

KØBENHAVNS MUSEUM MUSEUM OF COPENHAGEN / ARCHAEOLOGICAL REPORT

Gammel Strand

Metro Cityring Project

KBM 3828, Strand Kvarter, Københavns Sogn

Sokkelund Herred, Københavns Amt

Slots- og Kulturstyrelsen j.nr.: 2010-7.24.02/KBM-0013



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Cover picture: The Gammel Strand excavation, Main Excavation trench looking east.

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Abstract

This excavation report features the archaeological work undertaken at Gammel Strand, Copenhagen (KBM 3828) by the Museum of Copenhagen from 2012-2014 and a reassessment of the material from the 2010 watching brief. This work was conducted in association with the Metro Company prior to the construction of the new Metro station at Gammel Strand, one of 17, as part of the Metro Cityring project. Following on from the 2010 watching brief, the archaeological work comprised a series of watching briefs in 2012, an excavation for the Guide Wall of the new station box in 2012 and 2013, and a set of more watching briefs for a new re-infiltration system in 2013. The Main Excavation occurred in January 2014 for 6 months with a mixture of excavation and watching briefs for 3 months afterwards in the vicinity.

Prior to the Metro Cityring project, a series of small excavations in the area over the last 100 years revealed various fragments of buildings and posts and bulwarks suggesting that earlier harbours were preserved beneath the modern surfaces. Photo documentation of Gammel Strand using the daguerreotype form in the 1840s also portrayed the former harbour administrative buildings of the Gammel Strand harbourside with the *Vejerhus* (Weighing house) and *Pramlaugets hus* (Bargemen's Guild House), so their foundations were known in the excavation vicinity. A combination of the photographic record and the physical archaeological structural remains, combined with historic records and cartographic evidence of the area, suggested that the preservation of Renaissance archaeology and later archaeology was expected and that earlier Medieval archaeology was presumed.

The first excavation phase of the Gammel Strand Metro Cityring project from 2010 has already been covered in Olesen & Bork-Pedersen (2012) revealing the presence of Late Medieval bulwarks, a Late Medieval building and the Renaissance *Vejerhus*, amongst other Medieval and Post-Medieval finds and structures. This report will reassess various structures and place them within the overall phasing system of Gammel Strand. The archaeology undertaken between 2012 and 2014 was a mixture of full excavation, with the Guide Wall Excavation 2012 and Main Excavation 2014, and archaeological watching briefs, comprising various small trenches in 2012 and Re-infiltration trenches in 2013. The style of excavation was linked to the potential of various areas perceived in the 2009 Metro Cityring ring strategy report. All archaeological work was undertaken using the single context system and measured with total stations and documented in the IntraSiS database. The watching briefs were contractor led, but there was still opportunity to excavate and document if archaeology was uncovered.

The excavations revealed the expected archaeological remains such as harbour bulwarks, the *Vejerhus*, the Bargemen's Guild House and other administration buildings along with a large collection of archaeological artefacts showing evidence of trade, production, wealth, religion and thus consumption and networking. The single context recording method used on these excavations, in conjunction with the large quantity of dendrochronological dating of the wooden harboursides, enabled the opportunity of building a site chronology, and the creation of various site phases. Extra provenance work on various stone fragments from the harbour walls and from the various timber types also provided knowledge of where each constituent from the site structures was imported from.

The sheer number of harbour structures, and harbour phases from the 1400s to the modern day along with an unbroken finds register from land reclamation starting from the 1300s has enabled the archaeologists to uncover the story of how the area, Ved Stranden, by the beach, later called Gammel Strand, the old beach, was created and a view to how the harbour area was urbanized to first become the centre of the harbour in Copenhagen in the 1400s, and by the early 1600s, arguably the most important harbourside in Scandinavia as the centre of the harbour of the capital of Denmark. The results from the excavations from Gammel Strand are therefore of international importance, when compared to the other important harbour cities within the Late Medieval and Renaissance periods in Europe, as the harbour transforms from a small harbour to a regional harbour and finally an important international harbour. Within the report are the archaeological results, historical documentation and a national and international selection of finds and natural science reports discussing the evidence from the excavations.

Archaeological periods:

Medieval, Late Medieval, Renaissance, Post-medieval, Late Post-medieval, 20th Century

Feature types:

Harboursides, buildings, roads, bulwarks, posts, land reclamation deposits, levelling deposits, backfills, dumps, foundations, postholes, timber structures, demolition, wooden water pipes, and land ties.

Key words:

Harbours, trade, glass, ceramics, land reclamation, urbanisation, consumption, Late Medieval, Renaissance, administration buildings, Late Medieval Copenhagen, Renaissance Copenhagen, globalisation, urban waste, harbour construction, Fredrik II, Christian IV.

Chapter 1: Introduction

The excavation at Gammel Strand was undertaken as part of the new Metro Cityring project which will provide a new transportation system in the city centre to the surrounding areas of the city. Where new Metro Stations are to be constructed over archaeologically sensitive remains, archaeological excavations will be undertaken. The Museum of Copenhagen (KBM) is to conduct the archaeological work of the project.



Fig. 1 Plan of the proposed new Metro Cityring. Map by Metroselskabet

The excavation was planned to be undertaken over a period of either 4 or 5 years. The watching brief for realignment and changing of the service pipes would start in 2010 and continue into 2011. It was proposed that excavation for the Guide Wall/station box would start in 2012, ending in 2013. The Main Excavation experienced many delays and eventually started in January 2014, ending in August 2014 with only minor pieces of fieldwork occurring afterwards.

1.1. The location

Gammel Strand is located at the centre of the inner city of modern Copenhagen, bounded by the canal and *Slotsholmen* (Castle Island) to the south, *Højbro Plads* (High Bridge place) to the east, the *Kulturministeriet* (Culture Ministry) to the west and the most recent (1700s) Gammel Strand housing to the north. The area was created by land reclamation from the 1200s with the former beach and Medieval coastline under several metres of landfill. Today it is a modern tourist hub with cultural and governmental centres, restaurants, bars and private and public housing, with Christiansborg Palace on the opposite coastline.



Fig. 2 Location of Gammel Strand

By the Late Medieval period (1400-1536) the area was created and then transformed into the centre of the main harbour of the city with public tax buildings, private housing and moorage for the docking boats. The shape and style of the harbourside changed, at least six times from the 1400s-1800s, showing that the area has always been undergoing redevelopment. The name of the site has also changed from *Ved Stranden* (by the beach or shore) to its most recent incarnation of *Gammel Strand* (old beach) by the mid 1700s.

The use of the area as a harbourside had greatly decreased in the 1700s and a change in the tax laws by the mid 1800s made the administrative tax buildings obsolete. These buildings were then demolished and for approximately 80 years the area became a very popular fish market, and popular for tourism, which continued after the market was closed down in the mid 20th Century.

Gammel Strand has always been a hub for international visitors from its conception as a boundary zone with the world via the sea. It has also been a transport hub and the new Cityring station and the remodelling of the harbourside is the continuation of a process that has characterized the area for the last 800 years.

1.2. The excavation

The excavation project was undertaken at the location of the new Metro Station and the surrounding areas. Firstly the service trenches within the excavation area had to be re-routed and joined to a new system surrounding the area. This led to many watching brief trenches being observed and excavated in 2010, following the schedule of the NCC Construction Company (See Gammel Strand watching brief report, Olesen & Bork-Pedersen 2012). Once the area surrounding Gammel Strand was facilitated with power and water, the footprint/construction box Guide Wall was excavated so that a cofferdam/station box could be created for the Main Excavation and station box. This construction work was undertaken with CMT Construction Company, who was also involved with building the cofferdam into the canal and providing a building platform to be placed over the canal. Due to health and safety the Guide Wall could only be excavated to a depth of two metres from the modern surface, so excavation ceased at the discovery of the Renaissance harbour wall and the Late Medieval wooden bulwarks which were exposed at various levels. Included in the report are several trenches excavated in 2013 that are related to the regulation and re-infiltration of the water system for the harbour area.

The Main Excavation began in January 2014 after CMT completed the cofferdam and the surrounding area platform. A tent measuring 80 m long by 20 m wide and 9 m high from the ground surface was erected over the site, underneath which the project took place with the assistance of Slagelse Erhvervsservice, who undertook all of the mechanical excavation and removal of soil.

The Stairway trench on the eastern side of the station box measured 7 m by 9 m, and was open to the elements. Due to protecting the water level, the water levels were regulated within the station box and outside of the main station box. The excavation was undertaken by a mixture hand digging and use of a mini digger. The Main Excavation method was by single context with sections/profiles sometimes being used to assist with further understanding; measuring and surveying was undertaken using total stations and the IntraSiS database system for storage and recording of data. The main report was written using national and international finds and natural science specialists from autumn 2014 to autumn 2016.

1.2.1. Areas of cultural historical potential

The Gammel Strand project features three archaeological area types. These area types have been decided by factors such as the archaeological potential, the methodology and the complexity of the archaeology.

- 1) **Areas of major potential:** Archaeological excavation using the full methodology, sampling etc. The station box (Main Excavation trench), the Stairway trench as well as the majority of the Guide Wall trench (though to a prescribed depth). These areas within the Main Excavation trenches are

expected to yield sensitive and very complex archaeology and contain thick occupation and structural deposits. Since they are situated within the Main Excavation trench they will be fully excavated. They are hereafter referred to as *type 1* areas. Each of these complex areas will be fully excavated down to geological layers. This methodology will be used in the Guide Wall trench, but excavation will cease at 2 m below the surface.

- 2) **Areas of major potential but with limited documentation possibilities:** Areas where significant archaeological deposits and complex stratigraphy is expected, but the excavations will be conducted under watching brief conditions, and therefore limited recording can be achieved. Areas include locations south of the standing buildings on Gammel Strand, north of the station box, excavated as watching briefs and the southern parts of the Guide Wall trench. Areas also surrounding the site as part of the Re-infiltration trench project are also included in this area type.
- 3) **Areas with moderate potential:** The canal area. In these areas, the archaeological deposits are estimated as being to a large extent disturbed or destroyed, and/or being of a less complex type which is faster to investigate. They will be excavated as part of the Main Excavation in 2014.

1.3. Excavation Report

This excavation report conforms to specific Slots-og- Kulturstyrelsen (SLKS) 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.

1.3.1. Report Contributions

Report Management and Production:	Stuart Whatley and Camilla Haarby Hansen
Final Report Compilation:	Stuart Whatley
Figure Production:	Camilla Haarby Hansen, Per Jansson, Stuart Whatley, John Howorth
Final Report Editing:	Stuart Whatley, Camilla Haarby Hansen & John Howorth
Report writers	Stuart Whatley, Camilla Haarby Hansen & Rachel C Morgan
Contextual Grouping and Matrix:	Rachel Morgan
Photographs:	Museum of Copenhagen, unless stated

1.4 Glossary of selected terms

CBM: Ceramic building material (brick, tile)

AMS: Accelerator 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/Sub-group: Combinations of related contexts (deposits, cuts, structures)

FU: Finds Unit

FO: Finds Object

OD: Ordnance Datum

GLS: Gammel Strand

KGN: Kongens Nytorv

RHP: Rådhuspladsen

Chapter 2: Administrative data

Within this chapter will be the information on how the excavation was organised and undertaken. It includes information of timeframe of the projects, staff, project organisation, external and internal specialists of finds and natural sciences and the on-site facilities.

2.1. Timeframe of project

Included below are the start dates of each different phase of the project. The size of the projects varied, and so thus did the number of archaeologists. Generally, the watching briefs comprised between 1-5 people, depending on the amount of archaeology discovered. The Guide Wall excavation comprised between 5-15 people and the Main Excavation from 23-36 people.

Archaeological fieldwork	Area in m ²	Date starting	Date ending
Watching briefs 2010	1669.17	26 th February 2010	September 27 th 2010
Watching briefs 2012	16.00	2 nd May 2012	3 rd May 2012
Guide Wall excavation 2012-13	570.09	5 th May 2012	30 th May 2013
Oil Container trench 2012	29.38	20 th November 2012	22 nd November 2012
Re-infiltration trenches 2012-2013	37.92	11 th December 2012	19 th April 2013
Main Excavation 2014	1458.39 m ² full area. Full excavation area: 729.74 m ² . Watching brief area: 728.65 m ² .	22 nd January 2014	31 st August 2014

Table 1 Archaeological fieldwork phases, areas and durations

2.2. The Gammel Strand staffing and Project Organisation

2.2.1. The Gammel Strand excavation team

The amount of project staff and constituents of the excavation team depended on the type of project. Overall, the site was managed by Excavation Leader and Museums Curator Stuart Whatley 2012-2016 and assisted by the field leaders Rikke Simonsen 2012 & 2014, Camilla Haarby Hansen 2014-2016 and Gareth Dickinson 2014. They were supported by Finds-responsible archaeologists Jens Winter Johansen in 2012 and Mie Pedersen and Claes Hadevik in 2014. Total station and surveying responsibility was undertaken by Per Jansson in 2012-2014. Rachel Morgan was Stratigraphic matrix-responsible in the years 2012, 2014, 2015 & 2016 and Health and safety by Brendan Fagan in 2012, Jason Leech in 2014, under site-responsible Stuart Whatley and Museum-responsible Erik Van Acker.

A big thanks and gratitude is given to all the archaeologists who worked on the project in difficult conditions, providing the initial interpretations of the archaeological remains and creating the foundation for this report through their documentation. After fieldwork they were also involved with undertaking post excavation work such as sieving, big bag sieving and finds processing. Thanks are also given to the University of Copenhagen and Lund University who provided students who later became members of the team.

Archaeologists taking part in the fieldwork and post excavation work over the course of the project included: Amanda Summerfield, Andreas Bonde Hansen, Ann Sølvia Jacobsen, Anthony Ruter, Bo Jensen, Brendan Fagan, Camilla Haarby Hansen, Christopher Reese, Claes Hadevik, Edgar Wróblewski, Fredric Grehn, Fredrik Wirband, Gareth Dickinson, Ilona Carlson, Ingeborg Sæhle, Jason Leech, Jens Winther Johannsen, Joss Davis, John Howorth, Kamilla Ramsøe Majland, Karina Holm Truelsen, Kasia Högström, Kirstine Ejby Møller, Krister Kam Tayanin, Karin Roug, Kristoffer Brink, Lars Haugesten, Lise Christensen, Louise Melchior Rasmussen, Magdalena Lyne, Marc Hauge, Mie Pedersen, Mikkel B. Siebken, Niels Henrik Andreasen, Per Jansson, Rachel Morgan, Rikke Melin, Rikke Simonsen, Sam Keenan, Sofie Renström, Thomas Grane, Toke Østergaard and Truls Månsson.

For knowledge of the 2010 watching brief phase please see Gammel Strand excavations 2010 (unpublished excavation report) written by Olesen & Bork-Pedersen from the Museum of Copenhagen.

2.2.2. Gammel Strand Project Management

The project was overseen by the Metro Cityring project leader, Lene Høst Madsen in 2012 and 2013, under the umbrella of the Antiquarian section of the Museum of Copenhagen, managed by Leader Søren Bak-Jensen from 2012-2014, Archaeology Co-ordinator Hanna Dahlström in 2015 and Antiquarian Leader Thomas Roland in 2015 and 2016. Finds organisation and conservation organisation was undertaken by Finds Co-ordinator Mia Toftdal. Natural science organisation was undertaken by Natural Science Co-ordinator Hoda El-Sharnouby in 2012-2014, and Camilla Haarby Hansen from 2014-2016. John Howorth also worked with natural sciences with a responsibility for organisation of staff and procedures of natural sciences at the museum. Co-ordination of the finds specialists was undertaken by Stuart Whatley.

2.2.3. Natural Science specialists

The natural science work involved co-ordination between the specialists and the archaeologists whilst the fieldwork was in process and then again in the post excavation process. For environmental remains this comprised Mette Marie Hald (National Museum of Denmark) and Håkan Ranheden (Statens Historiska Museum), Pernille Bangsgaard (2015-16) and Inge Enghoff (2012-2015) (Statens Naturhistoriske Museum) in relation to the animal and fishbone remains, Svend Visby Funder (Statens Naturhistoriske Museum) for the mollusc remains, Arne Jouttijärvi (Heimdal-archaeometry) in relation to the metallurgical material and Aoife Daly (Dendro.dk) Services in relation to the dendrochronological material. Stone provenance work was undertaken by Anthony Ruter (University of Copenhagen & Statens Naturhistoriske Museum), osteological report on human remains was made by Per Jansson and Marie Louise Schiellerup Jørkov, and conservation work was conducted by Bevaring og Naturvidenskab, National Museum of Denmark.

2.2.4. Finds specialists

A group of internal and external specialists were involved in undertaking analysis of finds and writing the report. Specialists involved in the project comprise; Georg Haggren (University of Helsinki) on glass material, Michael Märcher (National Museum of Denmark) on coins, Torbjörn Brorsson (Kontoret för Keramiska Studier) on ICP Analysis, and from the Museum of Copenhagen; Rikke Kristensen on Medieval and Post-medieval ceramics, wall tiles and stove tiles, Mia Toftdal on textile products, toys and games, security equipment, writing equipment and with Charlotte Rimstad (University of Copenhagen) on textiles and rope, Vivi Lena Andersen (leather shoes and clothing), Mie Pedersen (clay pipes), Stuart Whatley (arms and armour, horse equipment and personal finds), Claes Hadevik (household material, building material,

cutlery, knives, trade items, tools, and unidentified objects), John Howorth (Other natural science finds), Niels Henrik Andreasen (Lithic flakes) and Gareth Dickinson (ships and fishing equipment).

