# The Harbour of Sebastos (Caesarea Maritima) in its Roman Mediterranean Context

†Avner Raban

Edited by
M. Artzy, B. Goodman and Z. Gal

BAR International Series 1930

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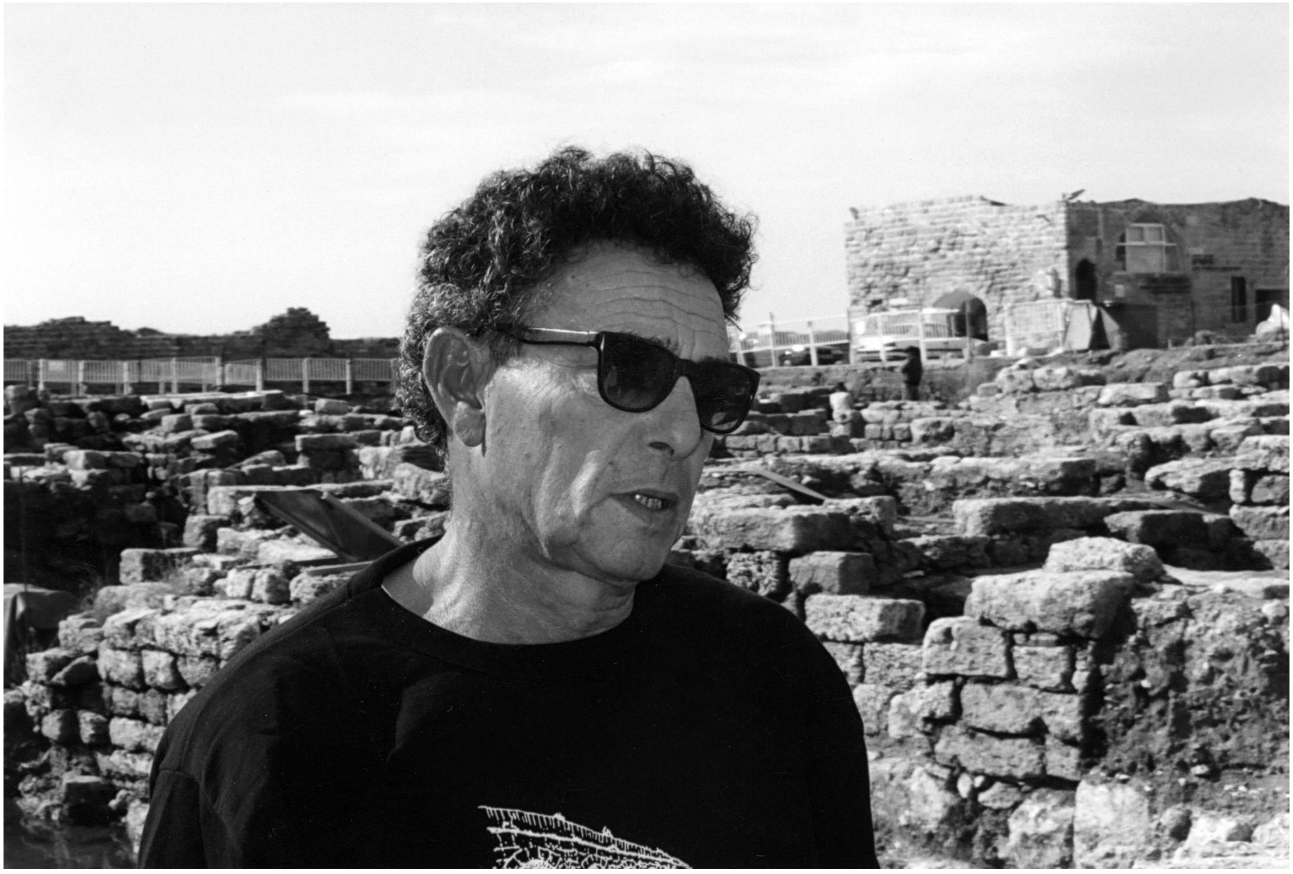
## Avner Raban 1936-2004



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**Abbreviations used frequently in this volume**

| | |
|---|---|
| BSAC | The British SubAqua Club. |
| CAHEP | Caesarea Ancient Harbours Excavation Project |
| CCE | Combined Caesarea Expedition. |
| IAA | Israel Antiquities Authority |
| IEC | Israel Electric Company. |
| IUES | Israel Underwater Exploration Society |
| JECM | The Joint Expedition to Caesarea Maritima |
| MSL | Mean Sea Level |
| UT | Ugarit Texts |

## Preface

In the fall of 2003, following summer underwater excavations at the harbour of Sebastos (Caesarea Maritima) and the harbour of Clazomenae/Liman Tepe, Turkey, Prof. Avner Raban started a sabbatical year in Oxford. He chose Wolfson College at Oxford University for its proximity to what he considered to be the best libraries. His main task was to prepare a manuscript on Caesarea, not necessarily a technical book on the excavations of Caesarea Maritima, the largest and most demanding project he had ever undertaken in his professional career, but more of a personal study. This was to be a more general overview of Herod's harbour in Caesarea within the Mediterranean context of the Roman period, addressing questions as to why Herod decided to build the harbour there, why he wished to have such a large harbour (which was no doubt a major financial burden during its construction), how it was built, the technology, the materials, the concept, how all this was achieved, and how the harbour fit within the context of the periods in which it functioned. Over the years, Avner and his colleagues had published numerous articles dealing with the site and its construction. This book was intended to be an overview of the site, from Avner's point of view.

Avner was also looking forward to spending time with some of his friends, among them Chris Brandon, with whom he traveled in the last weekend of his life, and Sir Maurice and Lady Irene Hatter who were awaiting his visit on very the day he collapsed in London. Avner's dream of a more general book on the harbour, in context of the Mediterranean world, did not materialize during his lifetime. He passed away very suddenly on the 11th of February, 2004 in London. A partially completed draft of a manuscript was found among his files. The draft arrived with the hard disk of the computer he used and a copy of it was given to me. Avner had already been in contact with the publisher, where he and his colleagues had published Caesarea related volumes.

The underwater and coastal excavations at Caesarea were a long-term project, which took place over many years and with different groups of participants and co-directors and thousands of volunteers. The project began as a small local endeavor within the University of Haifa's then named 'Center for Maritime Studies'. Participants included the University's Maritime Civilizations students and divers from the Underwater Society of Israel, an organization comprised primarily of Avner's military buddies, many of who were also 'kibbutzniks'. At first, along with Avner was Elisha Linder, Avner's mentor, the founder and living spirit behind the maritime program at the University of Haifa. It was a low-budget project and all the people who were involved volunteered their time. The fact that the project was successful in those circumstances must be credited to Avner's charismatic personality and his selfless dedication. It was clear to all who were involved in the first years of the project that Avner was the right person to take on the colossal project of a harbour built by King Herod. He was the only one who could encompass the history, geography, geomorphology, and the underwater archaeology involved in such an ambitious project.

As the project grew under Avner's leadership, he invited others to join him, among them Robert Hohlfelder, John Peter Oleson, Kenneth Holum, Robert Stieglitz, Eduard Reinhardt, and Christopher Brandon–who brought their passion, knowledge and expertise, as well as their students, to make this study a truly international venture. Many archaeologists from the USA, Canada, South America and Europe, working in harbour archaeology today, were first trained at Caesarea and continued their work in other harbour sites, especially in the Mediterranean. While the purely underwater aspects of the archaeological research at the harbour of Caesarea have been in a hiatus since Avner's passing, other research project continued. Among them were the Hydraulic Concrete project carried out by Oleson, Brandon and Hohlfelder; and the Tsunami Project by Beverly Goodman (a former Caesarea trainee), Yossi Mart, Hendrik Dey and Eduard Reinhardt with the aid of Steve Breitstein and Amir Yurman of the University of Haifa's Underwater Workshop of the Recanati Institute for Maritime Studies, Avner's 'scientific home'.

Throughout the years of the excavations, scientific papers, reports, and edited books have been published summarizing the results at different phases, and numerous sessions have been held in scholarly meetings, among them a yearly session dedicated to the harbour and its environs ('Herod's Dream') at the American Schools of Oriental Research annual meetings. Some were the results of Avner's personal initiative but others took place after his death. Kenneth Holum of the University of Maryland produced the latest publication, 'Caesarea Reports and Studies' (2008, British Archaeological Reports), and has now been granted support from the White-Levy Foundation for the publications of his land project. He has agreed to oversee, with us at the Institute, the scientific publication of one of Avner's extensive land excavations, namely, the important inner harbour of Caesarea Maritima (Area 'I').

Avner's draft manuscript, as it was given to me, needed more work than I had anticipated when I first volunteered, along with others, to oversee its preparation for publication. Several parts were very much in preliminary less-than-draft form. After some initial uncertainty as to how to approach the publication, I decided that the chapters Avner had envisioned would be retained and no others were to be added, especially since I found that Avner conceived of the manuscript as a unit and the 6 chapters (I separated one chapter into two, so there are now 7) he had left really constituted a complete framework. As a matter of fact, there was a clear line of thought as to what the structure of the book should be.

As is, the manuscript contained a wealth of material both on the harbour of Caesarea itself as well as its context in comparison to other Mediterranean harbours, especially in the Roman period. I retained his ideas as they had been expressed, although at times I had to put some order into his musings, which I am sure would have been rectified had he prepared the book for publication himself. The bibliography was problematic since Avner was very well read and had visited many libraries but didn't always supply clear bibliographical citing. I could not revisit these libraries and if there are still inconsistencies, I ask the reader to be forgiving. I did my best to find all the right articles and books. It was not always easy to understand what Avner meant in his writing. I often tried to translate sentences back into Hebrew in order to figure out what he was trying to convey. It was not an easy task since his usage of the English language was often quite innovative (as those who worked with him over the years would agree).

Yael Arnon, an assistant, close collaborator and PhD student of Avner's, prepared possible additions dealing with the harbour in the Islamic period, but by keeping the project to the plan and form he seemed to indicate in the draft, with the main topic being Sebastos, I decided not to include this material in the final version. Chris Brandon, who took it upon himself to prepare the figures, was very helpful with many of the illustrations, but even he could not find all the sources, so it was left to us at the Hatter Laboratory for Coastal and Harbour Archaeology to ferret out the final list of sources. I was greatly helped by Michal Oren-Paskal both with the figures and the bibliography. Michal, with the help of Svetlana Zagorski, labored to match the figures to the text. Avner, having had one of the more brilliant minds and memories I have known, hinted, in each of the chapters which figures he thought would be appropriate. It was not always easy to guess what he had meant or to find the particular figure among his files. We had to forfeit some of the figures, which we could not find, though we were mostly successful. I tried to keep Avner's ideas intact as I attempted, I hope successfully to make them understandable and approachable. I hope that it did not hamper his personal style, which should still be evident in the final version of the manuscript. Zvi Galhelped me greatly in the editing, especially of Chapter IV (now divided into IV and V), which was very much in a raw draft shape, so did Beverly Goodman. Nira Karmon, Yossi Tur-Caspa, Rachel Pollak, Shalom Yankelevich, John Oleson, Bob Hohlfelder, Ken Holum, Joe Boyce, and others who tried to help with such queries as 'what is the figure he meant and/or where could we find it?', 'what do you think he meant here?' or 'do you have any idea whom he was referring to when he mentioned…?'

Sveta Zagorski was most helpful with the graphics of the manuscript and preparing it for print, Noga Yoselevich helped me learn to set the manuscript, which with no doubt would go through another round at the publisher. Most of the costs of the preparation of the manuscript for print, whether of the text itself or the figures, etc. were borne by the Sir Maurice and Lady Irene Hatter Laboratory, which I head, as well as some private donations. The Rector of the University of Haifa, Y. Ben Artzi, a friend of Avner's, as well as the Faculty of Humanities, aided as well.

My own background in coastal and anchorage sites, especially those from the second and early first Millennia BCE on the Carmel coast, did not quite prepare me for dealing with Roman harbours, but being in the same academic department and institute and sharing field experiences with Avner (in Akko in the 1970's and 80's, Tell abu Hawamin the 1980's as well in the harbor at Liman Tepe with our colleague from Ankara University, Hayat Erkana from 2000 to 2003), encouraged me to undertake this project as a tribute to Avner.

Unfortunately, Avner did not live to dedicate this manuscript. Yet I am sure that his wife Dina, his children, Rowee, Smadar, Haggai and Ido, their spouses, his grandchildren and his beloved kibbutz, Ramat David in the Jezreel Valley, were all on his mind when he listened to Classical music, a constant companion, as he worked in Oxford on the unfinished draft of Sebastos, Caesarea Maritima and his beloved Mediterranean.

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# Chapter I

# Ancient Harbours of the Mediterranean

**A. History of Terminology**

The term "harbour" is general and often misleading, especially when it refers to a pre-modern context. The terms used in ancient languages are even more ambiguous. In old Semitic languages the term was sometimes used to as parallel "sea-shore" (Gen. 49:13; Judg. 5:17; 2 Chr. 2:16), although in translations of the Old Testament the words "haven" and "roadstead" are used. The old Semitic term, which might be etymologically a hybrid of Sumerian MA = a prefix for everything concerning the sea and the Akkadian *îaddu-îazzo* (strong), is known in the Bible as *Mahoz* (Ps. 107:30) = harbour and in Ugaritic *mihd* (UT. 2008). The Akkadian term *karum*, or *kaari*, is usually understood as a derivation of *kur* = market, emporium. In a famous document from the Neo-Assyrian era the imperial governor of the Phoenician city state of Arwad complained to his king that the local prince would not allow merchantmen to moor at the royal quay, using the term *ka-a-ru* to designate the type of harbour facility (ABL.992). During the Early and Middle Kingdoms, the Egyptians used the same word for "haven" and for a river outlet. In the New Kingdom they used a new term *Mnit,* which literally means "a mooring post for tying boats", but later became the colloquial term for a commercial harbour, equivalent to the Greek *emporion*. This ancient Egyptian word was transformed to *mineh* in Arabic and to *limen* in ancient and modern Greek. The Talmudic Hebrew reversed its consonants to NML (*namal*) and this remained the sole term for harbour in Hebrew until present time. The terms in Greek and Latin (Roman) were no clearer and names such as *'ormos*, *prosormos*, *'uphormos* and *limen* were often interchanged by different writers referring to the same harbour. Even if we recall that literally *'ormos* is also a bay and *limen* would be the only Greek parallel to the Latin term *portus*, we still cannot draw a clear picture of a particular complex for any of the titles mentioned above, not for its size, qualities, components, or physical properties (Casson 1971: 362; Leonard 1995a, 1997).

**B. Historical Development of City Ports**

It is not only that the terminology of the ancient texts is ambiguous, but also that our own notion is biased by what we conceive as a harbour that would be suitable to the scope of a given port city and the importance of seaborne trade for its thriving economy. The fact is that there have been only a few properly set, spacious, all-season harbour facilities around the Mediterranean basin throughout history. Alexandria, Piraeus, Valleta and the harbours of the gulf of Puteoli were the exceptions based on uniquely favorable topographic features. The trade, until the days of Claudius, changed when the metropolis of Rome added to its demands for seaborne goods. The Merchantmen arriving from around the Mediterranean rode on their anchors off the outlet of the Tiber and unloaded their cargo to lighters and barges. This was the routine exercised at major seaports in the history of seafaring and maritime trade (Frost 1995: 1). Building a full scale, year-round harbour, especially at sites exposed, partly or fully, to the violence of the winter gale, was (and still is) an extremely costly endeavor demanding financial resources usually beyond those of municipal entities. We learn that it was only when prime economic and political interests were at stake that the Roman Senate would allocate the needed resources for such a project, and even then,only after long deliberations. The badly needed proper harbour for Rome, first projected by Julius Caesar, was carried out only some 80 years later by Claudius and was not completed until the time of Trajan, in the early second century CE. In time, some rather large and sophisticated harbours, such as Nero's at Antium, Trajan's in Centumcellae and Septimius Severus' famous one at Leptis Magna, were conceived due to purely political, and in some cases even personal, considerations such as the glorification of the birthplace of a ruler (Rickman 1985: 111).

The financial burden of constantly maintaining such mega-harbours was heavy and problematic and thus almost all the major harbours of the ancient Mediterranean were abandoned, falling into disrepair, and/or silted up after they lost their economic significance. As stated by Smith and Morrison (1979: 368): "*In the last analysis a port is a man made feature and it is on human factors that its survival must depend.*" Yet, while some port cities, such as Miletus and Ephesus, declined and their habours went out of use, others (e.g., Rome, Corinth, Tarsus and Antioch) survived and were continuously active, utilizing replacements at nearby secondary havens.

Comparative studies of other major harbours in the Mediterranean during antiquity seem to suggest that no large-scale harbour works was initiated or financed by the central government after the mid third century CE, with the single exception of Constantinople, built by Justinian (Blackman 1982: 19; Hohlfelder 1988). One should take into account such comparisons when looking for harbour works at Caesarea in later periods.

There is, of course, the issue of types and sizes of maritime vessels the harbour would serve. This is a complicated issue involving both the geographical and geopolitical setting of each harbour within the network of sailing routes in every period, as well as the types of sailing ships and their maximum size and draught. As opposed to the supersized bulk carriers of the Roman grain fleet during the early imperial era which reached well over 1000 tons (Casson 1971: 170, 138) and other merchantmen of that period with capacities of up to 300–400 tons (Pomey and Tchernia 1978), according to the published data about the hulls of those wrecked in the Mediterranean, later Roman ships did not exceed a maximum length of 25–30 m with a capacity of up to 200–250 tons (Van Doorninck 1972: 139). The fully loaded ships of that latter period would have a draught of less than 3 m and one may consider Flemming's notion that "a useful harbour may have been 2 m deep" (1972: 60) as a reasonable one, although a 3 m bottom depth at the first class harbours of the tide-less Mediterranean seems more accurate (Rickman 1985: 108).

### C. Geo-morphological Effects

The true story behind almost every port city along the shallow coasts of the eastern Mediterranean was related to, and still is, the on-going rebounding human activities *versus* the coastal processes. The most significant property of the Mediterranean, as far as its coastlines are concerned, is its being tideless or having meager tidal amplitude. In addition, along most of its coastline there are only a few perennial river outlets of significant flow, and quantities of drifted sediments created a hostile environment for natural havens. In such geographic constellations the physical trend is almost everywhere toward straight and even shores with rocky headlands, or river estuaries turning into land-locked lagoons and sandy beaches that characterize hundreds of miles of the waterfront (Fig. 1.1).

This type of coastal process dominates the better part of the Mediterranean's shores: its southern African coast, the Levantine coast and along most of the Italian and the Spanish peninsulas coasts (Karmon 1985). With the rather delicate equilibrium between deposition and erosion, continuous changes in microtopography caused by either eustatic changes of sea level, tectonic faulting, or manmade off-shore structures might alter the whereabouts of the waterfront. These might enhance additional non-predicted siltation or extensive erosion at a rate that would affect every manmade structure at the coastline. In areas where the continental shelf is wider and of shallower gradient, these processes are more prominent and by far more effective (Nir 1982a). It is thus natural that among the leading scholars who study ancient harbours of the Mediterranean there are prominent geologists such as Flemming (1972, 1980), Neev and his collaborators (1976), Webb (1986), Pirazzoli (1987) and others. While studying the ancient harbours of Caesarea we soon found that for almost every issue with which we were concerned, the answer had to be looked for concurrently and in close collaboration with earth scientists. Every tumbled block of an ancient mole might have been better comprehended by studying the type of sediments on which it was found and those covering it. Marine encrustation can tell much about the water depth and the environmental situation of a given period datable either by C14 analysis of organic components as can archaeological artifacts in their non-disturbed context (if such survived). Types of marine fauna on manmade structures and artifacts can be studied by marine biologists in order to determine the environmental context in which these specimens survived. The grain size of a particular deposition can tell what type of wave energy caused it. The continuously changing land/sea relationship at a site, which undoubtedly affected maritime installations and the functioning quality of its harbour, is of paramount importance for its study, as equally are the examinations of wave climate, wind patterns, local neo-tectonics, eustatic changes and other factors in the long list of contributors in this everlasting flux of continuous environmental changes that characterize the least stable geographical feature on earth: the coastline. Some changes in the Caesarea area illustrate the point extensively. In the late 1950's, for instance, a feature was built and sand started to be deposited on its southern side while excessive erosion took place on its northern side. Then, an internal destruction of the promenade moles caused by a surge continued pulling off volumes of ashlars into the sea and dumping others on a nearby rocky shelf. Eventually, the destructive scouring and trenching along the northern edge of the stem of that mole of less than 30 years, in a modern, well-built structure, in a semi-protected environment, can be seen (Fig. 1.2). It is not necessary to search for catastrophes such as earthquakes or tsunami waves, when in a short period of only 30 years of disrepair, a modern manmade feature is undermined by the elements.

