladsen. The excavating archaeologists took photos, while the responsible person imported these to the database and project folder, recorded relevant data and related the photo to relevant context or group ids.

Procedure: *Archaeologist ➔ photo; Photo responsible person ➔ import to IntraSiS and project folder*.

A complete photographic archive was maintained throughout the excavation. On the main excavation this reflected the single context recording system used to document the site, i.e. representative and illustrative contexts were photographed. Further to this, photographs of larger areas were taken at appropriate times to illustrate key relationships and to allow for a coherent visual examination of the site at report stage.
Working shots were taken where appropriate; this served a number of functions, particularly to show people on the site (as human scales), and also to document the process of excavation. The photographic record is sufficiently thorough and detailed to illustrate all significant phases, structures, important stratigraphic and structural relationships, and individual items of interest, including artefacts. The latter were sometimes photographed in situ where deemed appropriate e.g. if it was likely that the object might not survive the excavation process intact, or if its find location/circumstance was deemed to be of significance.

In areas where a watching brief was in place the photographic archive reflected the methods employed. Excavation of these areas was not generally carried out using the single context excavation system, hence the photography was more general – individual contexts did not necessarily require individual photographs.
As far as possible, photographs were of publication standard, with guidelines provided to all members of staff to ensure a good degree of uniformity of composition e.g. all site photographs, except working shots,

were to include a photographic scale of appropriate size. Photographs were taken using digital single-lens reflex (DSLR) cameras (15,1 megapixel, Canon EOS 500D). The digital images were downloaded at regular intervals, generally weekly or more frequently as deemed necessary. They were then catalogued according to camera number, date taken and file number, e.g. C11_20110114_031 (where the photograph was taken on camera 11 on the 14th of January 2011). These photographs were then transferred to the Terminal Server for storage and security.

A written photographic index was compiled, relating site photograph number, context numbers, excavation area, date taken, and a brief description including any other relevant information. Furthermore, photographs deemed to be of sufficient importance or of key interpretive value were linked to the IntraSiS database for the site. This linking was done in relation to the particular context in question, with the photograph being displayed as a thumbnail related to that particular context. This thumbnail was then linked to the original full size image in the main photographic archive. Every image imported to IntraSiS got a numeric database id with attributes connected to it. The image was visible as a contextual relation to the archaeological context in question. Photographs that were not linked to IntraSiS were nonetheless retained in the main digital site archive as part of the complete archive, and could be added to IntraSiS at a later date if required.

Sampling and Analytical Procedures

Samples for environmental and scientific analysis were taken from structures and layers on site, and occasionally from artefacts and other materials during post-excavation. This was done in order to enhance our knowledge of the archaeology unearthed, and to allow us to interpret it better. An outline of the overall methodological framework of how and why sampling for scientific analysis was undertaken will be given here.

With adherence to the Danish Museums Law, in which no research may be undertaken within the scope of contractor financed archaeology, the majority of scientific sampling involved processing and evaluating the empirical results. Combined with this was the retention of a high quality source material for future research. All sample related work was agreed with on by the Museum together with KUAS on an ongoing basis during the excavation.

Samples were extracted by archaeologists or (very occasionally) consultants on site and further sampling was undertaken in the laboratories by consultants. Many of the bulk soil samples were initially processed within the museum, by museum employees, with John Howorth being responsible for this work. The samples were ultimately examined in external laboratories by consultants within the Public Procurement, and sub-sampled as necessary.

Through the tender selection process the Museum of Copenhagen assured collaboration with highly qualified consultants. The consultants handled the analyses, and were available to provide assistance during fieldwork. They partook in the planning and development of sampling strategies during the archaeological excavation at Rådhuspladsen, to varying degrees depending on their specialism. All sampling was recorded in IntraSiS.

Procedures and organisation

Sampling was conducted according to the principles laid out in this text. Changes were occasionally implemented after discussion with the Excavation Leader, Field Leaders, the Science Coordinator and the relevant consultants.

The Excavation Leader and Field Leaders decided which samples were to be sent for analysis. Each analysis was followed by a written justification, which related to how the results could contribute to the excavation aims. The procedures were established according to agreements with KUAS (Minutes of Meeting between KBM and KUAS 4th of September 2009) and KUAS' guidelines (KUAS Vejledning 2010).

During the excavation stage, the museum Science Coordinator (Hoda El Sharnouby) was responsible for contact with consultants, writing requisitions, and defining timeframes as well as the scope of the analyses, to oversee that the results were recorded in IntraSiS and that reports were done according to the given instructions. An important task (mainly conducted by the field leaders) was also to provide the consultant with the prioritization of the samples in accordance to the more specific archaeological aims of the site and context related questions. The Science Coordinator was furthermore responsible for the functional procedures concerning sieving and flotation of macro samples as well as the transportation of samples from the museum to the consultants. During post-excavation stage, the responsibilities outlined above were mainly transferred to the excavation field leaders.

The consultants were responsible for entering the results of the analysis directly into the Museum of Copenhagen's IntraSiS database. Templates for this purpose were developed in cooperation between the consultants and the Museum. The consultants were also responsible for producing reports for each set of analysis. These reports (see Appendices) should contain a description of the methodology, empirical results and basic interpretations as stated in Appendix 1 in the Public Procurement.

Procedure: *Archaeologist/consultant ➔ samples; Excavation Leader and Museum Science Coordinator ➔ analysis; Consultant ➔ record results in IntraSiS*

Recording of Bulk, Monolith and Core sampling

All samples taken within the field work phase were measured in by total station. Sample identities were then generated in the IntraSiS database. If the sample was to be analysed, it was the responsibility of the specialist to create a sample analysis id in the IntraSiS database.

Procedure: *Archaeologist (measure) □ sample id; specialist□ Sample analysis id*

Sample recording from finds

The finds were entered and registered in the IntraSiS database according to the principles laid out in the Method Statement (2011) and the Finds Handbook (2010). When a sample was to be taken from a find, it was the responsibility of the Finds Coordinator to create a sample id in the IntraSiS database. If this sample was to be analysed, it was the responsibility of the consultant to create a sample analysis in the IntraSiS database.

Procedure: *Finds coordinator □ sample id; Consultant □ Sample analysis id*

Recording of sub-samples

It was the responsibility of the consultant to create sample ids in the IntraSiS database, i.e. when picking out organic material from Macro samples for C14 analysis. The sample analysis id was created by the consultant conducting the analysis.

Procedure: *Consultant Sample id; Consultant Sample analysis id*

Procedures for sending samples for analysis

Sampling was conducted regarding macrofossil analysis (sampling motivation is to be found in the Method Statement, 2011). The field archaeologists recorded the sample circumstances. The Excavation Leader and or Field Leaders had the responsibility to assess the sample/group of samples for its analysis potential. The motivation was related to cultural historical questions from the Method Statement. The Science Coordinator sent the samples for analysis.

Procedure: *Field archaeologist takes sample according to directives in this document, if macro describes sample circumstances; Field leader cultural historical motivation for analysis Science Coordinator order analysis Consultant*

Sampling techniques

The sampling techniques were based on the aims of the excavation and thus they related to the types of remains that were expected in the different area types. There was a need for consistency concerning the different kinds of sampling, which were not randomly conducted without thought for the aims of the excavation.

During the excavation the environmental sampling procedure was altered somewhat; initially the advice given by the macro-environmental specialist was to sample all deposits in order to get the fullest possible picture, however, following discussion with the Field Leaders and Excavation Leader, this strategy was revised as it would not be possible to process and analyse the volume of material sampled. Consequently, in Areas 3, 4 and 5, this strategy was changed to one where the archaeologists on site, in conjunction with the Field Leaders, made selections during excavation regarding which deposits would be sampled. Further prioritisations were then taken during post-excavation, in order to identify the most appropriate samples to be processed, and also in what way.

Sampling was carried out with a range of techniques and each technique provided samples for a variety of analyses, as stated in the table below.

Sampling techniques	Sampler	Type of analysis	Tool	Size	Packing
Bulk sampling	Archaeologists, Consultants	Macro, zoological, wood, C 14, entomology	Trowel	100 % of the context or max 4 litres.	Plastic bags with a manila tag showing identification. Commonly used.
Monolith sampling	Archaeologists, Consultants	Macro, pollen, zoological, wood, geological, entomology, micromor-phology	Trowel	Squares 15x15x15 cm	Wrapped in cling film with a manila tag showing top layers and identification. Rarely used.

Core sampling	Archaeologists, Consultants	Pollen	Auger	-	Wrapped in cling film with a manila tag stating top layers and identification. Rarely used.
Other field sampling	Archaeologists, Consultants	Dendro, wood	Trowel, axe, saw etc.	-	Wrapped in plastic with a small amount of clean water – manila tag stating identification
Sampling from finds	Consultants	Zoological, metallurgical, chemical, geological, C 14, dendro, wood, macro, pollen	Laboratory	-	Packed to withstand transport as well as to meet the requirements of the material in question
Sub-sampling	Consultants	Macro, pollen, zoological, dendro, entomology, metallurgical, chemical, geological/ceramic, C 14	Laboratory	-	Packed to withstand transport as well as to meet the requirements of the material in question

Table 3 Sampling techniques.

Bulk sampling

Bulk samples were taken from a chosen context and only contained material from one context. 100% of a small context or a maximum of 4 litres from a larger context was generally considered to be a sufficient amount for bulk sampling from the rich urban layers represented in the excavations. Archaeologists or occasionally consultants on site were responsible for extracting the samples. The material was collected by trowel and kept in plastic bags. All samples were measured in by total station and registered on context sheets and in IntraSiS with cross-references to the relevant sample numbers and contexts. The sample type was registered as a point in IntraSiS.

Bulk samples were sieved at facilities in the finds basement at the Museum of Copenhagen by Museum employees. The extracted material was assessed by an archaeo-botanist working for RAÄ, and subsequently sent off to the relevant laboratories.

Material for a variety of scientific disciplines can be derived from bulk sampling. It is primarily a technique for providing samples for macrofossil analysis, but also produces material for C^{14} dating, wood anatomy, geological, entomological and chemical analysis. Material for zoological analysis - small skeletal parts like fish vertebrae and scales, small mammal and bird bones etc. – is also derived from bulk sampling.
Bulk sampling was done in all excavation area types, as appropriate. The sampling type was closely related to single context registration and was more frequent than monolith and core sampling, described below. Bulk sampling was conducted from vertical sections as well as, mainly, horizontal surfaces.

Monolith sampling

Monoliths are samples generally taken from vertical sections/profiles. They can be cut out of vertical sections or horizontal stratigraphy in 15x15x15 cm squares using a clean trowel. When the sample is taken as a cube of soil it must be supported and is thus wrapped tightly in plastic film immediately after extraction. Such samples were marked with up and down and marked with a manila tag stating identification number and context. Archaeologists or consultants on site were responsible for extracting the

samples. All samples were measured in by total station and registered on context sheets and in IntraSiS with cross-references to the relevant sample number and contexts.

Monolith samples can be taken from a single context or may contain several layers or contexts. If the sample contained more than one identifiable context, it was clearly noted on the sample in order for it to be divided by the consultant in the Museum according to the archaeological interpretations of the remains, coupled with observations made by the consultant. Separate sample units for each context were then created in IntraSiS by the consultant.

This sample type is always processed by consultants and is not sieved by Museum employees as is the case with the bulk samples. Analysis of monolith samples focuses on the vertical composition of the layer. However homogeneous a deposit might seem, it may have a very diverse composition from bottom to top, including evidence of its formation which is lost if the material is bulk sampled, sieved and the residue sent off to the specialists. Analysis of monolith samples can include plant macrofossils, zoological, entomological, and geological material as well as material for 14C-dating, chemical analysis, and pollen analysis. A single monolith sample can provide material for all the above mentioned sampling types.
This sample type is taken in connection with all area types related to the excavation but is generally specific to vertical sections. Only a small number of monolith samples were taken during the excavation at Rådhuspladsen, with the focus on taking bulk samples.

Core sampling

Cores are samples extracted by augers. Immediately after extraction the sample is placed on a supporting plastic board and wrapped tightly in plastic foil. All such samples are marked with up and down arrows and with a manila tag stating identification number and context. Consultants on site were generally responsible for extracting these samples. The samples were measured in by total station and registered on context sheets and in IntraSiS with a unique id and relation to the relevant context. The sample type was registered as a point in IntraSiS and each core was given a unique sample id.

On site Field Leaders oversaw the procedures and were in contact with the Museum's Finds Coordinator and Science Coordinator regarding any such samples. Core samples can be used to determine the depth and extent of structures and layers - or to obtain undisturbed samples for a variety of analyses. In the first case, their use is less formalised, and such tests were done on site by archaeologists, as an aid to excavation, and without retaining the sample obtained. For the more formal samples, cores were taken from chosen locations or structures and generally contained several layers or contexts. This sample type was always processed by consultants and was not sieved by Museum employees.

Detailed vertical analysis of core samples can extract knowledge concerning the origin and the history of a layer through time. Analysis of material from core samples can include plant macrofossils, zoological, entomological and geological material, while the core can also provide material for C14 dating, chemical analysis, and pollen analysis. The method can also be used to sample contexts that will not be excavated. On Rådhsupladsen, apart from testing depth, this method was mainly used for retrieving samples for pollen analysis.

Sampling from finds

Sampling from finds involves obtaining material from finds objects, like food deposits and other organic residue, for macrofossil analysis, C 14 dating, geological, zoological, chemical, fungal, and wood anatomy, as well as a series of analyses which were not included in the tenders, for instance strontium isotope analysis. These analyses were carried out as deemed necessary during the fieldwork phase as well as after. Finds were registered and stored at the Museum and were thus accessible for further analysis if needed.

Analyses done in order to answer cultural-historical questions were handled by the Science Coordinator, while sampling done as a part of the conservation process was the responsibility of the Finds Coordinator. Sampling from finds was done by consultants in the laboratory. The Collections Department consulted the Scientific Coordinator before forwarding the samples to the relevant consultants for further scientific analysis.

When samples are derived from finds objects, either as part of the conservation process or as part of the effort to answer questions about age, composition, morphology, provenence etc, the consultants must create separate samples units (sub-samples) for each sample in IntraSiS. All samples have to be registered in IntraSiS with relation to the relevant find ID and context.

Further sampling from samples (sub-sampling)

Further sampling from samples includes those collected from bulk, monolith, core or other field samples. The analysis of these was ongoing throughout the fieldwork phase as well as after. When samples were derived from other samples, the consultants created separate sample units for each sample in IntraSiS. All samples were registered in IntraSiS with relation to the relevant finds ID and context.

Types of analysis

Contract holder	Type of analysis	Purpose
Nationalmuseets Bevaringsafdeling Brede. NBB	Metallurgical analysis	Determination of provenence and composition of material, technology, craftsmanship, etc.
Nationalmuseets Bevaringsafdeling Brede. NBB	Fungal analysis	Preservation/degree of decay of wood remains.
Nationalmuseets Bevaringsafdeling Brede. NBB	Chemical analysis	Identification of a wide range of material, composites, human activity i.e. adhesives, colouring, tanning, animal husbandry, land use etc, as well as origins of amorphous organic remains not otherwise identified.
Kvartärgeologiska avdelningen, Geologiska Institutionen. Lunds Universitet. KGI	C^{14} dating	Determination of age of deposited organic material.
Statens Naturhistorisk Museum	Zoological analysis	Determination of species, sex, age, size, pathology etc. of deposited animal remains.
Riksantikvarieämbetet. Arkeologiska uppdragsverksamheten. RAÄ	Plant macrofossil analysis	Determination of deposited plant remains.
Riksantikvarieämbetet. Arkeologiska uppdragsverksamheten. RAÄ	Pollen analysis	Determination of deposited pollen.
1. Nationella Laboratoriet för vedanatomi och dendrokronologi, Geologiska Institutionen, Lunds universitet. NL 2. Dendro.dk	Dendrochronology	Determination of age of in situ wooden structures or deposited wood.