2.2.5. Contractors and consultants

The on-site building contractors changed over the course of the project. During the Guide Wall excavation, oil storage container excavation and Re-infiltration excavation the construction company was CMT, with the Site Engineer George Tenentes responsible for the excavation. In the Main Excavation in 2014, the contractors were Slagelse Erhvervsservice led by Claus Ludvigsen. The site contractors dealt with machining on the excavation removal; of big bag samples and large structural fragments such as harbour walls and harbour bulwarks. On the Main Excavation, Slagelse Erhvervsservice also constructed the sieving systems so big bag sieving could occur on the excavation.

2.2.6. Facilities

The facilities changed depending on the fieldwork project. Generally it comprised office spaces, canteen space, working finds area, storage spaces for tools, samples and finds and 2 changing areas. The office spaces included places for the excavation leader, field leaders, IT specialist, stratigraphic matrix and places for the archaeologists to input their work digitally, which was undertaken on a rotational process.

KBM	3828
County	Københavns Amt
District	Sokkelund Herred
City	København
Area	Strand Kvarter
Parish	Københavns Sogn
Duration of fieldwork phase	See table 2010-2014
Museum archaeologists	See list
Area (m²)	4895
Volume (m³)	5150
Coordinate system	DKTM zone3
Height system	DVR90
X-coordinates	1172831-1172876
Y-coordinates	652102 -652188
Construction work by	CMT (Copenhagen Metro Team) & Slagelse Erhvervsservice
Developer	Metroselskabet I/S (Metro company)

Table 2 Administrative data

Chapter 3: Cultural historical background and topography

In this chapter the natural and cultural topography as well as the cultural historical background are assessed with the purpose of forming the background to the excavations on Gammel Strand. For practical reasons the first part of the chapter is written by Camilla Haarby Hansen, whereas the later cultural history (after AD 1600) is co-written by Inger Wiene.

The natural topography is based on observations made during the last Century on the natural geology and sedimentation in the Copenhagen area in general and in the Gammel Strand area more specifically. These observations were usually made by amateurs in the early 20th Century, but in the late 20th Century and the early 21st Century, the former topographical observations were supplemented by numerous core tests done by professional geologists in connection with planning of large scale building projects (Stenestad 1976; Ruter 2014). However, as these core tests often were made for the purpose of assessing the deeper lying layers and their suitability for tunnelling through, they hardly ever describe in detail the upper layers relevant for the archaeological investigations.

Likewise the early cultural topography of Copenhagen in general and Gammel Strand more specifically is based on archaeological observations of which most were made in the 20th Century. Added to these observations is information gained from maps of Copenhagen of which the oldest dates back to the late 16th Century (see below).

The cultural historical background is based partly on the results of earlier archaeological observations and excavations. The chapter also uses both published material from historians dealing with the history of Copenhagen in general and from the collection of written sources made by historian and antiquarian O. Nielsen, *Københavns Diplomatarium*, which is digitized in full text and published by J. Möllerström on the web-page www.erevit.dk.

3.1. Topography, terrain and sub-soil

Located in this sub-chapter is a description of the natural topography for the area around Gammel Strand, covering landscape types, heights, soil conditions, and deposition types as well as the thickness and character of the topsoil and that of the natural sub-soil. Historical maps and depictions of Copenhagen that are relevant for the topographical and historical development of the area are assessed in a following sub-chapter and the source value discussed shortly.

3.1.1. Type of landscape, levels, soils, and deposition conditions etc.

The landscape in which the city of Copenhagen developed over time is characterised by a relatively flat area with a few scattered hills and close proximity to the sea.

During the retreat of the last Ice Age, the ice moved a little back and forwards several times. For the area around present day Copenhagen, this resulted in a number of elongated hills running approximately NE-SW

with valleys (eg. the harbour, the area where the lakes are and the area with Lersøen, Bispeengen and Damhussøen) in between (Bahnsen 1973, 1).

The Littorina transgression had a maximum impact on Copenhagen around 2500 BC, resulting in the shoreline being around 3.5 m above current sea level. Judging from the map from 1955 published by P. Bredal Christensen (Christensen 1963), it means that the coastline would have been situated some 200 m NNW of the nowadays Gammel Strand area, running parallel to but approximately 25 m on the south side of the street known as Strøget. The area where the Gammel Strand excavation was would then have been covered by water.

The Gammel Strand area – along with most of the old city of Copenhagen – is situated on Holocene marine sediments deposited during or after the maximum Littorina transgressions of the coast in the mid-Holocene (Ruter 2014, 1). Based on core tests made in and around the current excavation area, the Late Glacial moraine clay at Gammel Strand is situated between approximately 4.26 m and 5.49 m below modern sea level (DVR90) (Ruter 2014, 4). The Holocene marine deposits above the moraine consisted primarily of marine sand, but some coastal peat and gyttja was seen in a single core (Ruter 2014, 3). The surface of these Holocene deposits was seen between 1.62 m and 3.71 m below modern sea level (DVR90), and thus, the Holocene deposits were approximately 1 m – 2.5 m thick. As the Holocene sediments were probably deposited during or after the Littorina transgressions, the deposits could potentially cover much older Mesolithic and Palaeolithic material (Ruter 2014, 2).

Based on observations from former excavations in the Gammel Strand area, it was expected that a lot of the soils to be excavated were land reclamation fills, consisting of mixed organic and inorganic materials with a high content of cultural material. The deposition of this was expected to have happened both vertically and horizontally, in that the area seemed to have been extended southwards by the use of bulwarks and land reclamation fills – but also in that physical remains of activities happening in the limit-zone between the dry land and the water would have been deposited in the water over time.

3.1.2. Coastline and sea levels

Determining where the original coastline would have been is not easy given that “original” in this respect is a very wide term. Attempts have been made by several historians and archaeologists to find out where the coastline at different times would have been located. H. U. Ramsing’s “original” coastline, as presented in 1910 (Ramsing 1910, 542ff.) and 1940a (32) was based on observations of ground levels made by especially H. N. Rosenkjær (e.g. Rosenkjær 1906).

Defining the coastline through historical time is difficult as it is not certain whether the land has risen or sunk or if the sea levels were the same then as it is now. B. Skaarup (1999, 76) – with reference to A. Ödmann (1998) – points out the possibility for the sea level to have changed considerably from the Viking period to the 1600s.

Based on Rosenkjær’s and his own observations as well as historical maps, Ramsing published a synthesis over the “original” natural topography of Copenhagen (Ramsing 1940a: 20ff). In this, both the “original coastline” (based on measurements of the original topsoil/beach level – where it was in approximately 0 ASL, the coastline would have been – Skaarup 1999: 76) and the character and width of the coastal areas were described (Ramsing 1940a: 27ff). The coastal area was described as a beach meadow. Later, more

macro fossil analyses have contributed to the description of the coastal areas of Copenhagen and the development of this from a beach area with salt- and brackish waters to a built-up area (Skaarup 1999: 76). Even though the later investigations have shown that the coastline would have been placed further north than Ramsing situated it, it must be pointed out that a coastline in this low-lying beach meadow landscape would have been diffuse and fluctuating (Skaarup 1999: 77).

3.2. The Gammel Strand area during the Prehistoric periods

3.2.1. Prehistoric finds

Very few Prehistoric finds have been documented around present day Gammel Strand. Hence, characterising the Prehistoric activities in this area is not easy, but should probably be seen in close connection to the natural topography of the area in general.

From the Mesolithic period, settlement evidence was uncovered in the 20th Century on the corner of Frederiksberggade and Nytorv (sb. 14, Christophersen 1985, 14). In Mikkel Bryggersgade, five flint blades belonging with the Funnel Beaker culture were found in 1964 and interpreted as a votive find (sb. 64, Christophersen 1985, 17). Recently, more Stone Age finds – probably belonging to the same settlement complex as the Frederiksberggade finds from late Ertebølle culture – were retrieved from the basement under Kattesundet 10 (Niels Andreasen, pers. comm.).

From the recent excavations on Rådhuspladsen (KBM 3828) more than 450 Prehistoric flint artefacts were found, and though the majority of these cannot be considered as found in-situ, they still indicate a certain amount of Prehistoric activities – especially during the Ertebølle and Neolithic periods – in the area. (Haugesten & Johannsen 2015).

3.2.2. Early history of Copenhagen and the Gammel Strand area

The earliest datable document mentioning what would later be Copenhagen is Pope Urban III's letter of confirmation dated October 21st 1186 (Nielsen 1872, nr. 1, 1-2). In this the pope confirms that the castle in *Hafn* was given as a present to Bishop Absalon from the King Valdemar 1st along with the town and surrounding areas (Fabricius 1999a, 78).

Based on the assessment of both archaeological and written sources, H. Fabricius in 1998 concluded that the earliest Copenhagen would have been a marine orientated place with mercantile functions – that is a smaller, local market to which the farmers from the surrounding areas came to sell, buy or in other ways exchange goods. It seems plausible that the market would have been placed in – or even covered – the area between current Rådhuspladsen and Gammel Torv ("Old Market"), that is the area that in the first half of the 12th Century was limited by a low rampart and shallow moat. The possibility of a double town, where also the western end, near modern Kongens Nytorv, was developed is also an option. Early Copenhagen grew as a result of the herring fishing in the Sound (Fabricius 1999b, 222). However, exactly where the oldest harbour would have been placed is still not clarified (see below).

From recent excavations on Rådhuspladsen (KBM3828) new light has been shed on the development of the early Copenhagen. An Early Medieval cemetery as well as an area with a lot of High Medieval pits and wells was excavated, indicating that this area was indeed in use already in the Early and High Medieval periods (Lyne & Dahlström 2015). Likewise on Kongens Nytorv, new findings of Early and High Medieval fish

handling pits (*lerbottnar*) and possible plot border ditches may support the idea of more than one town area during this period (Steineke & Jark Jensen in prep). The further implications of these findings are yet to be analysed, but may indicate a former nobleman's estate in the area, which was then later destroyed by the placing of the High Medieval town fortifications at what is now Rådhuspladsen (Dahlström 2014).

During the High and Late Medieval periods, the area directly north of the current excavation area, Gammel Strand, seems to have been land filled gradually towards the south and bulwarks would have limited the dry land towards the water (Jark Jensen & Søndergård 2003), (Hadevik 2012), (Bork-Pedersen 2008). Based on the observations made during the 1994-95 excavations at Højbro Plads, the area northeast of Gammel Strand was developed continuously from the Early Medieval period onwards (Johansen 1999a).



Fig. 3 Section of the earliest map of Copenhagen, ca. AD 1600. The Gammel Strand area is in the middle. North is towards right. Original at the Royal Library

3.3. The Gammel Strand area during the Medieval and Post-medieval periods

In this sub-chapter a quick overview is presented of the relevant maps and sources for knowledge about the development of the Gammel Strand area through the Medieval and Post-medieval periods. The placement of the harbour as well as the layout and structures related to the use of the harbour over time are assessed based on selected written sources. Furthermore, an outline of the buildings being part of the harbour area is given.

3.3.1. Relevant maps and sources

A number of historical maps are relevant for the description of the topographical development of Gammel Strand during the Renaissance and later periods. Unfortunately no contemporary maps of Medieval Copenhagen exist, but it is often assumed that the map from around AD 1600 (see Fig. 3 above and Fig. 4 below) gives an impression of the city at least in terms of streets, churches and limitation/fortification during the later Medieval period as well. Further knowledge about Medieval Copenhagen and the Copenhageners can be obtained from the preserved written sources as well as from the archaeological excavations undertaken in recent years.

The earliest map depicting Copenhagen is from the years around AD 1600 (based on knowledge of when certain depicted buildings were erected, Fabricius 1999a, 29) but the producer of the map and the intentions for making it are unknown. The map shows the main outline of the city with fortifications,



Fig. 4 Section of the earliest map of Copenhagen (cropped and turned) showing the Gammel Strand area. North is almost upwards.

streets, churches and a few other public buildings (Lorenzen 1930). For Gammel Strand, however, only one rectangular building is shown in the westernmost end of the area (with no label) and there are no details on bulwarks or bridge structures (see section of map, Fig. 4). The areas around the city are drawn as fields and gardens and the coastal areas – with a different outline than today – are not shown in great detail. The original map is with the Danish Royal Library.

Peder Hansen Resen's map from 1674 (see Fig.5) is a depiction of both the older and newer parts of Copenhagen. Whereas the latter is not depicted very accurately, with a number of never-realised plans of buildings, it is believed that the former, the older parts of the city, are shown as a more accurate depiction of the outline of streets and buildings (Fabricius 2006, 1) – though the buildings themselves are merely symbols rather than realistic depictions. In the Gammel Strand area, both street names and certain buildings can be identified in the legend, which is written in German. The original of Resen's 1674 map is part of the Resen's *Atlas Danicus*, a collection of copper engravings, kept by the Danish Royal Library and published in part by I. R. Kejlbo (1974).



Fig. 5 Resen's map of Copenhagen, 1674. This section show the Gammel Strand area. North is downwards. The Danish Royal Library, Kejlbo 1974

A document from 1683, depicting and describing plans for changing certain structures at what is now the Gammel Strand square is stored at the Copenhagen city archives (*Stadsarkivet*). The map includes a lot of interesting information about current and future layout of the area and seems to be issued and signed by the King, Christian the 5th (see Fig.6). The text at the top of the map outlines the plans for creating a street in the alignment of Naboløs, running towards the Canal. This would in 1683 require the tearing down of slaughter booths and other buildings at the westernmost end of nowadays Gammel Strand.

The transcribed text is as follows: *“Voris allernaad (iste) villie og befalinger effter denne affridtzning skal imellom Veyer huset og begyndelsen aff Snaregaden ned til Canalen, gaer een gade, som skal Være atten alen bred tet (tæt) forbi de Vaaninger, som ligger imellom Snarregade og Canalen. Paa dend anden side Ved Veyer huset bliffver een pladz, lige saa bred og saa lang som Veyer huusets bygninger, som byen beholder at bygge paa, og som er i linie med begge ender aff Veyer huset uden for hvilken pladzes begreb alle Slagterboder og fieleboder skal strax nedbrydis, for at haffde een magelig fart faa husene Ved Stranden, giennem ommeldte nye gade, langs med med Canalen. Vor effter de ved kommende sig aller unded(anigst) haffver at rette skreffte(t) paa Vort Slott Kiøbenhaffn di 7. April 1683. Christian (V)”*.

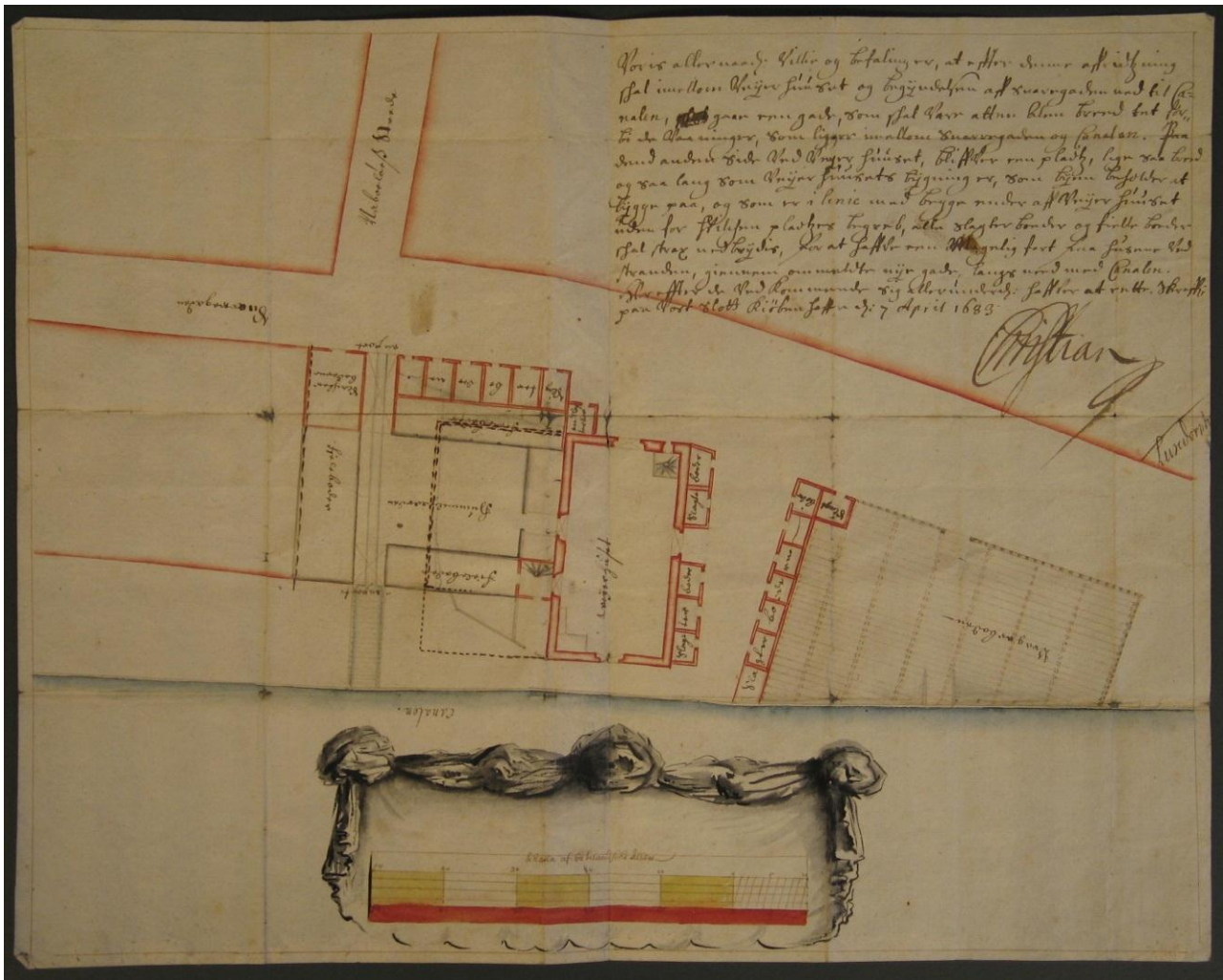


Fig. 6 Map of plans of changing the area of current Gammel Strand in 1683. NW is upwards. Copenhagen City Archive

As a result of the great Copenhagen fire in 1728, Engineer Officer Christian Gedde was appointed to draw new maps of the Copenhagen plots and buildings in the 1750's. The maps covered the 12 Kvarterer (different parts) of Copenhagen. Two of these maps are relevant for the Gammel Strand area, as the buildings on the northern side of what is now the Gammel Strand square in the 1750s were part of Strand Kvarter (see Fig. 7), whereas the building complex in the western end of the area was part of Snarens Kvarter (see Fig. 8). Later (between 1756 and 1806), the area was re-organised and the buildings in the western part were included in Strand Kvarter.