Based on historical sources and archaeological evidence, we know that the city of Caesarea continued exercising maritime activities and seaborne connections as long as the urban life continued at the site. The question is what type of harbour was there to serve these activities? We know much about Sebastos and can estimate the scope of seaborne trade that such a harbour could handle. Yet, the question is whether it actually functioned to its fullest capacity and for how long? We do not have textual evidence that can illustrate the in the volume of seaborne trade that passed through that harbour at any given period, and the only one to describe its physical demise was Procopius Gazeus (see below). Thus, it is through the study of the material remains at the site that the answers might be sought. In order to do so in a proper manner one has to be able to reconstruct the exact whereabouts of the urban coastline for each period and the prevailing coastal processes at

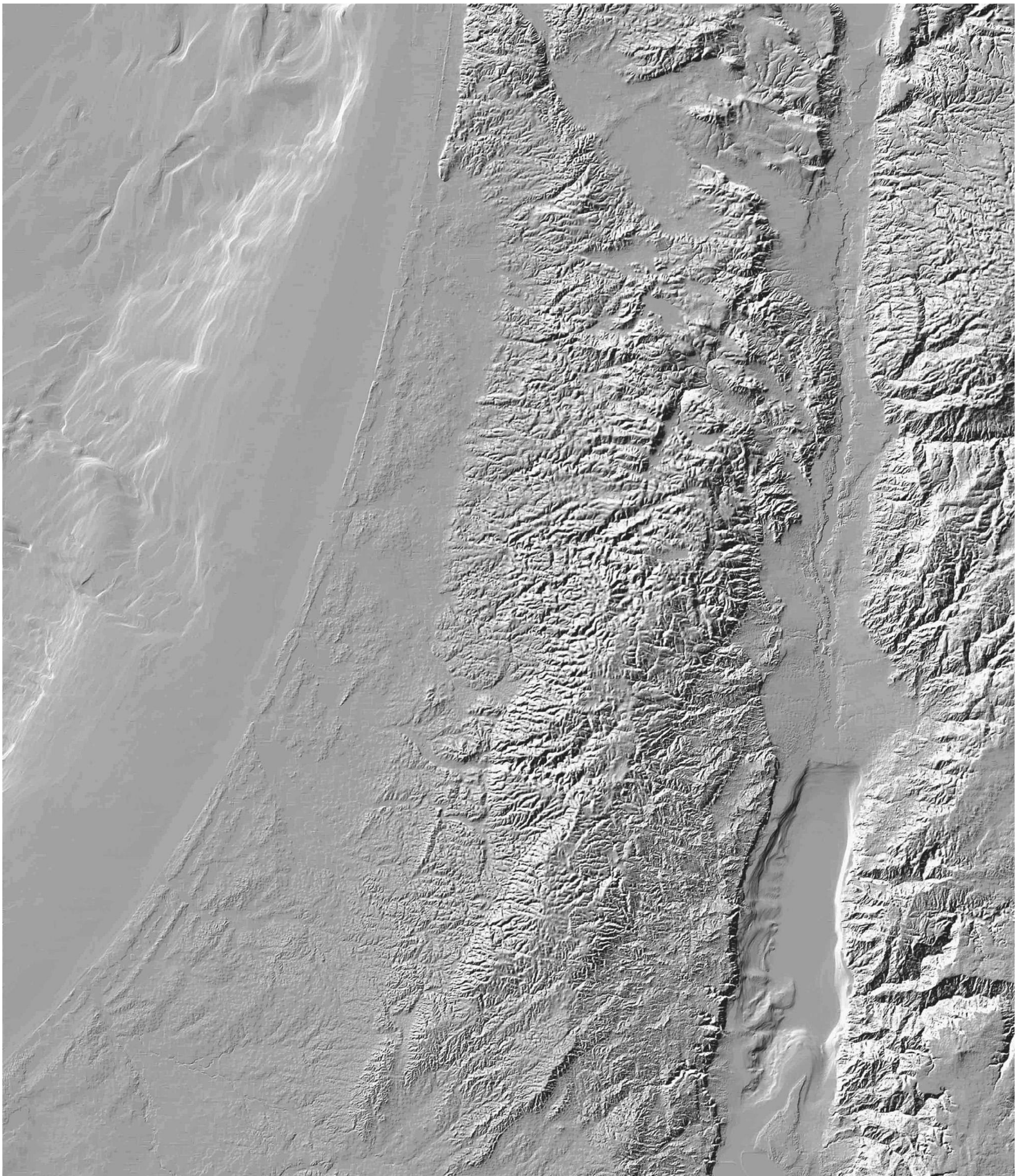


*Fig. 1.1 Typical development of a transgressed coastline (after J. Hall)*

*Figure 1.2. The northern mole of the fishermen anchorage in Caesarea 1997 (Photograph: A. Blantinschter)*

that site during each particular phase: Were the land/sea relations stable or manageable by the people of the city. When during the city's rather long history did the sea level rise and when did it recede and at what pace? What was the scope of destruction that might have been caused by tectonic upheavals, earthquakes and tsunamis? How did the local people react: by exercising preventive measures or by attempting to amend the damage?

**D. Ancient Harbours of the Mediterranean—Research History**

Remains of ancient harbour works have been studied and the results randomly published since the beginning of modern era, mostly in conjunction with land reclamation and the construction of new facilities. Such were the works done over centuries along the Tiber river and its mouth, where remains of Tiberius's Roman harbour were exposed (Lanciani 1897; Meiggs 1960: 149–171), or the shipsheds at Zea harbour in Piraeus (Georgiades 1907; Dragatsis and Dörpfeld 1885) and the remains along the Pharos island at Alexandria (Jondet 1916). Some very preliminary observations were made by scholars as part of their land surveys of ancient city sites, such as Terracine (La Blanchère1884), the Lechaeum of Corinth, and Delos (Paris 1916; Ardaillon 1896) the shipsheds at Oeniadae, Akarnania of Greece (Sears 1904), Lesbos (Koldewey 1890) and Forum Iulii Fréjus, in Provence (Aubenas 1881). The work carried out by Jondet at Alexandria in the years 1912–1916 was probably the first attempt to use helmeted divers in order to record structural components under the water, although on a limited scale. Being the chief Port Engineer for Egypt, Jondet's survey was carried out in preparation for building the present day new commercial and military port and was fully published (see the excellent summary and extensive bibliography by Blackman (1982: 85–90, 97–104).

The first scholarly, comprehensive study of ancient harbours in the Mediterranean was that of Lehmann-Hartleben (1923), which is still considered a major text book. It relied mainly on historical records, pictographic depictions and limited hydrographic and cartographic sources, recording 368 ancient harbours around the Mediterranean and its tributary seas, 184 of which are in its eastern basin (Flemming 1972: 163–5). This study is not just an exhaustive site catalogue; as he indicated by using the word "Städtebaues" in the subtitle, the author considered his work an essay on the history of town planning (Rickman 1985: 105). He took for granted that methods of harbour construction progressed evenly and universally and became less "primitive" and larger over time (Blackman 1988: 7). With all its shortcomings it was the first attempt to analyze the development of ancient harbour construction and layout in the Mediterranean.

The first strictly archaeological study of inundated harbour constructions was carried out by Poidebard (1939) in Lebanon. A series of airborne surveys properly documented by aerial photographs revealed to him intriguing artificially cut reefs and manmade moles at various sites along the coastline. In 1934–1936 he was assisted by local sponge

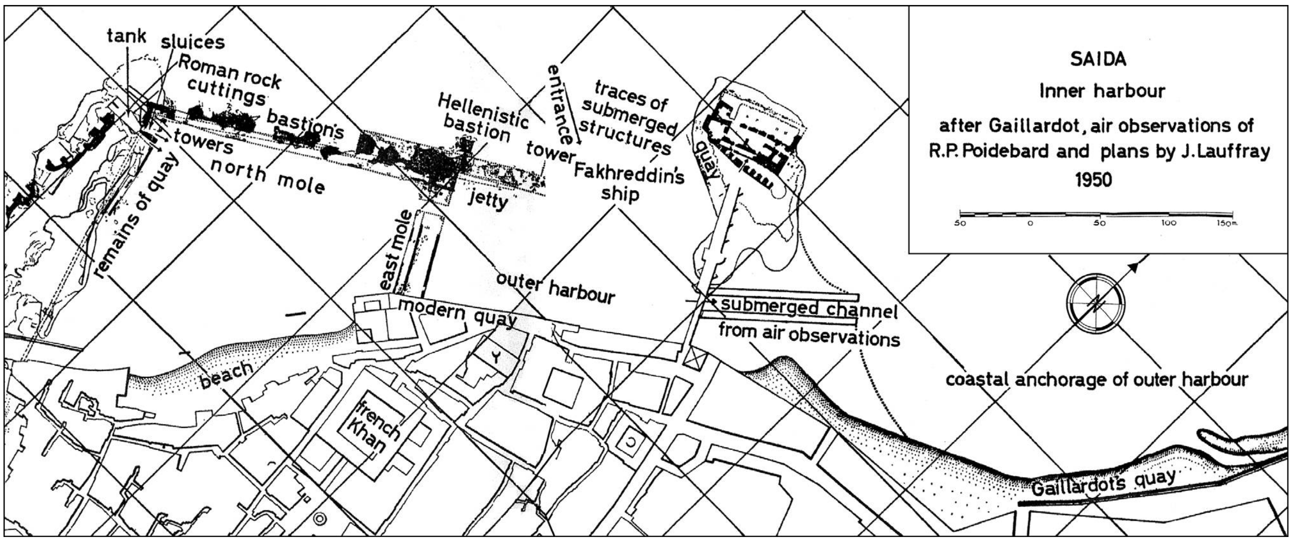



*Figure 1.3. Plan of the inner harbour at Sidon (after Poidebard & Lauffary 1951)*

divers and helmeted divers of the French navy in surveying and carrying out a series of small scale underwater probes, mainly along the southeastern mole of the southern inner harbour of Tyre (1937). The pioneering character of the project, coupled with the fact that there was no trained archaeologist among the divers and the photographs that were taken through a glass bottom bucket, yielded some erroneous conclusions (Poidebard 1939), which were questioned at the time by his collaborator, Jean Lauffray, during the execution of the next project at Sidon. For instance, the alleged manmade moles on the off-shore reefs south of the harbours were later shown to be natural features (Poidebard and Lauffray 1951: 73; Frost 1973: 75–76). After the Second World War, Poidebard, assisted by Lauffray, had the opportunity to extend his studies to Sidon where some renovations were made due to extensive silt-up of the harbour basin caused by a jetty built in 1939. They also surveyed the prominent rock-cut features on the off-shore island, tracing the various functional elements of an outer harbour, including a rock-cut winch for pulling up vessels and a detached, free standing (presently submerged), oblong rectangular quay.

Unfortunately, none of these features could be dated properly, and even later attempts by H. Frost utilizing earth science disciplines left most of the dating issue unclear (Frost 1973, 1995). Poidebard and Lauffray's study (1951) of the closed harbour, carried out while it was dredged by heavy machinery, is of great importance especially since much of the surveyed data is now covered by an additional burden of modern cement or silted up under heavy layers of mud and sand. The ancient inner harbours were surveyed at the southern side of the present harbour (Fig. 1.3) where two phases of construction (Hellenistic? and Late Roman) were recorded. These were associated with a main enclosure, an ashlar built mole on the northern side, stemming at the top of a rocky outcrop that was leveled on its leeward, leaving the western edge, which faces the open sea, as a natural breakwater. Frost (1995: 6) dated it as a Bronze Age "Proto Harbour". On both ends of that promontory there are rock-cut channels controlled by sluice gates leading towards the harbour basin via large rectangular tanks with additional sluices. Although the tanks may have been used to keep caught fish alive (*piscinae*), the more important function was clearly the flushing of the harbour basin. The efficiency of these installations for flushing can be observed in the aerial photograph of the harbour taken in 1942 (Fig. 1.4).

The changing coastline made it easier to carry out large scale excavations in some major harbours, which are now either silted up, or even well inland. The first harbour of that type was excavated by a team of the School of Architecture in Rome at the site of the Roman city of Leptis Magna (or Lepcis Magna), Libya, which is well preserved. This large artificial harbour was first built by Nero and later rebuilt and expanded by Septimius Severus, who was a native of the city. The harbour was left idle, almost untouched, over the centuries and the elements of its nicely cut building stones were not stolen until our era (a rather unique case for a coastal site). The Italian team cleared off much of the river mud that had silted up the harbour basin and managed to survey and study most of the architectural and constructive components of what is probably the last of the large scale imperial harbours built in the second and third centuries of the Roman era (Bartoccini 1958). It is a single basin complex with broad moles on which colonnaded facades and two stories-high magazines were placed, with additional temples, towers and a lighthouse at the tip of the larger northern mole. Its layout somewhat resembles that of Sebastos, although at Leptis Magna the course of the main mole was dictated by a natural line of near-shore reefs. Another main difference is the lack of hydraulic cement in its construction.

A second major harbour was excavated some ten years later, when the new international airport of Rome was built at Fiumicino—the site of Portus, the artificial harbour

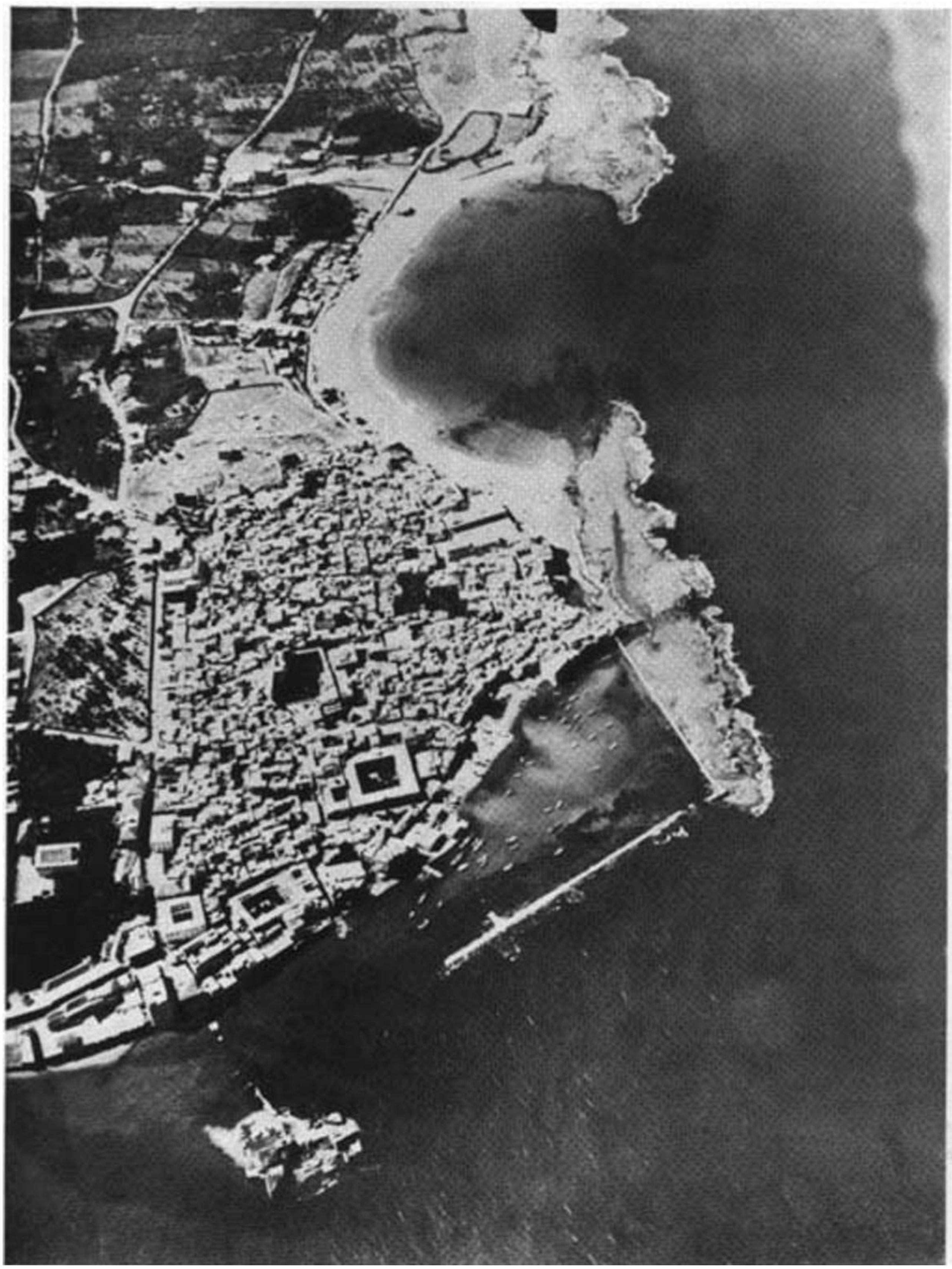


*Figure 1.4. Aerial photograph of the inner harbour at Sidon (Poidebard & Lauffray 1951)*

Claudius built near Ostia, north of the Tiber outlet. The excavations were properly financed and conducted on a large scale, but the final report (Testaguzza 1970) wants information concerning the exact layout and constructive techniques of the eastern mole, the means of protecting the north one from the surge of the open sea, and the facilities along the south eastern side of its basin.

Other major landlocked harbours, such as those at Ephesus, Miletus and Lechaeum of Corinth, were hardly excavated or studied although their setting and even their overall configuration are visible and well surveyed. Another partly silted famous harbour is that of Carthage. The multinational excavation project, enhanced by UNESCO in order to save the cultural heritage of that port city that was once the queen of the Mediterranean, was carried out from the late 1960's onward, but only a small part of it focused on the famous double "Cothon". Only a rather confined probe was attempted by the American teams in the rectangular commercial basin and only a few of its data have been published (Stager 1976). The round military basin was studied by a British team and somewhat more extensive preliminary reports published (Hurst 1975–1979; Hurst and Stager 1978). The external quays and moles were superficially surveyed by British divers (Yorke and Little 1975; Yorke *et al.* 1976) and only very tentative general conclusions and shaky chronological phasing were published (Fig. 1.4; Blackman 1982: 200–201; Yorke and Davidson 1985). At Kenchreai, the secondary eastern harbour of Corinth at the Saronic gulf, much more extensive excavations with proper final, full scale publication of the data were carried out during the mid 1960's by a combined team of land and marine (diving) archaeologists form the USA and Canada (Shaw 1978). This municipal harbour that was renovated and altered several times between the Hellenistic and Late Roman eras was "primitive" in comparison to Caesarea and other larger harbours (Hohlfelder 1985; Blackman 1988: 7–9). Another rather comprehensive excavation project, led by A.-M. McCann, was carried out in the late 1960's and early 1970's at Cosa in Etruria and published in an admirable volume (McCann 1987). In France, the rapid development of the port city of Marseilles enhanced land excavations of the area of the ancient Bourse, where the Greek and Roman inner harbour basin of the Lacedon was exposed in stages (Euzennat 1976; 1980). Nearby, at the eastern side of the Rhône, in the bay of Fos (the Roman Fossae Marianae) underwater excavations are continuously going on. Its northern part was briefly surveyed in 1968 before it was covered by a modern, electric power station complex. Other components along the eastern and southern creeks were studied and excavated during the 1980's where jetties and quays built during the first century CE were recorded. These constructions are of dressed blocks of stones, rubble and a unique series of articulated wooden beams (Ximenes and Moerman 1988a, 1989). The final report was the topic of Moerman's PhD dissertation at the Université de Provence (1993). Although it seems that this was only an auxiliary harbour on the sailing route up the river to Arles, its construction techniques are similar to those found at Sebastos (Blackman 1996: 41–43). French teams are surveying some additional manmade features along the Mediterranean coast of France, but due to the fact that almost all the ancient ports are presently covered by modern ones, or were dredged away, no full-scale study is feasible (Gassend 1993; Hesnard 1994). In addition, there is the published study on the Roman city of Forum Iulii (Fréjus) with its harbour, although its structures were never properly studied (Férier 1963).

Along the North African coasts of the Mediterranean the only harbours that were studied beyond mere surface surveys are Carthage and Leptis Magna, mentioned above. British divers surveyed other sites in Algeria (Davidson and Yorke 1969), Tunisia (Yorke 1967) and Tripolitania (Yorke 1967; Little 1977).

In Spain, although the coastal Phoenician, Punic and Roman sites are well known and most of their harbour works are presently landlocked or silted up, none was properly excavated or thoroughly studied; however, some interesting initial attempts have very recently been made (Nieto and Raurich 1998). In Italy, beside the harbours mentioned above, works at Portus and the small harbour and fishery at Cosa, many studies were carried out at the presently submerged sites of Nisida, Puteoli, Portus Julius, Baiae and Misenum at the bay of Puteoli. All these harbours were built or thoroughly renovated during the Augustan era and their dominant features are seawalls built over *pilae*, spaced free standing rectangular piers made of pozzolana (for a good summation in English see Gianfrotta 1996). Another harbour that was recently studied, down to minute construction details mainly of its concrete sea walls, is the Neronian harbour of Antium (Anzio). This is, by and large, the single-handed project of E. Felici whose Ph.D. dissertation at the University of Rome was published (Felici 1993). Another one-man project of ambiguous credibility is Benvenuto Frau's in the alleged Etruscan harbours of Tarquinia (Frau 1981) and Martanum (Frau 1985).

At Graviscae, there were also some preliminary underwater surveys and probes (Shuey 1981) and similar projects conducted at Pyrgi (Oleson 1977) and at the Etruscan harbour of Populonia (McCann *et al.* 1977). Some work was done at Luni, the famous source of marble (Ward-Perkins 1993), and at Sipontum (Smith and Morrison 1974). These studies, as most of those in Italy and other Mediterranean countries, focused more on the topographic setting of the port remains as an indication for changing sea/land relations (Schmidt 1972). A similar interest dictated most of the studies that were carried out in Sicily (Basile *et al.* 1988), although some, not yet fully published, were carried out at the presently silted up Estuarian harbours of Camarina (Blackman 1976), Selinunte, Eraclea Minoa and Marsala.

Important studies were carried out by the British team at the little island of Motya, where the alleged ashlar-built entrance channel to the Phoenician "cothon" was revealed (Isserlin 1971, 1974; Blackman 1982: n. 52). In Sardinia, Poseidon sea grass, which extensively covers all submerged structures at the ancient ports of Tharros and Nora (McNamara and Wilkes 1967), makes it rather difficult to trace and expose their remains. An attempt was made by a mixed group of Israelis and Sardinian divers at Tharros and Nora to study the submerged remains at both sites, but mostly with only limited success (Linder 1987).

Neither side of the Adriatic sea has really been studied in recent years and the few preliminary works done along the Dalmatian coasts are esoteric in character and published in local Yugoslavian bulletins (Faber 1980, 1981).