Nationella Laboratoriet för vedanatomi och dendrokronologi, Geologiska Institutionen, Lunds universitet. NL	Wood anatomy	Determination of species of deposited wood.
1. Ceramic Studies, Sweden. CS 2. Nationalmuseets Bevaringsafdeling Brede. NBB	Geological analysis	Provenience, age determination, type of geological material, assessment of geological features, site formation processes, etc.

Table 4 Contract holders and types of analysis within the Public Procurement nr. 2009-070118:Conservation and natural sciences in the Metro project.

Other prioritized types of analysis		
Statens Naturhistorisk e Museum	Entomological analysis	Environmental conditions (i.e. wet, dry, saline, etc.)
Riksantikvarie ämbetet. RAÄ	Soil micromorphological analysis	Detailed stratigraphic analysis (i.e. activity layers on floors and streets)

Table 5 Types of analysis outside the public procurement.

Sampling – purpose, methods and strategies

Sampling strategies for the site within the field of natural science had to be, as far as practicable, consistent throughout the excavation. Standard issues within urban historical studies - related to the background, direction and characterization of urbanization; economic and demographic fluctuations and the cultural and social implications and consequences for town life - combined with previous knowledge of the site - were essential for the implementation of the sampling strategies. This directed how the strategies were carried out and which sampling strategies and methods were most appropriate for the different type areas.

Metallurgical analysis

Purpose of analysis: Metallurgical analysis of objects and slag containing metals and corrosion products can provide detailed knowledge on composition, provenience, mechanical properties and processing history of archaeological metal objects.

Polished cross sections of metal samples are examined by optical - and scanning electron microscopy in order to identify the alloy and describe the mechanical property of the sample.

Chemical analyses can add further information regarding the metal value and provenience.

Sampling techniques: Samples for metallurgical analysis were predominantly collected from metal objects and slag. These were, as finds objects, collected according to the principles described earlier. Samples were however, also collected from environmental samples. In the latter instance they were collected as bulk samples or as a part of the macro analysis.

Strategy for sampling and analyses: Metallurgical analysis on finds was predominantly done after the fieldwork phase. The decision to conduct analysis was taken on the basis of the object, its context and its culture-historical potential, and was carried out in order to complement the interpretations made from the analysis of other source materials.

The identification of the different types of material use and craft can lead to knowledge of how objects were made; i.e. craftsmanship, technological knowledge, the availability of craft material and also its provenience. The latter has helped to pinpoint the scale of local craftsmanship, and local material versus imports.

Chemical analysis

Purpose of analysis: Chemical analysis can be used to identify the composition of a range of materials as well as traces of human activity otherwise unidentified– i.e. the use of adhesives and colouring, mortars and other building materials, practices of tanning, animal husbandry, land use latrines.

Analytical techniques such as Fourier Transform Infra Red Spectroscopy (FTIR) and Common and Pyrolysis – gaschromatography with mass spectrometry ((PY)-GC-MS) can be implemented to identify the nature and origin of amorphous organic remains that cannot be identified through, for instance, optical microscopy. The methods are common in forensic and analytical chemistry and are often employed in cases of analyses of fossil fuels, hallucinogens, adhesives, paints, and inks etc., the Method Statement enabling identification of specific markers, thereby uniquely identifying components pointing at specific materials.

Scanning electron microscopy with energy dispersive x-ray spectroscopy (SEM-EDS) is useful for characterizing both degraded inorganic and organic materials. The method is useful for identifying components in finds objects i.e. composite textiles and corroded metal objects as well as areas of manufacture on site.

Portable X-ray Fluorescence (PXRF) can identify remains of metal in the soil that might indicate metallurgical activities on the site, such as spilled molten metal or glazing as well as colouring substances; i.e. pigments of coloured plasters thus identifying areas of manufacture on site, for instance different kinds of smithies, as well as the provenience of colouring on finds objects.

The identification of these substances could lead to knowledge of how objects were made; i.e. craftsmanship, technological knowledge, the availability of craft material and their provenience, which then again may pinpoint the scale of trade connections versus local manufacture of goods.

Chemical analysis on material from Rådhuspladsen was requested by the museum and carried out in relation to ceramics (ICP analysis) to establish their provenance, and in some cases analysis was carried out at the behest of specialists as appropriate for their work, for example in relation to conservation and metal work analysis.

Sampling techniques: Samples for chemical analysis were collected from finds objects as well as from bulk samples.

Strategy for sampling and analyses: Samples for chemical analysis were collected from features of special interest which might give evidence of human activity like land use, craftsmanship (including any sort of finishing of materials for decorative as well as utilitarian purposes), industry etc.

Chemical analysis of finds objects was predominantly carried out after the fieldwork phase, according to the principles described earlier. The decision to conduct the analysis was taken on the basis of the object,

its context and its culture-historical potential, and carried out in order to complement the interpretations made from the analysis of other source materials.

C14 analysis

Purpose of analysis: C^{14} analysis can establish the age of organic (carbon-based) remains from before the 17th century.

Sampling techniques: Samples were collected from chosen contexts. Material for analysis was generally extracted from macrofossil samples or animal or human bone material, which was first identified by the relevant specialist.

Strategy for sampling and analyses: C^{14} analysis was carried out when stratigraphy and finds material were insufficient to determine the age of a context or group of contexts vital for the understanding of the site. Samples were analysed according to their cultural-historical potential during and after the fieldwork phase. C14 analysis cannot be used on material dating from the middle of the 17th century and onwards. C^{14} analysis on finds objects is carried out according to the principles described earlier. Dendrochronological analysis was prioritised over C^{14} analysis where it was an option to use it.

Zoological analysis

Purpose of analysis: Zoological analysis is used for identifying animal species, age/size and pathology, as well as determining butchering practices, thereby providing information about food consumption, animal husbandry and land use.

Sampling techniques: Animal bones were hand collected according to procedures described in the Finds Handling section. It was decided during the excavation however, that in the case of large deposits such as moat fills (which were often very rich in bone material) that hand retrieval of bone would have been too inconsistent and biased towards large bones, and instead it was decided that bone would be recovered from 'big bag' bulk samples during post-excavation sieving, and from 2 litre bulk samples in the case of very small bones such as fish bones. Bone artefacts (such as toys or skates) were of course exceptions to this, and were retrieved during excavation if observed. In general deposits of relevance which contained small fragmented bones (fish, bird, mammal etc) were bulk sampled and later sieved (at least 50 % of the volume, or 2 litres). The collection method was stated on the context sheets, and documented during the bone retrieval process. Animal remains found during sieving of macrofossil samples were also collected and registered as finds units.

Strategy for sampling and analyses: Only zoological material from defined archaeological features, were analysed in line with the Danish Museums law, according to which an analysis may only result in an identification of species, determination of type of bone and weight as well as a preliminary registration of i.e. cut marks, cleaving for the extraction of marrow and the effects of burning.

The material to be analysed was chosen during and following the field work phase, according to its cultural-historical potential and sampling was done according to the previously described procedures. The decision to conduct the analysis was taken on the basis of the cultural-historical potential, and carried out in order to complement the interpretations made from the analysis of other source materials. Assemblages of

special interest for the project objectives could however be analysed on an ongoing basis according to decisions made by the Excavation Leader and the Science Coordinator.

Macrofossil analysis

Purpose of analysis: Plant remains can provide information on agricultural practices and food consumption, and are also useful for reconstructing the ancient environment and land use.

Macrofossil samples were generally taken as bulk samples, as well as some monolith samples. Bulk samples either included 100% of a smaller context or a minimum of two litres from larger contexts.

Strategy for sampling and analyses: Sampling for macrofossil analysis was carried out according to different principles outlined for individual area types. The most ambitious sampling was undertaken in the areas where the cultural-historical potential was expected to be the highest. Neither funds nor logistics would permit every context to be sampled. In order to create a representative assemblage of source material; sampling was carried out consistently throughout the excavation, as far as possible – though as mentioned previously, there was a change introduced during the excavation, as the volume of samples was clearly going to greatly exceed that which could be analysed. Contexts to be analysed were chosen according to the relevant questions for the area type.

The features sampled included activity layers, floors and streets, the moat, pits and wells. Each sample was accompanied by a written justification stating why the sampled deposit should be analysed and how it was of relevance to the site objectives.

Some samples were assessed initially in the Museum finds basement in conjunction with a consultant, in order to establish whether or not the sample had an organic content sufficient for analysis. Samples with no potential were discarded. All organic remains were created as sample units in Intrasis. Decisions to analyse samples were taken according to cultural historical potential after the field work phase.

The different sampling strategies within the various zones were carried out in consultation with the Excavation Leader/Field Leaders and the Science Coordinator.

Pollen analysis

Purpose of analysis: Pollen analysis is undertaken in order to reconstruct the ancient vegetation and environment on site. Chronological pollen profiles can be used to detect man-made changes in the vegetation, such as forest clearance and field establishment.

Sampling techniques: The extraction of pollen samples is done by the consultant and the analysis is done according to their recommendation. Pollen samples are ideally taken as bulk samples from vertical sections, but can also be extracted from monolith samples in the laboratories, or in a pollen core sample, taken by auger.

Strategy for sampling and analyses: Pollen analysis was conducted on only one occasion on Rådhuspladsen, primarily as the analysis is extremely costly, and also can be somewhat problematic in terms of the information gained. Two wells were sampled, and some basal fills of the moat. Ultimately, only samples from one of the wells was processed and analysed, with quite useful results (see Appendices). It

was the responsibility of the field leaders to inform the Science Coordinator when a deposit of interest was identified, at which point the Science Coordinator contacted the relevant Consultant.

Dendrochronology

Purpose of analysis: Dendrochronological analysis can establish the date when a piece of timber was felled through the analysis of the growth rings, using reference samples as a guide. The origin (provenience) of the wood can also be established, again by examining the pattern of growth rings.

Sampling techniques: Dendrochronology samples were extracted as sections with the aid of hand or chain saw. The width of the section was ideally not more than 15 cm and, if possible, it was important that the sample was taken where the sapwood and bark is preserved. Knots and branch ends were to be avoided. Multiple samples from the same piece of wood were taken if deemed necessary, and several from a given structure if possible. Archaeologists were responsible for extracting the samples. After obtaining the sample it was important that it would not dehydrate. This was especially important if sapwood was preserved. When the sample was extracted it was packed in a heavy plastic bag or wrapped in plastic film, to ensure that sapwood and bark did not dislodge. The timbers were stored out of the sun in a container on site, and as fast as possible transferred to the museum, where they were placed in a refrigerated storage container to await analysis.

Strategy for sampling and analyses: Dendro analysis was carried out when stratigraphy and finds material were insufficient to determine the age of a feature or object vital for the understanding of the site. Samples were analysed according to the cultural-historical potential during and after the fieldwork phase. Concerning archaeological features from the 17th century and onwards, dendrochronological analysis were used instead of C^{14} as radiocarbon dating is ineffective from the mid 17^{th} century onwards. Dendro sampling on site was implemented on the vast majority of in situ wooden structures. At least one sample was generally taken from each defined structure including repairs and renewals. Re-deposited wood would not date a layer in which it was re-deposited, and was not therefore analysed. The decision to carry out the analysis was taken after the fieldwork phase and taken on the basis of the structure, its context and its cultural-historical potential, and carried out in order to complement the interpretations made from the analysis of other source materials.

Wood anatomy analysis

Purpose of analysis: Wood anatomy is useful for the identification of species or types of wood present in the archaeological layers, thus providing a picture of the types of wood available to the inhabitants of the site.

Sampling techniques: Analysis was carried out as a part of the macro and dendrochronology analysis (mainly the latter), and was thereby guided by similar principles.

Strategy for sampling and analyses: Analysis was carried out as a part of the macro and dendro analysis, and was thereby guided by similar principles. The decision to conduct the sampling is taken on the basis of the object, its context and its culture-historical potential, and carried out in order to complement the interpretations made from the analysis of other source materials. In general, species is defined as part of

the process of dendrochronological dating, and as a standard step prior to using wood or charcoal for C14 dating.

Geological analysis

Purpose of analysis: Geological analysis can distinguish between natural and cultural deposits and investigate how they were affected by later natural processes and human activities.

ICP analyses of pottery can determine the chemical composition of the clay and thereby point out the geographical origin of the pottery. The method can also be used to identify metal remains in objects such as crucibles and moulds.

The analysis of thin sections and crystalline matter can determine how a clay pot was produced, including the type of clay and tempering being used.

Thermal analysis can determine the firing temperature of the clay or the pot – this analysis is used to determine the function of different types of ceramics as well as craftsmanship.

Entomological analysis

Purpose of analysis: Insects are often relatively habitat specific and are thus useful indicators of environmental conditions, both natural and man-made. Water- or faeces-loving beetles, for instance, may be able to tell us about humidity levels or the presence of manure in stable areas.

Sampling techniques: Samples for entomological analysis were collected as bulk samples.

Strategy for sampling and analyses: While insect samples were taken on site from deposits thought to be relevant, it proved difficult in post-excavation stage to find a suitable person to carry out the analysis. Some samples have however been stored, and it may prove possible in the future to analyse some of these, perhaps as part of a research project.

Soil micro-morphological analysis

Purpose of analysis: Soil micromorphology is useful for determining activity events on floors and streets, as the finely laminated build-up of fill layers on floors and streets can be detected and interpreted under a microscope. The contents of a layer, in terms of, for instance, its mineral or organic material, can be analysed, and the preservation state of the material established. Processes of soil deposition (an in situ layer or colluvium) and human activity (ploughing, trampling, and burning) can be observed, as well as the presence of tiny fragments of material such as ceramics, charcoal, bones and manure.

Sampling techniques: Some monolith samples were taken on site with a view to carrying out micro-morphological analyses, however, none of these samples were processed during post-excavation as they were not deemed likely to provide sufficient extra information in the particular instances.

Strategy for sampling and analyses: Micro-morphological samples were taken on activity surfaces such as floors and streets. The Field Leader was responsible for contacting the Science coordinator when such deposits occurred. The analysis is, however, extremely expensive, and therefore samples were only to be

taken from clearly defined contexts with high cultural-historical potential according to decisions made by the Excavation Leader, the Science Coordinator and the relevant consultant.

Finds Procedures

Introduction

A strict methodology was created to standardise the process of finds retrieval, processing, recording and report writing for the Metro Cityring excavations. Finds retrieval and storage would follow methodologies deemed from 'First Aid for Finds' and assistance and education from the National Museum of Denmark. Set out in this chapter will be methodologies that follow the finds procedure set out in Guidelines for Finds (Københavns Museum, 2010).

Classification

Special finds & bulk finds

Before excavation commenced it was determined which finds were bulk finds or special finds. This was undertaken with a view to retrieval methodology, recording methodology, surveying and storage methodology. With regular site meetings some special finds were downgraded to bulk finds due to amount. This happened especially when excavating the moats when large quantities of finds were retrieved.

Special Finds

Finds classified for extra analysis which would provide extra information for sites. They are usually personal items, dress accessories, or coins and supply a rich insight into the past. For this reason, they require special care in terms of handling and conservation.

Bulk Finds

Generally, large quantities of finds, in comparison to smaller assemblages of Special Finds. Examples can be seen below. Prioritization may occur on certain types of bulk finds.