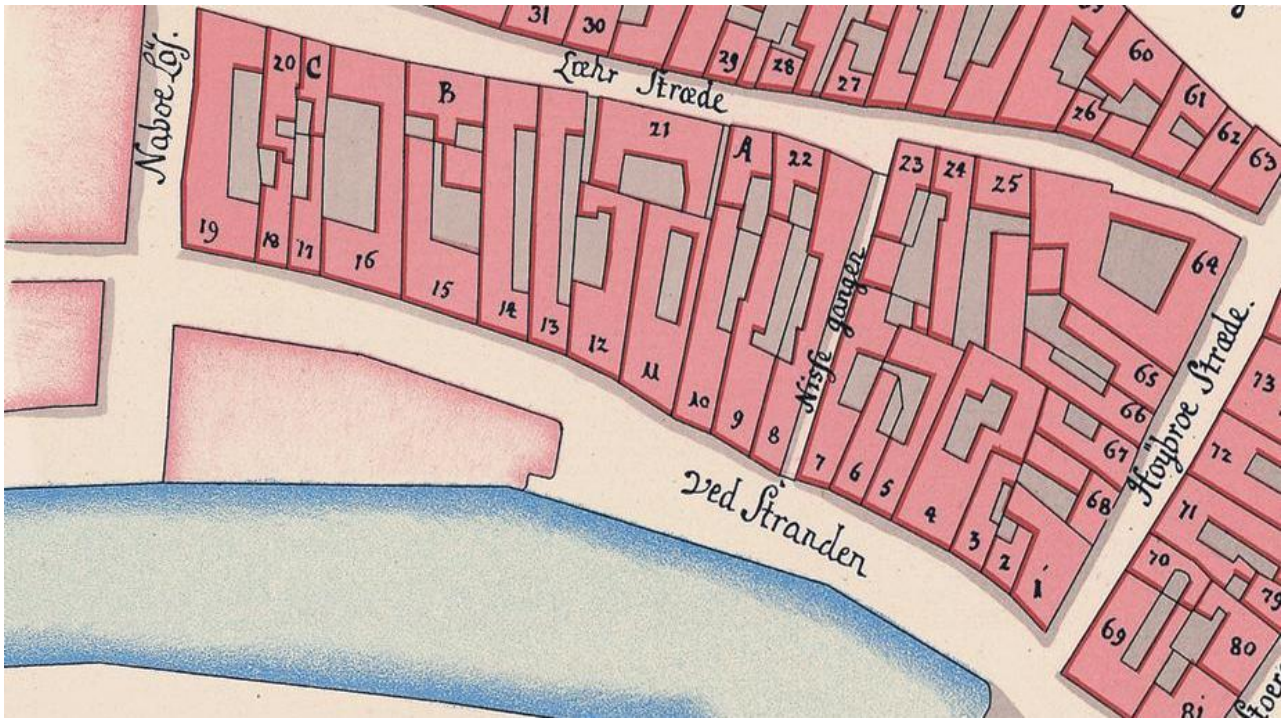


Fig. 7 Part of Gedde's 1757 map of Strand Kvarter. North is upwards. Copenhagen City Archive

In 1761 Gedde had his 12 area maps assembled as one map of Copenhagen. This map is known as Gedde's elevated map as the buildings were depicted more or less three dimensionally (see Fig. 10). However, even though the map was made very carefully and accurately there are certain biases' – for instance, some of the buildings are "turned around" to show their facades instead of their rear sides. It is not clear how accurately the map depicts the single buildings in the Gammel Strand area, but it appears certain that the buildings indicated would have been present in 1761. Both Gedde's Kvarter maps of the 1750s and the elevated map are stored at Copenhagen City Archives (Stadsarkivet), but can be accessed online: <http://www.kbharkiv.dk/udforsk/kobenhavn-1761> (accessed January 22nd 2016).

The Copenhagen plot registers are valuable sources the development of the city for late 17th Century till today. Based on the plot registers are digitized maps made either from contemporary plot maps (e.g. Gedde's maps from the 1750s) or from reconstruction maps, based on the plot descriptions (e.g. Ramsing's work with the 1689 plot registers). The plot register maps can be accessed online, via: <http://www.kbharkiv.dk/kbharkiv/collections/matrikelkort/> (accessed January 22nd 2016) and to help follow the development of the plots, a thorough database, known as the Copenhagen *Jævnførelsesregister* can also be found online: <http://www.kobenhavnshistorie.dk/bog/matrikel/> (accessed January 22nd 2016).

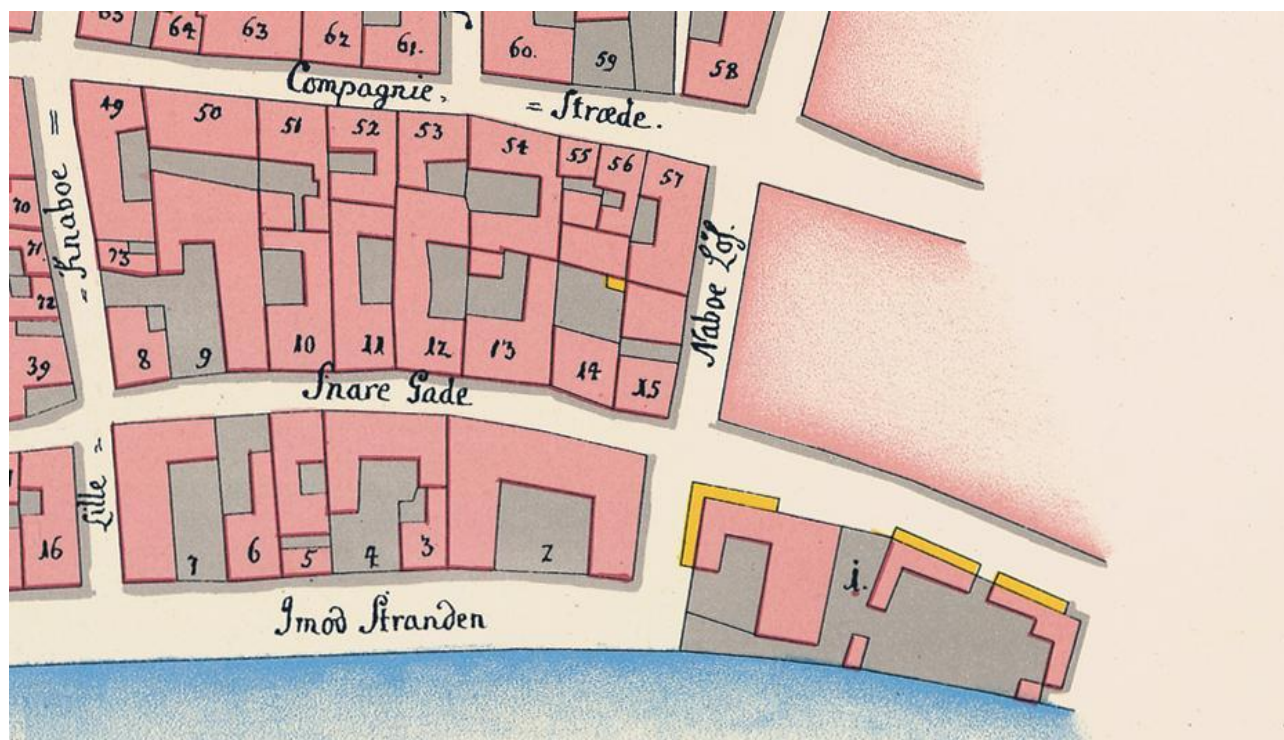


Fig. 8 Gedde's 1757 map of Snaren's Kvarter. North is upwards. Copenhagen City Archive

3.3.2. The harbour

The location of the Medieval harbour or harbours is still not placed with certainty. According to H. Fabricius (1999a, 135), some have placed what was known as *Gammelbodehavn* in the area near Nikolai Church, others by Gammel Strand, and Ramsing thought it would have been in front of the oldest town area *Clemensstaden* (Ramsing 1940c, 109). H. Fabricius (1999a, 135ff) has given an overview based on archaeological finds. Fabricius' conclusion is that it is very difficult to trace the Early and High Medieval harbour, as we may have to re-evaluate what we are looking for. Based on the written accounts, Fabricius finds it probable that the oldest harbour should be found in front of *Clemensstaden*, in the area around Løngangsstræde and Vandkunsten. This area would have been filled up and the harbour moved eastwards sometime during the 13th Century (Fabricius 1999a, 153). However, Fabricius also discusses the possibility of an early harbour near Vingårdsstræde by Kongens Nytorv – and asks whether the location of this would have been the reason for placing a settlement here already in the 11th Century (Fabricius 1999a, 153).

Fabricius thinks that *Gammelbodehavn* – the term is used for the harbour from sometime in the 13th Century – is to be found in the Gammel Strand area, where the oldest harbour related structures must be found under the standing buildings between Kompagnistræde/Læderstræde and Gammel Strand (Fabricius 1999a, 153).

3.3.2.1. Bridges and piers

A number of bridges and piers are mentioned in written sources, but unfortunately only a few can be identified with certainty. The remaining may or may not be many different names for one or just a few bridge structure(s), as suggested by H. Fabricius (Fabricius 1999b, 229f).

In a privilege from 1275 (Nielsen 1872, nr. 21, 24) a bridge (Latin: *ponte*) is mentioned – in Danish translated to a “*skibsbro*” which is a pier, and likewise in the *Stadsretten* (town privileges) from 1294 (Nielsen 1872, nr. 33, 34/43). However, the word *skibsbro* can also be an Old Danish term for a quay or a street running along the quay (Fabricius 1999a, 135). This has not been identified physically.

In 1342 a “*Blithebro*” is mentioned (Nielsen 1874, nr. 1, 12) in connection with a fight between Danes and people from Holstein. O. Nielsen suggests that this bridge would have been placed somewhere outside Copenhagen, near the western gate and protected/armed with one or more trebuchets (*blider*) (Nielsen 1879b, 18). However, it is also suggested that the *Blithebro* is an early or simply alternative term for *Højbro* (Ramsing 1940c, 110).

In 1373 an estate by “*Hysekebro*” is mentioned (Nielsen 1874, nr. 1, 14), but this is the only mention of this possible bridge, which would probably have been named after and placed near *Hyskenstræde* (Nielsen 1877b, 116).

Ladbroen (the loading bridge) is mentioned in *Roskildebispens Jordebog* (the bishop’s land register) from approximately 1377 (Nielsen 1872, nr. 75, 93). *Ladbro* – a loading bridge or pier – may also have given name to the street *Ladbrostræde* in the beginning of the 1400s (Nielsen 1874, nr. 1, 12 and Nielsen 1872, nr. 111, 148). *Ladbrostræde* was probably the name for what is now *Kompagnistræde* or at least some of it (Fabricius 1999a: 135), but as this street is running more or less parallel to the harbourside, it is not clear where the bridge would have been. According to O. Nielsen, the harbour itself was moved eastwards in the beginning of the 1400s and the *Ladbro* seems to have been given up – possibly because of silting up of the harbour (Nielsen 1877b, 116).

Højbro (the high bridge) is mentioned as such (spelled *Høwbro*) in 1433 (Nielsen 1872, nr. 122, 160), when a plot was rented west of this. The bridge was assumingly a drawbridge and is also referred to as such (“*windebroen*”) in 1443 in the town privileges by Christoffer af Bayern, when it is stated that whoever does damage to the bridge is obliged to repair it and will also be fined (Nielsen 1872, nr. 127, 174). It seems plausible that the bridge was not very robust, as in 1454 the king Christian I proclaimed that to avoid the repetitive damage done to the bridge by both storms and flooding, but especially by ships tied to it, no one was allowed to tie his ship to the bridge anymore. A number of posts should be driven into the harbour near the bridge for people to tie their ships to instead (Nielsen 1872, nr. 137, 187). It seems some construction work on the bridge (now spelled *Høyebro*) was undertaken in 1510, but it is not clear what was done (Nielsen 1872, nr. 192, 261). In connection with the wedding of King Christian 4th’s son, the chosen prince Christian, in 1634, the wooden *Højbro* was changed to a bridge on stone pillars. This work seems to have been undertaken by the architect Hans van Steenwinckel the Younger (Nielsen 1882, nr. 302, 146).



Fig. 9 Højbro as depicted in 1839 by painter Wilhelm Petersen. Museum of Copenhagen

The current Højbro was built in 1878, and Vilhelm Dahlerup was the architect. The bridge seems to have been moved slightly eastwards from the former bridge. Later renewals of parts of the bridge have been kept in the late 19th Century style (Møller 1988, 372).

Færgebroen – the ferry bridge – is mentioned in 1526 (Nielsen 1872, nr. 239, 362-363), and has probably also lent its name to *Færgebrostrædet* (the ferry bridge street), which is mentioned in 1477 (Nielsen 1874, nr. 143, 137). O. Nielsen (1877b, 116) claimed that this would have been placed south of present day Højbro Plads, and that this bridge was also called *Møndrikke-broen*. It is not clear how this would have been related to Højbro, but one possibility is that the *Færgebroen/Møndrikke-broen* was not actually a bridge crossing the canal, but rather a pier or landing platform.

A “new red bridge” near the end of *Knabrostræde* (WSW of Gammel Strand) is mentioned in 1699 (Nielsen 1886, nr. 873, 576). This was according to O. Nielsen a pedestrians’ bridge crossing the canal. It was identical with *Nybro* (the new bridge), which must have been established around 1681 as a replacement for the passage, *Løngangen* (Nielsen 1884, nr. 1197, 791-792, Nielsen 1889: 25).

In the oldest map of Copenhagen (see above, Fig. 3 and 4), a bridge or pier-like structure is seen west of the current Gammel Strand area, probably where the current *Knabrostræde* met the harbourfront. It seems to be a rather large, possibly timber built, structure. Given that this is the area where one of the public toilets,

the western “mag” would have been situated, it may however, be a structure related to this or even the mag itself.

3.3.2.2. Bulwarks and quay

In the written sources the bulwarks or the quayside are only mentioned a few times. In 1461 King Christian 1st issued a regulation stating that everyone to maintain the bulwarks in front of their houses or buildings by the beach (Nielsen 1872, nr. 151, 198-200) – this must refer to the bulwarks at Gammel Strand. No details were however given how the bulwarks were constructed or how they should be kept.