In the vast coastal areas of Greece and its numerous islands there are two properly studied harbours, both mentioned above: the early studies at Piraeus (Garland 1987) and Kenchreai (Shaw 1978). A third harbour, which was surveyed and studied underwater with limited excavations, is that of the port city of Thasos. It had a relatively small scale rectangular basin founded on rubble and narrow moles with some additional ashlar courses, and another half open mooring basin furnished with an extensive roadstead of similar character (Empereur and Simossi 1990). The harbour of Phalasarna at the northwestern corner of Crete is presently well above the sea level, in a tectonically uplifted area (Pirazzoli *et al*. 1992). It was most probably a harbour basin dug out of bedrock as a "cothon" (Frost 1995: 15–20) and fortified as a military outpost, being connected to the sea by a rock cut navigational channel. It is dated to the Hellenistic era and resembles the concept and structural features of the pre-Sebastos harbour of Straton's Tower (Hadjidaki 1996). The excavator of Phalasarna, E. Hadjidaki-Marder, wrote her M.A. thesis at the University of Manchester as an updated summation of the ancient harbours of Greece and the Aegean but at that time only a handful of harbours had been properly surveyed in that area, mostly by geologists and geographers. In Crete some surveys and preliminary probes were made at the *neosoikoi* (shipsheds) of Seteia (Davaras 1967) and Matala (Blackman 1973b) and more recently at the Minoan slipways of Kommos (Shaw 1984, 1986). There were additional surveys at Charsonissos, Nirouchani and Malia (Hue and Pelon 1991). On the mainland, the docks at Cape Sunion were surveyed and partly excavated (Kenny 1947). The almost intact Hellenistic harbour at Larymna in Lokris was properly surveyed and studied by a team led by Schäfer (1967). The same team surveyed the nearby third century CE ashlar-built quays at the harbour of Anthedon (Schläger *et al.* 1968; Blackman 1973a) and on the island of Aegina (Knoblauch 1972). This collaboration between British experts in ancient harbours (Blackman), an expert in Classical studies (Schäfer), a civil engineer (Knoblauch) and a young underwater archaeologist (Schläger) turned out to be very promising in advancing the discipline of studying ancient harbours with balanced attention given to historical sources, topography, land/sea alterations, geographical setting, conceptual planning and building techniques. This practice was further developed in their studies during the late 1960's and early 1970's at the Greek and Roman harbours in Turkey: Eolian Kyme (Schäfer 1974; Knoblauch 1974); Side in Pamphilia (Knoblauch 1977; Schläger 1971) and eventually, in their thorough survey of the city and the harbours of Phaselis (Schäfer et al. 1981). The traumatic fatal accident that caused the premature death of Helmut Schläger in the summer of 1969 brought to a halt all underwater studies by German scholars in the Mediterranean for over 20 years. A further study is the controversial research of the Hellenistic, alleged closed harbour of Limen Kleistos at the site of Argos, Helieis (Jameson 1973), which might not have been a harbour, but rather an inundated part of the city walls (F. Frost 1985). Some preliminary reports were published about a few additional harbours in Greece, such as Aigeira (Alzinger 1976; Papageorgiou *et al.* 1993), Perachora (Blackman 1966), Avlidos (Psarianos 1948), Gythion (Scoufopolos and McKernan 1975), Samos—the famous harbour of Polycrates which according to Herodotus was the first artificial manmade mole in Greece (Simossi 1991), and as far east as the island of Castellorizo (Pirazzoli 1987).

In Turkey the modern archaeological study of ancient harbours is now being developed. Beside the works of the German team at Kyme, Side and Phaselis (see above) there are only the individual surveys of Blackman at some other harbour sites, such as Teos (Blackman 1982: 203–204), Aperlae (Carter 1978; Hohlfelder and Vann 1998), the medieval harbour and arsenal at Alanya (Tigrel 1975), Pompeiopolis (Boyce 1958) and Seleucia Pieria (Erol and Pirazzoli 1992). Some new excavations in the inland harbours of Kaunos and the Aegean harbours Phokaia, Assos and Myrina were carried out by Turkish teams, but their findings have not yet been published; nor has the survey of the Roman harbours of Cicilia which was carried out by Vann in the late 1980's and early 1990's (Vann 1997). A new underwater excavation of a possible harbour in Liman Tepe/Clazomenae by the Institute for Maritime Studies at University of Haifa and Ankara University has been under way since 2000 (Artzy 2004).

In the northern Levantine coast of the Mediterranean (Syria and Lebanon), more important research studies have been conducted recently. Beside the early French projects at Tyre and Sidon land excavations have been done at the Bronze Age port site of Minet-el-Beida, the suburb harbour of Ugarit (Yon 1998), the Iron Age and Roman anchorage at Sarepta (Sarafand) half way between Tyre and Sidon (Pritchard 1971) and the continuous surveys and studies of H. Frost at Sidon and on the island of Arwad (Frost 1966; 1995: 7–12). Important soundings were made on the beach next to Tabbat el-Hammam in Syria, where one of the earliest manmade jetties, built of long and carefully designed ashlar headers, was exposed (Braidwood 1940) and dated on a stratigraphical basis to no later than the ninth century BCE (Fig. 1.5).

In Cyprus several studies, including field and underwater surveys, were carried out in the last 30 years. The first were the field surveys of the ancient topography of Nea Paphos

Figure 1.5. The ninth century BCE mole at Tabbat el Hammam (Braidwood 1940, Fig. 2)

(Nicolaou 1966) and Kition-Larnaca (Nicolaou 1976) with the remains of what was probably a Classical Period harbour at Ayios Philon (Karpasia) at the northeastern tip of the island. A possible Bronze Age harbour of Kition was excavated at Kathari (Karageorghis 1976: 315–24) and the later Limen Kleistos at the inner basin, near the Bambula and the shipsheds of the alleged "Naval Base" were recently excavated by a French team (Yon 1985, 1995). The first underwater surveys were carried out in the 1960's at Nea Paphos (Daszewski 1981) and later at various harbour sites, by E. Linder and the present author (Raban 1995a), and again by the geologist Flemming (1972). In the 1980s a French diving team carried out a few seasons of underwater excavations at the harbour of Amathus, on the south coast of the island. They did not excavate the low coastal area of the alleged inner harbour (Empereur 1985), but rather the presently submerged trapezoidal basin delineated by seawalls of ashlar headers, which somewhat resemble the moles at Akko and the seawalls at Arwad (Empereur and Verlinden 1987). It is suggested that the construction of the harbour should be dated to the last decade of the fourth century BCE. A small anchorage was surveyed at Kioni on the northwestern corner of the island, in a tedious and systematic manner by Leonard (1995a) who also published a good summation about Roman maritime installations on the island (Leonard 1995b). A recent underwater research study, although excluding systematic excavations, was carried out on the sea floor of the harbour of Nea Paphos and next to the nearby off-shore Moulia Rocks (Hohlfelder and Leonard 1993; Hohlfelder 1995, 1996).

In Israel, the study of ancient harbours was initiated with Link's expedition to Caesarea and is still focused mainly on this site. Yet, for a country with less than 200 km of Mediterranean coast, the number of properly surveyed and partly excavated harbour installations is quite significant. Due to meager maritime activities along the southeastern corner of the Mediterranean since the end of the Crusader era, almost no harbours were built, or renovated until the period following World War I. The modern ones are located at sites suitable for modern shipping—in most cases these are not at the same locations that were selected by the ancient mariners. The Mediterranean coast of Israel is rather straight with only one bay—the bay of Haifa (Akko)—with no off-shore islands and few inshore reefs. The continental shelf is rather wide and shallow with an average gradient of 1–4% near the shore (Nir 1982b: 886–889). Being part of the so-called "sedimentological Nile cell", its sea floor close to shore is heavily embedded with shifted sand (Nir 1985), as was already observed in antiquity by Josephus: "*… lie open to the southwest wind, which constantly sweeps sand up from the sea bottom on the shore and thus does not offer a smooth landing. Most of the time merchants most ride unsteadily at anchor off shore"* (AJ 15: 333). For that reason it is rather difficult to trace well preserved wreckage sites in this area—a favorable research topic in Marine Archaeology. The combination of the two above-mentioned facts channeled archaeological research in Israel toward the study of ancient harbour installations as its main goal in the sea.

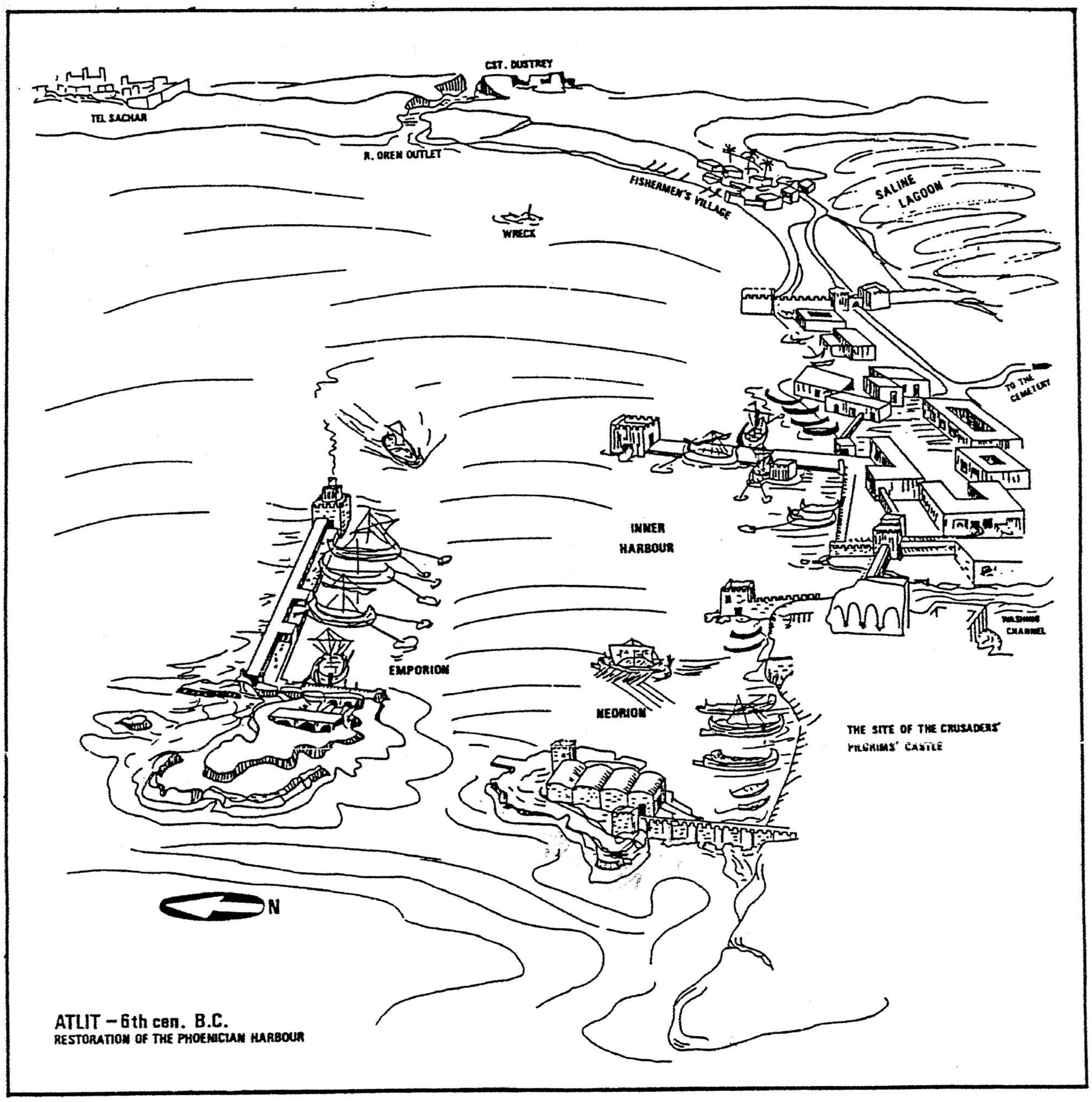



*Figure 1.6. Artistic reconstruction of the Phoenician harbour of Athlit. (Raban 1985a. Fig.19)*

After Link's expedition to Caesarea and the Sea of Galilee (Hohlfelder 1989) the Israel Undersea Exploration Society (IUES) focused also on surveying the sites of Dor (1963) and Akko (Linder and Raban 1965). At the same time the team began a long-lasting survey and underwater excavations at the Phoenician harbour of Athlit (Fig. 1.6; Linder 1967; Raban 1985a: 30–38; 1996a). In 1965-6 a British team of the recently established British SubAqua Club (BSAC) joined in resuming the works at Akko (Flinder *et al.* 1993). The Israeli team continued to excavate in a rather hasty manner at those parts of the harbour of Akko that were doomed to be covered by a modern fisherman's haven (Fig. 1.7; Raban 1986; 1995a: 158–161). In 1969 and 1971 the BSAC joined once more with the Israeli divers of IUES for land and underwater survey and excavations at the little island of Jezirat Far'un, on the northwestern side of the Gulf of Aqaba in the Red Sea, searching for King Solomon's harbour (Flinder 1977; Raban 1985a: 27–30). A larger research study was initiated at the Bronze Age site of Dor, where the shoreline surveys and excavations along the water's edge revealed the remains of what was the first clearly defined harbour works of the "Sea Peoples" (Raban 1981a; 1981b; 1983a; 1985a: 23–27; 1987a; 1988a; 1995a: 147–152; 1995b). Some other portal structures which were studied at that site belonged to an early second millennium BC era as well as to the Hellenistic and Roman eras, including a series of fourth–fifth century BCE rock-cut slipways and a small northern harbour which was furnished with flushing channels (Fig. 1.8; Raban and Artzy 1982; Raban and Galili 1985: 332–349; Raban 1995b). An important work is that done by M. Artzy at the small peninsular site with the MBIIa–LBII occupations


*Figure 1.7. Plan of the ancient harbour at Akko (Raban 1995a. Fig.27)*

*Figure 1.8. Aerial photograph of the flushing channels at Dor (Raban 1995b, Photo 9.12)*

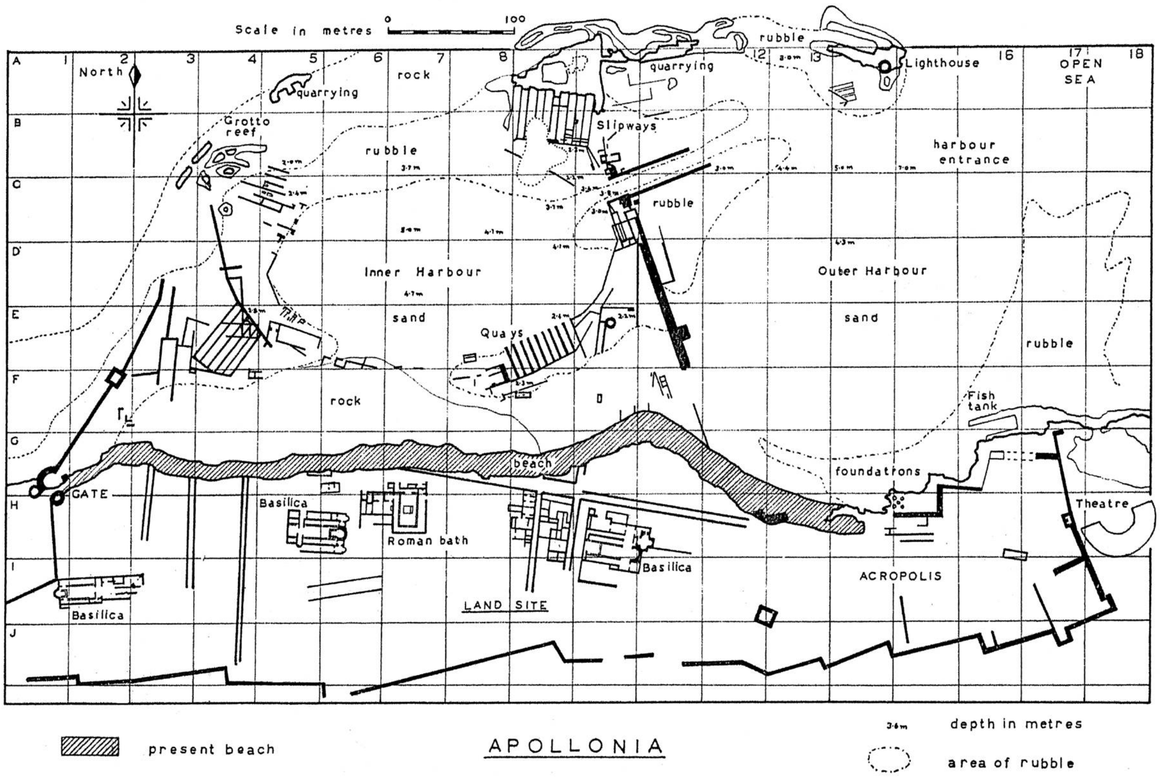



*Figure 1.9. Plan of the harbour of Apollonia. (after Flemming 1971,Fig. 14)*

and probably also harbour installations at Tel Nami (Artzy 1990; 1994). A series of estuarian and river outlet harbours that are dated to the early second millennium BCE were surveyed at various sites along the coast, such as Misrefot-Yam; Akhziv; Tell Abu Hawam; Michmoret and others (Raban 1985a: 14–23). In 2001, a salvage project at the important site of Tell abu Hawam, situated north of the Carmel Ridge, on the Qishon River was executed, which located the anchorage/harbour of the Late Bronze period (Artzy 2002/3:19-21). The study of ancient harbours, the Center for Maritime Studies was established at the University of Haifa, in 1972 by the founder of IUES, Elisha Linder. A year later he founded the post-graduate department for the study of "Maritime Civilizations". The academic approach of these agencies is collaborative and interdisciplinary, combining history, archaeology (both terrestrial and maritime), geology, geomorphology, sedimentology and marine biology integrated into one program of Human Oceanography (Flemming 1972).

However, the true godfather of this concept was Nick Flemming, a marine geologist whose pioneer study of the physical remains of ancient harbours around the Mediterranean shores traced eustatic and tectonic changes in the sea level during the Holocene period. One of his more significant breakthroughs was the underwater survey of the submerged features of the Hellenistic and Roman harbour at Apollonia, the port of Cyrene, Libya (Fig. 1.9; Flemming 1959; 1961). Flemming expanded his work and was the first to embrace the western basin of the Mediterranean, combining data collected from historical and archaeological sources with actual field surveys at almost every single site—a total of 179 sites (Flemming 1969). Flemming continued his surveys, expanding them to the eastern Mediterranean basin in order to define the rate of neo-tectonic displacement in the Aegean Arc (Flemming *et al.* 1973). In 1975 he was a visiting professor at the University of Haifa where ultimately he played a central role in the first step of the thorough study of Sebastos (Flemming 1989) and in the publication of the sites along the Israel coastline (Flemming *et al.* 1978). He was instrumental in leading others to pursue his conceptual methods, as was demonstrated in the proceedings volume of the international symposium held at the Scripps Institute of Oceanography at La Jolla, California, in 1981 (Masters and Flemming 1983) and at the first international workshop on ancient Mediterranean harbours, which was held at Caesarea in 1983.

A similar approach to Flemming's surveys, which incorporated also the study of aerial photographs, was used in Italy (Schmidt 1964; 1964-7; 1972). Among other of Flemming's followers are the French geologists Paskoff, Pirazzoli and Collombier (Trouset 1987) as well as Spanish Germans and more recently Greek geographers (Psychoyos 1988; Kambouroglou *et al.* 1988; Maroukian *et al.* 1997). In 1986 a larger workshop held in Haifa, where the Israel Oceanographic Institute, the Institute for Coastal Engineering at the Israel Institute of Technology and the Center for Maritime Studies at the University of Haifa co-hosted a multidisciplinary international conference. Over 250 scholars from all over the world participated in this conference, which produced two proceedings volumes of Archaeology of Coastal Changes and Mediterranean Cities. Another two symposia of the same type were held in Cyprus in 1993 and 1994. The first was co-hosted by the then newly established University of Cyprus and Cyprus Ports Authority (Karageorghis and Michaelides 1995) and the second, named Res Maritimae, was initiated by R.L. Hohlfelder, S. Swiny and H.W. Swiny as a continuation of the conference held in Haifa (Swiny *et al.* 1997). It was hosted by the Cyprus American Archaeological Research Institute at Nicosia.

# Chapter II

# Straton's Tower and its Havens

## A. The Historical Records

Josephus is quite clear when attesting that Herod established Caesarea at the site of a former town named Straton's Tower (*Stratonos Pyros*), which was at that time either "deserted", or "dilapidated", *Kamnousa* in Greek (AJ 15: 331; BJ 1: 408). The decayed state of the town may have been due to severe damage that affected its buildings and maybe also its harbour, during the disastrous earthquake of 30/31 BCE (AJ 15: 121; BJ 1: 371).

There are not many direct references to the history of Straton's Tower. The city is first mentioned by Zenon who was the Egyptian official of King Ptolemy II Philadelphus in Palestine. This papyrus (Abel 1923: No. 71, PCZ 59004), dated to 259/8 BCE, deals with Zenon's tax collecting mission. Straton's Tower was probably his landing place in the country, where he gathered a considerable amount of wheat (Abel 1923).

A hundred and fifty years later, the city is mentioned again when a local ruler (tyrannos), Zoilus, attempted to take over its territory and to detach it from the Seleucid Kingdom (AJ 13: 324–337). According to Josephus (AJ 13: 325), Zoilus made Straton's Tower the principle city of his petty kingdom, which also included the port city of Dora (Dor), and maintained a legion of professional mercenary soldiers. Zoilus' Straton's Tower was very probably fortified with a city wall, for it managed to withstand a series of attempts to capture it by the Hasmonean king, Alexander Jannaeus (Levine 1974a). Eventually, according to Josephus (AJ 13: 334–335), Jannaeus paid Ptolemy Lathyrus 400 silver talents in exchange for the disposing of Zoilus and the annexation of his cities and territory to the Jewish kingdom. This event was recalled in later Jewish Halachaic scriptures describing the day the Jews took over the city (14th of month of Sivan) as an established holiday (Levine 1974a: 63). We do not accurately know the extent of modifications in the city's population after its annexation to the Jewish state. It seems that some established Jews settled in what was then a totally pagan city (Levine 1974a: 64). The city was severely affected by a major earthquake and subsequent considerable tsunami waves (Amiran *et al.* 1994: 264, 294; Stieglitz 1996: 605).

In 63 BCE the city, like most of the other originally pagan coastal towns, was detached from the Jewish state and was included by the Roman commander Pompeius in the newly established province of Coele Syria (BJ 1: 156). In 30 BCE Octavian gave Straton's Tower back to Herod's Kingdom of Judah along with other cities such as Joppa (Yaffo), Gaza and Anthedon.

Of the last two direct references to the city by its proper name of Straton's Tower, the first comes, strangely enough, from a chronological context which postdates by some 15 years the formal inauguration of Caesarea, concerning Herod's son Archelaus (AJ 17: 320). The second is the entry in Papyrus Oxyrhynchus 1380 that was composed in the first century CE and was written in the second century CE. It mentions that the goddess Isis was worshipped at Stratonos Pyros under the names Hellas and Agathe (Grenfell and Hunt 1915: 190). The name of the city survived much later as "Caesarea Stratonis" in a Roman military diploma of 71 CE (CIL10.8967), a means to distinguish Caesarea from other cities of the same name within the Roman Empire (Ringel 1975a: 21). In the second century CE the geographer Ptolemy used the Greek name Kaisaréia Strátonos (Ptolemaius 5.16.2; 8.20.14) as a political bias against the renegade Herod.

It seems that Straton's Tower had a harbour as can deduced from the fact that Zenon preferred it as his landing place in the country (Roller 1982). Strabo stated that: "*After Akko is Straton's Tower, which has an anchorage (Prósormon). Between it and Mount Carmel are additional little places, of which not more than their names exist – Sykaminospolis, Boukolonpolis, Krokodeilonpolis and other similar ones*" (Strabo 16.2.27). Strabo's referring to Straton's Tower as a town with an anchorage rather than as a real harbour (Limen) is due either to the true decaying state of both in the third quarter of the first century BCE, or to the fact that he did not have more particular information about the site (Leonard 1995a, 1997). In spite of the fact that during his time there was a reasonable harbour at Dor to which he did not refer to at all, he considered Straton's Tower to be as important as Akko (contra the misinterpretation in Roller 1992).