Special Finds	**Bulk Finds**
Metal artefacts (copper alloy, iron, lead, gold, silver, pewter, tin,	**Iron nails, copper alloy pins, large structural pieces of building material**
Medieval and earlier glass, decorated Post medieval Glass	**Post medieval glass (window and bottle), undecorated**
Amber, ivory artefacts	**Undecorated Stone building material.** Sampling to occur after recording in context sheets
Decorated animal bone (un-decorated animal bones are registered as part of natural sciences)	**Slag & Kiln furniture**
Decorated clay tobacco pipes	**Clay tobacco pipes**

Textiles	**Worked flint**
Leather items	**Leather waste cuts, unidentified fragments**
Decorated ceramic building material (Floor, stove tiles hearth and wall tiles)	**Non-decorated Ceramic building material**
Decorated wooden artefacts	**Daub and fired clay**
Ceramic (figurines, lamps, graffiti, stamps, moulds, complete pots).	**Pottery**
Decorated stone material. i.e. statues, moulded fragments	
Decorated shell artefacts. Shells used as finds	

Table 6 Table of finds types

Retrieval and on-site and finds recording procedures

The retrieval of finds was subject to methodology described in the finds handbook (Museum of Copenhagen, 2010). Archaeological finds retrieved on the excavation were added into IntraSIS as Finds Units. Special finds were measured in by total station, whereby finds units identities are generated in the IntraSIS database. Finds Units for bulk finds were created by the archaeologists. The excavating archaeologist would split the finds material collected from the same context/excavation unit into various material types, and place it in a bag, labelled with KBM number, context number and Finds Unit ID number if already created on site. The date and finder's initials were noted, as well as trench number. KBM Collections department staff were consulted and used in the lifting procedure of selected delicate artefacts. Regular contact and meetings between the Excavation leader, Field leaders, on site finds responsible and Finds co-ordinator occurred. With this contact, issues such as prioritization of finds, retrieval methodology and on site-conservation could be discussed and problems could be easily solved, and if necessary, methodology. Regular contact also occurred with the Museums' conservator and the Conservation Department of National Museum of Denmark so that standards were high, and so that delicate objects and structures could be excavated and removed in the best possible conditions.

It was decided that no artefact fragments less than 5mm long would be collected unless deemed of special importance. Due to the large quantity of nails from the moat fills it was decided, as the excavation progressed, that they would be counted, registered and weighed and then discarded.

Each bag was registered in IntraSIS as a Finds Unit (see instructions below). Each bag and a manilla tag were marked with the following information:

KBM-number
Context number
Finds Unit ID
Initials of excavating archaeologist
Date

On the bag, the KBM-number was written on the top left hand side. The context number should be written in the centre of the bag, along with the Finds Unit ID. Below, the initials of the excavator and date should be written.

The manilla tag stating the same information as was recorded on the finds bag was then placed in the bag along with the finds.

Finds processing

The finds were then transported to the museum, processed (cleaned, weighed, counted, placed in bags and marked) then converted within IntraSIS from Finds Units into Finds Objects, whilst the fieldwork was on-going. Finds were processed and stored in their appropriate preservation styles according to methodologies attributed from First Aid for finds (Watkinson & Neal. 1998) and from guidance from the conservation department from the National Museum of Denmark

Registration within the IntraSIS program

Within the documentation process, artefacts were registered in the Finds Object section of IntraSIS. In this way they were further sorted using appropriate typologies, dated and split into function type. Through this process, information regarding chronology, trade, wealth, and land use were discerned. This information was then obtained by the archaeologists whilst the excavation was on-going.

Basic registration: The entering of information into the following fields in the "Class" section of the IntraSIS finds registration interface: Material, Type (including sub-class information in obvious cases), Date range, Weight, Number, Degree of Fragmentation, Whole [Helhed].

Finds subclasses

The subclasses were generally classified by function using function types that are similar to categories seen in the NORM registration and Museum of London registration systems. The artefacts that could not be identified were placed in an unidentified section. Bulk finds were continued as separate subclasses due to specialism, as is usual.

Finds Subclass	Examples of types of finds
Medieval pottery (1060-1535)	Pottery dating from Denmark's medieval periods (early, medieval and high medieval) from 1060-1535.
Post medieval pottery (1536-1800)	Pottery dating from the renaissance period (1536-1660) and later post medieval period (1661-1800)
Stove tiles	Decorated and undecorated tiles from stoves
Leather shoes and clothes	Various types of clothes (non military), shoes, slippers.
Textile	From clothing to household furnishes i.e. Covers, curtains
Glass	All types of glass vessels and window glass
Slag and other metallurgical waste	All by-products of metalworking
Wall tiles	Decorated and undecorated tiles from structure
Household Equipment	A selection containing wooden house furnishings to metal storage items, barrels, buckets and cooking and non ceramic

	storage objects
Arms and Armour	Military weapons, projectiles and armour
Coins and Tokens	Coins and various trading tokens
Personal Finds	A broad category representing finds linked to the individual i.e. Jewellery, badges, brooches, religious, buttons.
Combs and Comb Cases	Combs and comb cases from all periods from all different materials
Toys and games	An assemblage of all types of toys, games, gaming boards and gaming piece fragments
Horse Equipment	All types of equipment for the horse. These include bridles, mouth pieces, other head gear breastplates and saddles. This subclass also includes horse equipment worn and used by the rider such as spurs and stirrups
Tools	All various craft tools and equipment linked to industry
Ships and Fishing Equipment	Finds covering the broad spectrum of maritime archaeology and fishing equipment
Security Equipment	Archaeological equipment comprising various types of keys, locks and draw bars
Textile Production Tools	Crafts people equipment linked to textile production and repair. i.e. Pins, needles, thimbles, needle cases.
Trading equipment and cloth seals and other seals	Cloth seals, trading stamps, various trading objects outside of glass and ceramic finds objects
Writing Equipment	Slates, pens, stylus, stylus cases, wax slates
Statues and figurines	Various statues and decorated fragments of stone
Knives and cutlery	Domestic knives and knife and handle fragments, table knives, spoons and forks
Flint	Flint tools, gun flint and percussion flint
Clay pipe	Clay pipe fragments, pipe production equipment and figurines
Rope	Rope fragments
Building materials	Roof tiles, floor tiles, ridge tiles, bricks and other building related materials. Decorated and undecorated
Non grouped/sub classed objects	Various finds, either unidentifiable or corroded through soil conditions
Nails	Nails from many periods and types of manufacture

Table 7 Find subclasses at Rådhuspladsen.

Report writing.

The specialists added further documentation on the subclasses. The material was described, analysed, assessed and incorporated as chapters/sub chapters in the site report (see appendices). The finds were then archived, photographed and added to the permanent collections.

7 Archaeological results

Numbers and Quantifications

The main phase of archaeological excavation at Rådhuspladsen commenced with watching briefs from January 17 2011, while the first main excavation area (Area 1) was started on May 18th 2011. The main excavation was completed on August 14th 2012, with the conclusion of Area 4. A number of watching briefs were conducted over the following months, and minor watching briefs were conducted in 2013 and again in August 2014, with small teams of archaeologists in attendance.

The excavation Areas 1 to 4 had an estimated area of c. 1.609 m2, and it was estimated that they had 2.662 m3 of cultural layers surviving within them.

The watching briefs had an area of 436 m2 within Area 5, as well as many linear watching brief trenches, and were estimated to have 2.211 m3 of cultural layers surviving within them.

Figure 10 Area plan, showing Areas 1 to 4, and main watching briefs Area 5 and Z 77745

(Note: All main area and phase plans can also be found in A3 format the end of the report)

The number of archaeological staff employed varied during the project, depending on which of the excavation areas were being worked on at the time. At peak times a staff of c. 25 was employed, while in

the early stages and late stages (during watching briefs) there were sometimes as few as 2 archaeologists on site.

During the course of the excavation, a total of 2.527 archaeological contexts were documented on site, including 1,679 deposits, 436 cuts, 208 timber structures and 194 stone/brick structures. Also, at least 10 skeletons were identified during the course of the excavation. These contexts were organized into 475 groups and subgroups to facilitate better interpretation.

A total of 17,179 finds objects have been registered, as well as 16,573 animal bones. 1,780 samples were registered, including macro, dendro, pollen, metal and osteological. Finds objects may sometimes represent several objects, as for example several similar nails might be registered together. Therefore, the true number of finds from Rådhuspladsen is actually much greater than the figure stated above.

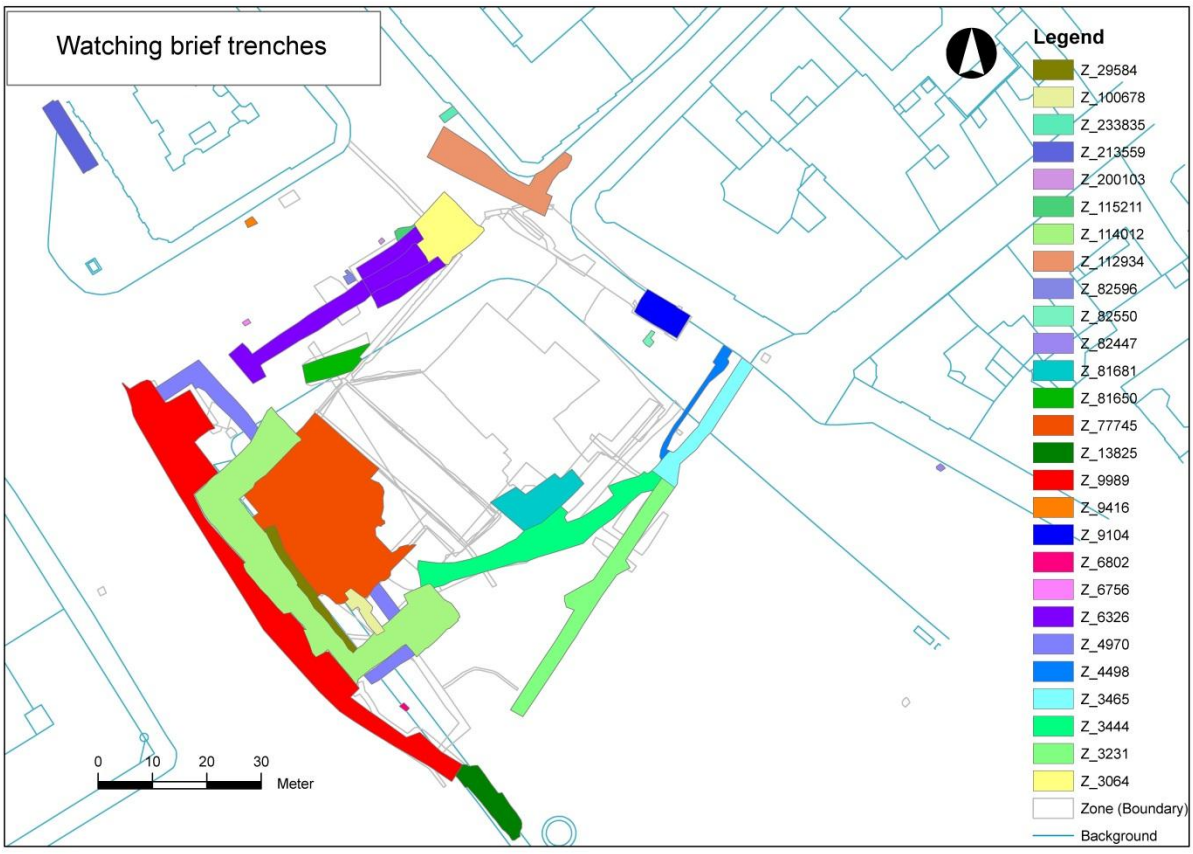

Figure 11 Watching brief trench plan

Finds

The finds recovered included a wide range of material types, all the more so due to the excellent organic preservation conditions observed in many of the features on site.

Finds registered included:

Ceramics – 8,789

Glass – 1,292

Metal – 1,868

Textiles – 2,712

CBM – 1,182

Natural Science

A range of samples were taken in order to aid in the interpretation of the site. The samples taken included:

Macro-environmental (including insect samples) – 1,465

Dendro – 163

Pollen – 23

Charcoal - 26

Metal - 9

Chronological Development

As will be seen in the site description in the following sections, the evidence uncovered on site at Rådhuspladsen suggests a range of human activity beginning in c. 1000 A.D, and continuing uninterrupted until the present day.

Initially the evidence suggests an area including a burial ground and some general proto-urban activity in the area of the excavation, with crafts of various kinds evident, as well as roads, wells, structures and pits. This activity was then interrupted somewhat with the placement of a moat and presumably rampart through the area in about 1372 A.D. This placed much of the excavation area outside of the medieval town, though activity naturally continued within the town boundary. A gate was also constructed at this time, and of course a bridge.

The subsequent centuries would see several changes being made to the urban fortifications, both in terms of form and layout, and indeed location, with the town ultimately being pushed further west again in the late 17th century. The establishment of a watermill will also be described, occurring in about 1600 A.D.

In the more modern era, it will be seen that Rådhuspladsen would also see the establishment of many air raid shelters during the early 1940s, when World War II was ongoing. The square has remained relatively unchanged in the subsequent decades, apart from the construction of the bus terminal, up until the construction of the new Metro station in the square, which will give it a new dimension and connect it in a new way to the rest of the city.

Phase 1 Early urban development – AD 1050-1250

Introduction

The oldest archaeological remains at Rådhuspladsen can be dated to the late Viking Age/early medieval time period. This is a period when Copenhagen was emerging and starting to develop, but there is not yet a clear understanding of the character of the city at this time. The features found at Rådhuspladsen are therefore of considerable significance for the understanding of early medieval Copenhagen.

From excavations and sampling from areas close by, as well as geological observations of the area, we know that during the Viking Age and early medieval period the area that is now Rådhuspladsen was situated considerably closer to the sea shore than today. The general notion is that the area was marshy and perhaps affected by temporary flooding (El-Sharnouby & Høst-Madsen 2008:147f), but this could not be confirmed by this excavation. However, the proximity to the sea would have made it an attractive area for settlement, but if there was flooding problems it would have required some measures being taken to make the location habitable.

The early medieval remains are, as the oldest, naturally most affected by later activity in the area. Since this was the place for the important western parts of the fortifications of the city from the 14thto the 17th century, huge cuts were made in the ground and large stone structures were built in the area, in order to dig moats and build gates. Later on, when Rådhuspladsen was made into a square, and became the important infrastructural hub in the city that it still is today, the area has been cut through with numerous modern services, destroying even more of the early medieval features. Due to these circumstances, the remains from this period are fragmentary and may not be representative of the full range of early medieval activities. The large truncations have destroyed the ground level from the time in large parts of the area, leaving almost only deeper early medieval features and the deposits filling them preserved. On the other hand, in the places where the medieval and post-medieval ramparts were built, the early medieval cultural layers have been protected, and therefore cultural deposits can in some parts of the excavation area appear quite close to the modern ground level.

Even though the remains were fragmentary, the excavations provide important information about life in early medieval Copenhagen which is previously unseen in the archaeological material from the city. Phase 1 is characterized by the early steps towards the making of the city, but the stratigraphical information, together with find's material, scientific dating and spatial analyses show a busy area with several re-organizations of the area within the timeframe of the phase. Up to four sub-phases have been identified; mainly based on structural evidence for buildings, pits and stratigraphical information including leveling layers separating different phases of activity.

Features and preservation

The types of features that can be dated to the early medieval period consist of graves, pits, wells, postholes, beam slots, floors, road layers and other stone set surfaces, ditches, leveling layers, foundation layers, activity layers and original topsoil. The remains were generally spread all over the excavation area, although there were large areas where later archaeology and modern truncations had destroyed any chance of early medieval layers being preserved (fig. 12).