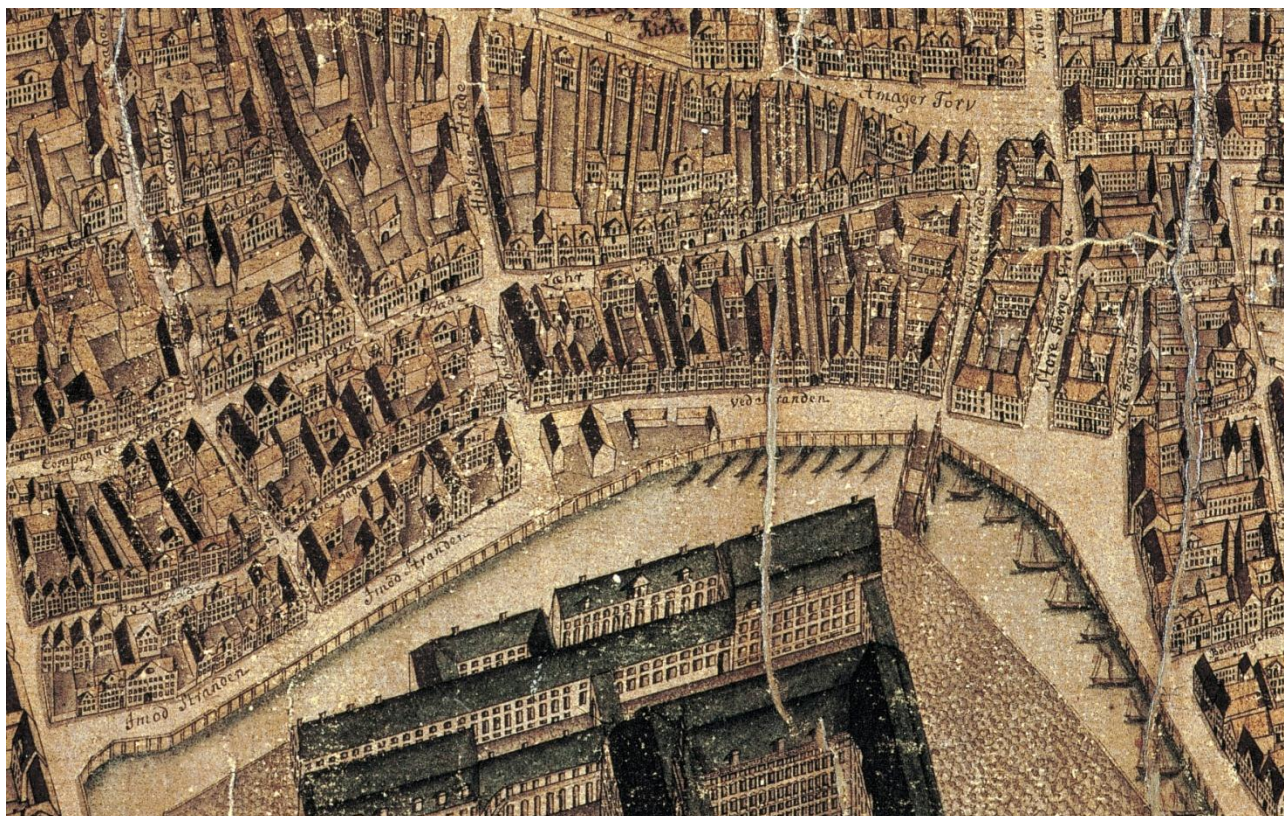


Fig. 10 Gedde's 1761 Elevated map. Section showing the Gammel Strand area. North is upwards. Copenhagen City Archive

In 1583 Christopher Valkendorf had the harbours “surrounded” with boulders (Nielsen 1872, nr. 363, 542). It is not clear exactly what this means, but it seems probable that a quay wall was erected – or maybe just renewed on one or both sides of the harbour. It is not clear from the sources if this quay also included timber elements, as only stones were mentioned.

During the 1660s bulwarks are mentioned a few times in connection with inspections of the harbour areas. In 1663 a man named Henrich Bielke was to make sure that the harbour was properly equipped with bulwarks and not filled up with sand and dirt, which seemed to be the case at the time (Nielsen 1884, nr. 345, 381).

In 1696 King Christian the 5th issued a letter to some prominent citizens, among others the head of the Police (*Politimester*), Claus Rask. From the letter it can be deduced that the bulwarks between the Weighing house (see below) and the Holmens Bro (east of the excavation area) were recently renewed at great cost (Nielsen 1886, nr. 747, 499). The bulwarks were still to be maintained by the house owners along the

harbour and it can be seen from later letters and orders, that the citizens were neither very willing to do so or to pay for the maintenance (1697: Nielsen 1886, nr. 787, 520-21; 1699: Nielsen 1886, nr. 849, 561; 1712: Nielsen 1887, nr. 396, 263; 1718: Nielsen 1887, nr. 710, 458; 1721: Nielsen 1887, nr. 822, 511).

Around 1880 a large stone quay was erected on a timber foundation and seems to have replaced the timber built bulwarks. This structure was renewed in 2007.



Fig. 11 The stone quay wall at Gammel Strand, ca. 1895. Københavns Museum

3.3.3. Streets and squares

On Resen's map from 1674 (see above, Fig. 5), the area of present day Gammel Strand is depicted and street names are mentioned in the legend. Here the term "*Beim Strande*" (Danish: *Ved Stranden*/ English: By the Beach) (number 60 on the map) is used for the street running along the harbour in the area called Gammel Strand today. The name Gammel Strand was not used in written sources until the 1700s (Fabricius 2006, 61). Resen's number 51 refers to "*Snaren's Gasse*" (Danish: *Snaregade*/English: Snare's or Snaren's Street). On Resen's map, a narrow alley called *Nissegangen* has number 64. Nissegangen was demolished in 1767, but kept as a passage in the façade line of current Gammel Strand 34 (Fabricius 2006, 56). Resen's number 65 refers to the short street named *Naboløs*, which was – and still is – the southern continuation of number 67, Hyskenstræde.

On Gedde's maps, the street on what is today Gammel Strand is likewise called Ved Stranden, while the street running along the waterfront to the west is called *Imod Stranden* (towards the beach).

It is clear that there would have been more little alleys and passages running between the beach/harbour and the parallel streets north of this. In 1645 the King Christian 4th ordered a citizen named Hans Mandixen to close off the narrow alley way next to Mandixen's house/estate in Snaregade running between Snaregade and the beach (harbour) (Nielsen 1877a, nr. 371, 254-55; Fabricius 2006, 54).

Until the middle of the 19th Century the western end of what is today the square Gammel Strand had a range of different masonry buildings on it (see 3.3.4), while the eastern end, towards Højbro, may have had only lighter buildings such as booths – and none are depicted on any of the maps. In 1857 the mentioned buildings were torn down and today's large square was created.

During the 17th and 18th Centuries, numerous written sources witness the issues of maintenance of streets and squares throughout Copenhagen (Lyne & Hansen 2016).

Until 1703 it seems to have been accepted that timber merchants stored their goods in large amounts along the side of the harbour next to the Weighing house on Gammel Strand. However, an order from the king, Frederik the 4th (Nielsen 1886, nr. 1060, 705) asked the merchants to find new spaces for the storing of timbers, in order to prevent fire in the city.

3.3.4. Buildings on Gammel Strand

Some buildings are seen on the maps dating back to around 1600, and written sources provide plenty of information regarding buildings and houses in the area. The challenge is, however, to identify the mentioned buildings on the maps and *vice versa*, as mapped buildings are not always mentioned in written sources, and mentioned buildings are not always mapped – and of course both source types need to be treated with caution.

Prior to the 2010-11 excavations at Gammel Strand, some archive work was undertaken, resulting amongst other things in the finding of a map of structures at Gammel Strand around the middle of the 19th Century. Unfortunately only parts of the map were then photographed, and it was not noted, where the original map was found or if there was other information to support the date deciphered from the scribbles in the lower left corner of it, 1839. It has subsequently not been possible to re-find the map, and of course this has bearing on the source value of it, but it has been included here, as it in many ways provides a missing link between the buildings mentioned in written sources and the layout of the buildings.

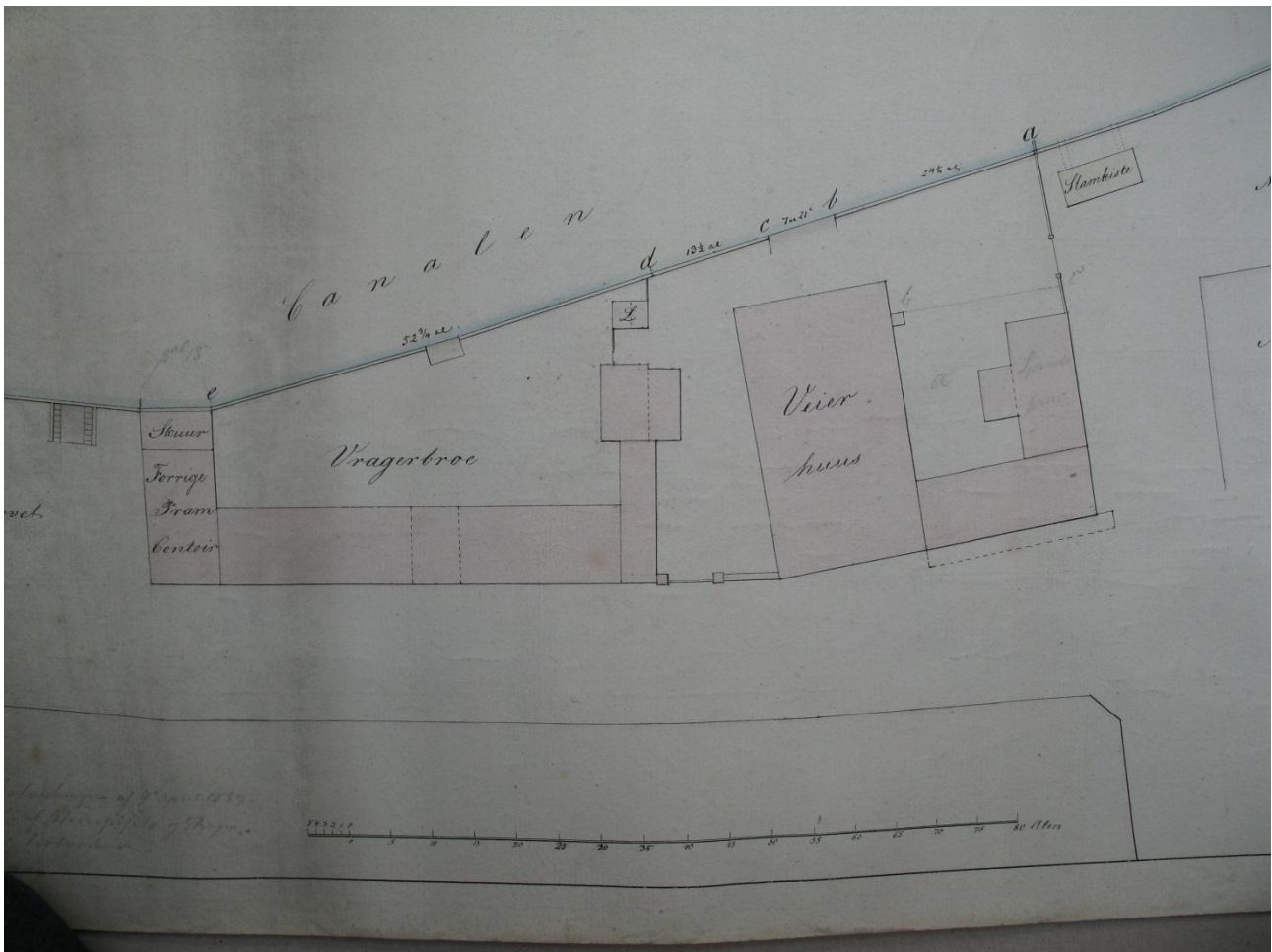


Fig. 12 Map of structures at Gammel Strand, presumably from 1839. SSE is at the top of the plan. Source unknown

3.3.4.1. The Weighing house

Already in 1281, the reason for establishing a Weighing house was presented in a document from the Bishop, giving the “Fogeden” and the town council the authority to establish anything that may benefit the

town and the inhabitants – especially in terms of weighing, controlling and price assessment of goods and with special reference to the measurement of German beer, as this had been sold with too much inaccuracy – resulting in loss for the buyers and destruction of the salesmen’s souls (Nielsen 1872, nr. 27, 29-30, Nielsen 1877b, 69). This was confirmed in the 1443 town privileges (Nielsen 1872, nr. 127, §57), but it is not clear whether such a building actually existed at the time or if it is just planned for. However, at some point a Weighing house must have been erected and O. Nielsen stated that the old Weighing house was situated between present day Kompagnistræde and Snaregade (Nielsen 1877b, 85) – later Nielsen revised this to be on the southern side of Snaregade, on the corner of Naboløs (Nielsen 1881, 152).

From the early 16th Century onwards the written sources mentioning the Weighing house are a little more numerous, and indicating where the Weighing house would have been placed at the time (Nielsen 1879a, nr. 330, 336; Nielsen 1872, nr. 217, 304; Nielsen 1872, nr. 276, 397; Nielsen 1872, nr. 282, 402; Nielsen 1872, nr. 297, 425), in that the location of other buildings are related to the location of the Weighing house in the deeds.

In 1580 the old Weighing house seems to have fallen into decay, and this among many other issues was complained about by the citizens (Nielsen 1874, nr. 496, 393-396). In April 1581 the king issued a document – the so-called Fredrik II’s *Stadsret* (privileges) – settling the dispute between the Magistrate and the citizens. In this, the Weighing house was to be rebuilt by the mayors and the town council at their expense and the town and the citizens should not be troubled with this (Nielsen 1874, nr. 502, 406). In December 1581 the king declared that the mayors and council were exempted from taxation (*siisefrij*) of 100 “læster” (a number of barrels) of Rostocker beer while the rebuilding and mending of the Weighing house was undertaken (Nielsen 1874, nr. 507, 413).

In the document called “Christopher Valkendorfs credits of the town” (Nielsen 1872, nr. 363, 540-542) it is stated that in 1581, Valkendorf let the beautiful Weighing house be built on (or into) the beach, “where no one would have thought a house would ever be built” (my translation). The rather odd wording may be seen in the connection with the location of one of the public toilets, *Østre Mag*, (the eastern latrine) which allegedly was placed near Hyskenstræde and even give the name to this street (Fleischer 1985). As the new Weighing house was built at the end of Naboløs, the later name for the southern part of Hyskenstræde, it may have been placed where a former latrine was and thus where no one would have expected it to be built.

On the earliest map of Copenhagen (Fig. 3) only one building-like form is depicted and there is nothing written to indicate which building it is representing. However, it seems reasonable to assume that the mapped building is the Weighing house from the late 1500s, though depicted more square in plan than it was in reality. On Resen’s map from 1674 (Fig. 5), the letter “V” is placed in the street Snaregade, west of Gammel Strand. In the legend this refers to “*die Waage und die neue Fleisch-Buden*” (the weight and the new slaughter booths). In correspondence with this, on Gedde’s 1757 map of Snaren’s Kvarter (Fig.8) plot number 1 is listed as owned by “*Stadens Vejerhus med Slagterboderne og Pramlaugets Hus*” (the Town’s Weighing house with the slaughter booths and the Bargemen’s Guild House).

The exact location of the late 16th Century Weighing house is well known as the building existed until 1857, when it was torn down along with all other buildings in what is now the square Gammel Strand (Fig. 12). The Weighing house was placed in the western end of today’s Gammel Strand square, south of current

Gammel Strand 50. The building was a stout, brick built house with three floors and an attic, as seen from the daguerreotype photo.

3.3.4.2. Vragerbro/Vragerbod

Occasionally the term “*Vragerbod*” or “*Vragerbro*” is mentioned in the written sources. The “*vrager*” or “*wrager*” is an Old Danish term used for a person who did quality assessment of trading goods (internet source: <http://ordnet.dk/ods/ordbog?query=Vrager>, assessed August 10th 2016).

On Resen’s 1674 map (see Fig. 5) the letter “X” seems to be surrounded on three sides by a structure or fence and is placed east of the Weighing house. In the legend to the map “X” refers to “*Waage-Brücke*”, which could be directly translated to “weight-bridge”, but must be identical to what is labelled *Wragerboden* on the map from 1683 (see Fig. 6). Here a rhomboid area is limited on the western side by slaughter booths and judging from the sketch-like drawing, it could consist mainly of a timber platform. On Gedde’s maps from 1757 and 1761 an area of the same shape and size seems delineated by buildings, but there are no references to *Vragerbro* on these. On the above mentioned map, presumably from 1839, the area between the buildings east of the Weighing house is labelled “*Vragerbroe*”, indicating that it was an open space, delineated by buildings (see Fig. 12).

In 1635 The King Chr 4th hired a hop “*vrager*” to assess the hop (Nielsen 1877a, nr. 192, 156). It is not clear whether this refers to hop imported into Copenhagen or if it was grown either in the town or near by (see below about *Humlegaarden*), and neither is it clear if this was in any way related to the *Vragerbro*, or if it took place somewhere else.

In a document from 1581, listing properties in Copenhagen, a number of additions seem to have been made in 1656 (Nielsen 1872, nr. 362, 483-540). Among these, *Wragerbroen* is mentioned as placed east of the Weighing house (486). If the date of the note is correct, this is the earliest mention of *Vragerbroen* on what is now Gammel Strand.

In a document from 1689 instructions for what a new *vrager* must do were described (Nielsen 1886, nr. 392, 254-57). The instructions indicate a highly specialized work area with advanced division of labour in the harbour. The *vrager* was responsible for the quality assessment of the goods that came in – and he had to make sure that no non-quality-proofed goods were offered for sale. Only goods which were already taxed were to be proofed. Along with the *vrager*, two coopers worked with packing the goods after the quality had been checked. The goods were put onto the *Vragerbro* using a *Vippe* (probably a crane) operated by two workers. Four carrier men took turns, two at a time, to work with the goods, while the other two were to guard the *Vragerbro* area. If any merchant violated the rules, his goods would be assigned to *Børnehuset*, which was an orphanage and later a jail house. The quality assessment was in many ways a strongly rationalized, public task related to the protection of legal rights of both buyers and sellers (Deggim 2005, 88f).