## B. The Establishment of the City and the Meaning of Its Name

Until recently most scholars believed that Straton's Tower was named after its royal founder, King 'Abd-'Ashtart of Sidon, whose name was rendered in Greek as: Straton

(Schüerer 1961: 19). He was one of either two or three kings of this name who reigned ca. mid-fourth century BCE (Levine 1973; 1975b: 5–8, 281–283; Foerster 1975: 9; Roller 1983: 61). Being Greek-inspired, the first ‘Abd-‘Ashtart (374–361 BCE) had the epithet Philhellene and was considered as the more likely founder of the city (Roller 1992: 23). The main problem with that assumption is the lack of ample archaeological evidence to substantiate such an early date. Two additional major difficulties are: 1. We do not have a single instance of a Phoenician settlement named after a living person, at least not prior to the Hellenistic era. 2. The same name was given to a tower with an underground passage in Jerusalem during the Hellenistic period (Josephus, AJ.13: 307–13; Levine 1974b: 64) and to several other locations, including a small island in the Red Sea, which was probably named after Strátonos Nùssos, a naval commander of King Ptolemy III (Arav 1989: 146; Stieglitz 1996: 596). Stieglitz convincingly interpreted the name found in the Halachaic text depicted on the mosaic floor of the early seventh century CE synagogue at Rehov in the Beth Shean Valley (Fig. 2.1; Sussman 1974; 1976; Feliks 1986: 38), as Commander’s, or Chief’s Tower.

This idea was already suggested in the preface to Novella 103 of Emperor Justinian issued in 534–546 CE, where the foundation of the city was attributed to a Hellene person called Straton. In the mid-nineteenth century it was suggested that Straton refers to a Ptolemaic officer (Stark 1852: 450), which both Arav (1989) and Stieglitz (1996:596) would consider to be of the time of Ptolemy II Philadelphus (283–246 BCE).

Another study suggests that the name of the founder was Philokles, one of the more prominent generals of Ptolemy I and Ptolemy II, who also bears the title of Basileus Sidonian, the king of the Sidonians (Hauben 1987: 427; Grainger 1991: 63). This suggestion (Rodan 1998) was an attempt to settle the debate about the complicated scene depicted in silver and copper wires and enamel technique on a bronze cup now at the Louvre Museum. This scene apparently describes the mythical foundation of Straton’s Tower with Straton offering a sacrifice on an altar before the city goddess Tyche. This goddess was identified with the Helleno-Semitic goddess Isis (Will 1987) who was prominently depicted on many Caesarea coins and whose larger-than-life marble statue was found at the site during the JECM excavations (Holum *et al.* 1988: 11–16). Isis was known in coastal towns as “the ship launcher” (*tà ploiaphésia*) and most probably was the forerunner of Caesarea’s Tyché, whose birthday was the first day of the sailing season and was celebrated in the city on March 4th 310 CE (Eusebius, Mart. Pal. 11.30).

Justinian’s Novella shows that, following the traumatic impact of the Bar-Kokhba revolt (131–135 CE), the Romans succeeded in their attempt to erase Herod’s name as the founder of Caesarea and any Jewish role in its history. Justinian described Straton as the Hellenic founder of a city that was later re-founded by Vespasian (71 CE) under the name of Colonia Prima Flavia Augusta Caesarea

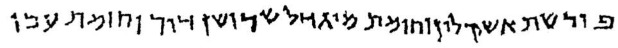


*Figure 2.1. Line 13 in the Rehov synagogue mosaic inscription. (after Stieglitz 1996, Fig. 1)*

(Stieglitz 1996: 595 contra Roller 1983: 64 and Wenning 1986: 116).

There are two theories regarding the source of the component ‘tower’ (*pyrgos* in Greek; *migdal* in Hebrew) in the city name:

1. The term is a literal translation from the West Semitic Migdal, or Migdol (Oren 1984: 38). Such a component in place names was well known in the area since the Biblical era in toponyms such as Migdal ‘Eder (Gen. 35:21), Migdal Gad (Josh. 15:37) or Migdal El (Josh. 19:38). Later, in the Hellenistic and Roman eras, there is the toponym of Migdal Nunia (translated to Greek as Tarichea = place for fish salting), which literally means the Fish Tower (in Aramaic), known from the Talmudic sources as Migdal êebásya = Town of the Dyers in Aramaic. Another toponym was Boukolónpolis (Strabo 16.2.27) identified as Migdal ‘Eder (Tower of Herds), or ‘Adaroth (Galling 1938:80), probably the coastal city just north of Caesarea. The term Migdal (= tower) as a component in these toponyms probably derived from the original military character of the place, meaning “camp” or “fort” (B. Mazar 1970). It might also be a traditional component in a toponym, recalling that a watchtower once stood there (Raban 1992c: 17; Zertal 1995: 267). There is, therefore, no problem in considering a Semitic toponym with the Migdal component even for a place that was eventually a real city, as was clearly the case for Migdal Nunia (Josephus BJ 3.466). However, following the more convincing idea that Straton’s Tower was founded by Hellenes (Greeks) in the early part of the third century BCE, its original name should be the Greek one—Stratonos Pyrgos which was replaced after the city had been taken by Alexander Jannaeus by its Semitic one – Migdal Sar (Stieglitz 1996: 598).

Was the component *pyrgos* suitable for a city? The scene depicted on the fourth century CE cup and the sixth century CE Novella of Justinian seems to have no problem with it. But it is still possible that the Semitic toponym predated the Greek one either for a place named Migdal + ? or even Migdal Sar as a Phoenician settlement of fifth century BCE (recalling the famous inscription of Ashmun‘ezer King of Sidon on his sarcophagus: “*May our Lord, the King of the Kings give us Dor and Yaffo, the mighty wheatlands in the fields of Sharon*”) that was re-founded by the Ptolemaids two hundred years later and was renamed by the Greek equivalent of its original Semitic one.

2. The second and more complicated theory attempts to equate Migdal=Migdol (as used for Egyptian military fortresses along the ‘via maris’; Oren 1984) =Stratopedon=Straton (Arav 1989: 146–147). According

to this theory Migdal Straton was the original name of this city, although it is never mentioned as such in ancient sources. Arav suggests that this was a hybrid name of Semitic Migdol and the Greek Stratopedon that was later amended by its Greek population to Stratonos Pyrgos. It is difficult to accept this theory, which hardly makes sense and contradicts the anti-Jewish notion that Straton was a person and not a military camp. The later Hebrew toponym Migdal Sar would not fit it either.

**C. Straton's Tower – The Archaeological Evidence**

Archaeological data for pre-Herodian activities in the area of Caesarea were found at various locations, both on land and underwater (Fig. 2.2). Most of the evidence was unearthed within the confines of the early city wall, but as in other cases this may be due to the fact that only a few small-scale excavations were carried out beyond this area. The larger bulk of archaeological data for the pre-Herodian, Hellenistic period were found in the northwestern side of the city (Figs. 2.3, field G according to the JECM and area J according to CAHEP and CCE).

1. The Pre-Herodian Quay and its Vicinity

In 1956 an archaeological expedition of the Hebrew University in Jerusalem, headed by M. Avi-Yonah, followed earlier (1944) findings which indicated the existence of a Jewish synagogue of the sixth seventh centuries CE, and excavated an area of about 600 sqm down to virgin soil. This area is over 100 m north of the northern Crusader city wall, close to the waterline. In his preliminary report Avi-Yonah wrote: "*At the bottom of the excavation Hellenistic and Persian foundations and pottery were found, belonging to the Tower of Straton which preceded Caesarea on this site"* (1956: 260). In the summer of 1962 the same team resumed excavations in the same area (now called Area A) that revealed: "*Hellenistic walls, mainly headers built on rubble foundations, at a level of 2.8 m above sea level. The foundations were laid on virgin soil. The pottery associated with this stratum included fishplates, 'Megarian' bowls and 'West slope ware'. The plan seems to indicate several rooms grouped around an open court. Possibly we have here the harbour quarter of Straton's Tower. No Persian pottery was found in this area."* The stratum above these remains included ashlar walls that survived to 2.5 m high and quantities of Late Hellenistic and Herodian pottery.

In Area D, east of the synagogue (500 sqm; Fig. 2.3), the excavators revealed: *"Close to the eastern end of the trench a considerable quantity of potsherds was discovered. It included a large collection of Rhodian, Coan and Cnidian stamped jar handles, fragments of 'Megarian' bowls, fish plates, early Hellenistic lamps, early types of eastern sigillata A and their like, on the whole a typical Hellenistic context, paralleled up to the present only at Samaria. When this accumulation of pottery was cleared, a corner of a large house emerged. Of this, only two courses were preserved, each course consisting of alternating two headers and a stretcher. Careful examination proved that the remaining walls were dismantled in antiquity, possibly during Herod's building activities at Caesarea. The examination of the pottery suggests that the building was abandoned some time in the early first century BCE, possibly after Alexander Jannaeus' conquest of Straton's Tower. In the sea, close to the synagogue remains, a massive wall can be seen; this well may be part of a mole of the harbour of Straton's Tower"* (Avi-Yonah and Negev 1963: 146–148).

These excavations were never fully published, so it is difficult to determine to which wall they referred. The most prominent wall in the water is a segment of a concrete structure (Figs. 2.4, 2.5; 4.6 m wide; 8 m long) rising 1.25 m above MSL. However, judging from the typology of the broken pieces of the wall, the type of mortar and the sherds that were mixed in it, this wall is certainly of the Byzantine era.

The 1978 and 1979 survey of CMS revealed two or three additional structures parallel to the Byzantine sea wall (Raban 1981a: 159). In the following seasons attempts were made to expose the base of what seemed to be a pre-Herodian quay, determine its stratigraphic sequence and connect this quay with the buildings on shore excavated by the Hebrew University (Raban and Stieglitz 1987; Raban *et al.* 1990; Raban 1992b: 11–15). The pre-Herodian quay is a platform built of slim ashlar headers that pave the base of the uplifted rocky shelf for 18 m on an east–west axis. Its eastern end is well defined, but is probably not the original one and its front follows a shallow S-curve. The entire structure is either tilted slightly down toward the west, or less abraded at its eastern end (Figs. 2.5, 2.6). The headers forming the platform are all 0.20–0.45×1.2 m on average and their height at the better-preserved eastern end is 0.42–0.46 m. The face of the platform is encrusted with biogenic growth and debris, so it is hard to follow each of its components. At several points, sections of an additional course are visible behind the front one and at two spots the platform can be followed to the base of the rocky shelf for a maximum breadth of c. 4 m (Fig. 2.5). To judge from its relative position, it is quite likely that a large part of this platform was removed when the Byzantine roadstead was built. For this reason the quay does not retain its original face and its entire eastern segment is now missing. Clearing the debris and silt from the sea bottom in the area revealed two additional courses of headers. These courses make the structure look more like a real quay rather than a mere platform or a landing stage.

A segment of another wall survived farther to the east, 1 m to the south of the pre-Herodian quay (Fig. 2.5; Raban 1989: Fig. III.96). Six large ashlar blocks of this wall are still more or less in situ. They are much broader than those of the quay and considerably larger (1.6–1.7×0.90–1.05×0.6 m). Almost all the blocks bear matching grooves for dovetail clamps on their front edges (Raban 1989: Fig. III.97). Stratigraphically, it is possible to associate these blocks with the second wall to the west. However, given

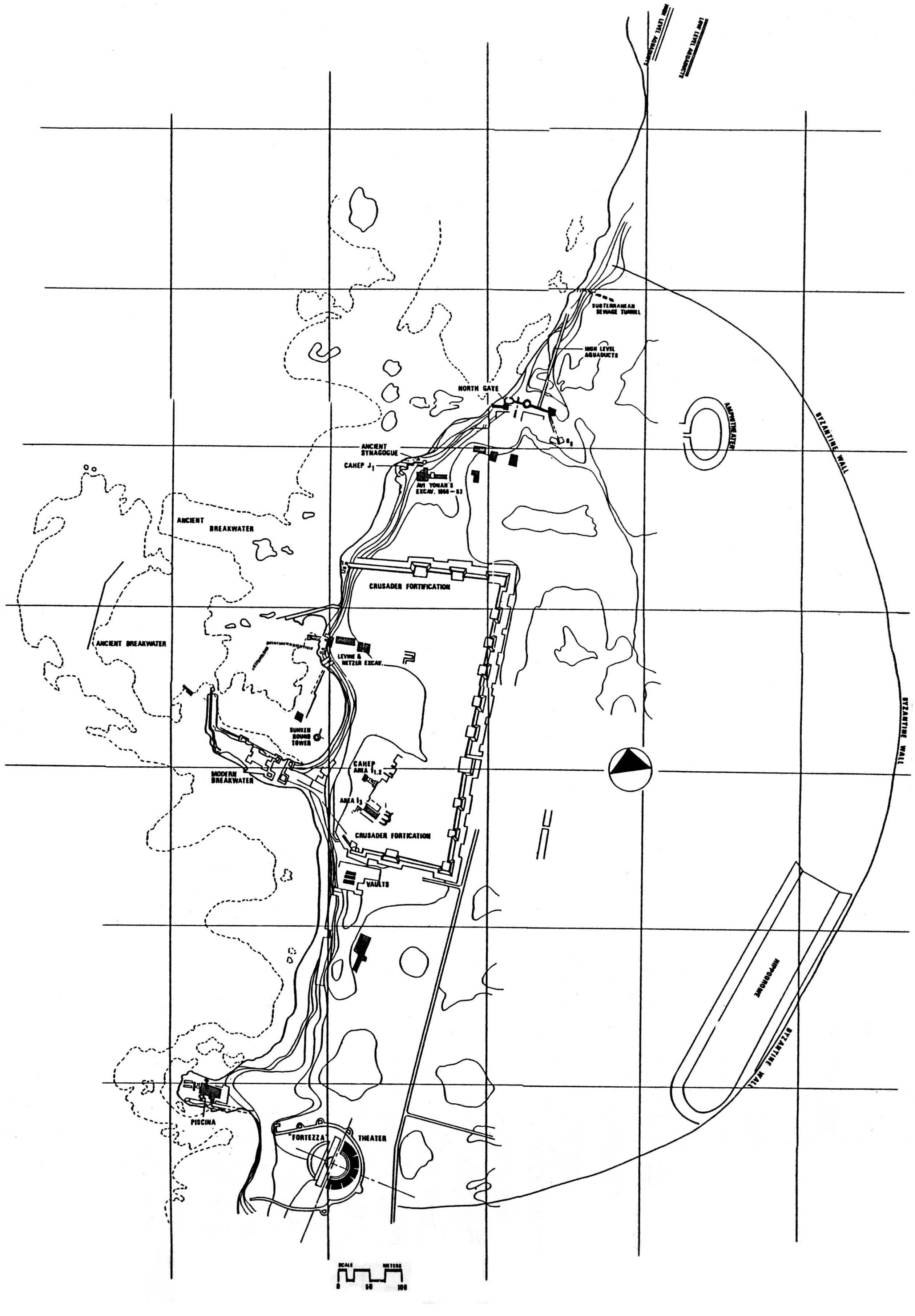



*Figure 2.2. Caesarea map with locations of Hellenistic remains. (Raban 1992, Fig. 2)*

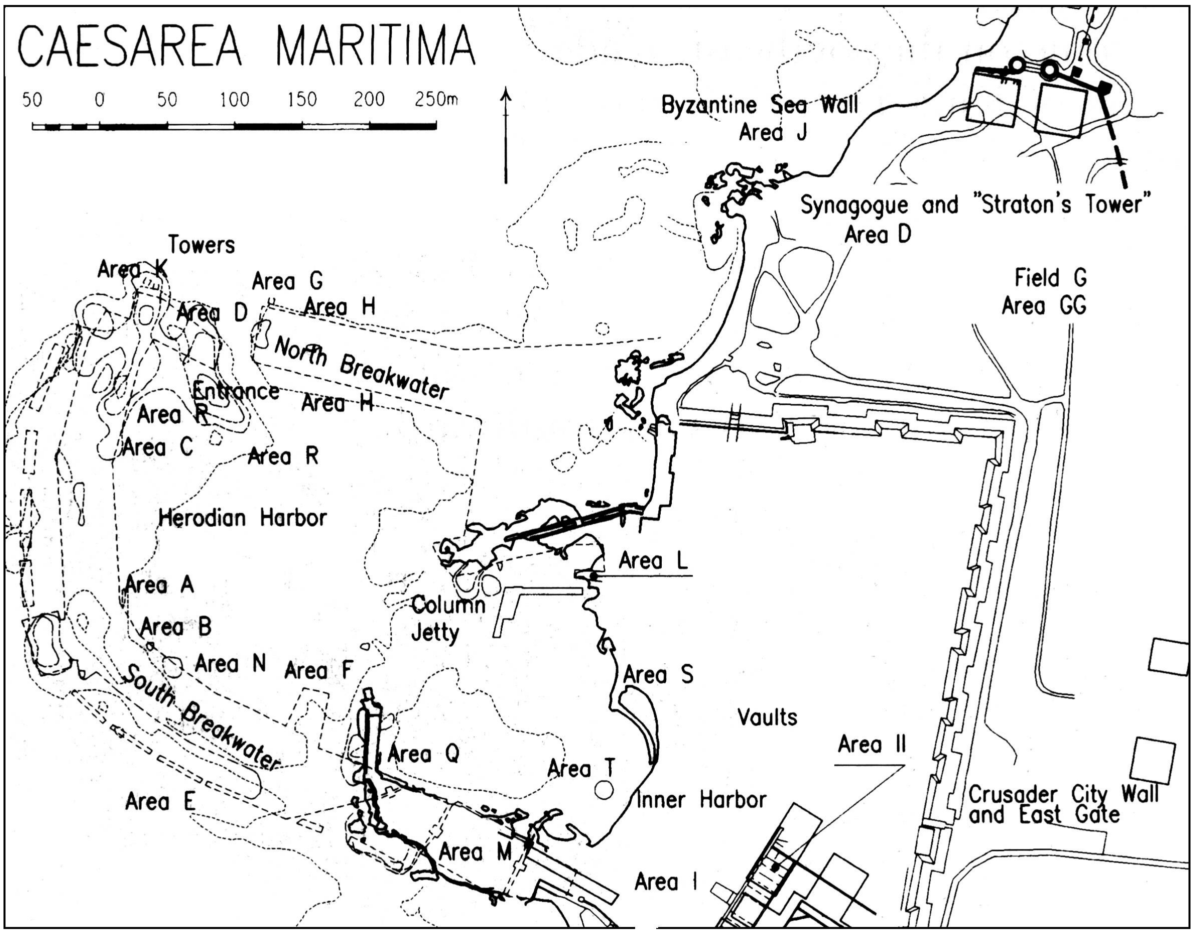



*Figure 2.3. The excavated areas at the NW part of the site. (A. Raban, Caesarea Project)*

the fact that dovetailed clamps were never used at Caesarea in structures of the post-Herodian period, the highest of the three structures along the south shore of the lagoon gives a *terminus post quem*. Thus, if this wall can be considered Herodian, then the underlying quay is pre-Herodian in date. This matches the evidence of similar Phoenician and Hellenistic marine structures in Tyre, Athlit, and Akko (Raban 1985b: 30–40), as well as at nearby Dor (Raban 1981b: 297–305, Fig. 24.5; 1995b: 311–313). The typical order of adjacent courses of long and narrow headers is known also from the fortifications and sea walls at Dor (Sharon 1987: 25–26), Akko (Dothan 1976: 41) and Samaria (Crowfoot *et al*. 1942: 118–21, Pls. 12, 13, 36).

In 1981 a probe (5×5 m) was made down to the rocky shelf and the top of the rear eastern part of the quay (Fig. 2.5) where at least four different building stages were identified. The lowest structure was built of small ashlars directly on the quay platform and it seems to be the northwestern corner (0.69–1.01 m above MSL) of a large structure. Byzantine walls overlaid these remains.

West of the Byzantine structures there was a gap filled with debris and wave-carried silt. All finds in the fill were badly worn by the waves, and although some datable artifacts could be traced back to the late third century BCE, none was associated with intact stratigraphy. It was apparently a possible passage (1 m long) that connected the quay to the structure on land. A rectangular hollow or a tank (1.5×1.5 m) was exposed opened toward the water line at the north, with its rocky bottom just below sea level (Fig. 2.7). Beyond the passage another rock-cut tank of a very irregular shape (B on the plan) was cleared. At this point a thin, rock cut partition wall was exposed (Fig. 2.8). West of the wall there was a course of blocks edging the west side of a third tank paved with *kurkar* slabs. Under secondary wave deposition an undisturbed layer was exposed containing pottery vessels dating to the late second–early first century BCE. Among these there were eight complete and several other broken double hole-mouth jars of various shapes (Figs. 2.9–2.11; Oleson *et al.* 1994: 143–148; Figs. 52–56). These jars resemble drainpipes, but the expansion in the walls and variations in dimensions would not allow their assembly into a single pipe unit. One type resembles Punic fish containers from Sicily, North Africa, and Spain (Eisman 1973; Bisi 1970: Pl. XXII: 14p 15; Pascual-Guasch 1962: Fig. 16) and in the Levant (Duncan 1930: 47T; Reisner *et al.* 1924: Fig. 164: Al). Although these parallels are known as containers for pickled fish (Eisman 1973; Williams 1979: 116–117), they are not closely related to our jars. The contents of two of the better-preserved jars were analyzed, but no residues of fish tissue or bones were noted (Oleson *et al.* 1994: 20–21).