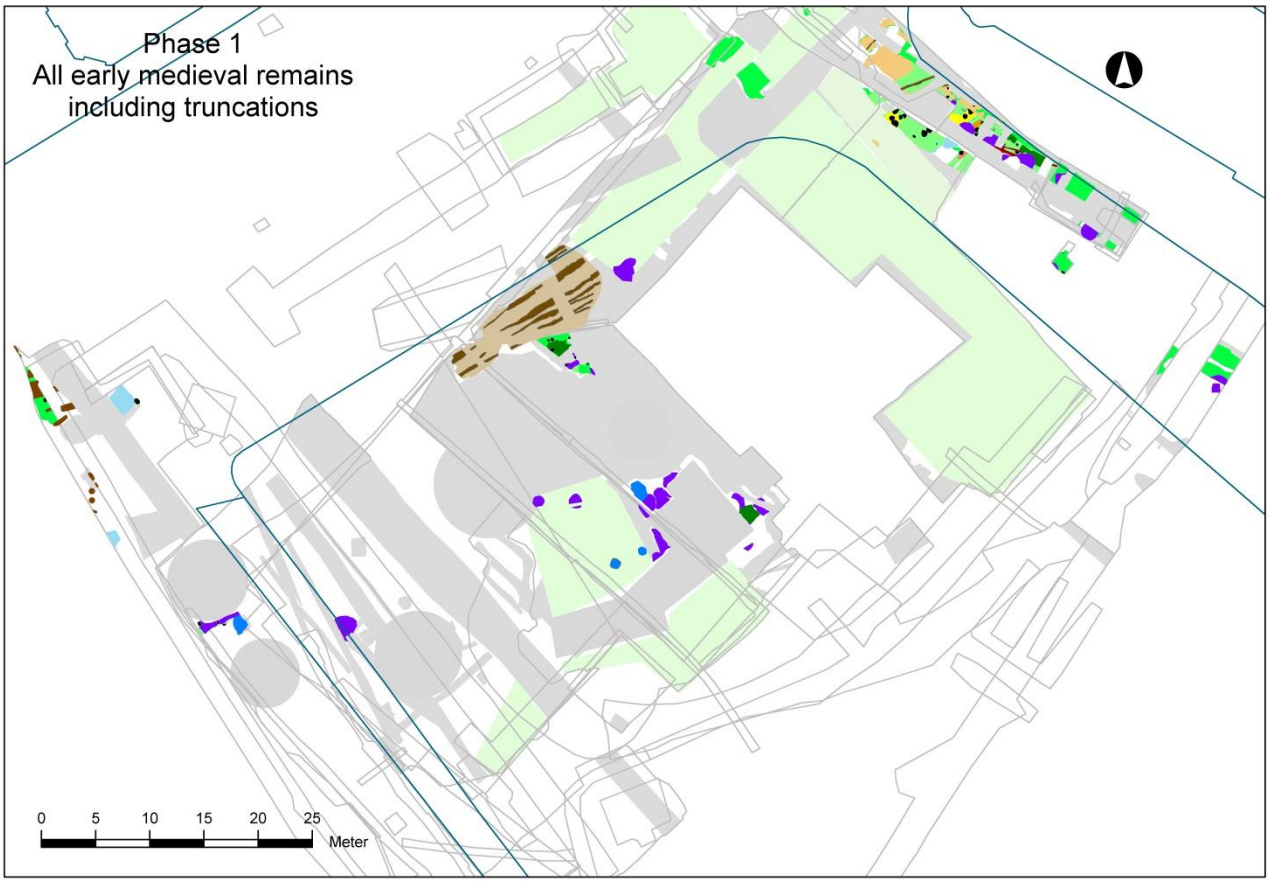

Figure 12 All early medieval features at Rådhuspladsen. Large truncations or later archaeological features are marked with grey. Also see fold out plan with legend in the back of this report.

The intense usage of the area and degree of restructuring of activities has resulted in a high amount of intercutting and redeposition of material during the early and high medieval period (11th-14th centuries; phases 1-2). This is obvious in the finds material, where younger pottery and bricks sometimes are found together with, or stratigraphically below deposits with Early Greyware and Baltic Ware. Also, this should be seen in connection with 14C-dates, which are on the whole earlier than some finds from the same deposits. These circumstances make the phasing of the activities ambiguous and therefore spatial relationships between archaeological features have sometimes been accorded more weight than the observed stratigraphy. In general, dating of contexts are based on a collective assessment of stratigraphy, dateable finds, 14C-dates (where available) and spatial relationships.

Most finds from the phase can be characterized as household refuse or production waste – pottery, animal bones, iron slag, forge material and different tools. Personal objects were also represented in the material, such as bone combs, bone pins and needles, and a few glass pearls and coins. The distribution of the features and finds reveals different activity zones, and in that way an organization of the area at the time can be discussed (see end of the phase 1 chapter).

The presentation of the remains from phase 1 will be given from two perspectives. First there will be an account for the different feature types – *Buildings; Pits and wells*; *Surfaces and infrastructure* and *Graves and cemetery features.* After the overall description of the individual feature types, there will be a contextual presentation of the features and finds from different areas. From *Areas 1 and 3* there will be a presentation of the main chronological development from the 11th century until the mid-13th century. The results from the other parts of the excavation area will be grouped as follows: *The central parts (Areas 2A, 2B and 4*), *The western parts* and *The burial area* (the subareas can be easily identified in Figure 12). Findings from small watching brief trenches close to Area 1 will be presented together with this area.

Buildings

The remains of buildings were fragmentary and quite difficult to reconstruct. In Vester Voldgade there were clearly several phases of cuts, deposits and stone constructions, separated by leveling layers, and which have been parts of different building structures. The level of fragmentation, both due to complex stratigraphy with younger building phases disturbing the older, and many modern truncations, make the interpretations of the extent and attributes of the buildings very uncertain. On the other hand, it is clear from the fragmented remains that several phases of building activity and usage of the area has occurred, and some changes in the organization of activities can be traced through the archaeological material.

Group	Group name	Area	Dating	Subgroups	Context types
464	Oldest building traces	1	1050-1100	87, 114	Postholes
94	Post-built house	1	1100-1125	103	Postholes, beam slots
302	Building with kiln	1 & 3	1125-1175	58, 82, 83, 234, 271, 288, 289, 290, 446	Postholes, floor deposits, demolition deposits, kiln
462	Building with sill stones	1	1175-1250	86, 98, 101, 105	Postholes, sill stones
216	Building by the road	2B	1100-1150	161, 218	Postholes, activity layer
460	Building with pot in the floor	Z 82550	1100-1175		Postholes, floor deposit, activity layer, demolition deposit

Table 8 Buildings from Phase 1. Details of the 14C-dates are to be found in the text related to each building.

The features linked to buildings consisted of postholes, beam slots, sill stones, floors, foundation layers, demolition layers and other leveling deposits (Table 8). Almost all of the identified buildings were found in Area 1 and 3, in present day Vester Voldgade. This may be because this area was closest to the centre of the town with a different use pattern than outlying areas. Areas 2A, 2B, 5 and the watching brief area were characterized by primarily pits and wells which could have been the result of different early medieval use patterns. The lack of buildings in these areas could also be due to preservation conditions. Areas 2A, 2B, 5 and the watching brief area were heavily affected by later activities, resulting in no cultural deposits being

preserved. Only large and deep cuts were found in these areas. This argument is supported by the character of remains in Areas 1 and 3, where an equal amount of pits as in the other areas were found, together with remains of buildings and other preserved cultural layers. The extent of the original topsoil, is an indication of where preservation conditions made it possible to find buildings and other cultural layers and could be a clue to why there were buildings in certain areas and not in others (features marked with green in Figure 12). However, in some of the areas with topsoil no other cultural layers had survived.

In all, parts or fragments of six different buildings have been identified in the whole area during the early medieval period. Three of them were found in Area 1, one in areas 1 & 3, one in 2B and another in the small watching brief trench south of Area 1. All of them had been constructed with posts, one also with sill stones. Traces of beam slots were found connected to one of the oldest buildings, while sill stones were linked to the youngest, perhaps showing a change in construction techniques within the phase. Size of the buildings has due to preservation conditions been very difficult to say anything about. The buildings have been interpreted as either domestic houses or buildings with an economic function, possibly with some workshops. Finds material in leveling layers and other deposits connected to the houses was mostly of household character, such as pottery, animal bones and tools. Material in deconstruction layers show that the walls have been made of wattle-and-daub, but also bricks were present in the younger demolition deposits.

In the presentation of the buildings in Area 1, Vester Voldgade, much emphasis has been put on spatial or structural relationships, especially when stratigraphy seems to be ambiguous. The oldest features have a general orientation of southwest-northeast and northwest-southeast respectively, while the slightly later show a more varied picture. Since very few border ditches have been found, the placement of buildings and their relation to other features like roads, pits and wells form the basis for the overall interpretation of the physical organization of the area.

Pits and wells

34 features, spread over large parts of the excavation area were interpreted as early medieval pits (see Table 9). The basis for the interpretation as pits was their shape and dimensions. Circular and semicircular features with a measured or probable diameter over c. 0.45 m were classified as pits. The distinction between a small pit and a posthole, or a deep pit and a well could sometimes be debatable. The pits showed a variety of appearances, ranging from small, shallow pits (at least what was preserved) to large circular, deep pits. What most have in common are their regular shape and the types of backfills, containing household and production waste. Dating of the pits is based on pottery and comb types found in the backfills, and radiocarbon dates from the lower deposits within them.

The pits were in many cases placed quite close together, some were also intercutting, which suggests several phases of activity. Also the general stratigraphical conditions, with leveling layers separating pits into different phases, imply the same. Discrepancies between dates of finds from the pits and radiocarbon dates sometimes suggests that the usage took place some time before the backfilling, or that the pit was used for quite a long period of time. Most finds from the pits and wells were found in deposits interpreted as backfills, and the radiocarbon dates are mostly from lower usage fills. This indicates a function for the pits prior to the use as refuse dumps.

The larger pits were between 1.5 and 2 m in diameter, and up to 2 m depth. 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 pit 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 backfills generally were mottled and rich in finds. This suggests that the usage of the pits did not leave many material traces, while the backfill 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?).

Five features were interpreted as wells from the early medieval period. All but one were placed in the same areas as the pits, and in some cases it was not fully clear if a feature should be seen as a deep pit or a well, especially since even some of the most well-like features did not contain any evidence of lining or showed signs of being placed in a wet environment. One well had quite a different placement, almost in the way of the medieval road leading into town.

The finds retrieved from pits and wells consisted of a mixture of household refuse and production waste. The most common find category was animal bones – in some cases the pits were rich in fish bones. Pottery was also often found, mostly Baltic Ware or Early Greyware, but in some of the younger pits also Early Redware, Younger Greyware and German Stoneware were represented in the upper backfills. In a few of the younger pits imported ceramics such as Rouen Ware was encountered. Another important finds category was slag together with other metal working residue such as hammer scales and fragments of oven walls. These remains give essential information on the types of activities going on in the area during the early medieval period. The metal working residue show that both primary and secondary iron smithing has taken place in the immediate area. No direct evidence of workshops has been found, but material from different stages in the smithing process is represented in the waste material (see Appendix 7).

Other important finds included different tools, nails, whetstones and combs. In two of the pits, Groups 399 and 61 several combs and material which can be seen as comb manufacturing residue were found, indicating comb production in the immediate area. The finds from pits taken together give an impression of an area used for occupation and craft/production over a period of at least a hundred years. The fact that the pits can be divided into several sub-phases, speak for similar usage of the area during throughout Phase 1.

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 slag, fishbone, 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, maybe in connection with craft or production (Karg & Lafuente 2007, p. 188ff). Considering the comparably large quantities of iron working residue in some pits, these can perhaps have had a specific function related to the iron smithing process. The typical placement of the pits, together with fragmented traces of settlement could also be seen as implying a primary function of storage connected to dwellings. Usually, at this time, pits for refuse and also sometimes work shops were placed in the backyards

of houses (Carelli 2001, p. 106ff; Christophersen 1980). As mentioned before, the preservation conditions at the location resulted in whole areas where only deeper cuts and their fills had survived, so the relation to other settlement remains are to a degree hypothetical. We do not either have any firm evidence for plot borders to back this hypothesis. However, the location of the pits, generally c. 10 m from a road running southwest-northeast through the excavation area (see Figure 12), may suggest a pattern that relates to other settlement activity – with connections to dwellings, stalls or other settlement structures in the area (see further discussion at the end of the Phase 1 sub-chapter). An example from early medieval Ribe in western Denmark shows a similar pattern of intercutting pits, placed behind domestic buildings on plots (Jensen forthcoming.) It is likely that the better preservation conditions seen in the most eastern part of the excavation area, in present day Vester Voldgade, give an idea of how the whole area has been used.

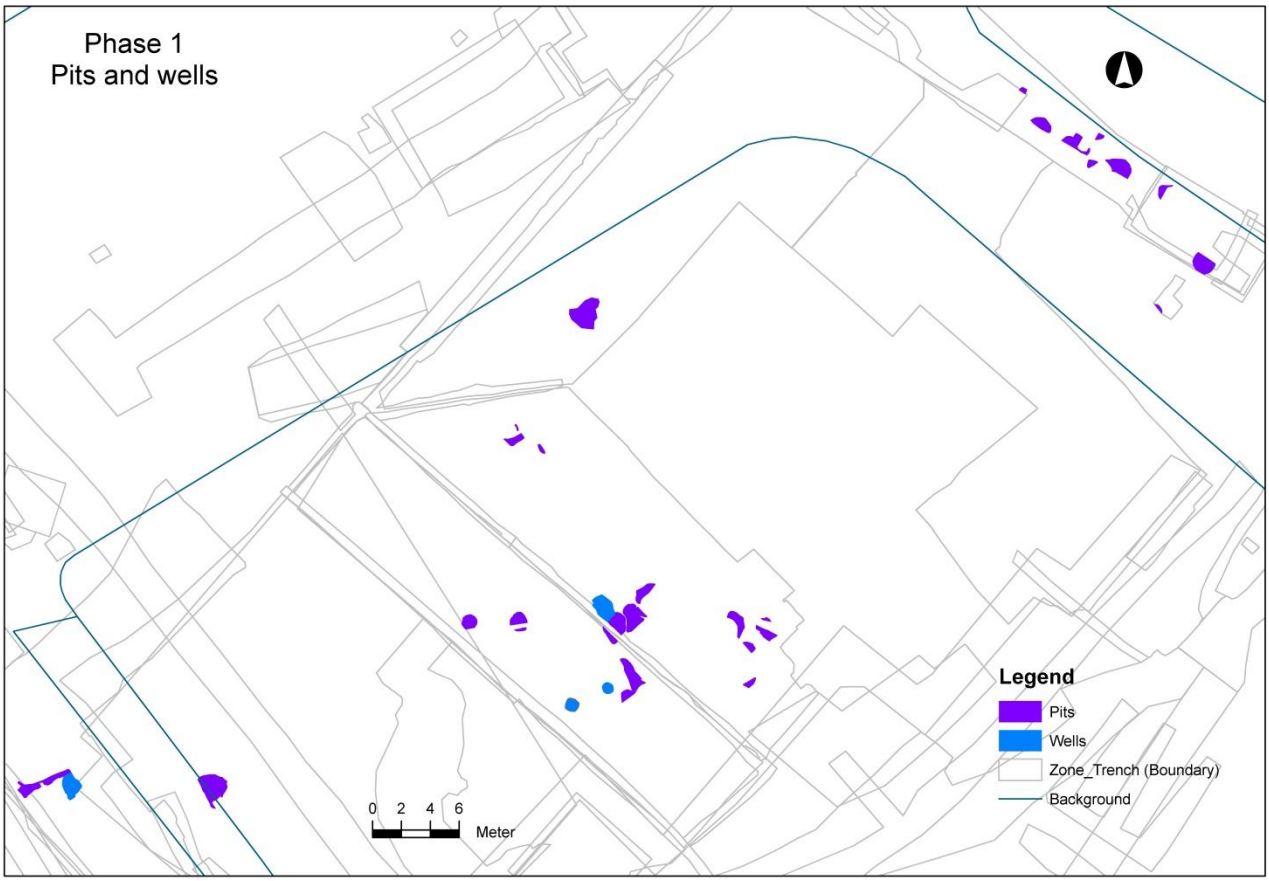

Figure 13 All features interpreted as pits or wells from Phase 1.