It is not very clear which type of structure this *Vragerbro* would have been, but it seems probable that it was at least partly timber built as it seemed to stretch all the way out to the harbour front and was possibly interlinked with the bulwark. In some of the maps the area seems to have been delineated by buildings on three sides, but it is not clear from the sources, if these buildings would have been related directly –

physically as well as functionally – to the *Vragerbro* area, or if they would have served other purposes as slaughter booths etc.

3.3.4.3. *Pramlaugets Hus* – The Bargemen’s Guild House

A structure referred to as *Pramlaugets Hus/Kontor* (The Bargemen’s Guild House or Office) seems to have been present at Gammel Strand, at least from the middle of the 18th Century, when Gedde drew his map of Snaren’s Kvarter (see Fig. 8). The building is not depicted on the 1683 map and in the plot correspondence registers (*Københavnske Jævnførelsesregistre*), the Bargemen’s Guild House is not mentioned in 1689, but it is in 1756. At this point the plot (the large plot number 1 in Snarens Kvarter) is listed as owned by the Weighing house, the slaughter booths and the Bargemen’s Guild House. Later (but before 1806) the plot was split into several plots, where number 1A of Snarens Kvarter is listed as owned by the Bargemen’s Guild House, but unfortunately we have no maps depicting which of the buildings this is. In 1806 the plots were re-organized and the former plots 1A-1D in Snarens Kvarter were now divided into plots 55-60 in Strand Kvarter (though on the digital plot register map the whole complex is still seen as one, plot number 55). *Pramlaugets Hus* is by then plot 55.



Fig. 13 Painting of Gammel Strand by A. Juul, ca. 1820. Museum of Copenhagen/VÆGGEN

From the written sources, it is a little difficult to identify the Bargemen’s Guild House. In 1783 N. Jonge, a contemporary writer, described the *Pramlavets Contoir* as a small one storey building placed at the western end of the fish market, across the pavement next to the Gammel Strand Canal (Jonge 1783, 410). From the probable 1839 map (Fig. 12), the “former Barge Office” (*Forrige Pram-Contoir*) seems to be the

easternmost of the buildings in the complex at the western end of Gammel Strand – and the building depicted in the foreground to the right on the painting from around 1820 (Fig.13) and the daguerreotype from 1840 (Fig. 14). This was in other sources (tax assessments, see below) from the early 19th Century described as belonging to *det ophævede Pram- og Steenfører Laug* (the former/dissolved Barge- and Stone Transport Guild).

Twice, in 1811 and again in 1822 the building and its outhouses were assessed and valued (records in the Copenhagen city archive, *Stadsarkivet, Vurderinger til prioritetsefterretninger, Strand 46-55*). In both instances the building is described as consisting of a basement, a first and a second floor and a floor under the roof. The building was brick built and the width of the building was five bays towards the square (meaning east) and two bays towards the street (meaning north). As the width of the bays was not recorded, it can only be estimated that the building would probably have been approximately 4 m by 10 m. In the basement level there was a brick floor (in the 1822 source called *Steengulve*, stone floors, which can probably mean either a brick floor or a stone floor) and both a *bilægger-ovn* (a type of oven/stove), a kitchen with an open chimney as well as a two level wind oven with pipe (to *etagers vind ovn med rør/tromle*) – the latter probably the same as also mentioned on the first and second floors. In the descriptions are also some outhouses, but nothing is described as the annex with the rounded roof as seen on the southern side of the building on the picture from 1840 and on the painting from around 1820. It is possible, however, that it is identical to the building described just as a small yard room with cobblestones.

In Villads Christensen's accounts of the city 1840-1857 written in 1912, what must be the same building is referred to as built by a huckster named Seith in 1823 after being granted Royal permission (source not found) and in the middle of the 19th Century owned by a bar keeper named Hansen (Villads Christensen 1912, 52f). However, it seems more probable that Seith was given permission to rebuild an existing building and did not build a completely new one.

3.3.4.4. Other buildings on and near Gammel Strand

The row of houses along the northern side of the square Gammel Strand was spared by the fire in 1728, but was unfortunately ruined by the other great fire in 1795 (Møller 1988, 377). According to H. Fabricius (2006, 54), the buildings on Gammel Strand were during the Medieval and Renaissance periods large merchants' and noblemen's estates, and though the houses were located right next to the harbour, the maritime professions do not appear on the lists of who lived in these buildings. Such people working with rope-making and other maritime related crafts, ships clerks, skippers etc, primarily lived in the streets leading towards the harbour. At Gammel Strand there were however public houses and bars also.

In O. Nielsen's synthesis the history of Copenhagen 1536-1660, it is mentioned that the old Weighing house (see above) was turned into a "humlegaard" (a hop farm?), where probably the imported hop would have been quality assessed (Nielsen 1881, 152). In the Grundtaxt from 1668, the Weighing house by the hop garten (?) is mentioned and value estimated 400 rdl (Nielsen 1874, nr. 804, 814). Likewise in a document from 1581 with notes added in 1656 (Nielsen 1872, nr. 362, 486), "*Hommelgaarden*" (the hop farm?) is mentioned, but it is not clear if it is a building or merely an area, where the former Weighing house was once situated. In the map from 1683 (Fig. 6), an area called "Humlegaarden" is depicted just west of the later Weighing house. According to the map, this was to be torn down to make room for a broad street or space leading from the Naboløs Street to the Canal.

On Resen's 1674 map (see Fig. 5) there seems to be a symbol just north of the Weighing house – this is either something to indicate a large gate with wheel tracks – or could it be “ll” (two small L's) which in the legend refers to “the old East-India house”. In a deed from 1627 (Nielsen 1877a, nr. 77, 68-69) the King, Christian the 4th, conveys a building to the East India Company. It is indicated that the company already owns another building next to this and they are placed at Ved Stranden. Together these two must have been of considerable size – when the king sold his part to one of the directors of the company, Roland Crappe, in 1639 this part of the building was described as being 50 alen (=100 feet) wide towards the harbour (Nielsen 1877a, nr. 265, 195-96). It is not clear exactly which of the buildings on Gammel Strand this covered, as the plots have changed since then, but it was in the western end on either the eastern or the western side of current Gammel Strand 48 (Nielsen 1885, 228).

Booths for selling salt, fish and meat are mentioned several times in the written sources, but it is not very clear where these would have been situated, or what types of buildings they were. A document from 1609 witnesses that a lot of illegal booths, sheds and other light structures had started to crowd the streets of Copenhagen. At Gammel Strand (called Ved Stranden in Snaren's Kvarter), drinking booths, cellar/basement booths and other booths are mentioned, but the exact location is not given (Nielsen 1874, nr. 664, 556). It seems probable, however, that these would have been erected along the façades of the houses on the northern side of today's square. In 1683 it seems to have been prohibited to build timber sheds near the streets and squares – the buildings should have masonry outer walls (Nielsen 1886, nr. 42, 34-36). According to the above mentioned map from 1683 with orders from king Christian the 5th (Fig. 6), a number of wooden booths (*fjelleboder*) and slaughter booths were to be removed to fulfil the plans of making a wide street leading towards the harbour west of the Weighing house. On the eastern side of the Weighing house, slaughter booths are mapped, as well as delimiting the western side of the *Vragerbro*-area. On Gedde's 1757 map of Snaren's Kvarter, the yellow markings seem to indicate wooden booths, placed on the northern and western side of the Weighing house and Vragerbro complex.

As part of the Weighing house complex a *sprøjtehus* (engine house) is mentioned to have been built to contain material for fire fighting. It is not clear when the engine house itself was built, but in 1792 it must have been supplemented by a *brandskur* as well as a *vandskur* (sheds for fire equipment). From the possible 1839 map (Fig. 12) the engine house seems to be placed on the western side of the Weighing house, which is supported by the description of the city's fire fighting equipment in a publication from 1835 describing the location as “by the Weighing house in the wall towards Assistenshuset” (anon 1835, 12).

West of the excavation area, in Nybrogade 2, a large building, known as Assistenshuset has since 1962 housed the Danish Ministry of Culture. The building was originally a three winged structure, built in 1729-30 after the large fire in 1728 had demolished this part of the area (though sparing the Weighing house and Bargemen's Guild House). The building was bought in 1757 by the *Assistenshuset* (by then a Royal institution for privileges functioning as a pawnbroker) and the fourth wing towards the canal was built in 1765 (Møller 1988, 380 ff).

3.4. Modern topography and history of Gammel Strand

Present day Gammel Strand is situated in Copenhagen in an urban landscape dominated by 19th and 20th Century buildings to the north and west with the canal (*Slotsholmskanalen*) to the south. A few metres east of the excavation's eastern limits, the bridge, Højbro, crosses the canal and leads towards the nowadays parliament building, Christiansborg. The development of the area from the late 19th Century can be followed from paintings and photographs of the area. Among these is a daguerreotype from 1840 which bears witness to the buildings at Gammel Strand before these were demolished between 1850 and 1857.



Fig. 14 Daguerreotype by T. Neubourgh from 1840. Museum of Copenhagen/VÆGGEN.

Once the buildings in this area were demolished, the open space was used as a large flea market as well as fish market at the eastern end of the square.



Fig. 15 Højbro bridge and Gammel Strand looking towards the west, ca. 1865. Museum of Copenhagen

In 1958 a new fish market was built in the Sydhavnen (Møller 1988, 366) area of Copenhagen, and the large scale fish trade was moved from Gammel Strand. Before then, in 1940 a stone statue of a fish saleswoman had been erected on the quay wall in the eastern end at the square.



Fig. 16 The statue of the fisher woman, erected on Gammel Strand in 1940. Source: KKnet.

Chapter 4: Older Excavations

The purpose of this chapter is to create an overview of the archaeological evidence within and surrounding the project area. The methods that were used to obtain knowledge of former activities and structures in the area are deemed as crucial for the understanding of the recently found archaeological remains. Furthermore it should be noted that locations that have been previously excavated will potentially have had an impact – in that the excavation trenches will have truncated the features and structures found in the excavation covered by this report, just like it may be possible to see what was found in the recent excavations in a larger archaeological perspective. Therefore the assessment of the level of documentation and the accuracy of the locations of former excavations and observations is important.

A large number of archaeological observations were made by Museum professionals and amateurs from the late 19th Century to the beginning of the 21st Century in the vicinity of what is now Gammel Strand. In this chapter the streets and areas relevant for examination consist of now Gammel Strand and the streets leading directly up to this; the southern end of what is now Højbro Plads, the west end of the street Ved Stranden and the northernmost parts of Slotsholmen.

The results of the observations were usually limited to a few lines and sketches and were stored in the archives of the National Museum and as copies in what is now the Museum of Copenhagen. Larger scale observations containing more thorough documentation are also found in the archives along with documentation material from actual archaeological excavations – see table of earlier excavations and observations. In the following table, some of these observations will be highlighted, as they are assessed as having direct relevance for the current excavation at Gammel Strand.

4.1. Late 19th and early 20th centuries

In the late 19th and early 20th Centuries construction works connected to the construction of service pipes were undertaken both in the street of Gammel Strand and along Nybrogade in 1884 and again along Gammel Strand and in the south end of Højbro Plads (Rosenkjær 1902, letters from Rosenberg and reports by Smidt 1902). The observations made were clearly limited by both the character of the trenches and the urge not to interfere with the time plan of the construction work. However, in some instances it is possible to gain insights into where the trenches were situated, and furthermore what was found in them. Observations were made by historians (L. Both), architects (C.M. Smidt) and teacher H. N. Rosenkjær whose observations were later supplemented by those of general major H. U. Ramsing.

In the reports from these campaigns, both wooden structures were interpreted as bulwarks from different harbour phases and rebuilds of the harbour and stone and brick structures are described, but this location was not clearly described. For the 1901 works overall plan drawings exist, and from these plans it is possible to link the excavated remains seen on Gammel Strand and Højbro Plads to the recent excavations. In 1908 a new main water pipe line appears to have been laid down along the front of the current buildings at Gammel Strand, and based on the observations from this event as well as other previous observations, Ramsing attempted to a synthesis the development of the harbour (Ramsing 1910), including the

observations made and described by Rosenkjær in 1905 in the building plot of what is now Gammel Strand 26 (Rosenkjær 1905; Rosenkjær 1906, 6-7; 75).

4.1.1. The 1901 Gammel Strand excavation

In October 1901 at least two trenches were dug in an approximate NE-SW direction on Gammel Strand in connection with construction of a sewer. The two documented trenches may have been linked into one, but this is not documented. The trenches were approximately 0.7 m (2 feet) wide and 2.5-3 m deep. In the northernmost trench, approximately 10 metres SSE of what is now Gammel Strand numbers 46 and 44, a wider area was opened to facilitate a welder's pit. In this and the connecting trench leading in a southwest direction, a number of structures were seen and drawn in section (oblique section, not cross section). From the drawings it appears that there was a large, ENE-WSW-oriented wall of granite blocks and large, red bricks. On top of this was later built a narrower wall of smaller, yellow bricks, so-called Flensborgsten. On the northern side of the trench what was thought to be the same brick structure continued, but it was constructed differently with the wall built upon both granite boulders and pine planks and beams. The direction of this structure is uncertain, but it was possibly NNW-SSE. West of these walls, a structure consisting of two walls seemingly perpendicular to each other was documented. It was seen as a combination of oak posts with pine planks/beams and boulder foundation. Both walls were built of a combination of red and yellow bricks.

The easternmost part of these walls was orientated ENE-WSW, and the westernmost part NNW-SSE-oriented, to form a corner north of the limits of the trench. A timber structure, approximately N-S-oriented, and consisting of closely set vertical planks/posts was documented between the two latter described walls (Smidt 1902a). As the trench was very narrow, the exact directions of the walls were not possible to establish, as well as the dimensions of the structures outside the trench. In the report no interpretation of the building structure was offered, but it seems clear that the structures can be linked to the structures seen in this area in later excavations, interpreted as parts of the Vragerbros structures (Olesen & Bork-Pedersen 2012).

In 1902 N. H. Rosenkjær wrote a report for the then Rådhusmuseet (Rosenkjær 1902), describing structures observed when a large gas pipe trench was excavated along Gammel Strand – it is not clear whether this work was done simultaneously with the construction of the sewer in 1901, as mentioned above, or if it was actually undertaken in 1902. Various structures described by Rosenkjær seem to have been the same as Smidt described (see above), but Rosenkjær seems to have made observations over a larger area of Gammel Strand and can therefore supplement Smidt's observations. Unfortunately Rosenkjær's report is not accompanied by any drawings to help understand the descriptions of the seen structures.

Rosenkjær also described bulwarks along Gammel Strand in the gas pipe trench. These comprise a large foundation wall of carved boulders seen outside Gammel Strand numbers 44 and 46 and various building remains of small yellow bricks outside Gammel Strand numbers 46 and 48. A quay wall of large natural boulders running towards Højbro was observed along with timber posts with some planks attached on the outside of this – the posts seemed in some places to have been affected by fire. North of the quay wall, outside Gammel Strand 42 some vaults were built of yellow or flamed bricks. Immediately east of the building now housing the Ministry of Culture, Rosenkjær saw a timber built boat slip, consisting of planks resting on posts and with a bulwark on at least one side. A large opening under the floor had over time

been filled with sand from the streets. East of this was a large sewer built of boulders and pieces of limestone held together with reddish mortar. The sewer came from Naboløs and ran towards the canal. Ramsing (1910, 547ff) published most of Rosenkjær's accounts of what was seen on this occasion, but for the above, the original report was read.

4.1.1. The 1901 Højbro Plads excavation

In October 1901 an area east of Gammel Strand, on the southern end of Højbro Plads, was excavated as part of the same sewer construction work. During this work archaeological observations were made by both C. M. Smidt from the National Museum and teacher H. N. Rosenkjær, who sent his observations by letters to the National Museum. It is clear from the report by C. M. Smidt that the excavations were not followed closely, and that a number of the observations were made by the construction workers and included in the report. A larger welder's pit was excavated approximately 10 metres ESE of the corner of Gammel Strand and Højbro Plads (now Gammel Strand number 26) and from this a trench was dug further east, towards the southern corner of Højbro Plads number 21.

In the trenches were documented a number of walls – both E-W-oriented and N-S-oriented. The westernmost of the N-S-oriented walls was seen to a depth of more than 3 metres, and was a red brick wall overlying stone boulder foundations. This wall was built in conjunction with a brick and stone built sewer comprising a wooden floor orientated north-south, west of the previously mentioned wall. At the southern side of the trench, a large, east-west-oriented boulder wall was seen to a depth of approximately 3 metres.

At the bottom of the trench a line of oak posts, running approximately E-W, was seen. The posts were driven into the bottom and all along the post line the construction workers had seen and removed large boulders which had been resting on the posts (Smidt 1902b).