*Figure 2.4. The western part of Area J from the east at extremely low tide (Photograph: A. Raban)*

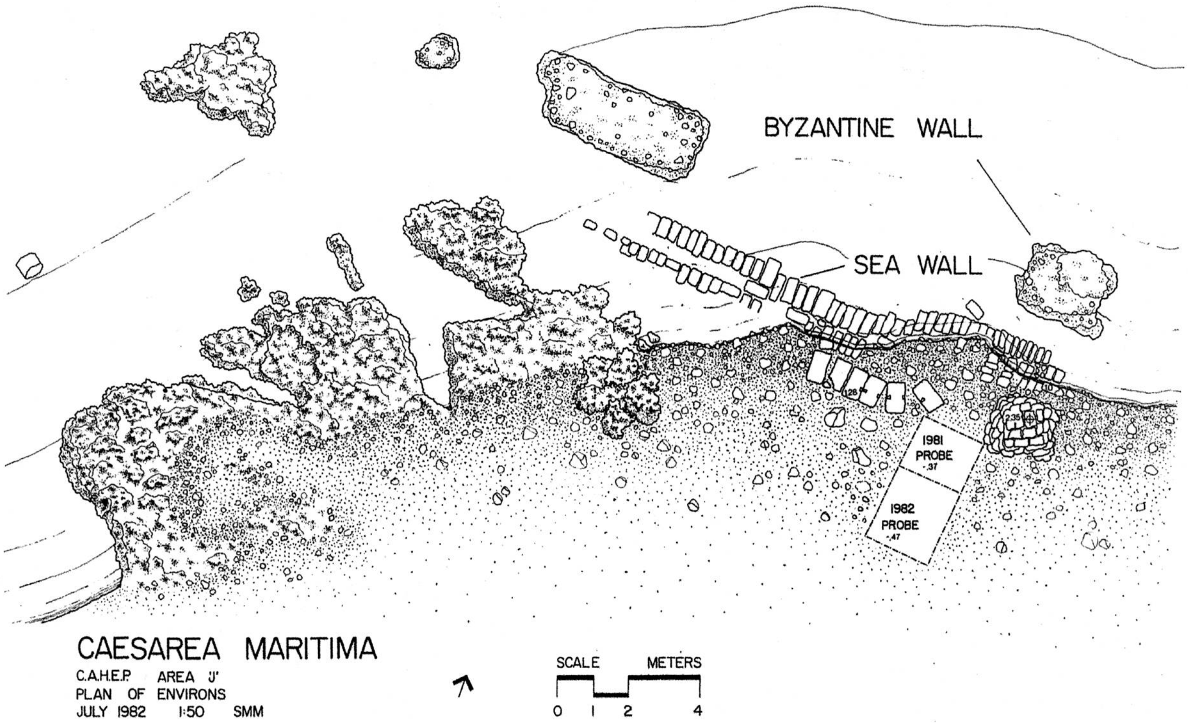



*Figure 2.5. Plan of CAHEP's Area J after the 1983 season (Raban 1989, Fig. III.92).*

*Figure 2.6. The eastern side of the Hellenistic quay at Area J, from the south (Photograph: A. Raban)*

*Figure 2.7. The rock-cut chambers at Area J during the excavations, from the south (Raban 1989, Fig.III.101)*

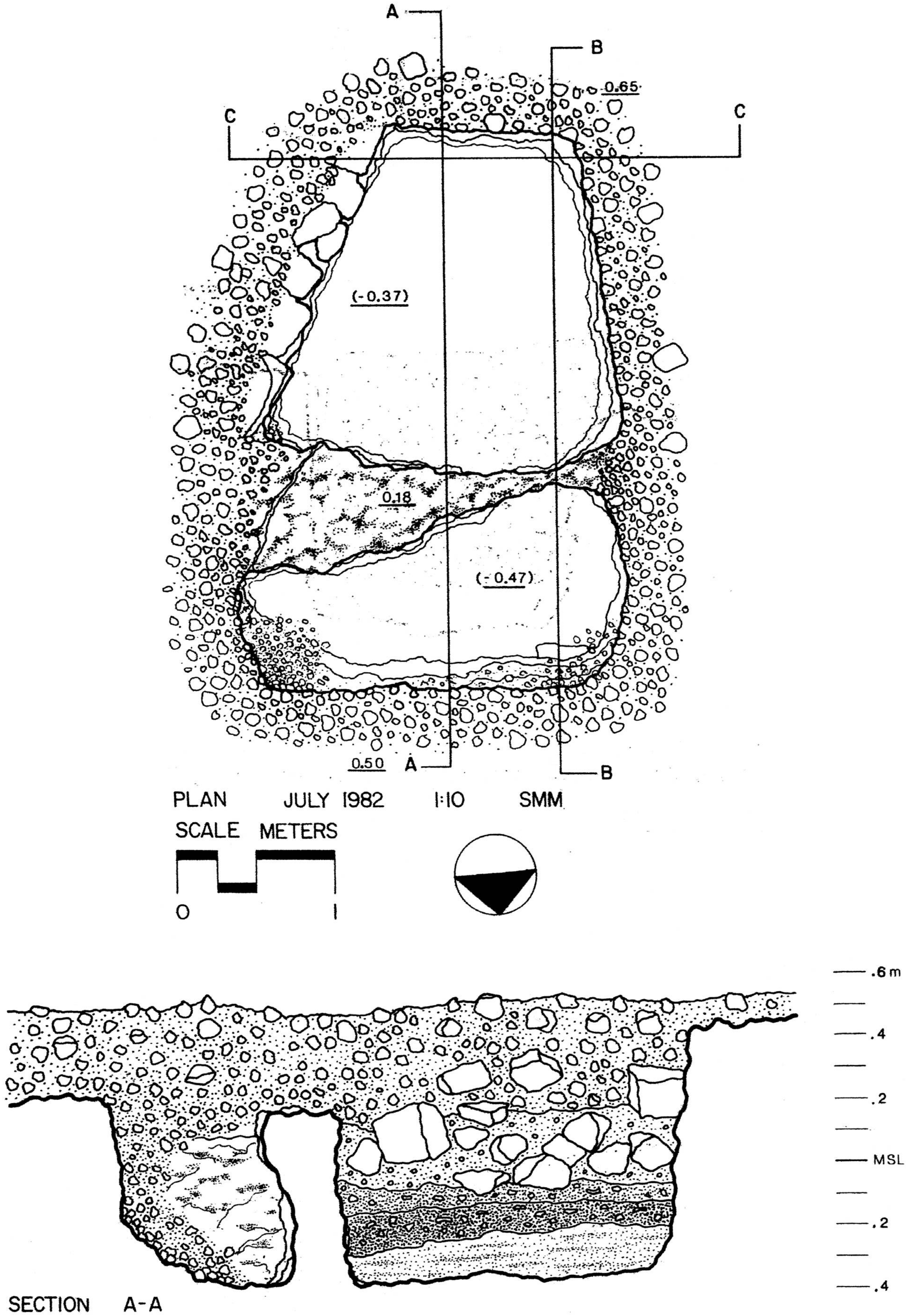



*Figure 2.8. Plan and sections of the rock-cut chambers at Area J. (Raban 1989, Fig. III.99)*

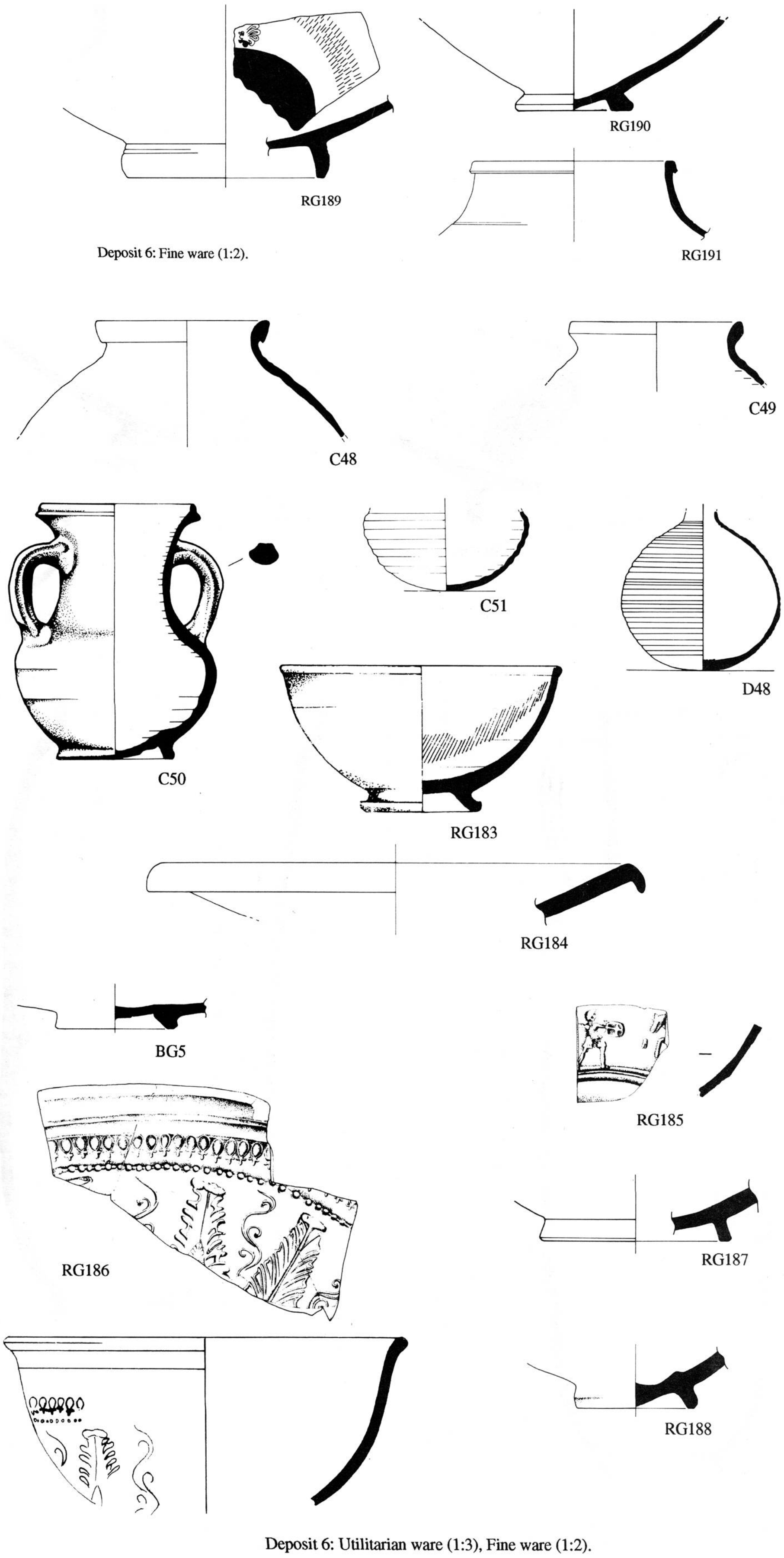
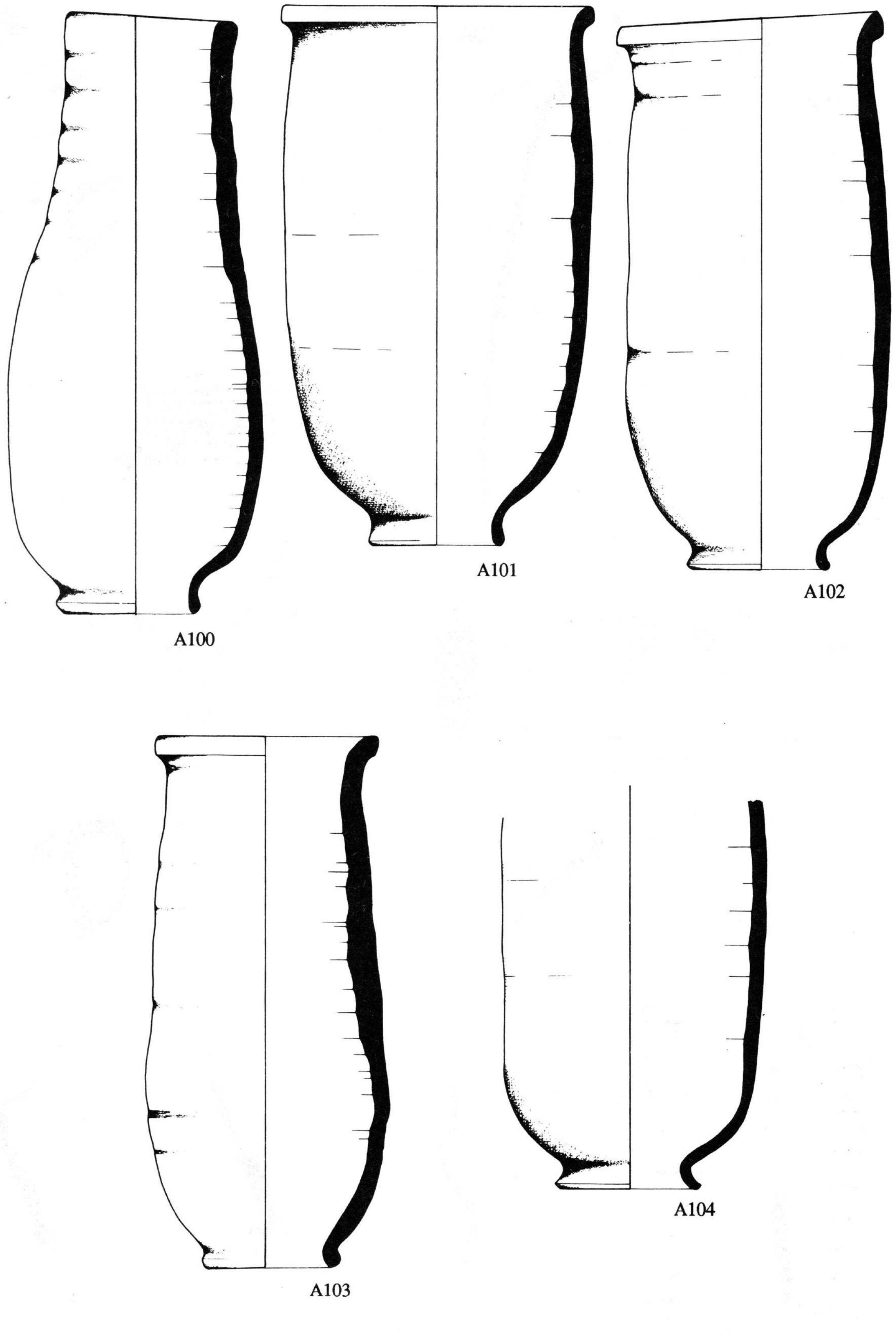
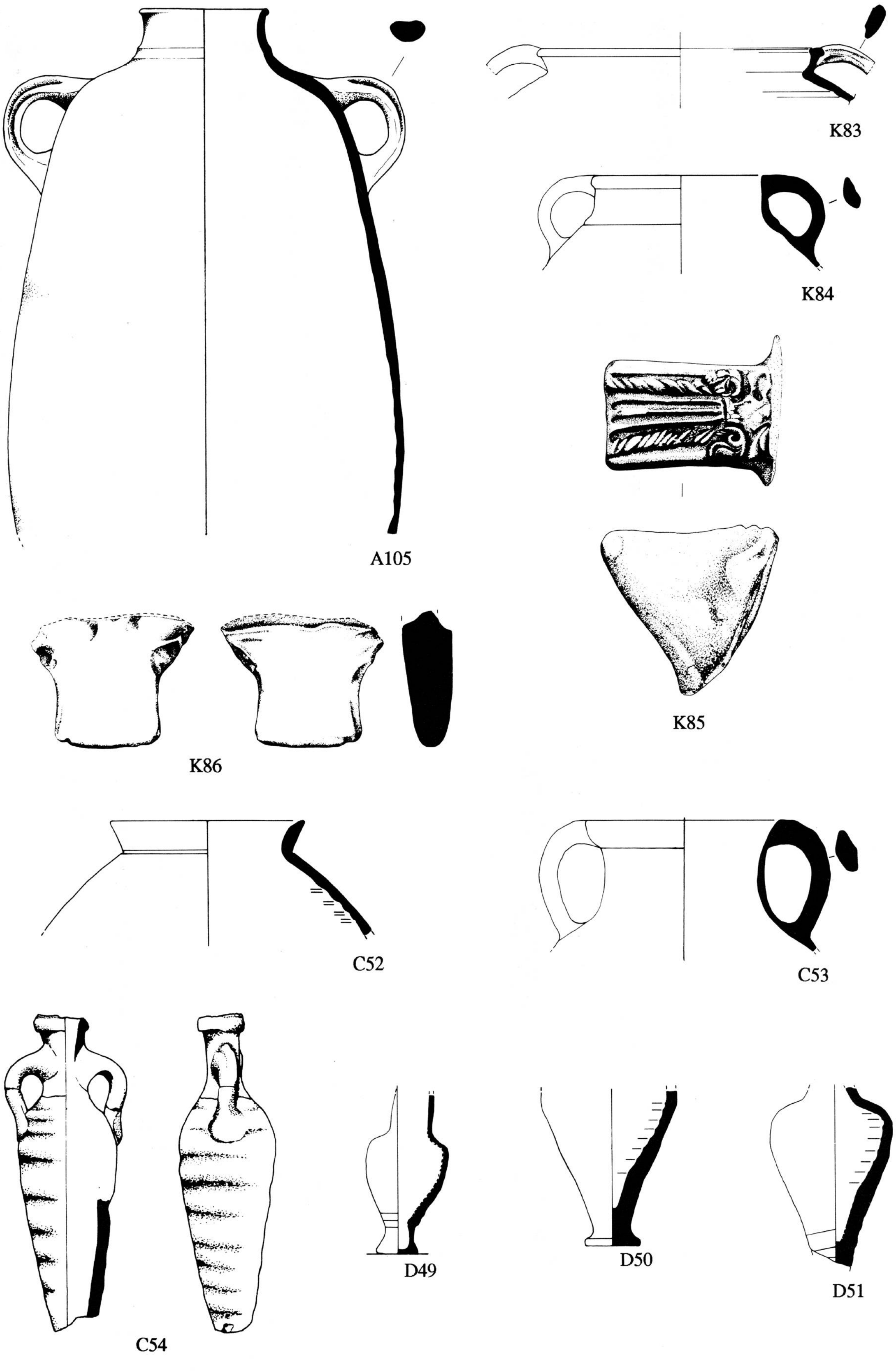



*Figure 2.9. Ceramic vessels from Locus 20 and Locus 22 at Area J. (after Oleson et al. 1994, Figs.51-52)*




Deposit 7: Amphoras (1:4).

*Figure 2.10a. Jars from Loci 21, 23 at Area J. (after Oleson et al. 1994, Figs. 52-54).*




**Deposit 7: Amphoras (1:4), Utilitarian ware (1:3).**

*Figure 2.10b. Jars from Loci 21, 23 at Area J. (after Oleson et al. 1994, Figs. 52-54).*

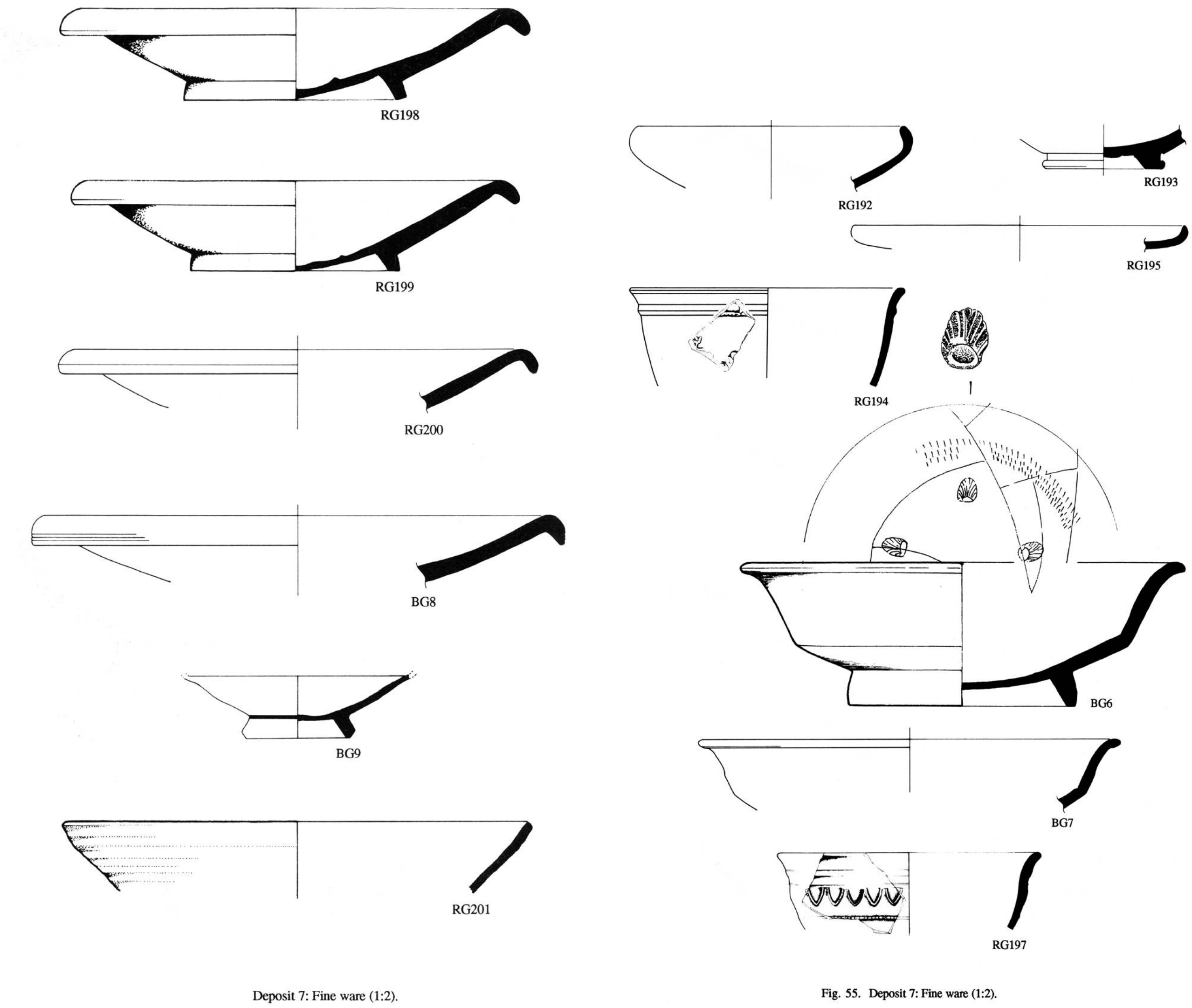



*Figure 2.11. Kitchen and tableware from Loci 21, 23, in area J. (after Oleson et al. 1994, Figs. 54-56).*

During the 1982 season excavation was renewed in Area J2. In a probe (2.0×2.5 m) a floor of *kurkar* slabs packed with potsherds was found, including two double holemouth jars, cooking pots, typical Hellenistic black-gloss bowls, fish plates, mould-made bowls, Rhodian amphorae, and three Aegean amphorae of unknown provenance. These securely dated the assemblage to the second century BCE.