Group	Name	Area	Basic Interpretation
19	Pit	9104/Area1	Pit
55	Pit	Area1	Pit
61	Large pit	Area1	Pit
63	Pit	Area1	Pit
70	Large pit	Area1	Pit
85	Partially preserved pit	Area1	Pit
92	Base of pit	9104/Area1	Pit
99	Partially preserved pit	Area1	Pit

104	Pit w walrus tusk	Area1	Pit
132	Well	Area 2A	Well
134	Well	Area2A	Well
143	Deep pit w kiln remains	Area2A	Pit
144	Deep pit with red fills	Area2A	Pit
145	Pit in 2Ab	Area2A	Pit
146	Pit?	Area2A	Pit
147	Pit	Area2A	Pit
148	Pit	3465	Pit
157	Partially preserved pit	Area2B	Pit
158	Heavily truncated pit	Area2B	Pit
159	Pit	Area2B	Pit
166	Pit	Area2B	Pit
167	Pit	Area2B	Pit
169	Pit	Area2B	Pit
170	Truncated pit	Area 2B	Pit
172	Possible pit	114012	Pit
173	Pit, heavily truncated	Area2B	Pit
174	Clay lined pit	43195	Pit
175	Pit	Area2B	Pit
176	Pit with clay lining	Area2B	Pit
178	Pit in 2Ab	Area2B	Pit
179	Well	114012	Well
183	Fish waste pit	Area2B	Pit
188	Large pit	114012	Pit
191	Large pit	114012	Pit
193	Pit	Area2B	Pit
194	Well	Area2B	Well
389	Well	Area4	Well
399	Pit	77745	Pit
459	Pit	82550	Pit

Table 9 *Early medieval features interpreted as pits or wells, Phase 1.*

Surfaces and Infrastructure

All infrastructural features like roads, open spaces and ditches will be presented and discussed under this headline, as well as less distinct features like leveling layers and garden soil. The interpretation of the infrastructural features is of great importance, since it can contribute with valuable information about spatial organisation of the area and changes in this over time. The deposits interpreted as leveling layers also have an important role in the understanding of the relative chronology of the area, since they physically divide different building phases. However, it should be noted that the “absolute” dating of leveling deposits can be ambiguous, since they may consist of a mixture of deconstruction material from several building phases, depending on the deposition history and number of building phases at the exact spot. This is often shown in a very broad dating frame of the finds within what is interpreted as the same leveling deposit.

Infrastructural remains were found in Areas 1 and 3. Also, the oldest phase of the road (Group 76), found in Areas 2A, 2B and 4, and leading into town can be dated back to Phase 1. Across the site there were some smaller remains of ditches, among others a ditch believed to have functioned as border for the cemetery.

Graves

Unexpectedly, a number of burials were encountered in one of the watching brief areas. They indicate the presence of a cemetery to the immediate north of the road Group 76, leading into town. In total, 17 graves and 10 in-situ skeletons were documented. Together with the disarticulated bones there were a total of 21 individuals recorded from this area. All burials were orientated east-west and a few had traces of coffin wood preserved. The graves will be presented further in the section "The burial area" later on in the chapter.

Figure 14 Archaeologist Sam Keenan excavating one of the graves. Seen from southeast.

Chronological development

In the post-excavation phase it was to a degree possible to identify different sub-phases. This was certainly the case for Areas 1 and 3, where preservation was good with a higher degree of surviving stratigraphical relationships and cultural deposits, but also in the other areas several sub phases were identified to a degree.

Sub-phasing of the remains means that re-organisations of activities could be identified. The main grounds for dividing activities from phase 1 in several sub phases lie in stratigraphical and structural relationships between buildings, pits and leveling deposits. Finds and scientific dating has aided in giving finer dates within the phase, but it is due to the fact that buildings and pits are seen cutting each other, and that leveling deposits clearly separate features from each other, that we can begin to separate some of the activities in chronological phases. With that said, the land use has been of the same character throughout Phase 1, with some exceptions. It should be noted, that it has not been possible within the scope of this report to go into detailed analyses of all the stratigraphic, spatial, contextual and chronological relationships between archaeological contexts, finds and samples which is necessary in order to receive as

full an understanding as possible of the activities from this period. Both the complex and fragmentary nature of archaeological remains have made this difficult. The sections below should be seen as a basic interpretation of the functions of features, of the relative chronology and contextual relationships between structures and activities from the early medieval period at present day Rådhuspladsen.

Remains and chronological development in the different parts of Rådhuspladsen

Areas 1 and 3

The chronological development is mainly based on spatial and stratigraphic relationships of buildings. In Areas 1 and 3 (which were situated next to each other, see fig. 10) fragments of four buildings were identified, which for stratigraphical and spatial reasons could not have been in use at the same time. The account of the chronological development in Areas 1 and 3 will take its starting point with these buildings, and leveling layers, pits, wells and other features will be related to these building sub-phases to the extent possible.

Buildings

The building traces interpreted as the oldest in the area, Post built structure Group 464, constituted of 11 postholes (subgroups 87 and 114; Figure 15). They were stratigraphically the oldest features in that part of the area, except for Group 239, original topsoil, which at least some of the postholes were seen dug into. An AMS dating and finds can confirm the interpretation of the structure being the oldest. The postholes were placed close together and seen together they were aligned northwest-southeast which could indicate they were from the same construction/structure, although the exact appearance of the construction is difficult to imagine. The remains might be representing some outer walls or parts of roof bearing construction together with some inner walls or dividing structures. The postholes were of different sizes, but some quite small, 0,08 – 0,4 m in diameter and 0,06 – 0,2 m deep. The smallest of these should be seen as stake holes rather than postholes. They stretched from southeast towards northwest. Maybe the building was of a temporary or changeable character, and the features within building Group 464 and the later building Group 94 should be seen as representing different short term usage phases. It is also quite possible that the remains come from different buildings, very fragmentarily preserved. An AMS date from Subgroup 114, taken from beech charcoal, ranged between cal. AD 1010 – 1170 (2 Sigma, LuS 10995; App. 37), likely date using Cal Pal Online (http://www.calpal-online.de) is cal. AD 1034-1136. The only finds related to this structure are daub and animal bones.

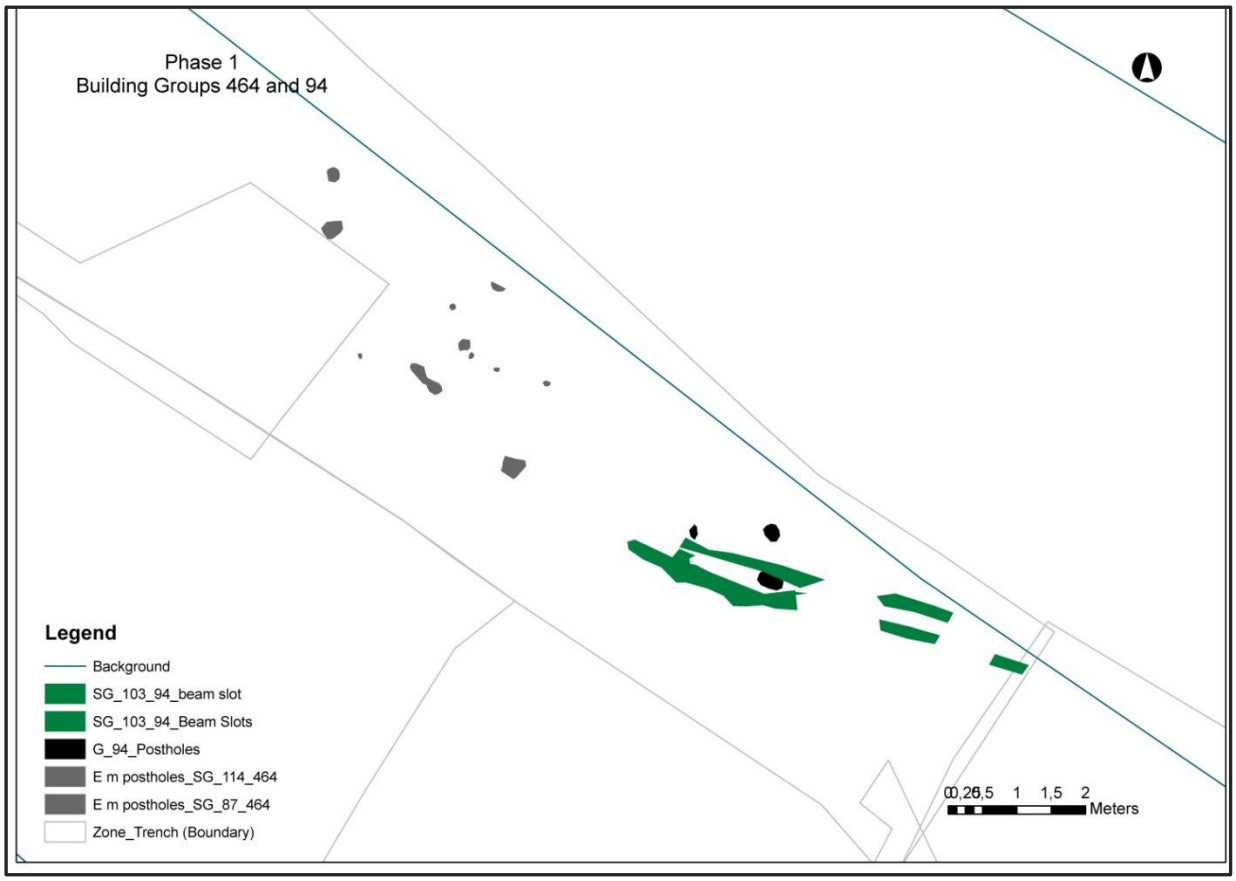

Figure 15 The two oldest building phases in Area 1 – Groups 464 and 94 with their subgroups marked.

In the same area as Group 464 a number of postholes and beam slots were interpreted as constituting parts of other buildings. Stratigraphical and spatial relationships between these features and Group 464 make it likely that they should be seen as later than Group 464. Group 94, Building remains with beam slots, consists of postholes and beam slots which might not belong to the same phase of the building (Figure 15). The postholes are partly placed within the beam slot structure. All features are sealed by Group 78, a leveling deposit.

The postholes were placed in a triangular relation to one another, with a distance of 0,6- 1,2 meter between them. Their sizes varied from 0,3 m to 0,4 m in diameter. The beam slots (Subgroup 103; see Figure 16) were parallel placed with a distance of 0,3 meter in between. They were 0,15-0,3 m wide and up to 0,2 m deep. The cuts had straight sides and a flat base, indicating they had been the foundation for a structural element, like wooden beams supporting vertical posts. They were dug in a southwest-northeast direction, which fits with the alignment of many of the features from this time period. They had a length of 4 and 6 m respectively. The fills contained deconstruction material such as burnt clay, daub and charcoal, indicating a previous phase of building. The beam slots are dug into the upper parts of pit Group 85, which then must have belonged to an earlier phase of usage. The features are themselves heavily truncated by pit Group 60, which would mean yet another sub phase, since the pit represents a new way of usage of this particular spot after the building was torn down. It is fairly clear that the metalled surface Group 79 towards north east and these structural elements are fairly contemporary. Maybe we should imagine a building associated with the function of the metalled surface – perhaps a stall? Finds of Early Greyware

suggest a dating for the building to the early medieval period. Seen in relation to stratigraphy, a late 11th century to early 12th century date seems plausible for this structure. It should be noted, that the identification of these three oldest structures are tentative due to complex stratigraphy and the fragmented nature of the remains. Further analysis of pottery, additional 14C-dating and more thorough analysis of the stratigraphy might change the interpretation.

Figure 16 Photo of beam slot in Subgroup 103. Truncated by high medieval pit Group 60 at the top of the picture. In the front a square modern truncation is seen. From northwest.

About 2,5 m to the northwest in Area 1, Group 108, a structural feature interpreted as a foundation cut was recorded. It was a rectangular shaped feature with rounded corners, preserved to a length of 1 m, but originally larger since it was truncated in the southwest by the early medieval pit Group 70. The cut for Group 108 was 0,55 m wide and with a depth 0,1 m. The base was completely flat. The fill contained no

dateable finds, only some fragments of animal bones and a flint flake. A 14C-analysis was made from a Rosaceae seed in the fill, giving a date range of cal. AD 775 – 1030 (2 Sigma , LuS 10655; App. 37); likely AD 893-987 (cal. 2 Sigma by Calpal Online).

The feature was orientated in a southwest to northeast direction, an alignment which fits with most of the features from this time period. The shape of the cut suggests it has been made for some kind of upper structure, likely related to a building. It is very wide to be a cut for a beam, so some other structure should be imagined. It is unclear in what way the feature should be related to Group 94. They seem to be contemporary, on the basis of stratigraphy, but their alignments do not match fully. The foundation cut seems to have been respected by the metalled surface (Group 79), suggesting these would have been in use at the same time. The metalling sloped gently to the edge of the cut. Maybe we should imagine the cut associated with the function of the metalled surface, which is believed to have been an outdoors surface. The AMS-date from a seed from the fill must be seen as secondary and in that way not representative of the true usage period of this Group. However it indicates that there has been some activity in the area prior to the early medieval period. Additional AMS dating would give a better idea of when this feature was in use.

About eight metres to the south of Group 94, some fragmentary remains of a building, Group 460, were recorded in a small watching brief trench (Z82550). The remains were mostly seen in profile and consisted of two postholes, partly seen in plan, a floor layer plus some leveling layers. The orientation of the building was not possible to ascertain. Below the floor layer there was a charcoal-rich deposit which could have belonged to an earlier phase of activity, but it is also grouped with this building as a leveling layer. The floor and the charcoal deposit were the oldest levels of activity, placed directly above original topsoil (see Figure 17).In one of the postholes quite a few sherds of Baltic Ware were found, among them a more unusual rim sherd. Iron working residue was also found - hammer scales and slag. Other finds were scarce, but also of household waste character. The floor layer appeared as a mix of clay and burnt sand and seemed to have been in a fire, with a few centimeters of very hard surface. A Baltic Ware pot, small, about 10 cm in diameter, had been deliberately put into the floor, with the rim even with the floor surface. The purpose of this was perhaps as storage, keeping food warm or other activity. The presence of hammer scales in related floor deposit (SD 82574) could maybe suggest an activity connected to smithing? The contents of the pot are being processed for more information. Above the floor a couple of leveling layers were deposited, perhaps to raise the ground for later usage of area.

Figure 17 Profile of watching brief trench Z82550, seen towards northwest. This part was about 1,2 m long. Deposits related to Group 460 are seen together with almost complete pot of Baltic Ware (FU 241714; marked with a circle to the right in the photo) which was found sticking out of the profile. The placement of the pot indicated that it was put down in the floor, since the surface of the floor was seen on level with the rim of the pot.

The fragmentary evidence for early settlement in Area 1 were stratigraphically sealed by garden soil/leveling layer Group 78 (see later in this chapter). Above this quite substantial layer there were two more phases of building traces preserved.

The next phase of building remains, Group 302, spanned over parts of Areas 1 and 3, and consisted of seven postholes, floor foundation deposits, demolition layers and was also associated with deposits which could have been the remains of a kiln (Figure 18). The remains were, again, highly fragmented, and the full extent or shape of the building was not seen. The difference compared to earlier building remains was, that culture layers were preserved, giving more chances to identify possible functions for the house. The building seems to have been two-aisled and orientated in a NNE-SSW direction. That goes against the orientation of previous structures, suggesting a large scale re-organization of space, a theory which is strengthened by the leveling layer Group 78 put over large parts of the area before the construction of Group 302. The dimensions for the preserved parts of the building were >8 m x c. 4,5 m.