4.2. Mid to late 20th Century

No excavations or observations of note occurred between 1908 and the 1950s. From the late 1950s to the 1970s observations were made, primarily linked to smaller scale construction activities in basements and back yards. In 1965, however, a district heating construction project was carried out in the eastern side of Højbro Plads (Ahlefeldt-Laurvig 1966, 174f). The documentation does not allow an accurate pinpointing of the location of the found building remains. The same situation goes for the building structures registered as being seen in the basements of Gammel Strand 44 (1958) and 38 (1971) and in the back yard of Nybrogade 2 (1956).

In the basements of standing buildings at Gammel Strand (nos. 38/40 and 34) observations were made of parts of ships in the 1960s and again in 1972. The ships timbers found in 1972 were registered by the National Museum's ships laboratory, but could not be dated closely.

4.3. Late 20th Century

Since the 1980s the Museum of Copenhagen (formerly Københavns Bymuseum) employed a full time archaeologist, which seems to have had a positive effect on the observations made in construction works near Gammel Strand.

The documentation materials from some of the early observations are, however, still rather limited, most likely due to the planning conditions. Large stones were removed in relation to construction works in the

basement of Ved Stranden 14 (in 1986) and likewise outside (?) Gammel Strand number 52 (in 1990). In 1994 a large sewer was also constructed along Ved Stranden, and in this process a large number of timber posts – both pine and oak – were removed from the trench. Only small levels of documentation were made on site by the archaeologist from Københavns Bymuseum, but a rather large number of the timbers were taken to the dendrochronological laboratory at the National Museum (NNU). A total of 44 of these – all oak – were dated, with the majority being felled in the early 1600s AD – just before 1630 (Bonde 2008). Although very little information accompanies this excavation it is evident that there would have been a bulwark with this date, running along the street Ved Stranden. The majority of these timbers would have originated from the southernmost part of Norway (Bonde 2008, 4), with a few timbers that were found to be older (from the 1520s and the early 1600s) and these originated from Mecklenburg in Germany (Bonde 2008, 5).

4.3.1. Højbro Plads 1994-95

Linked to the construction of a 250 m² overflow water basin, a large part of Højbro Plads was excavated in the autumn of 1994 and winter of 1995. This was the largest excavation at the time conducted within the former Medieval Copenhagen. The results from the archaeological excavations comprised evidence of the natural topography and terrain – in this area there was a flat coast and beach area, slowly increasing in height towards the northern part of Højbro Plads. In the Early Medieval period, the beach would have been 15-20 m wide and placed between present Højbro Plads number 4 and 13. From this area a natural alluvial sand layer extended south around the street Gammel Strand (Johansen 1999a, 134f). This alluvial deposit was uncovered 1.85 m below the surface. The excavations also revealed that almost half of the excavation area was truncated by large aircraft bunkers constructed in 1944 (Johansen 1999a, 131).

At some point in the 1300s AD a levelling of the area had taken place, removing the original top soil and replacing it with spreads of pebbles and stones, probably to create a stable foundation for building activities. This process had only affected the then dry land, whereas the cultural material deposited in the water before then was left in-situ. This comprised of household rubbish and manure deposited from the 1000s to the 1200s AD. This deposit was up to 1 m thick and the organic material in it was very well preserved (Johansen 1999a, 135f). In the beginning of the 13th Century AD, the building area seems to have been extended and the filled up coastal area claimed as land using a considerable layer of flat limestones. Above this, up to five levels of different types of paving were seen. In the middle of the 13th C, the area both north and south of the coastline was raised again, which was seen as a result of problems with flooding. For this process a substantial layer of branches and twigs had been laid out as a foundation for a compact layer of brick rubble – both misfired munkesten and bricks with mortar, possibly from demolished buildings. Above this another paving of smaller stones was seen and the date of the layout of this seems to correspond with the above mentioned levelling of the northern part of the area, removing the top soil in the 14th C (Johansen 1999a, 137f).

The earliest building remains excavated were stone and brick built houses, of which none of the floor layers had survived later building activities, whereas the foundations had been reused as parts of basements for the later buildings – all the way up to the late 18th C – on site. Some of the oldest building remains were dated using Thermoluminescence to 1330 +/- 40 AD and 1370 +/- 40 AD (Johansen 1999a, 139). Two Medieval wells – one made of a barrel and the other post and plank built – were documented. The latter was placed immediately west of the Absalon Statue. The corner posts were dendrochronologically dated to

winter 1449/50 AD and the well seems to have been only short lived as it was filled in in the late 15th Century with slaughter/horn making debris (*hornstejler*), household waste and a few almost intact vessels of glass and ceramic (Johansen 1999a, 140ff).

The excavation furthermore revealed substantial remains of the basements partly destroyed and levelled out after the city fire in 1795 (Johansen 1999b).

4.4. The 21st Century

From 2001 to 2012 excavations and watching briefs were undertaken in and around the area of Gammel Strand. A few of the observations deserve further elaboration here. The Metro Cityring 2010 watching brief, will not be mentioned any further, as the report from this (Olesen & Bork-Pedersen 2012) is already extensive and written in English. When appropriate, results from the watching brief will be discussed in this report.

In 2001 a trench for new district heating was excavated in the eastern side of the northern end of the street Naboløs. During the archaeological watching brief relating to this, a north-south oriented line of five oak posts was documented. No interpretation for the structure was presented, but the dendrochronological analysis revealed that the felling dates for the timbers date to 1344 AD (Mikkelsen 2002; Eriksen 2001). In 2003 the above mentioned trench was continued south in connection with cable construction and what is interpreted as the continuation of the post line structure was documented. Dendrochronological dates from this are from 1324, 1344 and 1396 AD. During the same construction work, a trench was dug immediately south of Gammel Strand 52. Here an E-W oriented structure consisting of vertical posts with horizontal planks attached was documented. The dendrochronological dates from this structure offer a *terminus post quem* date to *after* 1270 AD and approximately 1332 AD. The finds related to the structure suggest that the structure was in use in the 1400-1500s. The timber structure was interpreted as either a bulwark or a land reclamation box (Jark Jensen & Søndergaard 2003).

4.5. Pre-excavations

In 2006-07 a series of pre-excavation test trenches and core tests were made for the Metro City ring excavations (El-Sharnouby 2007a). On Gammel Strand, 6 small trenches were excavated on the land along with core tests, and a further 3 core tests were made in the canal.

The trenches did not reveal much on the archaeology, apart from the thickness of the layers above the natural ground and in a few instances, some timber structures were seen in the trenches. From one of the cores (Core 6) a series of macro fossils, representing three different phases in the core, were carbon dated. The carbon dates were 764 cal BC, 778 cal AD and 1300s cal AD (El-Sharnoube 2007b), which may date activities in the immediate area within these periods, but more likely date the secondarily deposited material.

In 2008 3 N-S oriented trenches were excavated on Gammel Strand (outside numbers 26, 36 and 42) with the combined purpose of searching for existing cables and locating archaeological remains (Bork-Pedersen 2008). The trenches were placed in the street Gammel Strand and only one of them (Trench 1 – outside Gammel Strand 42) reached into the area excavated in 2014. In this trench parts of brick structures were uncovered. They were interpreted as a floor and a brick wall and remains of a stone foundation and a

timber structure, interpreted as a bulwark. A dendrochronological date suggests that the felling date for the bulwark timber is *after* 1500 AD.

In Trench 2 (outside Gammel Strand number 36) a bulwark structure was dendrochronologically dated to 1405/06 AD. A cobbled area, limited towards the south by pine planks and posts was also observed. This was truncated by a north-south oriented, wooden water pipe which was lined on both sides with a brick and limestone structure, probably the remains of a vault/arch over the water pipe. In Trench 3, located south of Gammel Strand number 26, remains of a latrine were seen in the north eastern corner of the trench. Apart from this, only scattered parts of timber structures were seen.

Chapter 5: Objectives and Aims

The objective of this excavation was to undertake a site specific application of the overall aims defined in the Project Design (Thomasson & Høst-Madsen 2009). The aims were connected to these themes:

- The urbanisation of Copenhagen
- Health and living conditions in the city
- City life in Copenhagen
- Harbour infrastructure
- Trade and trading route changes
- The southern city border zone.

In this chapter the specific location of the site of Gammel Strand is considered and the possibilities to answer questions relating to the overall themes are assessed. Specific questions connected to the site and the expected archaeological remains are formulated. These are then related to the overall project aims.

5.1. Site specific questions

The questions that were addressed by the excavation are divided into different themes, related to functions and activities in and near the former harbour of Gammel Strand. Former topography, Prehistoric and Early Medieval activities, are however areas of interest.

5.1.1. Topography, Prehistoric and Early Medieval activities

Considering the lack of knowledge of activities in the area in the earliest phase of settlement, it is vital to learn more about the topography from Prehistoric periods and Early Medieval times – this will give information on which kind of activities could have taken place in the area question. Compared to other in Early Medieval towns in eastern Denmark, it is likely that Copenhagen started as a seasonal trading place. In such a place it can be expected that evidence for craft and trade activities, roads, seasonal habitation and animal husbandry can be found.

The boundary of Copenhagen in the Early Medieval period would probably have been the natural harbour and channel between the islets of Slotsholmen and/or Skarnholmene and Zealand. It would have been the meeting point and trading point between Copenhagen and the sea. This is highlighted by the name of the city which it originally took from the harbour (Havn).

5.1.1.1. The area in Prehistoric periods:

Although it was not anticipated that significant remains of Prehistoric date have survived in the immediate area, there may have been low levels of activity in the form of residual artefacts. There may also have been evidence of occupation as the site lies near former wetlands/marshlands. Locations similar to these would be coveted during the Prehistoric periods as they provide ample resources for hunting, fishing and foraging. Any information from the excavation on the area during this period may help to clarify its usage prior to the establishment of Copenhagen.

Examples of specific questions:

- Can the topography from Prehistoric periods be established? Where was the coastline situated?
- Can Prehistoric activities be identified? What kind of activities do these represent? Can the remains be dated? (relating to a marine core containing a fragment of charcoal C14 dated to around 700 (El-Sharnouby 2007b).
- Characterization of landscape and waterside. Based on macrofossil work can we understand the overall topography of the area?

5.1.1.2. 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 demark 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 the Early Middle Ages, can provide opportunities to understand if there have been market activities on the beach (Thomasson 2008) and how this can be related to the settlement in what was to become the town area. Vital to this however, is to understand the existing topography of the area.

From what we know, the excavation area lies south and perhaps west of the Early Medieval coastline – however, the excavation may help us establish what the topography was like.

Examples of specific questions:

- Can the topography from the Viking Age and Early Middle Ages be further established? Where was the coastline situated?
- What circumstances could have led to the formation of the town? Did it happen in different stages – seasonal activities -> permanent settlement?
- Is there any evidence of ditches, walls or other structures which could mark the town border from this period?
- Were there any defences in the channel? As is known from other Medieval harbours (Haderslev, Næstved, Vordingborg etc.).

5.1.2. High Medieval, Late Medieval and Post-medieval periods

A discussion on all activities and structures linked to these periods on Gammel Strand, periods most visible from the finds and remains.

5.1.2.1. Settlement areas near the harbour/on the harbourside

The objective of the forthcoming investigations is also to contribute to new knowledge relating to the nature of everyday life, building culture, craft and trade and their changes over time.

Example of a specific question:

- What do posts and other bulwarks suggest about the harbourside in this period?

5.1.2.2. Constitution and changes of everyday life over time

The source material can clarify how the area just within the harbour area 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. Provided with a rich archaeological source

material, it is 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 is to investigate if there were specific activities which were placed in the outer limits of the town.

Examples of more detailed questions:

- Is it possible to distinguish public spaces from private?
- Are there traces of plot boundaries? In what shape? Are changes in plot structure detectable?
- Are there any signs of maintenance of bulwarks undertaken by plot owners detectable by differences in construction or reconstruction.
- How were buildings oriented toward public spaces?
- If not found in-situ, the finds material in the harbour nearby will most likely entail plenty of objects reflecting everyday life. What does the material culture tell about the households?

5.1.2.3. The nature of the buildings – Post-medieval periods

There may be possibilities to examine the construction and design of buildings.

A typical urban phenomenon is booths or stalls around the harbourside. These were buildings or parts 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 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 streets (Christophersen 1990; Carelli 2001). In Malmö, booths have been found as poorly built constructions on the actual market street (Thomasson 2008). Booths were also a term for added constructions on house façades, alongside the most important public spaces in towns (Bager 1971).

We know of buildings from maps and written sources – can these be identified – and/or are there building traces we do not yet know anything about?

The most common building remains are foundation and floor layers, sill stones, postholes which sometimes are complemented by sill beams or beam slots, threshold stones and floor paving. It is also important to relate inclusions in deposits to the in-situ building remains, in order to establish wall and roof constructions.

Examples of more detailed questions:

- Which kind of house types (in relation to construction, design and layout) can be identified? Are there changes over time?
- Is it possible to identify houses with different functions (dwellings and economic buildings)? Are there differences which could relate to different social groups such as merchants and craftsmen?
- In written sources and maps certain buildings placed at GLS are mentioned – Bargemen’s Guild House, Vragerbod/-bod, Weighing house, “Strandgaarden” (personal info from Hanne Fabricius, Strandgaarden, mentioned in 1423). Were there public buildings alongside the quay, and if so, can they be distinguished if they were public or private buildings?
- Can booths be identified in the areas? Where were they situated and how were they constructed?

5.1.2.4. Craft and trade

During the past towns were the allocated spaces for trade and craft. Special legislation applied to the towns, which was not applicable in the countryside, making them juridical enclaves. Excavation of primary and secondary deposits should produce interesting material.

Examples of more detailed questions:

- Can workshops be identified in the area? Which kinds of crafts are represented? How was the production organized (spatially and socially)? Were there differences over time?
- The land reclamation deposits can be 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?
- Can usage of money be identified? Were there differences in the areas, spatially or socially, in how money was handled? Were there differences over time?

5.1.2.5. Everyday life from finds at the harbourside

It is believed that the harbourside was constantly expanded by creating new land from rubbish and soil from the surrounding area. As with moat backfills it is expected that there will be a large collection of finds from Copenhagen with the dumped material. These finds could be used to spot general trends in the lives of Copenhageners, and can be compared to similar dump deposits of the same period within Copenhagen. The soils from these deposit types are expected to be, in areas, anaerobic soil conditions, therefore organic objects will be preserved to a higher degree.

Examples of more detailed questions:

- In relation to finds, are all aspects of society represented? Are different levels of society more prominent than others in different periods, if this is so, why?
- What evidence of fashion can be identified, and from which materials are they made? Did the Copenhageners follow national and international trends, and are there any unique styles present?
- It is presumed that Gammel Strand was the first contact point by sea for many migrants, is there any evidence of immigration from the finds assemblage?
- From natural science evidence such as plant remains and animal remains, diet and the health of the Copenhageners can be studied. What new information can be discovered about the physical welfare of the Copenhageners, and can changes be seen?

5.1.2.6. The town limits

In general there are possibilities to investigate a vital part of the town boundary in a long-term perspective. Because of the extensive fill layers in the different land reclamation phases, large quantities of finds material, deposited as rubbish, can also be expected. This is a vital source of knowledge regarding every day life of the town citizens.

Examples of more detailed questions:

- Can a chronology and morphology of the southern part of the town boundary be established? What evidence does this give regarding dating, activities, source of power/initiative in the formation and evolution of the town? Were there differences between the construction of town boundaries 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)? Do the differences over time reflect differences in power/governing?

- Are there primary deposits within the harbour which could be evidence of attacks or defence (battle)?
- Can the construction type of the fortification in different time periods be compared to other contemporary Danish or European towns? What can that tell us about the contacts, status and function of the town?
- Can the different contents of the deposits in the harbour be related to the settlement? What kind of finds material was deposited as garbage in the fill? Can these be related to living conditions in the neighbouring plots? Is it possible to use stratigraphy to identify different phases of backfill or finds material?
- How did the area function as a customs point? Did this change over time, and how did it change? How can this be referenced to other Danish and Scandinavian settlements?

5.1.2.7. Infrastructure

Knowledge of older streets in Copenhagen is mainly based on limited written source material, including maps. The stratigraphic sequences in older street environments are characterized mainly by the surviving street layers as well as drained foundation layers. Archaeological evidence has shown that there is a clear chronological division of type of street covering, from the tightly packed small stones and branches in the older levels and stones and cobbles in the later. Previous archaeological surveys in Malmö have shown up to six street levels (cf. Heimer et al 2007, 24). Street foundation layers may 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:

- When were the streets established? Has their spatial extension varied? Can patterns be established (i.e. from narrow to wider streets, etc.)?
- Where were streets established? What was the previous land use?
- How were the streets constructed, relating both to degree of foundation layers and type of pavements? Were there differences in time?
- Are there wooden water pipes within the area? Is it possible to see if some are contemporary or can a sequence be established?
- Are there any gutters – and is it possible to establish whether the service pipes were public or private?

5.1.2.8. Harbour area and use of land around the harbour

We know from sources and maps that the harbour region at Gammel Strand developed by expanding southwards. Archaeological evidence from primary usage deposits should provide evidence from finds and structural remains from ships. Previous studies from harbour excavations have found this evidence which can be used as comparative data (Milne, 1999,145-152).