The excavations of CAHEP in Area J continued for two more seasons under the direction of R.R. Stieglitz, when two additional rock-cut chambers or tanks were exposed. The first was hemispheric in plan (c. 4 × 4 m) and seemed to have served as a kind of a reservoir to the already exposed chambers. It was pierced near its base and was used as a dump for domestic garbage after losing its original function. The ceramics included quantities of Hellenistic vessels, such as fish plates, early Eastern Sigillata and 16 stamped handles of Rhodian amphorae and others (e.g., Coan and Cypriot; Stieglitz 1987; Raban 1992c: 12–15). This chamber was incorporated and re-used in the second century BCE building unit (Raban 1990: Fig. 4). The unique building technique, 'Phoenician' (Fig.2.12), of that unit was also found in early Hellenistic contexts at the nearby site of Tel Dor (Sharon 1987; Stern *et al.* 1997: 33–36).

### 2. Straton's Tower

The excavation and clearing of the rock-cut features along the 15 m of the uplifted abrasive shelf, from the east end of the Hellenistic quay in the north, to the land site in the south, yielded some industrial features of the late Hellenistic period associated with Straton's Tower.

The series of chambers or tanks was cut in the bedrock sometime before the second century BCE. These eastern inland tanks were larger than the western ones. Tank C was divided from the neighboring hollows by thin, rock-cut screen walls that were pierced by two holes in their base.

*Figure 2.12. Wall of Phoenician building style (w.363) at Area J, looking to the north (Photograph: A. Raban)*

It is quite possible that these tanks had some industrial function at first using the perforated drain holes in order to facilitate complete drainage of the tanks. This function may indicate that the sea level was lower than at present by at least 0.20–0.30 m. Alternatively, these were fish tanks that used the perforated drain holes for better circulation of sea water. If so, it indicates that the sea level was at least 0.5 m higher than at present. It is difficult to determine whether the tanks were plastered in order to combat the *kurkar*'s porosity. However, the lime-rich character of the muddy layer and the sand below it could indicate that such plaster existed there and disintegrated during the centuries.

The *kurkar* slab floors were either the original bases of these tanks or were put in place in a second phase. Considering the level of the drain holes the first alternative is preferred. In this case their function as a fish tank should be excluded because a floor would have been superfluous for such a purpose. Although some scattered sherds found on these floors are dated to the third rather than the second century BCE (Oleson *et al.* 1994: 147), they could have originated in an earlier stage of the tanks.

The cylindrical double hole-mouth jars found mostly in tank C could be associated with a later pipe in the bottom of the tanks, connecting the holes on both its sides. This would agree with their alleged function as some kind of industrial installation. Yet, they can also be in agreement with the hypothesis of a fish packing workshop at the site. Alternately, these jars were either stored in the tank or dumped there with other vessels at some later period. Tank C may have been a storage place, while tank D was filled with refuse. If this was the case, then tank D lost its original use by the second half of the second century BCE

In the rich corpus of Hellenistic pottery found in the tanks there is nothing that could be dated later than 100 BCE. Of the eight stamped Rhodian amphora handles, four bear the eponyms Timokles, Gorgon and Timotheos all dated to the late second century BCE (Grace 1952: 529–30; 1956: 144). Gorgon is dated to period IV (180–146 BCE) and Timokles and Timotheos are dated to period V (146–108 BCE; Grace and Sarvatiannou-Petropoulakou 1970: 286). Other stamped handles are attributed to the fabricant Susilas (Grace and Sarvatiannou-Petropoulakou 1970: 311) and a stamped handle depicting the head of Helios dated to the third or fourth quarter of the second century BCE (Grace 1956: 144). The Rhodian amphorae stamps correspond well to the Hellenistic pottery types and create a solid late second century BCE date for the latest Hellenistic occupation at this site. Sixteen additional stamped Rhodian amphora handles, which were studied by Stieglitz, corroborates this chronological reconstruction (Stieglitz 1996: 606–608).

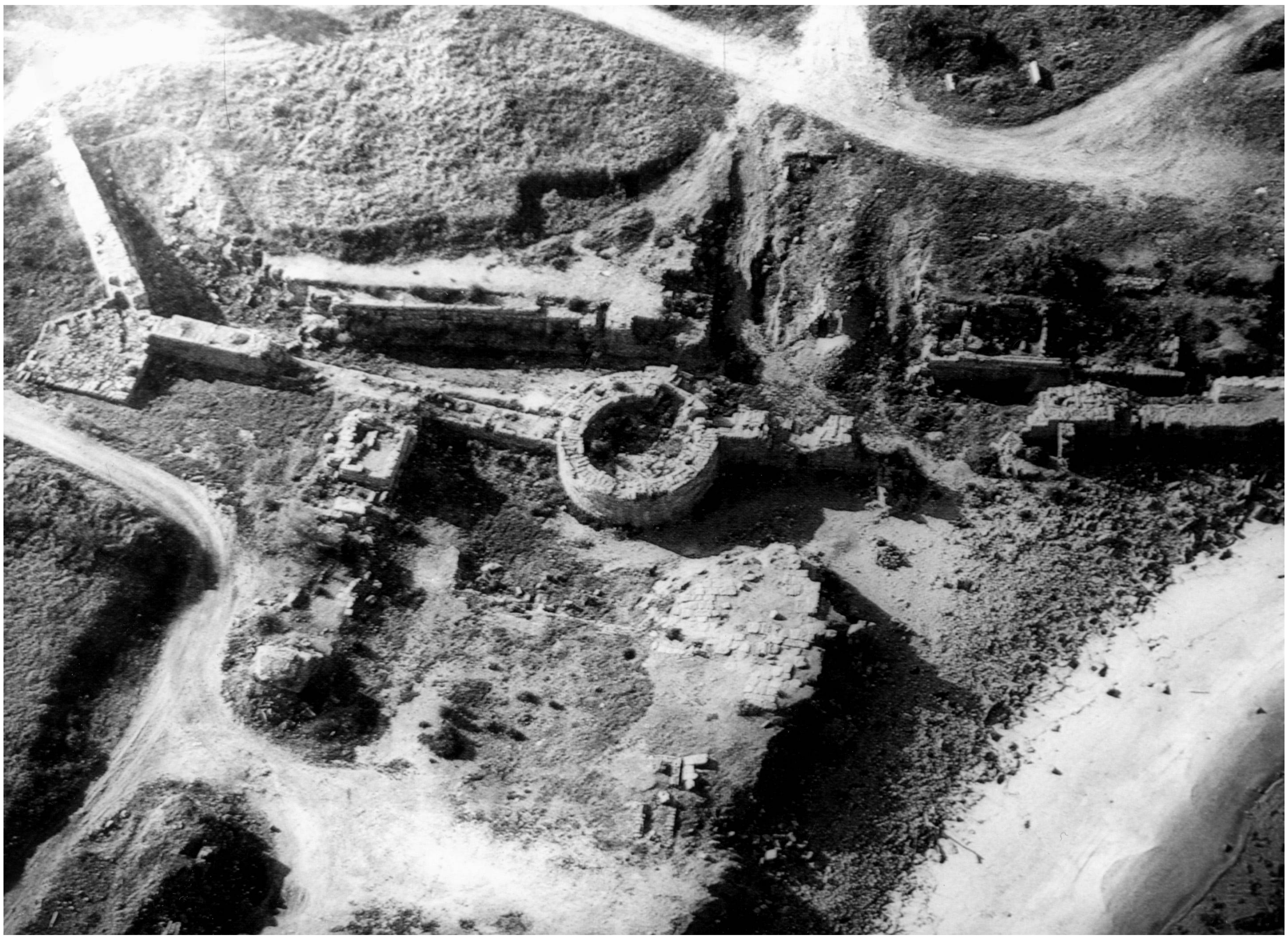


*Figure 2.13. Aerial photograph of the northern inner wall (Raban 1989, Fig. I,35)*

The rock-cut tanks illustrate the extensive activities along the shore line adjacent to the quay during the latter half of the Hellenistic era. These activities likely constituted a fishery or fish packing factory, but not in a direct context with the quay as such. The elevation of the quay corresponds to a sea level about 0.2 m lower than the present one. These data agree with one of the alternatives for sea levels deduced for the rock-cut tanks and it also fits in with the elevation of Hellenistic floors which were exposed next to a Byzantine well dug to a water table higher than the present one by at least 0.5 m. This would confirm the ancient sea levels at this site as being respectively lower during the Hellenistic period and higher during the Byzantine era in comparison to the present level (Raban and Stieglitz 1987; Nir and Eldar 1987).

Sometime in the second century BCE the area was re-planned and re-built. Tank C still functioned, but tank D was covered up by a fill and new walls were placed on it. It is tentatively suggested that the long, rock-based stone walls were laid in the area at that stage.

a. The North Inner Wall

The archaeological evidence collected by CAHEP and by Avi-Yonah and Negev (1963: 148) suggests that this harbour was not the quay found in Area J. This area seems to have been abandoned after Straton's Tower was taken by Alexander Jannaeus in ca. 100 BCE and until Herod built Caesarea. Josephus (BJ 1: 408) notes that Straton's Tower was already destroyed when Herod selected its site for his city, but Strabo (16.2.27) states that Straton's Tower had a harbour or anchorage (*prosormon*) during the mid-first century BCE. Thus, the anchorage referred to by Strabo might be sought for in the Inner Basin of Sebastos.

The north inner wall is located some 150 m north east of Area J. This 2.3 m wide ashlar structure was exposed by the Italian Mission in 1959–1964 (Frova 1965: 247–292). The wall was exposed for about 120 m from the seashore eastward. It was built of local eolianite stones (averaged 0.45 × 0.6 × 1.2 m) and laid in alternating order of stretchers and headers and had several sections (counted from the shore eastward; Fig. 2.13).

**Section 1:** This section consists of 30 m of a renovated wall. The original wall, which survived only at the eastern 3 m of that section, was composed of tightly fitted smooth face ashlars on their external (northern) side, and marginal drafted ones on the inner side. The renovation, however, can easily be noted as a mixture – on both sides, with relocated blocks in a non-discriminating way (Fig. 2.14).

*Figure 2.14. The inner face of the western section of the north inner wall, during the 1990 excavations in Area J/6. (Photograph: A. Raban)*

The blocks of the renovated section are of a less tight fit, with chunks of lime rubble filling the extended spacers.

**Section 2:** This section consists of two round towers (12 m in diameter), 12 m apart. Of the western tower only a few segments survived above the 3–4 foundation courses of small cut stones and rubble (Prova 1965: 252–254, Fig. 308). Its eastern half was preserved to a maximum height of eight courses (over 3.5m) above its foundation (Fig. 2.15). On top of the foundation there was a half height course of ashlars and concentric course of headers overriding it. The upper courses were comprised of alternating headers and stretchers, all of which are fashioned with marginal drafted crude busts, except the eastern side in which the ashlars' faces are smoothly leveled. The width of the circular wall is about 2 m (= length of a header + width of a stretcher), leaving 8 m in diameter for the ashlars' paved internal hollow. The eastern segment of the fortification wall is well incorporated with the center of the tower, unlike the wedged connection between the western wall and the other tower. The section of the eastern wall is 34 m long, between the eastern tower and the point where it turns 50° towards the southeast. The eastern half of that section seems to retain its original layout, – comprising tightly fitted ashlars with no binding matrix and well ordered courses of alternating, smoothly faced, headers and stretchers on its external side (Fig. 2.16), and marginal drafted busts on the internal one (Fig. 2.17). At the turning corner there is a pentagonal tower (Frova *et al.* 1965: 278–279), but it is not clear whether it belonged to the original phase, or was added at a later stage. Its ashlars are smaller than those of the adjacent wall and the round towers. Yet their face is drafted marginally in the area next to the wall and in a smooth manner along the northern and eastern sides, which are further out (Frova 1965: Figs. 370–372).

The continuation of this fortification wall towards the southeast was studied by the Joint Expedition (JECM) which dug a probe (6 × 8 m) against the external face in order to date the inner north wall (Blakely 1984; 1992). Unfortunately, this probe yielded only a tentative and questionable conclusion that the wall was built between 128 and the end of the first century BCE (Blakely 1992: 40). The published pottery from the wall's foundation trench contains types that should be dated to the second century BCE (Blakely 1984: 10: Figs. 8, 9).

Unlike the eastern section of the north wall, between the eastern and the pentagonal towers, the external surface of the wall exposed in the JECM probe did not retain its original quality, but rather is constituted of a mixture of replaced blocks, some of which were already defective and eroded, some with marginal drafted busts and some, as in the upper course, laid as headers only (Blakely 1984:

*Figure 2.15. The eastern tower from the north (Photograph: A. Raban)*

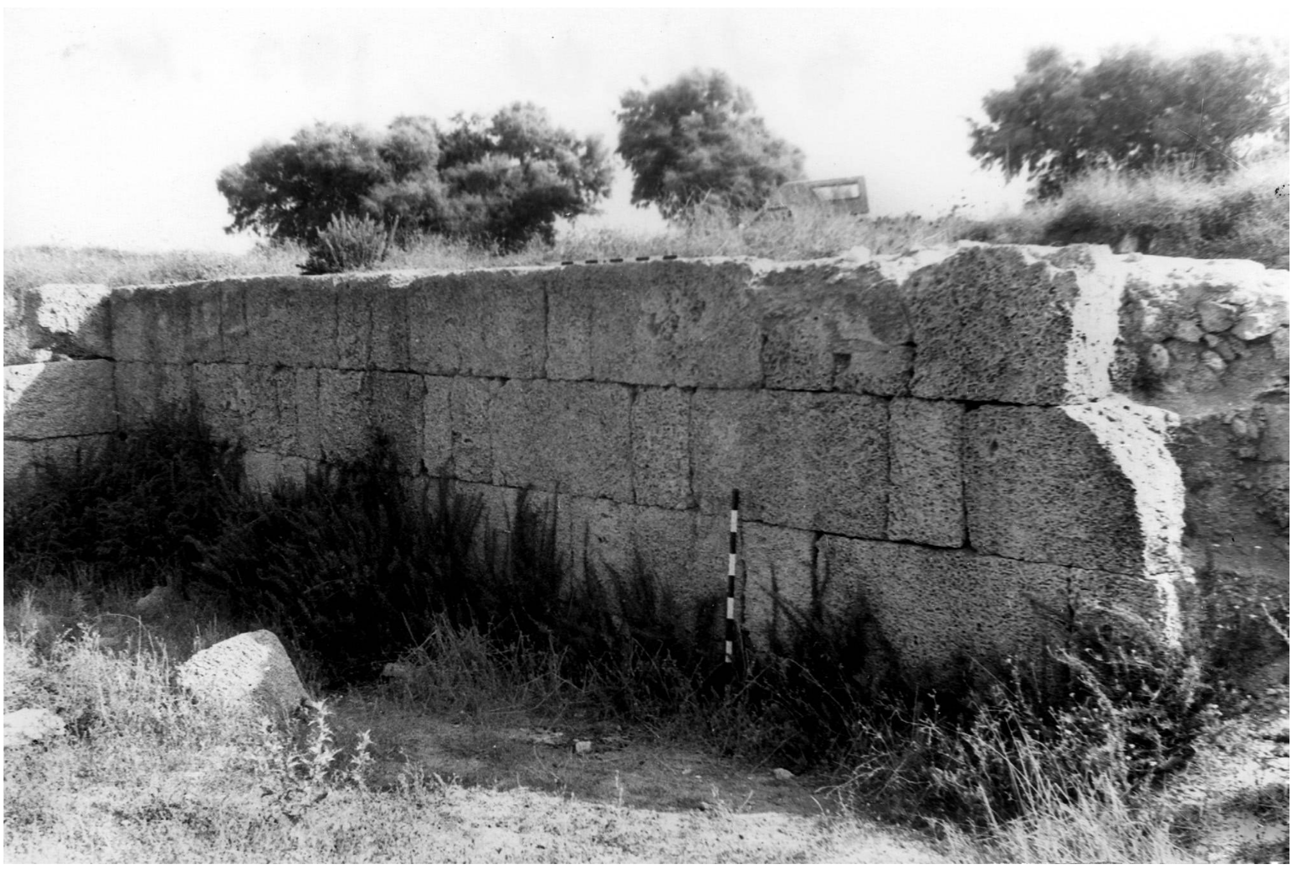


*Figure 2.16. The northern face of the eastern section of the north inner wall (Photograph: A. Raban).*

*Figure 2.17. The southern face of the eastern section of the northern inner wall (Photograph: A. Raban)*

Plate 1; 1992: Fig. 2). One may argue that the foundation trench reflects an attempt to renovate the fortification wall long after it was built, which can agree with the absence of first century BCE pottery (Blakely 1992: 31). This makes it difficult to accept the suggestion that the wall was originally built between 57 and 55 BCE by order of Gabinius, the Roman governor of Syria (Hillard 1992).

The dating of that inner fortification wall has been discussed by many, it being argued either that Herod would not have built a non-fortified city (Levine 1975b: 9–13), or that the style of a marginal drafted bust was not earlier than the time of Herod (Frova 1965: 282–284). Some followed the suggestion made by the Italian mission that there might had been an earlier, Hellenistic, phase under the Herodian round towers and fortification wall (Ringel 1975a: 76–77; Levine 1975b:11: n. 53) and others argued for an early Hellenistic, late second century BCE date (Stieglitz 1993; 1996: 599–602; Negev 1993: 272) built by the local tyrant Zoilus (Raban 1987b).

Supporting the arguments in favor of the Hellenistic dating: (a) Josephus does not mention the building of a city wall when describing the building of Caesarea by Herod; (b) none of the historical Roman era sources refers to the city walls of Caesarea; (c) in the Talmud there is a consistent reference to the "Walls of Migdal Sar" (Straton's Tower) that survived as late as the seventh century CE (the inscription in the Rehov synagogue); and (d) Zoilus withstood the siege of Alexander Jannaeus in a city that Josephus called phrourion (= fortress; AJ: 16.293; Raban 1992b).

*b. The Tower in the Crusaders City Wall*

Another round tower was observed and surveyed in a preliminarily way by the CMS staff (Raban and Linder 1978: 243). It was further surveyed and excavated by CAHEP (Raban 1989: 177–181) and by CCE (Holum *et al.* 1992: 79–83) and designated as Area T1. This tower is located in shallow waters, less than 20 m off the public beach within the confinement of the Crusaders city walls (Fig. 2.2). Despite the fact that it has been trampled by thousands of bathers, it was noticed only in a relatively later phase of the project and can hardly be discerned (Fig. 2.18). This tower resembles, in its size and building style, the towers at the north inner wall. It is somewhat larger (13 m in diameter) and constructed of radially laid long ashlar headers (1.6–2.0 × 0.4–0.5 × 0.5–0.6 m). There are about 60 headers in the upper course of the tower (compared to 58 in the first course of the eastern tower at the northern inner wall) and up to four courses of headers that were laid directly on the leveled bedrock.

Probes that were dug along the northern face of the tower exposed sections that were repaired, reusing some plastered ashlars from terrestrial structures. Similar renovations

*Figure 2.18. Aerial view of the round tower T.1 (after Blakely, J.A. 1992, Fig.17)*

were traced along the eastern face of the tower including a modification and the placement of a lead water pipe, which carried fresh water from land across the seabed and up to the lee side of the tower (Figs. 2.19, 2.20). The course of headers of the tower's north to northeastern sections was replaced by what seems to be a connecting wall built of somewhat smaller ashlars, most of which are no longer in place (Fig. 2.21). The overall width of this adjacent structure was about 5 m and it seems that its external half was a seawall, while the lee half was some kind of a rampart, or a raised walkway.