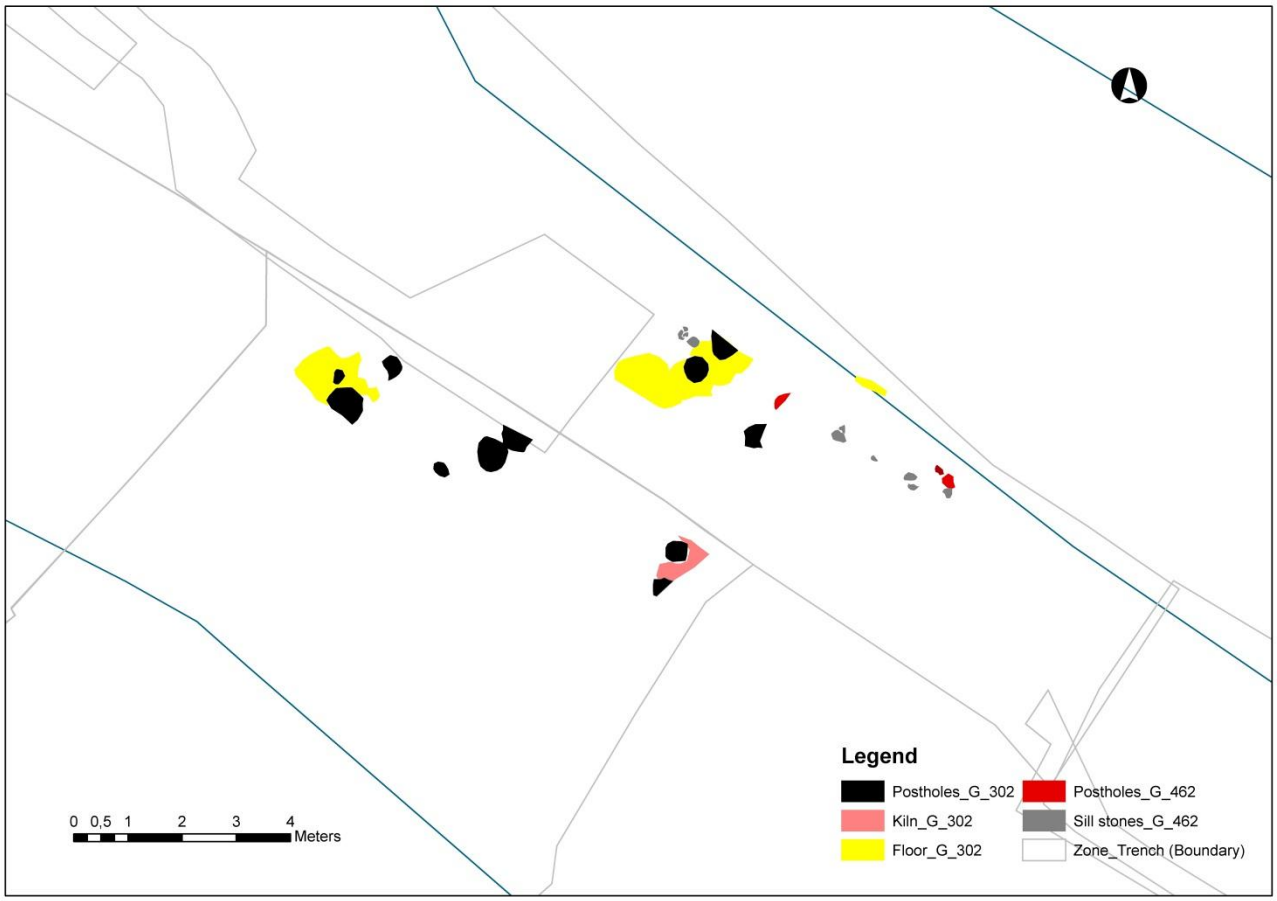

Figure 18 Buildings, Group 302 and 462.

The postholes were quite large, between 0,4 and 0,5 m in diameter, and some were placed next to each other, as of either supporting the roof together or one replacing the other. No datable finds were obtained, but some animal bones, flint flakes and nails were collected.

Two of the postholes were associated with deposits interpreted as floor layers, demolition layers and later foundations for a younger building. One deposit was full of charcoal and heat affected, while another had inclusions of slag. This could indicate that the building functioned as a smithy or a workshop. In the southern end of the possible building, slightly extended from the place where the southern wall would have been, some very fragmented remains of heat affected layers were documented. They consisted of one charcoal-rich layer overlain by burnt and degraded chalk or lime fragments. The feature can be interpreted as an episode of in-situ burning most likely associated with small scale lime production. It has perhaps been a building placed outside Group 302. Perhaps the kiln was part of the activities connected to a workshop, maybe used for lime production? The proximity to the contemporary church of Sct. Clemens could suggest a workshop used for building or renovating the stone church. The function of the building is difficult to interpret. Size and dimensions could suggest a building used for occupation, but there is not many household finds associated with its remains. However finds of slag, nails and a knife blade, together with the feature interpreted as a lime kiln, could be seen as indications of some kind of workshop. Seeing the contemporary finds of slag and other iron working residue in the immediate area, a function as a smithy could be plausible. Further scientific analyses of material from the deposits related to the group would be

needed to confirm that theory. Also, the dating of finds from this building is ambiguous. The building contained Baltic Ware, Early Greyware, Early Redware, and Late Greyware. This suggests that there was high medieval interference in the early medieval remains, due to intense activity in this area at later stages. One 14C-dating from a barley seed in the kiln gave a result of cal. AD 1025 - 1210 AD (LuS 10653; App.37), likely AD 1053-1159 (cal. 2 Sigma by Calpal Online). The collective evidence indicate a dating of the structure to the 12th century, with later finds material likely having been mixed into these older layers from above.

Remains of a building with sill stones, Group 462, which is partly stratigraphically younger than building 302, were found to the immediate east of Group 302 (Figure 18). The remains consisted of three postholes and a few Groups of sill stones, all placed in a row aligned northwest-southeast. All together the feature was about 5,75 m long. The postholes were placed about 3 m apart and the sill stones appeared as groups at every 0,6 m, except for one group of stones which was at a greater distance but still in line with the others. Together the postholes and the stones made a distinctive feature, probably marking a wall. The stones were 0,1-0,25 m in diameter and mostly placed in groups of two or three. The postholes were of different sizes, from c. 0,2 to 0,4 m in diameter and up to 0,2 m deep.

Finds consisted of Early Redware, a slate whetstone and animal bones. Seeing the shallow depth of the cuts and the younger pottery in one of the fills, it is possible that some or most of the postholes come stratigraphically from above, and as such are younger than the sill stones and should perhaps belong to a younger phase of activity. Based on the one pottery find, the structure can be dated to the early 13th century, making this the youngest early medieval building remains in Area 1. It must be said, that the relation between Group 302 and 462 is ambiguous, and stratigraphic relationships between the two are not clear at all points. Even if the alignment does not fully match, this building could be viewed as a later attachment or side building to Group 302. The features were situated at the eastern edge of the excavation area (Area 1) and possibly more parts of the building are to be found outside of the excavation area. It is also possible that Group 462 does not represent the remains of a building, but a fence or some other structure connected to the early medieval settlement.

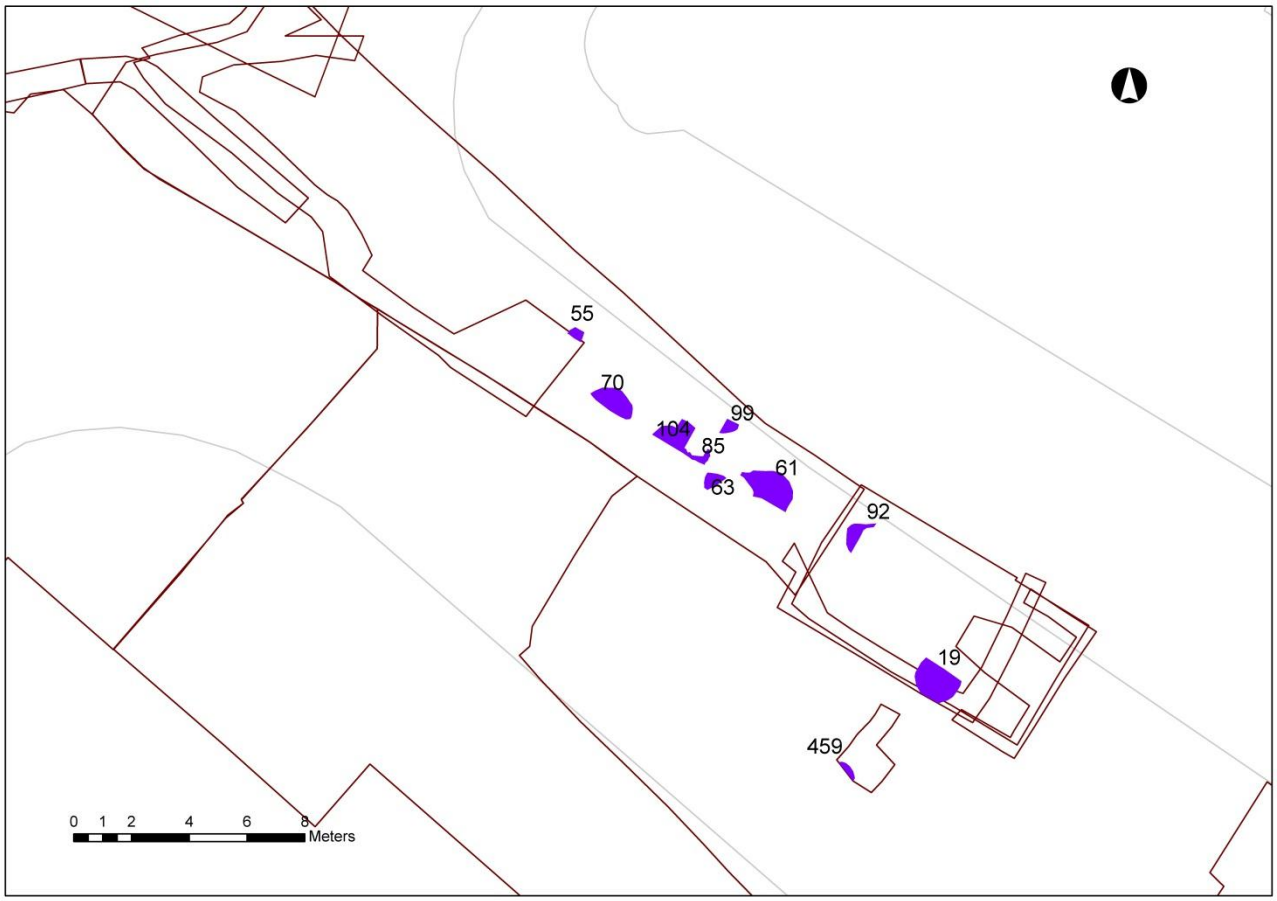

Figure 19 Pits in Area 1 and watching brief trench Z82550.

Pits

Ten early medieval pits were excavated in Area 1 and the small watching brief trench Z 82550 (Figur 19). All were placed 7 m or more from where the road into the centre of the town would have passed. Due to stratigraphic and spatial relationships to buildings and leveling layers, most pits in Area 1 can be dated to the middle and later part of the early medieval period.

Among the oldest of the pits were Group 85, Group 104 and possible Group 92. Group 85 was placed in the middle, most intensely used part of Area 1 and was stratigraphically right below the beam slots related to building Group 94. It was dug into original topsoil in Area 1 and was heavily truncated. Only 0,1 m in depth was preserved, which was due to the above placed beam slots. It was preserved at a length of 0,96 m and a width of 0,53 m but truncated in the N and S so the original dimensions are not known. There was one fill of uniform character, with inclusions of charcoal, stone, bone but no finds. Next to Group 85 the remains of pit Group 104, a large, but again heavily truncated pit, was located. About a quarter of this, seemingly circular, pit was preserved. It would have measured c. 1,5-2 m in diameter. Only 0,3 m in depth was preserved, which makes it likely the upper parts have been truncated. In the post-excavation phase, the possibility became apparent that the remains of pit 85 and pit 104 could be two pieces of the same pit. Dimensions, placement and dating suggestion for both pits make this likely, although fills were registered differently. The pit Group 104 had regular shape and contained two fills, both of backfill character. The upper fill was AMS-dated by a barley seed to cal. AD 990 - 1185 (2 Sigma , LuS 10661; App. 37); likely AD

1033-1139 (cal. 2 Sigma by Calpal Online). The pit was quite rich in finds, containing Early Greyware, slag, nail, flint flake and animal bones. This deposit contained an unusual offcut of walrus tusk (Figure 20). This piece would have been imported to Copenhagen as raw material to be used in the making of objects of some kind. Like many other pits, the finds in the backfills suggest they have been placed in an area with combined household and production. The original function might have been as a storage or refuse pit, and later as refuse pit. A probable date for the pit is late 11th or early 12th century, representing some of the earliest activities in the area.

Figure 20 Offcut from walrus tusk, FO 200988.

About 5 m to the southwest, the base of another pit, Group 92, was registered. It was found in an area which at the beginning of the excavation had been excavated with machine by mistake, leaving only a few features to be documented. Half of this quite large pit was preserved in plan, and only the bottom part (0,16 m) of it. Its size would have been 1,15 m in diameter and it has been sub circular in shape. It had steep sides and a flat base with irregularities. The feature contained one fill, interpreted as representing the usage phase. There were finds of many fish bones, other animal bones, Early Greyware, Baltic Ware and iron objects. Its function may have been as storage pit initially, or as a refuse pit from the beginning. The placement was next to other contemporary settlement features, perhaps also craftwork and production. Dating based on pottery indicates that this complex of features dates to 1050-1150.

Four m to the southeast of pit 92, a large circular pit, Group 19, was situated. It was sub circular in shape, about 1,6 m in diameter and 1,4 m deep. The pit had vertical but stepped sides and a concave base. It contained six fills, of which all but the lowest were backfills not connected to the pit's primary function. The backfills were characterised by clayish mottled material and different inclusions and lenses, as well as a find's material with a wide date range. Towards the bottom, the fills were more homogenous and organic. Some thin, dark deposits suggest the pit had been left abandoned for a period of time. The full extent of the pit was not visible, due to a truncation toward northeast. Also, a small part of the pit continued to the

southwest, outside of the excavation area. Based on dimensions and shape, the pit is interpreted as a storage pit in its primary function. The primary fill does not give many clues to its function. The only finds in the lower deposit are some animal bones. The backfilling show that it had a secondary use as a refuse pit over a period of time. The character of the fill material, with mottled soil and lenses, shows that there had been periodic rapid backfilling. The backfills were rich in finds, containing Baltic Ware, Younger Greyware, slag, forge material, animal bones, fish bones, nails, glass smoother, coin, whetstone, brick fragments and a stove tile fragment. The character of the find's material indicates the refuse coming from both a household and a production environment. Archaeometallurgical waste from smithing has been identified (Jouttijärvi 2013, App.7.2). The animal bone analysis however shows the material as refuse from one or more households, with the presence of lamb bones indicating a household with higher status (Enghoff & Magnusen 2015, App. 1). The upper fills seem to have been contaminated with finds from younger levelling layers which were removed by machine. An AMS date from cattle bone from the oldest fill gave a date range of cal. AD 1020-1170 (2 Sigma , LuS 10816; App. 37); likely AD 1052-1176 (cal. 2 Sigma by Calpal Online). Together with a few pieces of Baltic Ware, the date for the usage of the pit can be set to the first half of the 12th century.

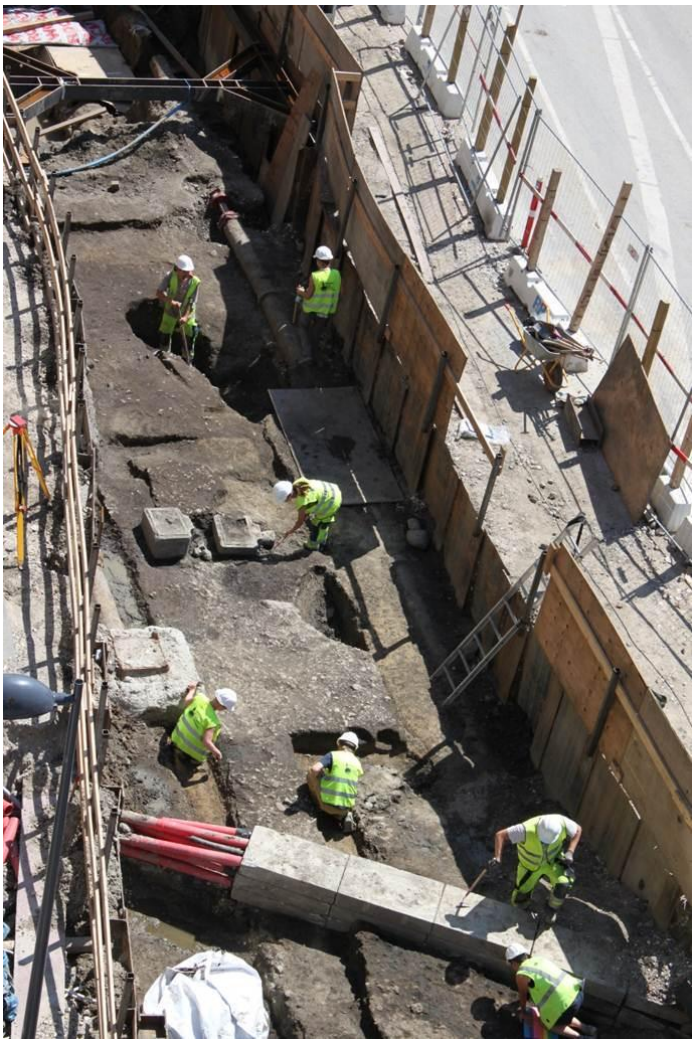

Figure 21 View over Area 1 with work going on with pit Group 61 (back of picture) and with external surface Group 79 (front). Half the cut for pit Group 70 is also seen excavated (middle).Seen from northwest.