Examples of more detailed questions:

- Is there evidence of any structures, ships or finds from the harbour from the deposits. What types of finds represent this activity?
- From written sources we know of great problems with floor sands being swept or washed into the harbour from the houses along the harbourside (e.g. Nielsen 1884, nr. 1115. 728-35) – are there any traces that can confirm this? Sand or dredging?
- Is there any information suggesting how the harbour morphology has been influenced by the Copenhageners, and if so, why and when?
- Can the morphology of the harbourside suggest which types of ships and vessels could use the harbour, and with harbour construction, how does this affect the type of vessels using the harbour?
- In regard to the physical harbour extensions (as seen by new bulwarks and land ties) these questions should be answered: how was this work done (who did it, how did they work, where did the timber come from?). Why was the harbour extended so many times? And finally, when was it extended?

5.2. Objectives of the project

The previously mentioned site specific questions, connected to the special empirical circumstances in the area of Gammel Strand, all contribute to the project aims (Thomassen & Høst-Madsen 2009). These aims relate to standard urban historical questions, but are designed 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 can contribute to the overall project aims. These questions however have a broad range; what is in empirical focus in the different areas of the excavation can have bearing upon several perspectives covered by the project aims. Of great interest is to compare the findings from Gammel Strand with those from Kongens Nytorv and Rådhuspladsen, where some similar types of features and themes are being investigated. The site will also be compared to other harbour excavations within Copenhagen, Denmark and North Western Europe.

5.2.1. Background, organisation, direction and characterization of urbanisation

This first theme refers to the emergence and development of urban structures in long-term and landscape perspectives. Of interest is the landscape of Copenhagen and surroundings, from Prehistoric to Early Modern times. Urban structures are 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 into public and private space (plots vs. roads and squares).
- Activities showing some degree of centralised organization
- Activities/production and infrastructure related to non-agrarian production.

The more general questions regarding all of the different area types, relating to the original topography and Prehistoric land use, 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, is vital. In addition, to understand the chronological depth of the site and surrounding landscape, the characteristics of what kind

of activities were present in this area, are fundamental for the understanding of why Havn was an obvious place to establish and invest in urban structures.

In the Type 1 and 2 areas, there are great possibilities to explore establishment and changes of roads and paths, which in turn contribute to knowledge about public and private space. Excavations of predecessors to Gammel Strand road etc. (Type 2 area), together with possible unknown and unexpected roads, can for example yield information about maintenance, how they were built, if there were differences between the roads, and thereby also contribute to more in depth understanding of the organisation of public space.

Gammel Strand is situated in an area that once was a border zone, which differs to the other excavations at Kongens Nytorv and Rådhuspladsen as they were town wall border zones whereas Gammel Strand was a harbour border zone. The harbour marked the boundary in jurisdiction and production. This offers great possibilities to explore the establishment and development of the spatial denotation of the town, and thereby one of the key parameters in the spatial structure of Medieval and early modern urbanism. It is especially interesting to fill in the gaps of knowledge regarding chronology and morphology of later versions of the town limits. Of interest in this respect is to investigate the construction and development of the fortifications, not at least relating to the making of Copenhagen as a capital.

Even if the documentation possibilities are not optimal (Type 2 areas), there may be opportunities to establish what the land use was north of the harbour. Currently, there is limited knowledge about how these areas were used in the Medieval and Renaissance period. Notes in the written records are of a late date and influenced either by planned or occurring refurbishments. Knowledge about areas just outside at the harbourside can contribute to the understanding of how the town structures reacted to demographic and economic fluctuations (below), as well as social stress.

5.2.2. Economic and demographic fluctuations

The essence of this second project aim relates to economics and demographics. Whereas the first and above discussed project aim is orientated to establish presence of non-agrarian production, the focus of the second aim is on content and changes.

Regarding economics, it is vital to establish knowledge about the different kinds of crafts and craft industries (including food producing crafts such as butchers, bakers etc.), organisation, infrastructure and their development. It is equally important to study the means of exchange, whether it is based on redistributive gift economy, reciprocity or trade, and dependent upon a close connection with production. Of significance is the development of a 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?

The excavations in the Gammel Strand area may have possibilities to contribute to these questions. In the Type 1 and 2 areas there are possibilities to find traces of workshops or trading facilities, where the

different kinds of booths (compare the questions regarding Kongens- and Kronens boder; Vikarieboderne) can yield information. Analysis of the finds material, as representative of consumed material culture, will produce vital information regarding domestic craft industries as well as imports, both regarding identification and development. Finally, artefacts that can be understood as the means of trade, such as coins, scales and weights, are of course vital objects for study.

Regarding demographics, there are limitations as to what kind of information 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 notes in the written records. The excavation is not expected to contain any evidence of primary burials, only redeposited remains in land reclamation, so demographic fluctuations from physical remains are not expected to be found on Gammel Strand.

5.2.3. 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 – urban culture. In relation to the economic and demographic aims, focus has changed from establishing contents, to studying social interaction and lifestyles.

Within the stipulated long-term perspective of the project, a vital issue 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. Of great interest is if there were changes in lifestyles when the town changed from bishop's town to capital in the 15th Century, which kind of changes can be identified and their associations with the different urban social groups. While the options to excavate settlement remains are most wide-ranging in the Type 1 area, collection of finds material from all areas can contribute to knowledge regarding consumption in general. This is true especially of finds from fills of the different phases of land reclamation.

The intension of these topics is to establish differences and development of social topography. It will in this capacity be interesting if there are possibilities to compare structures and finds material from areas around the harbour to other places within the city 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 ethnic groups. This is of special importance around the harbourside which was the first contact point via the sea to Copenhagen. The importance of public space and monumental structures 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 the harbourside as one of the town's most visible landmarks, can increase our knowledge on the importance of public space.

There also 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. Obviously the harbour facilities dominate the nature and process of trade and the craft industry remains might be more strongly linked to maritime industries. A second step could be to investigate if there is different organisation relating to different crafts and their development over time.

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

5.3. Metro Cityring Project research themes for Gammel Strand

The sub-chapter will then discuss the results in relation to the four Gammel Strand research themes from the Metro Cityring project. These themes are developed from the overall research themes made by the Museum of Copenhagen for the Metro Cityring project (Metro Cityring Research Project, 2012. Internal Museum document). As mentioned previously, the research potential from Gammel Strand is vast, and can be split between four research themes (see below). Each of these themes utilise physical, artefactual or natural science remains from the excavation.

1. Urbanisation of the harbour area
2. The lives of Copenhageners
3. Connections near and far
4. Life on the borders

Chapter 6: Methodology

This chapter includes information on the excavation methodology including finds handling and sampling methodology as well as documentation principles used at the Gammel Strand excavations 2012-2014.

The overall methodologies to be used for the metro project were initially stated in the Project Design (Thomasson & Høst-Madsen 2009). This specified the use of Museum standards for project management and Museum policies on archaeological recording and finds handling. Strategy documents describing the principles of finds management (Bak-Jensen & Whatley 2010) and report management (Thomasson 2010) together with manuals covering how to use context sheets including context typology (Thomasson 2011) were also developed. 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 Kulturstyrelsen.

6.1. Excavation and documentation methodology

The excavation at Gammel Strand consisted of many excavation phases, using different forms of excavation style as well as documentation principles. In 2010-11 a large number of service trenches were dug and the archaeological work was done as watching briefs. The methodology used during this excavation phase is described in the report (Olesen & Bork-Pedersen 2012).

In 2012 the area where the later station box was to be placed – the Guide Wall trench – was partly excavated, but only to a depth of two metres below present level. Also in 2012 and 2013 a number of so-called Re-infiltration trenches were dug as watching briefs. Finally in 2014 the Main Excavation of the area within the station box underwent an actual archaeological excavation.

6.1.1. Initial soil removal

The initial removal of the upper layers of soil and modern overburden was done by using an excavating machine with a toothless bucket, made available by the contractors. The machining was supervised by Field Leaders or other appointed persons during this process. This methodology was applied both in the Main Excavation and during the 2012 Guide Wall excavation. The machining process led to between 1-1.5 m of soil being removed from the present surface (at the time) until archaeology was encountered.

6.1.2. Excavation procedures

Once these layers were removed, the archaeological features and structures were cleaned and defined and then excavated primarily by hand, using a variety of hand tools. The physical act of excavating the archaeological remains was however conducted in different ways depending on what was appropriate for the remains in question. In instances of extensive deposits of dumped material, interpreted as land reclamation fills or levelling layers, machines of different sizes were used – under supervision – for excavation. Likewise, where large timber and stone structures were encountered, it was in some instances necessary to use a machine to remove these once they had been fully documented, as they would not be preserved in-situ.

Once identified, the archaeological contexts were cleaned and defined using hand tools before being surveyed, recorded and excavated.

In addition to the excavation of man-made deposits, assessment of exposed 'naturally deposited' levels was also done, especially where these were organically preserved and laid down within archaeological timescales; for example alluvial deposits.

6.1.3. Documentation principles

Every context was surveyed with a total station and got a unique identification number, generated by the total station. All information was transferred and registered into IntraSiS Explorer and the contexts placed into an overall site matrix. All archaeological contexts (cuts, structures and deposits) were recorded in written form on designated standard forms (context sheets) in the field. The context sheets used for the Main Excavation were modified slightly from former metro excavations as minor improvements were seen to be possible, based on experiences from the Guide Wall excavation.

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 on the three different types of context sheets. 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.

All archaeological contexts were recorded according to the stratigraphical, single context method as described by S. Roskams (2001). This means that archaeological contexts were recorded down to the smallest visible event identified by the archaeologist. These were then linked together to form a flow of events that happened through time on the site. The contexts were documented in reverse chronological order as the archaeologist excavated down, starting with the most recent remains 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, features such as the large scale land reclamation and levelling deposits, (which included contexts that were very similar but separated by thin lenses of sand) were in some instances 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 land reclamation and levelling layers; 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.

The photographic documentation was thorough, and where appropriate, included photogrammetry; where the geometric properties of objects were determined from photographic images of structures using fixed points surveyed by the total station.

6.1.4. Photography

A complete photographic archive was maintained throughout the 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.

As far as possible, photographs were of publication standard, 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. C03_20140402_9270 (where the photograph was taken using camera 3 on the 2nd of April 2014). 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. This index is kept as a series of notebooks as well as a photographic record of the pages of these notebooks.

6.1.5. Matrices and grouping (this sub-chapter is mainly written by R. C. Morgan)

In keeping with the principles of single context recording, a Harris matrix was created concurrent with the ongoing excavation to facilitate understanding of the stratigraphic relationships between contexts across site (Harris 1997). This was done without reference to artefactual dating, dendrochronology or other analyses, which were later amalgamated into the results during postexcavation work. The sub-grouping, grouping and preliminary phasing were also undertaken on site as far as possible. This was done alongside the creation of the matrix, rather than afterwards, both for expediency and to allow the first hand knowledge of the archaeologists to be incorporated into these processes. The Harris matrix was created using the programme Stratify to maintain consistency across the metro excavations (along with Kongens Nytorv and Rådhuspladsen) where this programme was also used.

6.1.5.1. Matrices

The Harris matrix was created by transferring the immediate stratigraphic relations of each context as recorded by the archaeologist on the context sheets into the database of the Stratify programme. These relationships were checked with those of other relevant contexts, geo-objects and stratigraphic relations in the IntraSis Explorer database, and relationships already entered in the Stratify programme, so that all cross-referencing was accurate. One person was given overall responsibility to create the matrix and group contexts to minimise potential errors and maintain consistency across the excavation.

Matrices for the Guide Wall and Main Excavations were created separately to allow for any discrepancies between the two to be more easily identified and mitigated during post excavation. These two matrices were then amalgamated into one overall matrix drawn at the sub-group/group level (without contexts shown) and definitively phased when post excavation artefactual analyses and dendrochronology results were returned.

6.1.5.2. Grouping and Phasing

The sub-grouping, grouping and phasing was carried out broadly in accordance with the strategy document Guidelines for Contextual Documentation (Thomasson 2011), with the caveat that these processes were

concurrent with the ongoing excavation and creation of the matrix. Context sheets contained a 'group with' entry so archaeologists could suggest elements of the excavation which should be incorporated into the same group. This was especially helpful for the on site grouping of large areas of land reclamation deposits which would otherwise have been postponed until the later stages of post excavation work due to the different rates at which areas of site were excavated.

Sub-groups and groups were created in IntraSiS Explorer using a sequential numbering system beginning at 400 so as to ensure a separate sequence from the groups which had been created during the previous watching briefs of 2010 (see Olesen and Bork-Pedersen 2012). Details of sub-groups and groups were also recorded separately in a notebook for ease of reference. Due to a demonstrable sequence of bulwarks seen during excavation, it was possible to do a partial preliminary phasing of some groups on site. Each bulwark was given a colour code (rather than phase 1, 2 etc.) to facilitate on site reference to a specific bulwark and therefore phase, and these colours were translated during post excavation into a chronological phase sequence.

Some group numbers from the Guide Wall excavation and watching briefs were also able to be used during the Main Excavation when there was no possibility of misidentification of features e.g. water pipes running north-south. This simplified the grouping of surrounding features across separate excavations, however, where identification was uncertain separate group numbers were assigned which could later be either amalgamated or described as identical.

6.1.5.3. Programming

The matrix, grouping and phasing were collated through the programme Stratify, which is available as a free download. This programme works by compiling a database of known stratigraphic and sub-group/group relations from which it then composes a visual depiction of a Harris matrix. This diagram is static and unable to be manipulated by the user to account for e.g. contexts on the same chronological level, and once a context is within a group its stratigraphic relations are no longer illustrated – only those of the group. This necessitated the careful cross-checking of all stratigraphic relationships across a large number of contexts so as to mitigate later errors in grouping and phasing. Groups were phased by using the grouping relation in the programme rather than the phase feature as this allowed for individual groups to be excluded from a phase if the chronology was unclear (otherwise all units must have an entry in the 'phase' field in order for the programme to draw the matrix diagram).

The watching briefs, Guide Wall and Main Excavations were all treated separately with regard to drawing the matrix. This was partly to avoid compound errors as stated above, but also due to the limited capacity of the Stratify programme to contend with large amounts of data. To mitigate this, once capacity was reached, the context numbers of known, established groups were deleted and the group number and its relations substituted. In that way relations were maintained, but one number used rather than many.

6.2. Finds collection, handling and prioritization

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' (Watkinson & Neal 1998) and assistance and education from the National Museum of Denmark. Set out in this chapter will be methodologies that follow the finds procedure presented in Guidelines for Finds (Bak-Jensen & Whatley 2010).

6.2.1. Classification

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.

6.2.1.1. Special Finds

Special Finds are 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. The finds that were seen as **Special Finds** are labelled (SF) in table 3 in section 6.2.3.2, and were put into separate sub-classes in IntraSiS. Although **Special Finds** are usually found within certain sub-classes set aside for **Special Finds**, there are exceptions where finds from the **Bulk Finds** sub-classes are made **Special Finds**, as they provide important new information for the excavation and finds assemblage from Gammel Strand.

6.2.1.2. Bulk Finds

Bulk Finds are generally large quantities of finds, in comparison to smaller assemblages of **Special Finds**. Whereas **Special Finds** are recorded individually, **Bulk Finds** are recorded by type, per context, and receive less registration. Information on the **Bulk Finds** strategy can be seen in section 6.3.4. The finds sub-classes that are labelled **Bulk Finds** are marked by this code, (BF), can be seen in table 3 in section 6.2.3.2

6.2.1.3. Zoological material

Though zoological material (animal bones, fish bones, molluscs and similar) was collected as bulk finds, prioritizations were made and only a small proportion from selected groups and contexts was sent for scientific analysis with the Natural History Museum of Denmark. The material classed as Natural science remains are marked (NS) in table 5 in section 6.3.2.3.

6.2.2. Retrieval and on-site and finds recording procedures

The retrieval of finds was subject to methodology described in the Guidelines for finds (Bak-Jensen & Whatley 2010). Archaeological finds retrieved on the excavation were added into IntraSiS as Finds Units (FU). **Special Finds** were in some instances measured in by total station, whereby Finds Units identities were generated in the IntraSiS database. Finds Units for **Bulk Finds** were created by the archaeologist doing the initial finds recording. 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 and context number (and Finds Unit number if already created on site). The date and finder's initials were noted, as well as trench number. 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 and site abbreviation (KBM3828 GLS)

- Context number
- Finds Unit number
- Initials of excavating archaeologist
- Date.

6.2.2.1. Big bag sampling

As it was stated via the former excavation phases that the majority of the deposits within the Gammel Strand Main Excavation trench would be deposits interpreted as dumped material used for land reclamation, a strategy for the Main Excavation using large tools as well as machines was made. Apart from the hand collection of finds, a system of big bag sampling for finds retrieval and sub-sampling for environmental analysis was developed. According to this a grid of points was to be laid out over the entire trench for the purpose of taking out big bag samples from a large number of deposits. The grid system was to be horizontal as well as vertical. This strategy was made to get a thorough sample, comparable to other deposits where the same procedure was used, of what the deposits contained, without having to excavate the deposits fully by hand to collect and register even smaller objects. Using a fixed grid, the big bag samples would furthermore be evenly dispersed and possibly have a lesser degree of bias compared to if only deposits found “interesting” were sampled.