Almost all of this structure has tumbled down and most of its ashlars tilt westward, probably due to the destructive affect of an earthquake. Its remains survived for only about 6 m north of the round tower, and it seems that the rest of it, farther to the north, was stolen in later antiquity. Inside the tower there was a concentric circle built of 12 slim orthostats with their top in 0.8m of water. This circle bounds a hollow which is 4.5 m across and paved with polygonal slabs of local eolianite and *kurkar* stone in 1.3 m of water. Similar paving stones, although larger in size, filled the 2 m space between the inner circle and the

*Figure 2.19. The lead pipe ascending to the tower at T.1, from the east (Holum et al. 1992, Fig.5)*

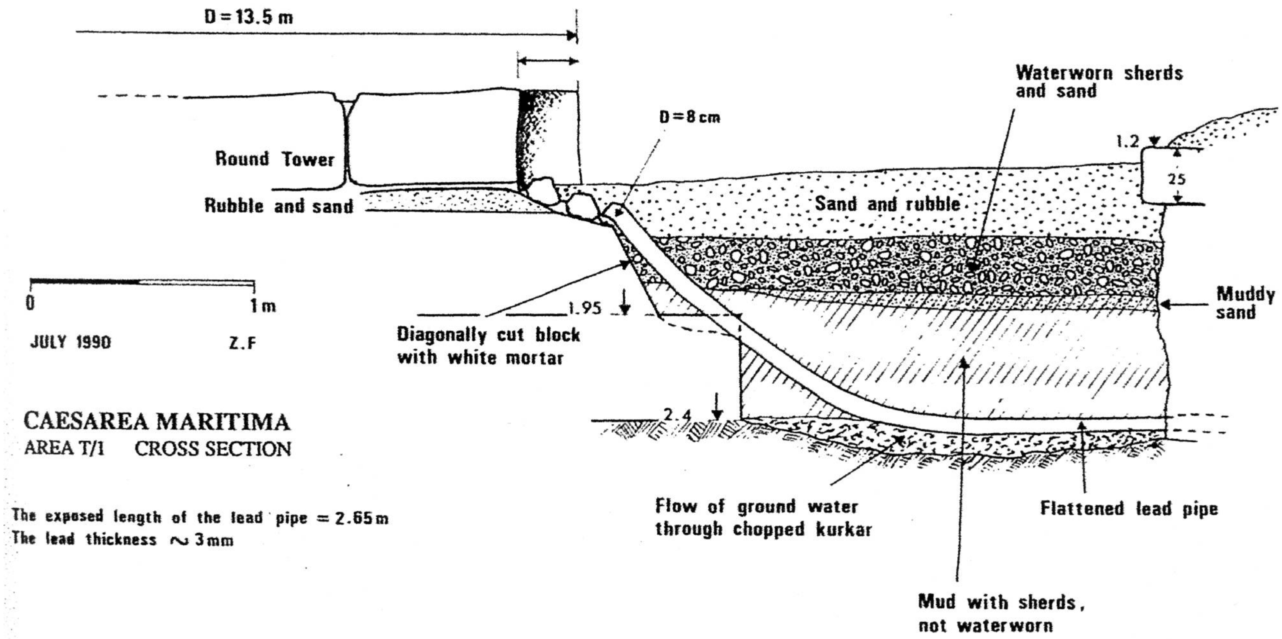



*Figure 2.20. An E-W section of the probe at the eastern side of the tower at T.1 (Holum et al. 1992, Fig.3)*

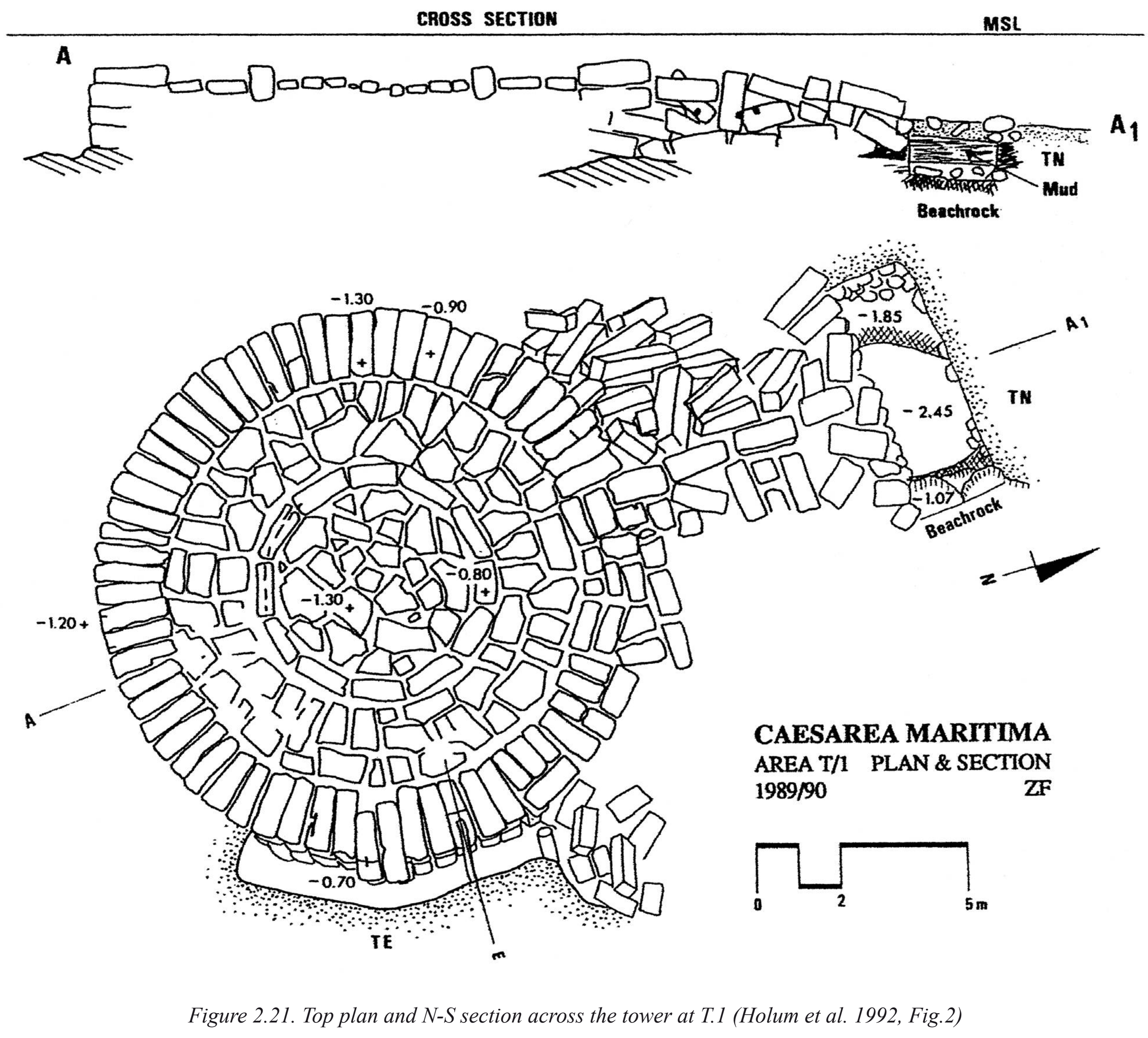



*Figure 2.21. Top plan and N-S section across the tower at T.1 (Holum et al. 1992, Fig.2)*

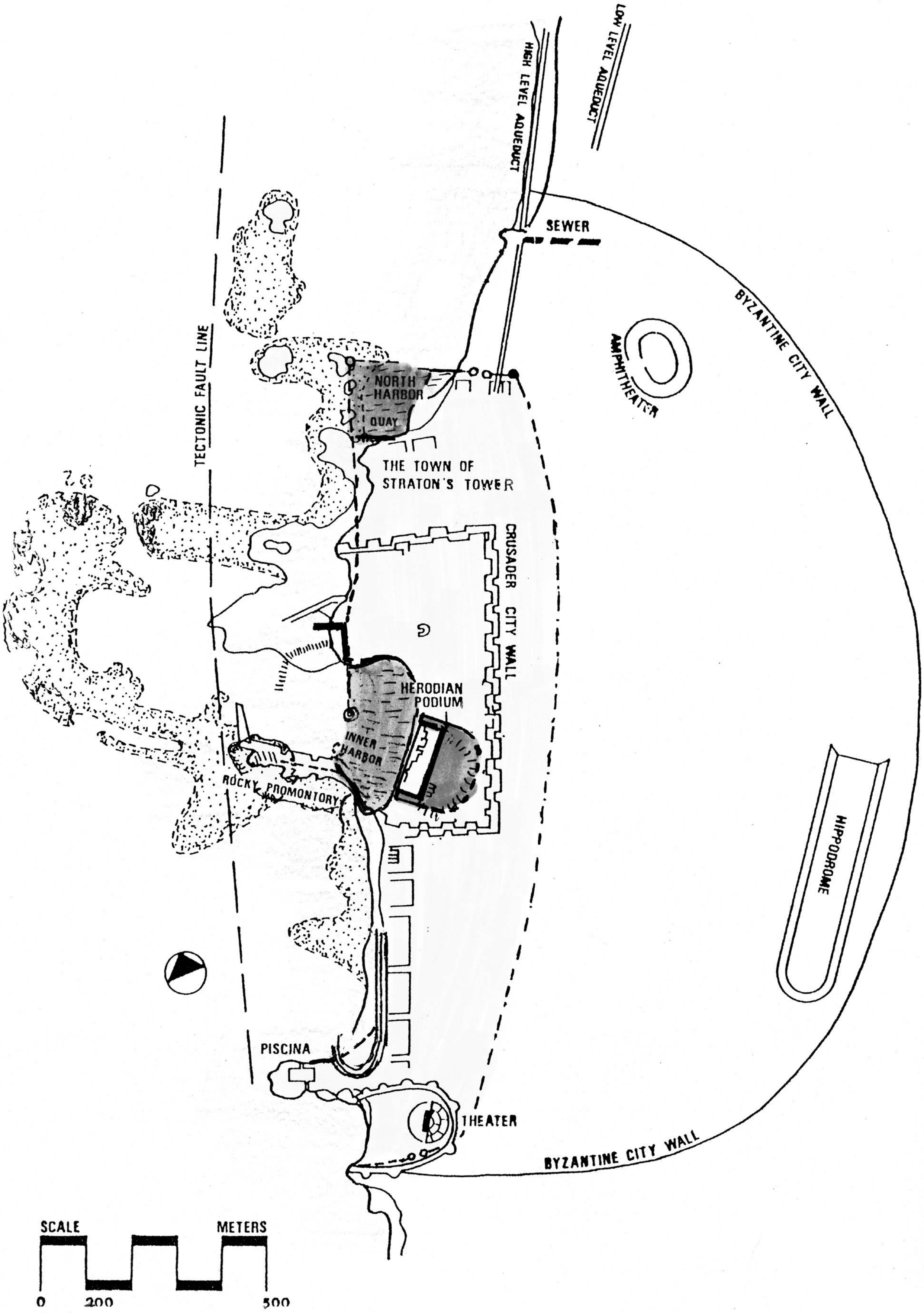



*Figure 2.22. Plan reconstructing the location of the harbour basins of Straton's Tower and the line of the city walls (Drawing: A. Raban)*

external wall. These pavers are 0.95 m below water on the east and 1.12 m on the west, suggesting that the tower tilts westward by some degrees, probably due to the above-mentioned eighth century CE earthquake.

If we consider the space between the two concentric walls of the tower as a pavement or a base for an ascending staircase, then its present submerged level cannot be understood. One would expect that such stairs should be at the same level as the rampart on top of the adjacent fortification wall, or at least well above the water level. The present low level suggests a vertical displacement of about 2 m, which is perplexing given the comparative stability of nearby features. The later submerged walls and tower located somewhat farther west and northwest in the basin, are not based on natural bedrock as was the tower in area T1. The data are even more perplexing in relation to the fact that bed rock was found at the same level all across the bottom of the present bay, between the tower (T1) and the southern promontory. Reconstructing the elevation of this rocky bed at 2 m above its present level negates any possibility of a navigable channel into the Inner Basin in Area I1, 100 m farther east. The absence of a wall adjacent to the Tower (T1) on the promontory side makes sense only if there was an inlet for such an Inner Basin at this point.

A tentative solution is that the round tower (T1) was built at a depth similar to the present one and that the paving within its walls was merely part of the building process. The interior would then be filled up to a level that was suitable for the operational demands of such a fortification. This assumption would agree with the differences in the construction techniques of this tower and the other two towers on the north shore, where the thin inner wall was just a means of retaining fill.

In the light of the absence of datable stratified ceramics the exact date of the submerged tower (T1) can be deduced only by stylistic and historical arguments. The best parallels for the architectural style of the tower are found at Samaria (Reisner *et al*. 1924: 11, Plan 10; Crowfoot 1942-58: 40) where they were dated to the Late Hellenistic period, prior to 88 BCE (Crowfoot 1942-58: 118–21). Such a date would agree with Josephus' record that Straton's Tower was, at that time, a fortified stronghold and the capital of Zoilus (AJ 13: 324-35).

The towers at two distant locations may be associated to the same fortification system that incorporated the southern and the eastern walls of the Herodian Podium Vault in Area I3 (see below). Projecting the continuation of the southern wall of this vault westward, it leads to the promontory on the south side of the bay in which the submerged tower (T1) was found. This course for the southern part of the wall would fit an enceinte designed to protect Straton's Tower. From the topographic point of view, it encompasses the Intermediate and Inner Harbour Basins. Similarly, the western segment of the northern wall with its two round towers can be projected toward the sea at a point appropriate for protecting the northern entrance into the lagoon, with the Hellenistic quay at its inner end (Fig. 2.22).

### *c. The Original Topography*

It is still not clear when the coastal low ridge of *kurkar* and eolianite sandstone, where Straton's Tower was located, was first occupied. A few Iron Age sherds and more from the Persian Period (fifth–fourth centuries BCE) were found in the vicinity of the site and within the Herodian fills close to the area of the Inner Harbour Basin. Yet, no significant architectural features that may attest to these early phases have so far been found. This is also true for the following Hellenistic period, although much more pottery dating to that time was found, both within the Inner Basin and at the top of the rocky outcrop east of it, where the later Herodian temple stood (Berlin 1992: 112–119). In any case, it seems that prior to any human intervention the topography of the site was characterized by a well-eroded, long shore low ridge of *kurkar*, with its western, seaward side segmented and partly inundated by the sea. Of that part some residual in-shore reefs and rocky islets remained well above the waves. The most prominent was the one presently under the so-called Harbour Citadel. Underwater surveying of the sea floor south of this outcrop showed that at some time in the past there was a very extensive abrasive shelf adjacent to it. At that time the relative sea level was about 2.4 m lower than at present. However, recent drills and probes at its lee traced the topography of the bedrock at a depth of 6 m below the present MSL, indicating that the south bay was originally connected to the area of the Inner Basin. No sand depositions were traced at these probes to suggest that there was a stable perennial Tombolo that bridged the gap (Toueg 1996: 21–25).

### *d. The First Inner Basin*

The exact time when the water passage between the rocky islet of the Harbour Citadel and the shore to the east was closed and bridged by a man-made sea wall is still under debate. So far no direct archaeological and architectural evidence of that alleged structure has been found. Yet, many scholars suggested that the Harbour Citadel was the original site of Straton's Tower (Guérin 1875: 225; Schumacher 1888: 134–141; Levine 1973; Roller 1983; Fig. 2.23). The most intriguing architectural feature is the round tower (T1). Its ashlar headers and its close resemblance, in shape and size, to the two towers in the inner north wall are in complete disaccord with the formed mixture of rubble and *pozzolana* that characterizes the eastern quay of the Inner Harbour Basin. Yet it corresponds, quite clearly, with the style of the Pre-Herodian quay in the north bay and other Phoenician harbour works at Athlit and Akko (Raban 1995a: 154–163).

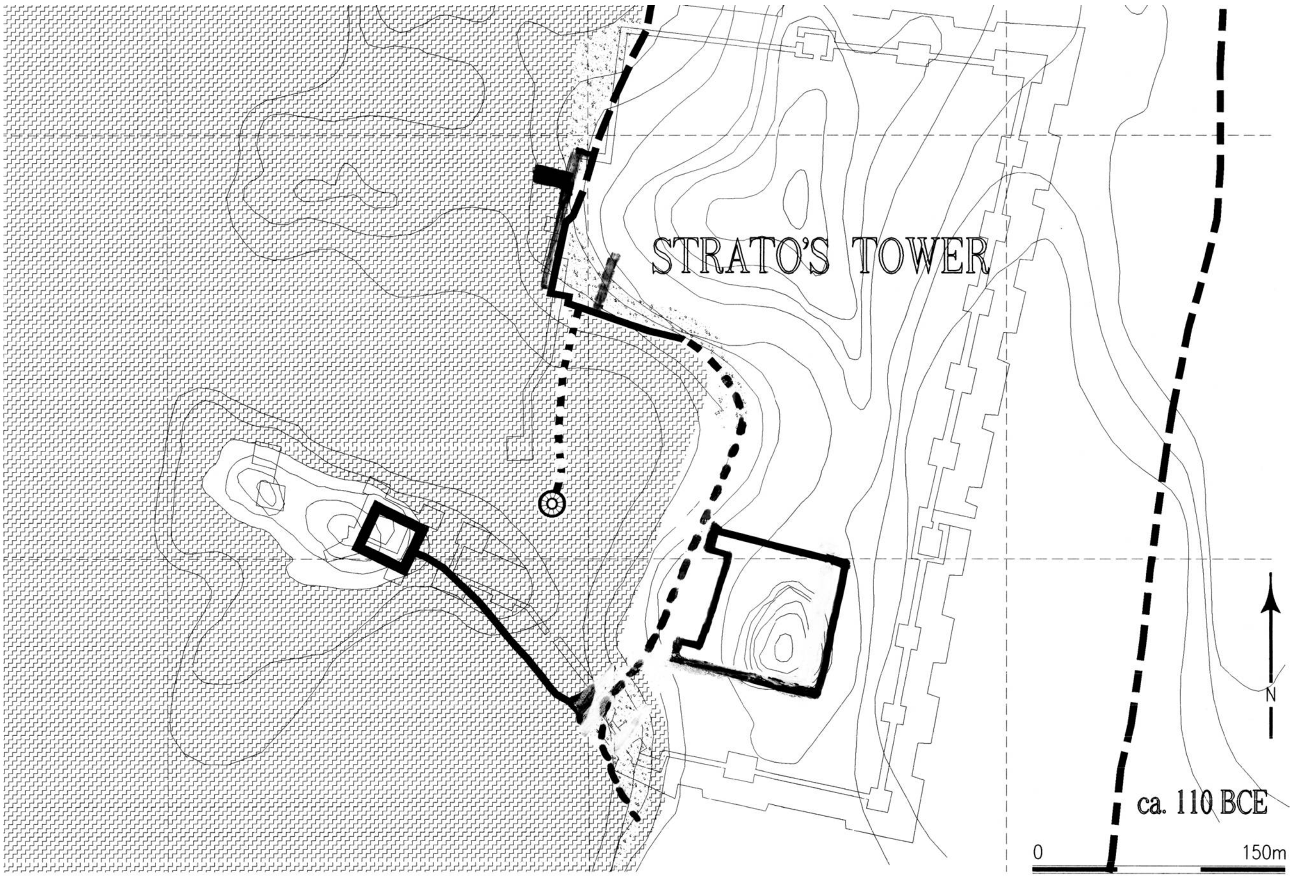



*Figure 2.23. Schematic map of the inner basin c. 110 BCE (Raban 1996b, Fig. 3).*

Bearing all the circumstantial data in mind, one may consider the round tower (T1) and some fragmentary Pre-Herodian ashlar structures parallel to the eastern quay of the Inner Basin, on its lee (Raban *et al.* 1993: 37–41), as components of what may be identified as the *Hormos*, or *Hyphormos* of Zoilus' Straton's Tower (Figs. 2.24, 2.25). The very location of the round tower does not agree with any reasonable layout other than that of a protecting feature at the entrance to a closed basin (*Limen Kleistos*). As such, it would not fit the overall layout of Sebastos as described by Josephus or any later harbour.

The relatively large quantities of third-second century BCE sherds found within the thin layer of fine mud that covers the rocky sea floor in the Inner Harbour Basin close to its eastern quay (CAHEP Area I1) support a situation of there still being a body of sea water (attested to by the multitude of Ostreae shells) in that period (Holum *et al.* 1992: 89–93). Therefore, the conjectural conclusion must be that the area of the Inner Basin was devoid of any wave energy with no supply of sand and eroded sherds prior to Herod's time. Yet, the earliest quays studied around this basin are all of the molded mixture of rubble and *pozzolana*—a building compound unknown in Hellenistic Levant before the first century BCE.

There is, however, one exception, at the very northwestern end of the basin (CAHEP Area S2; Fig. 2.25). The quay in that area was exposed in two spots, 10 m apart, where it was built of ashlar blocks with no binding matrix, although *ostreae* shells were found along its south face at 0.42 cm below MSL (Stieglitz 1987: 188; Raban 1989: 173–177). The western probe was dug down to almost 2 m below MSL where bedrock was reached at 2.7 m (Fig. 2.26). This quay, and maybe also the headers paved passage northwest of it (Figs. 2.25, 2.27), might have been built earlier than Sebastos as the harbour of Straton's Tower, at a time when the relative sea level was 0.4 m lower. Such data would agree better with the Hellenistic than the Herodian era (Raban 1989: 293–295).

**D. The Podium Vault (Area I3)**

The podium vault (5 × 13 × 21 m) was the southernmost one in a series, and was excavated by Negev (1967: 21–25), while the others have collapsed, some during the Late Roman period and the remainder at later dates (Negev 1967: 22). The vault was found to have been filled with earth almost to its roof during the latest occupation of the Fatimid period. The original floor was reached only in one small area next to the north wall at about 2 m above MSL. It consisted of a heavy fill of crushed *kurkar* on which numerous Late Hellenistic and Herodian potsherds were found (Negev 1963: 728; 1993: 273). Negev noticed that the southern and eastern walls of the vault differed in the height of courses, surface treatment, and means of binding

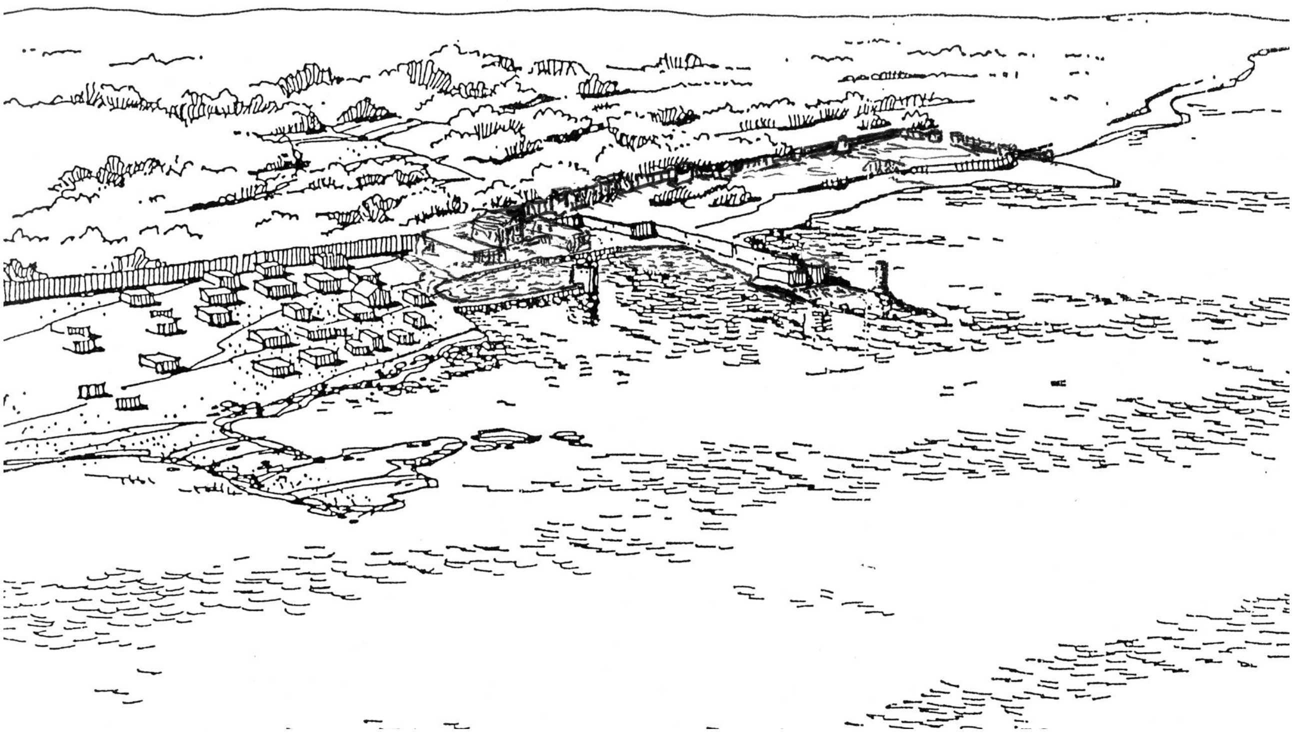


*Figure 2.24. Artist's rendering of view of the central and southern parts of Straton's Tower at the time of Zoilus (after Giannetti in Holum, Hohlfelder, Bull, and Raban (eds.) 1988, Fig.11)*

from the north wall and the roof (Fig. 2.28). These latter components were built of smooth-faced, smaller blocks laid in mortar. Clearly this vault was constructed in two different stages. During the first phase the vertical portions of the southern and eastern walls were built with ashlar blocks bearing drafted edges on their front surfaces and held together with iron clamps set in lead (Fig. 2.29). In the second phase an additional wall was built parallel to the southern one, extending eastward to the back wall. This chamber was then roofed with a vault that rested on top of the earlier walls (Fig. 2.30). This re-building has a bearing on the chronology of the north gate. Negev's suggestion of a Herodian date for the vault in the Temple Podium was based on his probe along the later wall. Consequently, the other two walls might be either pre-Herodian or just an earlier phase of the Herodian plan.