A meter north of pit Group 19, there were two pits, Groups 32 and 49, which have been placed in Phase 2, but possibly have been in use already in Phase 1. Group 49 was cut by Group 32. They were of the same character as pit Group 19 when it comes to shape of cut and contents of backfills, including finds. Date span for those pits is likely to be late 12th century to late 13th century and they have been interpreted as possible storage pits, reused as waste pits (see Phase 2 for description and interpretation).

About 3,5 m southwest of pit Group 19, a small part of pit Group 459 was exposed and registered in the small watching brief trench Z 82550. The cut of this pit had a very smooth edge and near vertical sides, and a base which sloped steeply at about 45˚. It was not possible to excavate fully since it was partly outside the excavation area. The pit was 0,9 m in diameter and may have been a cess pit due to its very sticky and organic-feeling dark fill. However it was not particularly smelly, and did contain a fair amount of animal bones, so it could also have served as a domestic waste pit. The fill was however very clean, with very few finds apart from animal bones, fish bones and one sherd of Baltic Ware/Early Greyware. It is dated to the early medieval period, both because of the one Baltic Ware find, but also, same as for the rest of the remains in this area, because this area most likely was covered over during the high or certainly late medieval period by the city rampart (see discussion for Phase 2).

In the middle part of Area 1 there was a cluster of pits, where some were cutting one another. Groups 61 and 63 were early medieval, and possibly contemporary (see Figure 22 a and b). Both are cut by the later medieval pits Group 60 and later Group 66. Group 61 was a partially preserved pit, and from what is left (about half) is seems to have been a very large, sub circular pit with a diameter of 2,1 m and a depth of 1,2 m. The sides were irregular and the base was flat. The pit contained nine fills, some very rich in finds. The deposits show that it has been left open at times with several backfill phases. This is also supported by the dating of the finds in the different fills, with some Late Greyware at the top, and further down Early Greyware and Baltic Ware. Also a 14C-date from a cattle bone from the lowest fill gave a date range of cal. AD 1020 – 1170 (2 Sigma , LuS 11059; App. 37), likely AD 1046-1142 (cal. 2 Sigma by Calpal Online). An assessment of usage period can be set to early to mid-12th century, with the latest backfills in the early 13th century. It has probably originally been as storage pit and secondarily been used as refuse pit. Among the noteworthy finds are two comb fragments and one semi-manufacture (from the same fill; SD 16302; one is shown in Figure 24), one comb case (Figure 25), bone stylus, bone skate, flint flakes, iron nail, iron slag (in the lower fills), whetstone, slag (Cu rich slag), Cu Alloy barrel padlock (see Figure 23) and lots of animal bones. Parts of roe and red deer antler bones indicate refuse from a bone workshop, also indicated by the four comb fragments in the fills. The diverse and rich finds contents should be seen as an indication of the type of household and activities present in the immediate area.

Figure 22a and b. Pit Groups 61 pre ex and post ex. On the pre-ex photo, the cut for younger pit Group 60 is seen excavated, and contemporary, smaller pit Group 63 is seen to the left. Post-ex photo shows all three pits excavated. Seen from southwest.

Figure 23 and 24 Finds from pit Group 61. Cu Alloy padlock FO201314 from SD 14960. Photo: National Museum. Comb fragment FO212595 from SD 16302.

Figure 25 Comb case fragment FO200722 from SD16129 in Pit Group 61.

Approximately 1 m west of Group 61, pit Group 63 was encountered. This was a rather small pit, heavily truncated both by later pits and by modern cuts. The cut of the pit was sub-circular, and had almost vertical sides. The pit as it survived measured 0,75 m x 0,45 m with a depth of 1 m. Six separate fills were identified, and comprised of quite mixed deposits, suggestive of a mixture of silting up of the pit and dumping of waste at times. The character of the fills indicates it was contemporary with pit 61 close by. Finds material included Early Greyware, iron slag, possible furnace lining, a corroded copper fragment and animal bones (cattle, sheep/goat, pig, cat and goose). Given its heavily truncated condition, and mixed finds material, its function is uncertain, but was likely to have been a storage or waste pit. Inclusions and finds could be seen as reflecting activities nearby, for instance production activity like metal working. The pit would, based on the probable full extent, have been cutting the older pit Group 104.

Close to pit 63 there was yet another truncated pit, Group 99. What looked like a quarter of a circular pit was preserved at the eastern edge of the area, truncated by modern services. It was preserved with a size in plan of 0,7 x 0,6 m and with a depth of 0,17 m with sloping sides. It contained one fill, suggesting rapid backfilling connected to the pit's original usage. Only a few animal bones were retrieved from the fill. The function might have been as storage originally. Since the pit was situated in an area with early medieval features a similar dating is likely also for this pit. A similar pit, Group 55, was excavated about 5 m to the northwest of pit 99 in Area 1, also at the edge of the area and heavily truncated by modern services. It seemed to have been circular in shape originally, but about a quarter was preserved; 0,55 x 0,36 m in plan and only 0,15 m in depth. It had steep sides and sloping base (towards the original centre of the pit?). Only one fill remained, mottled in character and containing finds of animal bones, slag and bricks or daub. Finds suggest an occupation environment, and the inclusions of slag which were in the backfills of almost every pit in this area also indicate that iron working at a larger scale was undertaken. Stratigraphy puts this pit below the youngest building, Group 462, which gives a dating suggestion of mid-to late 12th century.

Another pit, Group 70, was situated about 1,5 m south of pit 55. It was a large pit (1,55 x 0,85 x 0,85 m) with six fills, mostly backfills with household refuse. Finds consisted of Early Redware, CBM (ceramic building material), Baltic Ware, iron fittings, animal bones, fish bones, nail, slag and a possible stove tile. In the lowest fill there were only animal bones. It was according to stratigraphy younger than the postholes related to building 302. The finds collected from the backfills would also suggest a quite late Phase 1 date for the pit. However, an 14C-date of a barley seed from the second lowest fill produced an early date range, cal. AD 1010-1190 (2 Sigma, LuS 10656; App. 37), likely AD 1036-1140 (cal. 2 Sigma by Calpal Online). This suggests that either the barley seed was from cultural horizons earlier than the backfilling of the pit or that it filled over a long period of time – up to 50 years. A situation like that could indicate that this pit has been an indoor storage pit. It is possible that the pit was within a phase of the use of building 302, even if one of the postholes (Subgroup 83) is truncated by the cut for the pit.

About 16 m southeast of Area 1, one pit, Group 148, was excavated in a linear watching brief trench (ZT3465). It was a partially preserved cut feature, likely circular or sub circular in its whole extent. The dimensions preserved were 0,86 x 0,8 x 0,85 m, although it was not fully excavated and depth was obtained by probing. One fill was recorded, clayey and of uniform character. One sherd of Baltic Ware and one sherd of Early Greyware were collected from the fill, as well as a few fragments of animal bones. The feature is interpreted as a pit, but it could also have been a well. Based on the pottery finds and other similar features in the immediate area, the pit is dated to 12th century.

Leveling layers, activity layers and other surfaces

A number of deposits interpreted as leveling layers, activity layers, open area surfaces, and old ground level was identified on different stratigraphical levels within phase 1. Some of them are of vital importance since they mark re-organisations of activities in the area, and making a finer chronology of the activities easier to obtain. Secondly, together with the many pits, wells and buildings intercutting one another, they indicate that this was an area with some restrictions of space, making it necessary to fit houses and other structures within a limited area.

The oldest of the surfaces was Group 239, consisting of more than 20 deposits throughout the whole excavation area which represent the naturally formed palaeo-soil, or the original topsoil which were the ground level at the site at the start of the first activity phase. These deposits were the ones closest to the

till, and truncated by all cuts in the area. As 'original' topsoil, the Group has no age as such, but presumed to be the ground surface when the area first was taken into real use in the early medieval period. The original topsoil can generally be seen to give indications to the degree of intensity of usage in the first period of settlement. Across the site of Rådhuspladsen, the degree of human influence in the original topsoil differs quite a lot, which gives clues to the different functions, organisation and development of activities in the area. The deposits representing the original topsoil were found in large parts of Area 1, the northern part of Area 2A, the eastern parts of Area 3 and 4 and also in parts of the burial area in the very northwest corner of the excavation area (see plan).

The depth of the deposits vary between 0,05 and 0,3 m. The shallow depth suggests the deposits have been truncated by landscaping events, probably already in the medieval period when the area became more intensely used. In Areas 1, 3 and 4 the topsoil shows very few signs of human activity, although charcoal inclusions and some flint fragments, animal bones and a Cu Alloy clasp (FO 202678) were found. The soil was mainly built up of silty sand, which indicates the area was dry, and not as previously been said about the area, marshy and waterlogged. The deposit had the character of organic soil with traces of roots and worms, like a field or cultivated soil. In the northwestern corner of the excavation area, the original topsoil deposits were of a different character. They functioned as cemetery soil, with numerous graves cutting into them. They also seemed to extend outside the excavation area towards the east, west and north. In the south it was completely destroyed by modern trenches. The deposits consisted of clayey material and were mottled, with sometimes considerable inclusions of charcoal, showing human activity contemporary or prior to the use of the area as a cemetery. Towards the north there were however indications of the layers being more uniform, suggesting this part was maybe more undisturbed by human activity. The concentration of charcoal towards the south is worth noting. Maybe the ditch filled with burnt clay and containing Baltic Ware (Group 20) which is interpreted as the southern border of the cemetery should be seen in this context. Analysis of the clay from the ditch shows it has been fired in high temperatures (more than 1200^{o}) and also contains fragments of iron slag (Brorsson 2015, see App. 6). These circumstances could suggest there has been a workshop close by, involved in iron production. One find of Early Redware comes from an upper fill which might not belong to this Group (SD 10433). Otherwise animal bones and one rope fragment made of animal fibers were the only finds.

In Areas 1 and 3, covering the old topsoil and the oldest building structure (Group 464), a metalled deposit, Group 79, was found. It was preserved in a 15 x 10 m large area, but it was truncated at all sides, so the full extent of the deposit is not known. It is interpreted as an outdoor surface, consisting of small stones, about 5 cm in diameter, with inclusions of slag and large animal bones. The depth of the deposit was only c. 0,12 m. In the middle part of the deposit and in the far north two wheel ruts where recorded, running in slightly different directions (see Figure 26), but seemingly into the town area. The deposit seemed to have been created as one action, since different phases and layers could not be identified.

Figure 26 The metalled surface Group 79 with wheel ruts and related ditch Group 293, seen together with reconstructed image of road Group 76 and wheel ruts.

One possible interpretation of the feature would be as a road, but several circumstances speak against that. Some stones were a little loose, which suggests that at least not the entire surface had been heavily trafficked. The preserved extent of the surface follows the modern Vester Voldgade, but it is more likely that the later use of the area as rampart and then as a street had preserved this particular part of the stony feature. 10 m would also be too wide for an early medieval road. It is also obvious that the feature was continuing at least towards the northeast. Lastly, the direction of the preserved wheel ruts give indications of directions for traveling, and they don't match an imagined road going southwest-northeast (figure 26). Possible interpretations would be as an open area of some kind - maybe a yard or an area where people traveling into Copenhagen, sometimes with carts went past (hence the wheel ruts). It could have been some kind of informal marketplace, or an area of reloading goods going in and out of town. There are many possibilities, and further contextual studies in the stratigraphy and relationships to other features as well as specialist analyses of samples and finds must be made to reach a better understanding of the role of this feature. But the fact that a large deposit of this kind, constructed as one action, exists in the first place is indicative of a certain level of organization of the area at this time. Possible contemporary features were the building Group 94, in the southern part of the surface, structural element Group 108, and possibly Group 293, a ditch also south of the area, which could have functioned as drainage and/or a border ditch to both Group 76 and 79 (see below).

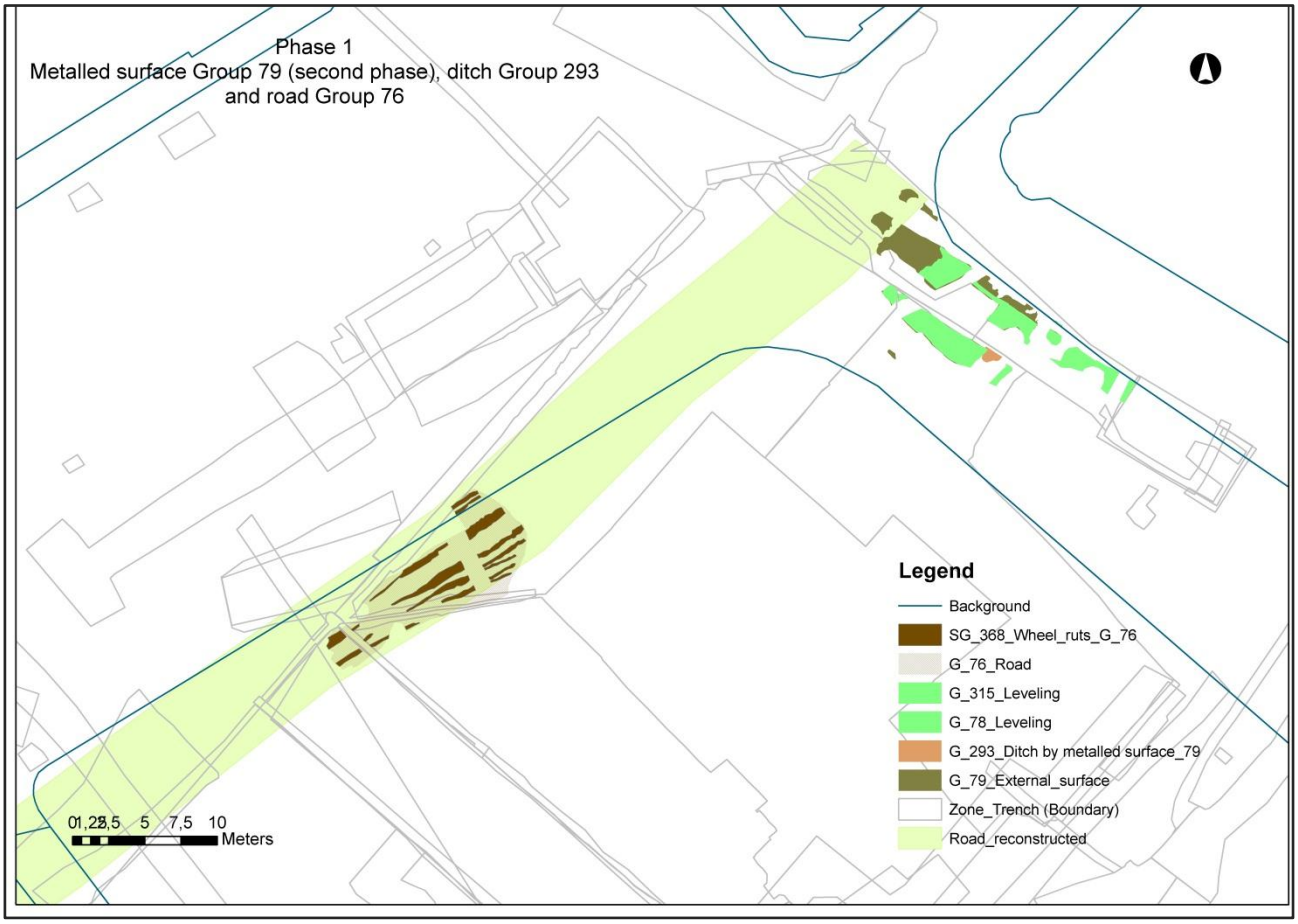

Figure 27 Second phase of usage for Group 79, seen together with reconstructed image of road Group 79 and wheel ruts.