In practice however, the grid system was never fully implemented – it was too difficult to keep track of which samples in a grid had been taken and which were still to be taken, when large deposits were removed. Instead, the big bag sample methodology was used differently depending on the types of deposits encountered throughout the excavation.

In areas with large dump layers interpreted as land fills, e.g. between and around the wooden land ties, soil from defined and recorded dump layers was shovelled into big bags. From deposits inside wooden drain pipes some material was also sampled in big bags. In areas where alluvial deposits containing finds that can be interpreted as remains of harbour activities are encountered, the strategy of big bag sampling was used depending on the possibility of identifying single deposits.

It was seen as important that the big bags contained more or less the same amount of soil, if the samples were to be comparable, but in practice it was decided to just sieve a fixed amount of each big bag – equalling the content of a wheel barrow, approximately 73 l of soil. The big bag samples were surveyed with the total station (the code for big bags was 1PBxxx) and labelled thoroughly with zone number, sample number, context number etc.

The big bag sampling was carried out in close connection to the sampling for environmental analysis. Deposits that were big bag sampled were also sampled for environmental analysis (sub-samples were taken from the big bags), as the two approaches’ processing methodologies would then be able to compliment each other.

6.2.2.2. Sieving of big bags on site

A wet-sieving station was constructed on site, using water tanks and a 5 mm metal mesh. The big bag sampling for finds provided material from approximately 73 l soil from each big bag sample. All finds materials collected from the wet-sieve were split between the finds material categories and Finds Units were created and related to the deposits (SD’s) from which they were collected. Types of materials that

should be retrieved from the big bags in the sieving process were artefacts of glass, ceramics, metal, bone, leather, textile, wood, stone and other materials, but also objects that are elsewhere considered "inclusions": animal bones, fish bones, shell, slag and organic materials.

These materials were picked up from the sieve, registered and weighed/counted.



Fig. 17 Working photo of finds sieving on site. Museum of Copenhagen

6.2.3. 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, after fieldwork was complete. 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.

6.2.3.1. 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 was discerned.

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].

6.2.3.2. Finds sub-classes

The sub-classes 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 sub-classes due to specialism, as is usual.

Finds Sub-class	Examples of types of finds
Animal bones (NS)	(Collected as finds, analysed as natural science objects)
Arms and armour (SF)	Military weapons, projectiles and armour
Building materials (BF)	Roof tiles, floor tiles, ridge tiles, bricks and other building related materials. Decorated and undecorated
Ceramic (BF)	Divided into Medieval (dating from Denmark's Medieval periods from 1060-1535) and Post-medieval ceramics (dating from the Renaissance period, 1536-1660 and later Post-medieval period, 1661-1800)
Clay pipe (BF)	Clay pipe fragments, pipe production equipment
Coin (SF)	Coins and jettons
Combs (SF)	Combs from different materials
Copper alloy pins (SF)	Accessory pins
Cutlery (SF)	Handle fragments, spoons and forks
Flint (BF)	Flint tools, gun flint and flakes
Glass (BF)	All types of glass vessels and window glass
Horse equipment (SF)	Horse shoes
Household equipment (SF)	A selection containing wooden house furnishings to metal storage items, barrels, buckets and cooking and non ceramic storage objects
Knives (SF)	Domestic knives, handle fragments and table knives
Leather shoes and clothes (BF)	Various types of clothes (non military), shoes, slippers.
Nails (BF)	Nails from many periods and types of manufacture
Off cuts-production waste (SF)	Leather-, bone- and metal off-cuts
Other organic (SF)	Amber, egg-shell etc.
Personal items (SF)	A broad category representing finds linked to the individual i.e. jewellery, badges, brooches, religious, buttons
Rope (BF)	Rope fragments
Security (SF)	Keys and locks
Shell-molluscs (NS)	(Collected as finds, analysed as natural science objects)
Ship and fishing tools (SF)	Finds covering the broad spectrum of maritime archaeology and fishing equipment
Skeleton (NS)	Human bones and teeth (collected as finds, analysed as natural science objects)
Slag (BF)	All by-products of metalworking and glass working
Stove tiles (BF)	Decorated and undecorated tiles from stoves
Textile production (SF)	Crafts people equipment linked to textile production and repair, i.e. pins, needles, thimbles and needle cases
Textile (BF)	From clothing to household furnishings i.e. covers, curtains
Tools (SF)	All various craft tools and equipment linked to industry
Toys and games(#)	An assemblage of all types of toys, games, gaming boards and gaming piece fragments
Trade items (SF)	Cloth seals
Wall tiles (BF)	Decorated and undecorated tiles from structures
Writing tools (SF)	Styli, book clasps

Non grouped/sub-classed objects (BF)	Various finds, either unidentifiable or corroded through soil conditions
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Table 3 Finds sub-classes

6.2.3.3. Report writing.

The specialists on the different types of materials added further registration on the objects. The finds and natural science objects were described, analysed, assessed and incorporated as chapters/sub-chapters in the site report (see appendices).

6.2.4. Finds prioritizing

When undertaking the finds work for the Gammel Strand project, due to the large quantity of collected **Bulk Finds**, prioritization had to occur. A prioritization strategy was developed to cover all **Bulk Finds** retrieved from the Gammel Strand Excavations from 2012-14 – ceramics, CBM (floor tiles, stove tiles and wall tiles), glass and leather. Regarding the clay pipes, these were used as study material for Mie Pedersen's university dissertation and thus fully registered as part of this (Pedersen 2016). The other **Bulk Finds'** Finds Units underwent a prioritizing process, linked to the strategy described below, before other processing (finds washing etc.) began.

The purpose of the prioritizing strategy was to provide archaeological and scientific arguments for limiting the amounts of **Bulk Finds** that needed washing, registration and analysis due to reasons of budget. The choices made in the strategy were crucial as we would not know exactly what information would be lost by this methodology. It was decided that the strategy should tie in with the overall aims of the excavation as well as the site specific questions, for prioritization to occur.

When prioritizing the finds it was decided that instead of prioritizing by production date/typological date, we would go by deposition date as well as deposition type. Finds from certain types of deposits (e.g. inside drain pipes) could be more interesting – or interesting for other reasons – than finds from, for example, post 1700 dump layers. However, we decided we should not completely leave out the dump layer finds, as they serve as a great opportunity for comparing the dumped material from other "large dumps excavations" (e.g. KBM2307 A. P. Møllers Hovedsæde/Esplanaden, KBM3827 Rådhuspladsen, KBM3829 Kongens Nytorv, KBM3967 Krøyers Plads etc.). Post 1700 finds at GLS come primarily from usage layers and land reclamation dumps on the southern side of the Phase 4 bulwark.

With all these factors taken into account, a strategy was made for the Main Excavation **Bulk Finds**. An example of the strategy is given for the prioritization of the ceramic material below.

6.2.4.1. Prioritization strategy - ceramics

From following all these points and reasoning, it was decided that a total of 52% of the ceramic Finds Units, 394 from 753 Find Units would be looked at. The reasons for this amount are listed below, by Phase. A total of 63 bags of un-phased deposits were not prioritized.

Phase	Total number of Finds Units	Prioritized Finds Units (total)	Prioritized Finds Units from Guide Wall excavation (already washed)	To be found and washed
1	93	93	1	92

2	130	130	25	105
3	72	42	0	42
4	247	94	28	66
4 with Bargemens Guild House remains	39	10	6	4
5	78	21	0	21
6	94	4	1	3
Total Phased	753	394	61	333
Un-phased	63			

Table 4 Amount of ceramic Finds Units and prioritized amounts from the Guide Wall and Main Excavation

- The emphasis on the amount of Finds Units chosen, and percentage of the phase chosen was first linked to budget and overall quantity. The chosen amount was then split between the phases and their historical period, to answer specific questions on Gammel Strand, Copenhagen and Denmark. Viewing the finds retrieved within the excavation was also factored into the equation.
- Finds were at first chosen from deposits interpreted as the usage stages of the different bulwark phases, and then expanded.
- A combination of big bag finds and hand collected finds from certain types of deposits were to be looked at to see what was missed by the two different procedures.
- The pottery from the Guide Wall excavation had already been washed before the Main Excavation had occurred and was linked to an unknown view of what would happen in the Main Excavation.
- Post 1700 dump layers would be chosen from various depths and locations along the excavation area, to obtain a good representative sample.

Phase 1 and 2

All pottery from Phase 1 and Phase 2 was washed, registered and analysed. This was decided because of two reasons; the assemblage from these phases comprised a mixture of either large sherds or near complete vessels. This suggests a different discarding or dumping policy to what was found in other phases on Gammel Strand, or what has been found on other excavations in Copenhagen. Secondly, the period from 1500-1630 has not been represented greatly in finds material or structures from other excavations in Copenhagen, so this excavation gave us the opportunity to focus on it.

Types of deposit analysed in this phase include:

- Alluvial usage deposits
- Construction/land reclamation/levelling deposits
- Deconstruction deposits
- Fill deposits
- Posthole deposits

Phase 3

This phase features deposition layers from 1630-1690. The phase was deemed important so a larger amount of deposits and types of deposit were selected. Deposits not chosen for finds processing include deposits that were not fully excavated, and construction cut backfill. Levelling layers that were chosen was

only a selection of the levelling layers from Phase 3. The deposits that were not fully excavated were found near the limit of the excavation in the Guide Wall excavation. As we did not fully uncover the deposit, or understand what was below, we decided to not choose these Finds Units.

A total of 60% of the ceramic assemblage from this phase was selected.

Types of deposit analysed in this phase include:

- A sample of the levelling layers
- Alluvial deposits

Phase 4

Phase 4 was the longest historical period on Gammel Strand with the phase dating from the 1690s to the 1820s. The largest quantity of Finds Units was retrieved from this phase which also included the largest reclamation of land. Although this period represented part of the period when Copenhagen was becoming more globalized, it also represents the phase where Gammel Strand becomes more of a distribution centre and administrative harbour rather than being the sole harbour, which it functioned as in Phases 1 and 2. A total of 104 Finds Units from 286 Finds Units were chosen. This amounted to approximately 36% of the Phase 4 assemblage. Finds from construction cuts were again not selected.

Types of deposit analysed in this phase include:

- A sample of the levelling layers
- Alluvial deposits
- Finds from drains/water pipes
- Finds from the Bargeman Guild House

Phase 5

Phase 5 was a short phase in Gammel Strand's history, lasting only 40 years. It featured the final stage of the harbour functioning as the administrative centre of the port. With the decreased importance of this period in the harbours' history, it is also reflected with the decreased importance of finds. For this reason in only 21 of the 78 ceramic Finds Units were chosen, approximately 25% of the phase assemblage.

Type of deposits analysed in this phase include:

- A sample of the levelling layers.

Phase 6

The final phase from Gammel Strand dated from 1880-2014. It featured the harbour being used as a fisherman's harbour and finally as a tourist harbour. The old working harbour ended with the tax laws changing in Denmark in 1849. This led to the administrative buildings being destroyed in 1857. As the harbour had been downplayed in importance, so was the importance of the finds. Representative samples of levelling layers and harbour construction backfill were chosen. Only 4 Finds Units from the phase assemblage of 94 were processed and analysed, 5% of the phase assemblage.

Types of deposit analysed in this phase include:

- A sample of the levelling layers.

The non prioritised **Bulk Finds** were stored for future analysis and research in the archive after the finds process was completed. The objects that were in bad condition and could not be retained were documented and discarded.

6.3. Sampling methodology

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 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. 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 Gammel Strand, to varying degrees depending on their specialism.

6.3.1. Procedures

Sampling was conducted according to the principles laid out in this text. Changes were occasionally implemented after discussion with the Excavation Leader, Field Leaders 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 (Online access: <http://slks.dk/fortidsminderdiger/arkaeologi-paa-land/museernes-arkaeologiske-arbejde/vejledning-om-arkaeologiske-undersogelser/> Accessed October 30th 2016).

The consultants were responsible for either entering the results of the analysis directly into the Museum of Copenhagen's IntraSiS database or providing Excel databases. These databases were then added into the archive. 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.

All samples taken within the field work phase were measured in by total station. Sample identities were then generated in the IntraSiS database. This was also the case for the large number of big bag samples taken during the Main Excavation, which were given the code PB, when surveyed. From these, sub-samples

were taken during the post excavation process to be used for macro botanical analysis as well as sieving for small bones for the zoological analyses.

6.3.2. Sampling techniques

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.

6.3.2.1. Bulk sampling

Bulk samples were taken from single large contexts. The size of the samples varied from approximately 3000 ml to 8500 ml which was registered when the samples were processed. From small deposits, such as fills within drain pipes, the sample amounts were smaller, approximately 300-700 ml. Archaeologists 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 C14 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.

6.3.2.2. Monolith sampling

Monoliths are samples generally taken from vertical sections/profiles. They can be cut out of vertical sections or horizontal stratigraphy in 15 x 15 x 15 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 are marked with up and down and marked with a manila tag stating identification number and context. Archaeologists or consultants on site are responsible for extracting the samples. All samples are 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 contains more than one identifiable context, it is clearly noted on the sample so it can 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 are then to be 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 C14 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 Gammel Strand, with the focus on taking bulk samples.

6.3.2.3. Sampling from finds

Natural science sampling of finds involved obtaining material from finds objects for further analysis. Examples include; 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.

6.3.2.4. 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 samples 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.

6.3.3. Types of analysis

Contract holder	Type of analysis	Purpose
Nationalmuseets Bevaringsafdeling Brede. NBB	Metallurgical analysis	Determination of provenance and composition of material, technology, craftsmanship, etc.
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.
Statens Naturhistoriske 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.
2. Dendro.dk	Dendrochronology	Determination of age and species of in-situ wooden structures or 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 5 Types of analysis and contract holders

6.3.4. Sampling – purpose, methods and strategies

Sampling strategies for the site, within the field of natural science were aimed at being consistent throughout the excavation, within a certain degree of practicality. 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.

6.3.4.1. Zoological analysis

Zoological analysis was 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.

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 land reclamation layers (which were often very rich in bone material) that hand retrieval of bone would have been too inconsistent and biased towards large bones, and it was decided to complement the hand collection of zoological material with material collected from big bag bulk samples as well as from sub-samples of these. The big bag samples were wet-sieved through a 5 mm net and the small bone sub-samples (amounts corresponding to the bulk samples described above) were fine sieved through a 2 mm, 1.8 mm and 1.0 mm net.

The strategy for sampling and analyses: only zoological material from defined archaeological features, was 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 e.g.. cut marks, cleaving for the extraction of marrow and the effects of burning.

The material to be analysed was chosen during and following the fieldwork phase, according to its cultural-historical potential. Sampling was undertaken 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 analyses 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.

6.3.4.2 Macrofossil analysis

Macrofossil analysis was undertaken on Gammel Strand to provide information on agricultural practices and food consumption, and to help reconstruct 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 2 litres from larger contexts.

The 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 workphase.

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

6.3.4.3. Dendrochronology

Dendrochronological analysis was undertaken on Gammel Strand to 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 (provenance) 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: dendrochronological 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 analyses were used instead of C14 as radiocarbon dating is ineffective from the mid 17th Century onwards. Dendrochronological 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.

6.3.4.4. Geological analysis

Geological analysis was undertaken on Gammel Strand to provide information on natural and cultural deposits and investigate how they were affected by later natural processes and human activities.

ICP analysis 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.

Identification of stone type was also undertaken to better understand the provenance of the material, and help with registration.

6.3.4.5. External natural science projects linked to Gammel Strand material

During the Main Excavation, samples from Gammel Strand were taken for analysis linked to external research projects.

M. L. S. Jørkov sampled animal bones from 18th and 19th Century contexts to use for reference in a study of stable isotopes reflecting diet in connection with the post-doc project “Af jord skal du igen opstå”, supported by Det Frie Forskningsråd for Kultur og Kommunikation (DFF|FKK; projekt no. 10-094535) (Jørkov & Gröcke 2016).

In connection with the The Genomic History of Denmark, I. Merkyte and P. C. Ilsøe took out samples for analysis from organic deposits from the 17th and 18th Century (Søe et al *in prep*).

6.3.5. Prioritizations of samples

Due to the large number of environmental samples taken either as such or as sub-samples to the big bag samples during the field phase of the excavations, prioritizations of the samples were necessary before processing of the material. Likewise a very large number of samples for dendrochronological analysis were taken, but not all were prioritized for analysis.

6.4. Digital documentation and storage

During the fieldwork phases the information on the context sheets was transferred to the corresponding IntraSiS Explorer database for further analysis and storing. Entering information into IntraSiS also included grouping according to the principles in the Guidelines for Contextual Documentation 2011. In addition, all the features were entered into an overall site matrix.

All documentation regarding the excavations and watching briefs on Gammel Strand is stored at the Museum of Copenhagen. This means that all paperwork: context sheets, diaries, drawings and such are kept in the Museum storage along with finds materials and natural science materials.

Digital material, such as photos, IntraSiS database, Excel-workbooks, email correspondence and so on, has been saved in the Museum’s digital archive with relevant back-up.