The usage of Group 79 can be divided into two sub-phases (Figure 26 and 27). It is clear that the northern part of the metalled surface was in use longer than the rest, which at one point was covered by leveling layer Groups 78 and 315) while the northern part seems to have continued as a proper road going southwest-northeast, possibly functioning together with Group 76, the road in Areas 2A, 2B and 3 (see presentation of the central area). In addition to the southern part of Group 79 being covered at one point, the inclusions of bones and other household refuse were far more common in the northern part, suggesting a different, perhaps longer usage life for this part. Many types of finds, all of metal or stone, were recovered from the deposit, for example whetstones, one wooden shoe last, one Cu Alloy lock, slag, a flint blade and - flakes, iron mount, iron nails, Cu Alloy fragments and animal bones. The stratigraphic relationships, with this surface being among the oldest features in the area, suggest the first part of the early medieval period. One 14C date from an animal bone resulted in a date range of cal. AD 1025 - 1205 (2 Sigma LuS 11067, App. 37), likely AD 1053-1155 (cal. 2 sigma by Cal Pal Online). A likely usage phase from the late 11th century to mid 12th century is likely for the metalled surface.

South of the surface Group 79 and the building Group 94, there was a ditch, Group 293, which probably was contemporary with these features. It was interpreted as a drainage and/or border ditch, on the basis of its placement and attributes. The feature was situated in Area 3, aligned from southwest to northeast and was truncated in southwest. It seemed to continue towards northeast but was not seen in Area 1. Perhaps

it had been truncated by younger cuts, such as pit Group 70 which was placed next to Group 293. The ditch was 1,4 m wide and preserved in two fragments, with a combined length of 1,85 m and a depth of 0,5 meter. The shape of the cut suggests a function as a ditch, and stratigraphy and placement indicate a connection to the surface Group 79. Maybe it was a border ditch, a drain or both? There were no dateable finds, only some animal bones and a bone tool.

Covering parts of the metalled surface, the ditch, building 94 and the oldest pits were a number of leveling deposits, Grouped as Group 78 in Area 1 and Group 315 in Area 3. These groups consisted of leveling-like or accumulated layers, which possibly had different functions originally. Some deposits were mottled, some were uniform in character, with different strata of clay and sand. There were inclusions of stones, pebbles, charcoal, slag, bone and flint. They covered together an area of c. 17 x 5 m, and were truncated in all directions except toward northwest, where they ended, in a way suggesting that they may partly be contemporary with later phases of Group 79, the metalled surface. It was then probably contemporary with the later usage phase of the surface, when it seems to have functioned as a road. Groups 315 and 78 would then represent the area beside the road, and parts of it may have been in use for quite some time. Even if the character of deposits differ, in the context of this group they are seen as important because they were separating different sub phases of activity. The group of deposits marks a quite clear change in the usage of the area. Before, there were extensive remains of a few buildings, pits and the metalled surface. With this group comes a period with intense usage in the shape of more substantial buildings, and a large number of intercutting pits. It seems like a general intensification of activities followed with these leveling layers as base. Due to the many events which seem to have occurred in relation to these deposits, the stratigraphical relationships are sometimes a bit unsure. The main goal in grouping them has been to find their place in relation to important structures like buildings, the metalled surface and pits. One substantial layer (SD16977) is clearly situated on top of the metalled surface Group 79, and may be interpreted as a usage phase, together with the later disuse of the surface. Total preserved length of the deposit (it was truncated in the middle by modern service) was c. 16 m, with a width up to 2,7 m, although truncated at the sides. Finds from this deposit included Baltic Ware, a bone skate, an iron key, slag, CBM and many animal bones, and notably a large amount of jaw bones (possible from pig?). The finds indicate both occupation and production activities in the area at the time of the disuse of the metalled surface. Dating of this group can on grounds of stratigraphy be set to early to mid-12th century.

Contemporary with some of the pits cut into Group 78 was activity layer Group 107. It was a clay deposit surrounding some of the big pits in the southern part of phase 1. It appears to have been at least partially contemporary with pit Group 61, with some of its contents sliding into the side of the pit in its usage phase. The deposit is interpreted as an activity layer connected to the pits - and has perhaps functioned as a surface for moving about in the area. If the pits were placed indoors the deposit could represent a clay floor, otherwise maybe an outdoors surface under a simple roof. The deposit contained no datable finds but can, due to its relation to pit Group 61, be dated to mid-12th century.

Subgroup 270, Dump/levelling layers was made up of highly truncated deposits which consisted of seemingly dumped material, two of which (SD 51444 & SD 51526) could be from industrial waste. Interpretation of these deposits is difficult because of heavy truncation. They may be levelling layers associated with a construction stage of a building or simply dump deposits. Textile fragments in SD 51444 are some of very few medieval textiles from the excavation and could perhaps be indicative of the function

of building Group 302. The subgroup should be seen together with Subgroup 291 as leveling in between building phases Group 302 and 462. Very little datable material was recovered from this group. Based on stratigraphy a date of early 13th century is estimated. Subgroup 291 consisted of two dump layers composed of industrial waste material (contains frequent slag and charcoal inclusions). It can be interpreted as a dumping event associated with structural Group 302. As a leveling layer it indicates modifications and changes to the structure in this area, making place for the next building phase, Group 462. The material may be related to activities associated with Group 302. The firing residue interpreted as a kiln (Group 271) associated with building phase Group 302 could perhaps be seen in relation to this dump layer. SD 51830 contained a single piece of Baltic Ware pottery. This one find in combination with stratigraphy places this group in the late 12th – early 13th century.

In the southern part of Area 1 there was another leveling layer, Group 461, which is interpreted as post dating Group 302. As the two subgroups from Area 3, the deposits were probably dumps from activities related to the building phase Group 302, and were later used as leveling for a new sub phase of activity. This group contained a few sherds of Baltic Ware, slag, iron tools, nails, flint flake and animal bones.

The central parts of Rådhuspladsen – Areas 2A, 2B and 4

In Areas 2A and 2B there were quite large parts which had been fully exploited during the 20th century and thus leaving parts of those areas completely devoid of archaeological remains. Also, the late medieval fortifications had totally or partly destroyed any potentially earlier archaeological remains in other parts of Areas 2A and 2B. In the undisturbed parts of these areas were, however, numerous early medieval features preserved, resulting in “islands” or “pockets” of archaeological remains. These islands did show that at least some, if not all, of the area which today is the central part of Rådhuspladsen, was a busy place during the early medieval period, probably with both dwellings and workshops present. The same pattern of activity was seen continued into the high medieval period.

There were roughly two locations within Areas 2A, 2B and the southwest part of Area 4 which had surviving archaeological remains from this early period. In the middle of Areas 2A and 2B quite a large number of pits and wells were documented (Table 10 and Figure 28), together with one fragment of activity surface. The features were partly intercutting each other, indicating intensive activity and several usage phases. Due to the high degree of intercutting it is difficult to identify a spatial structure to the features, but in some cases it can perhaps be seen.

Approximately 15 m north of this area the remains of a southwest-northeast aligned road leading into the central parts of town were documented, together with one or more built structures, likely to have been a building placed along the road, three pits and fragments of a leveling layer and the original topsoil. The road (Group 76) has a broad dating range and has probably been in use for most of the medieval time period (see also Phase 2).

Pits and wells

Group	Name	Area	Basic interpretation	Suggested date
132	Well	Area2A	Well	Mid-12th c
134	Well	Area2A	Well	Late 11th-early 12th c
143	Deep pit w kiln remains	Area2A	Pit	12th c.
144	Deep pit with red deposits	Area2A	Pit	Late 11th-early 12th c
146	Pit?	Area2A	Pit	Late 12th-13th c.
147	Pit	Area2A	Pit	Late 12th-13th c.
157	Pit	Area 2B	Pit	12th c.
158	Heavily truncated pit	Area2A	Pit	12th c.
159	Pit	Area2A	Pit	12th c.
166	Pit	Area2A	Pit	Late 11th-early 12th c
167	Pit	Area2A	Pit	Late 11th-early 12th c
169	Pit	Area2A	Pit	12th c.
170	Truncated pit	Area 2B	Pit	Late 11th-early 12th c
172	Possible pit	Area2A	Pit	Mid-12th c.
173	Pit, heavily truncated	Area2B	Pit	Late 11th-early 12th c
174	Clay lined pit	Area2B	Pit	Mid-12th-13th c.
175	Pit	Area2B	Pit	Late 11th-early 12th c
176	Pit with clay lining	Area2B	Pit	Late 11th-early 12th c
145/178	Pit in 2Ab	Area2B	Pit	12th c.
183	Fish waste pit	Area2B	Pit	Mid-12th-13th c.
193	Pit	Area2B	Pit	Late 11th-early 12th c
194	Well	Area2B	Well	Mid-12th c
389	Well	Area4	Well	Early Medieval

Table 10 All pits and wells in Areas 2A, 2B and 4.

There were mainly two clusters of pits and wells which were intercutting each other. Next to the clusters there were a few singular pits and wells from the same time period. Based on stratigraphic relationships, AMS-dates and pottery types, suggestions of relative sub-phasing will be made in the presentation of these features.

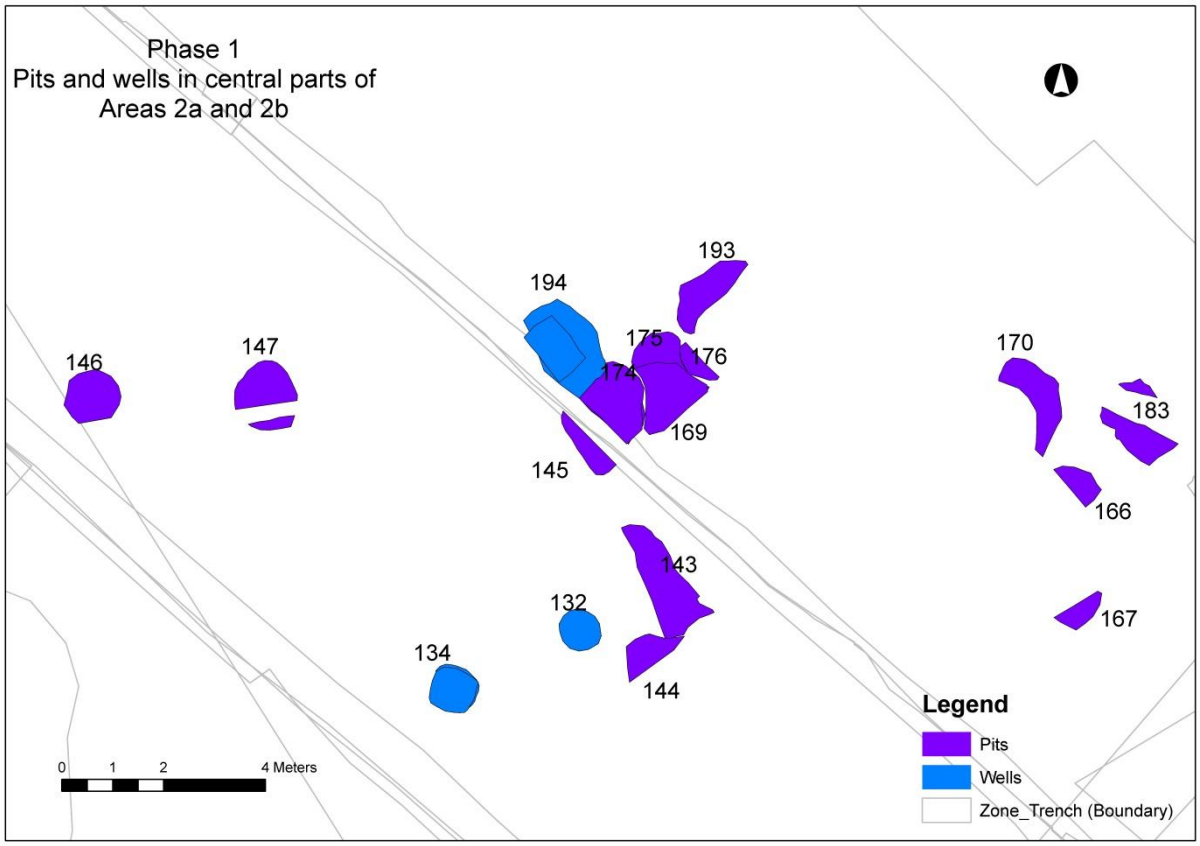

Figure 28 Central parts of areas 2A and 2B showing all Phase 1 pits and wells with Group id.

Belonging to the earliest sub-phase were pit Groups 173 and 175, placed next to each other in Area 2B. Only a small slice of pit Group 173 was preserved, since it had been truncated by several younger features. Dimensions of the preserved pit were 0,84 x 0,29 m, with a depth of 0,39 m. It is possible that the pit had been deeper originally. Six fills were registered. One sherd of Early Greyware was found. Pit Group 175 was the oldest of several pits in a sequence, and it had been truncated on all sides. Its preserved dimensions were 1 x 1,5 m with a depth of 0,23 m. It contained three fills, with some large slag lumps, suggesting iron working in the area. Other finds were animal bones and a nail. The pit has been dated to the early medieval period based on stratigraphy and proximity to other similar early medieval features. Next to pit Group 175 a part of another pit, Group 193 was documented. Perhaps they were not in use at the same time since they were placed so close together, but both show evidence of being among the oldest features in the area. The part of the pit which had survived was 1,9 x 1,07 m in plan and 1,5 m deep. It was likely to have been circular, and the sides were vertical with a flat base. It was not preserved from its original cut level, so the true depth remains unknown. The pit contained five fills, and AMS dating from a sedge seed in one of the fills resulted in a dating span of cal. AD 985 – 1165 (2 Sigma LuS 10669, App. 37), likely AD 1015-1125 (cal. 2 Sigma by Calpal Online). Together with dateable finds of Baltic Ware and Early Greyware, this puts the pit firmly in the early medieval period. Finds were, except for the pottery mentioned, daub, flint flakes and animal bones. The osteological analysis showed the material to be of household waste character, except for two cow horn cores, which had been sawn off. They could indicate a workshop close by. The feature is interpreted as a storage pit, due to its regular shape and lack of residue in the bottom, which suggests that

the pit has been kept clean. An alternative could be a cistern used for water in connection with household or craft activities.

5 m towards the south and southwest, one more pit, Group 144 and a well, Group 134, are interpreted as belonging to the first sub-phase. Pit Group 144 was partially preserved but very deep. It was older than pit Group 143 which was cutting the northern edge of Group 144 (Figure 28 and 29). The feature was also heavily cut by the later cut for the gate building and an air raid shelter. The pit seems to have been sub-circular with a diameter of 1,4 m and a surviving depth of 2,5 m. Modern water level was reached while excavating. The pit contained 12 fills, of which some were seen as sliding down one of the sides, which could suggest tipping instead of throwing in the material. Throughout the pit (upper half) there were reoccurring fills of reddish fine material which seemed heat affected. Samples of the material have not been analysed within the scope of this project. Some fills contained a large quantity of charcoal. The pit contained quite a lot of finds – for instance a large amount of fish bones, as well as other domestic animal bones. Other finds were Early Greyware, Baltic Ware, slag, furnace-waste, Cu alloy objects, a whetstone and a bone awl/needle.

The feature can be interpreted as a large domestic refuse pit, maybe initially serving as a well. Finds strongly suggest metal working in the area. The characteristic reddish fills could however represent some specific function for the pit or at least in the nearby area, given this phenomenon is not seen in other pits at the site. Based on finds and stratigraphy the pit is dated to the early medieval period, probably the 12th century. About 3 m to the west, the well Group 134 was situated. The feature was exposed when the post-medieval outer gate foundation was removed. The well was circular at the surface, but squarer with rounded edges further down. It had a diameter of c. 1 m, and a depth of more than 1,3 m. It is likely that the well originally had been deeper, but that the upper parts had been destroyed in relation to the later construction of the outer gate. Three deposits were documented, the bottom one was probably contemporary with the use of the well, the others were backfills. The upper backfill contained iron working residue, pointing to such activities taking place at the time of the well being taken out of use. No datable finds material was found. Mainly on the basis of spatial relationships to other pits and a well which is believed to be later, Group 134 is interpreted as belonging to the oldest phase in this area.