In order to sort out these alternatives, two probes were dug inside the vault down to the foundation level of both the southern and the northern walls (Figs. 2.30, 2.31). In the first probe under ill-stratified fill of the Byzantine period, a chamber was found. Under Byzantine and Late Roman layers a light reddish-brown, silty sand mixed with angular fragments of *kurkar* was found, including very few datable sherds and two pieces of Eastern Sigillata A dated to the first century BCE. The fill of the foundation trench, clearly visible in the section, contained very few potsherds of which two were fragments of Eastern Sigillata A and one a badly eroded Rhodian amphora handle of late second century BCE.

The second probe (Fig. 2.32) was placed on Negev's earlier probe. Below Early Islamic through Early Roman layers, a horizontally stratified fill of crushed *kurkar* chunks was found that contained pieces of charcoal and a considerable number of lustrous red sherds of Sigillata vessels, a major portion of an Eastern Sigillata bowl and a complete cooking pot. This corpus seems to be uniformly Herodian in character.

The two probes in Area I3 yielded clear-cut stratigraphic evidence that the northern and southern walls of the southern vault were built at different periods. Since the north wall is related in its earliest stage not only to a floor or occupational level 0.80 m higher, but also to a later historical phase, they should be later than the south wall. It could be that the existing, massive southern and eastern walls were taken into account and their better preserved parts re-used when the master plan for Caesarea was laid out. If, as it is argued above (Fig. 2.22), this wall was actually the inner face of the southeastern corner of the wall of Straton's Tower, it may be that Herod's town planners decided to keep it as a boundary between the city of Caesarea and the emporium of Sebastos (Levine 1975a:11, n. 50). According to literary sources, the walls of Straton's Tower remained physical landmarks through the Roman era (Klein 1928: 19–22),

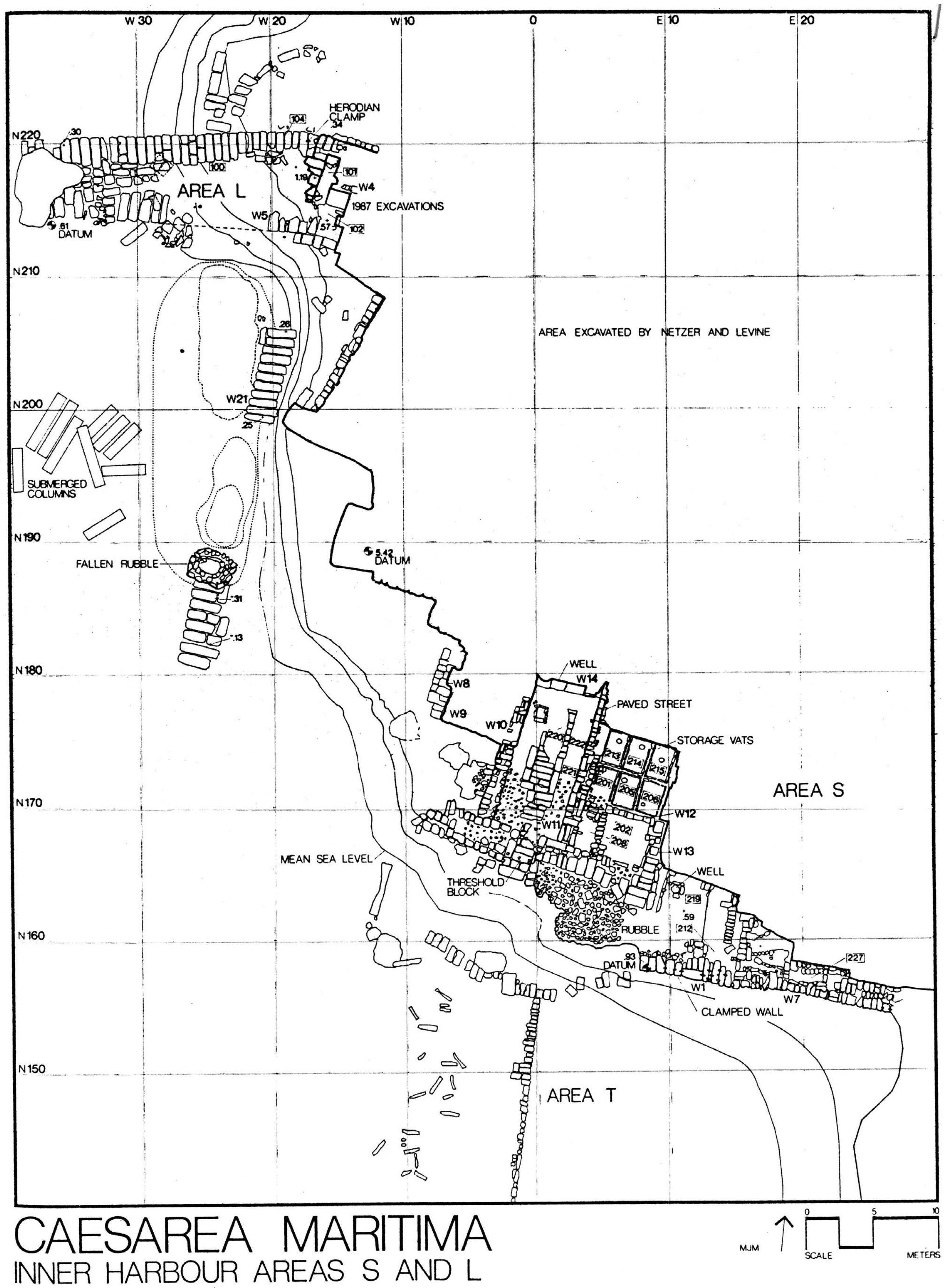



*Figure 2.25. General plan of the excavations at the north side of the intermediate harbour basin (Raban 1996b, Fig.5)*

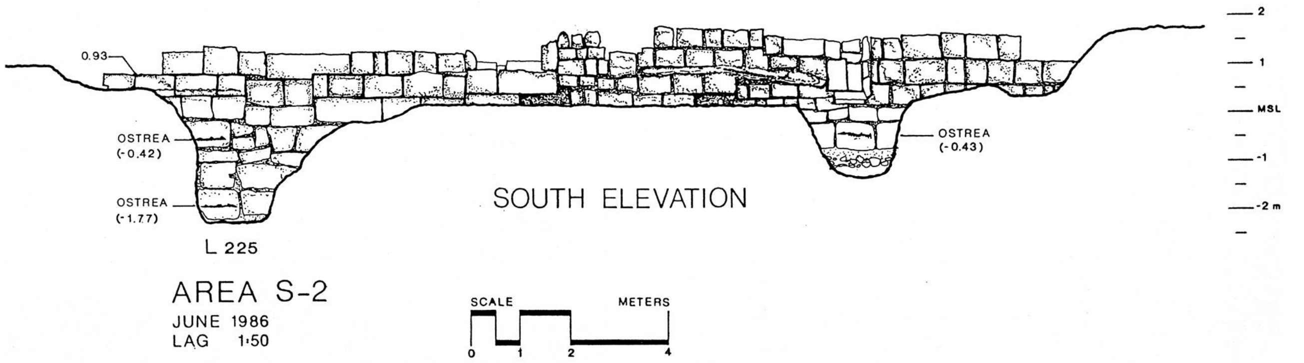



*Figure 2.26. The southern elevation of W-1 at Area S at the end of the 1986 season (A. Raban 1996b, Fig.6)*

*Figure 2.27. W.220 in Area S, looking to the south. The arrow points at the lower course of longer ashlar headers (Photograpah: A. Raban)*

so their outline must have been easily distinguished within the built up area of Caesarea. As their confinement had a religious and juristic meaning in the Jewish Halacha, it might have also had an initial administrative role. One of Caesarea's epithets on coins from the reign of Agrippa I (37–44 CE) is *Kaisaria-k-pros Sebastou limeni* (Caesarea by the harbour of Sebastos; Ringel 1975a: 153), implying that the two were separate entities. This assumption solves the difficulty of attributing the north wall and the two towers to the Herodian city walls of Caesarea (Levine 1975b: 9-13; Negev 1993: 272-273; Raban 1992b).

Concerning recent excavations conducted by Porath, on behalf of the IAA, in the southern vault (1) and in other two adjacent ones (vaults 2 and 3) the excavator claims that the vaults should not be dated to the time of Herod as was been argued before (Negev 1967: 25; Raban 1989: 138–142), but to about 300 years later (Porath 1996a: 107–109; 1998: 45–46). Unfortunately this claim is based on uncompleted excavations and prior to a careful study of the multiphase side walls of vault 3, which seems to have been re-built at least a half a dozen times, as can clearly be seen at the back wall (Fig. 2.33). On its south side there are clear structural

*Figure 2.28. The southern vault at the western façade of the Temple Platform (CAHEP's I.3), looking west from within (Photograpah: A. Raban)*

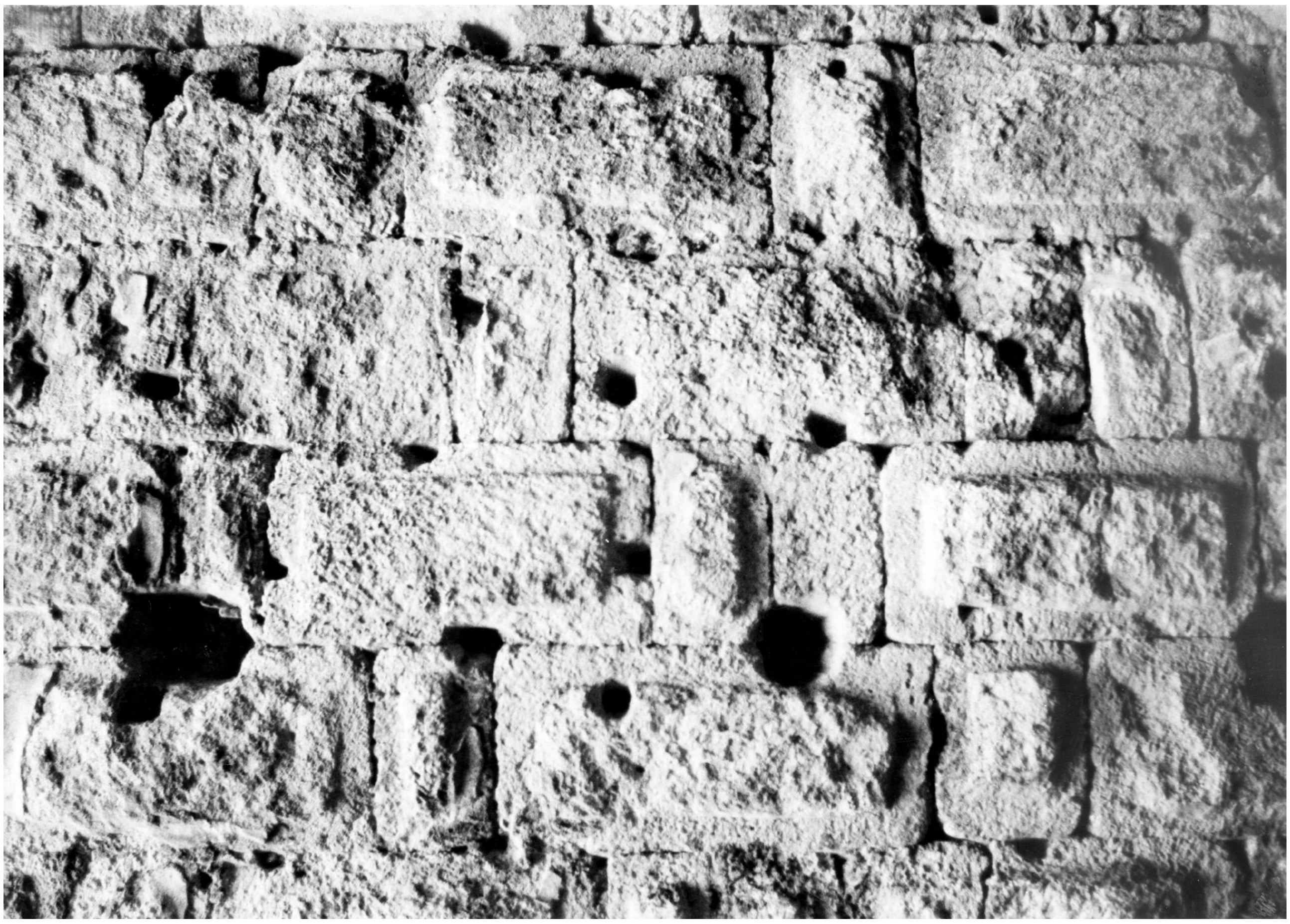


*Figure 2.29. A close-up view of the south wall of vault I.3 (Photograpah: A. Raban)*

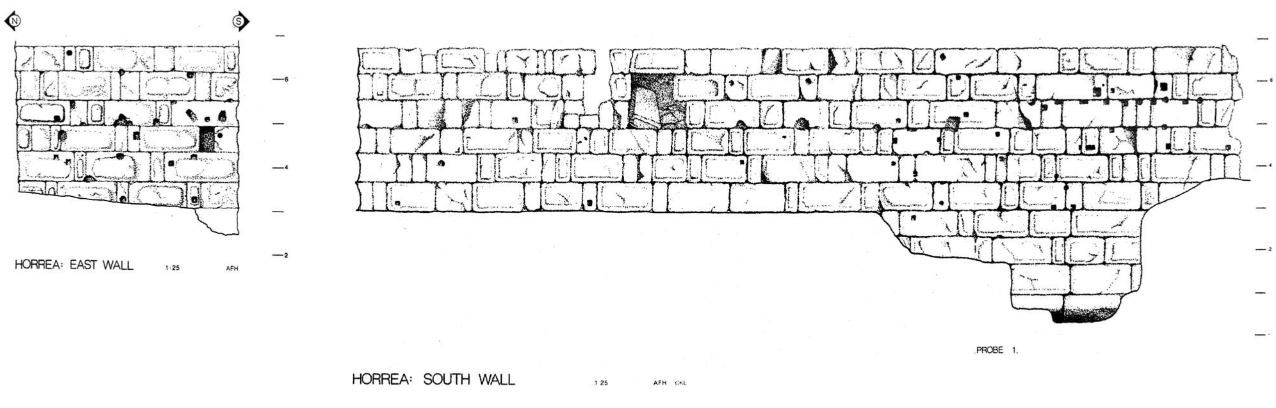



*Figure 2.30. CAHEP's drawing of the southern and eastern walls of vault I.3 indicating the probed location (Raban 1989, Fig. III.83)*

remains of a vertical cross wall that predates the vaulting and probably belongs to a considerable higher vault (Fig. 2.34), as the top of Vault 1 (I.3) is higher than Vaults 2 and 3 and built in different type of blocks. The fact is that the floors in all the studied vaults were disturbed in antiquity, either for maintenance and rebuilding, or in order to steal the lead from the iron clamps. The most interesting feature exposed by the IAA team was a revetment wall, almost 2 m high, which runs at the base of the western facade of the Temple Platform and was built of the same courses of intermittent marginal drafted headers and stretchers (Porath 1996a: 109). Porath's suggests that reconstruction of the western facade of Herod's Temple Platform (Fig. 2.35) is not only purely conjectural, but also does not fit either the existing archaeological data or the topographic and architectural logic. His "Herodian Open Court" that allegedly retained the Temple Platform is, at a maximum height of 6.8m, above the MSL everywhere, while the southern retainer of that platform exposed by CCE was built with ashlars of a different type and size and survived

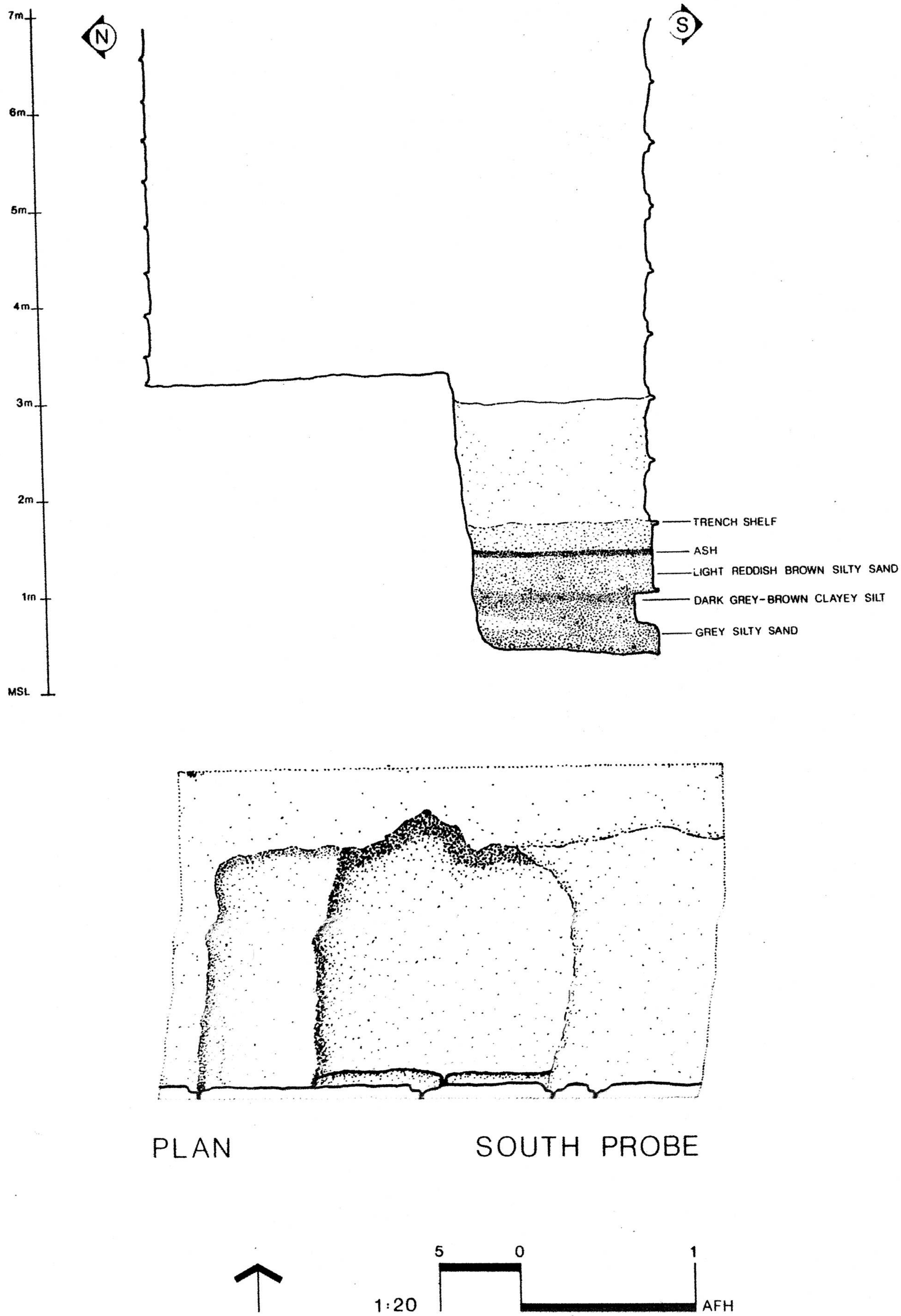



*Figure 2.31. The probe of 1984, next to the south wall of vault I.3 (I.3a), from the west. (Raban 1989, Fig. III.86)*

*Figure 2.32. The probe of 1984, next to the north wall of vault I.3 (I.3b), from the SW (Raban 1989, Fig.III.87 and photograph: A. Raban)*

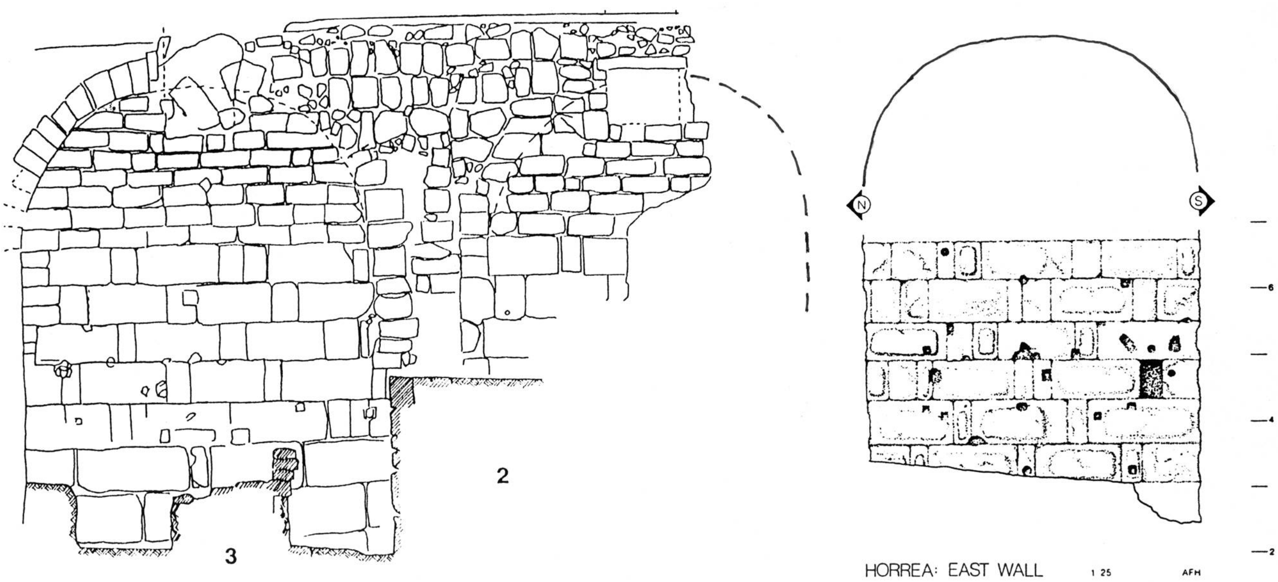



*Figure 2.33. Drawing of the back walls of IAA vaults 2, 3 (after Porath 1998, Fig. 12) and that of CAHEP's vault I.3 (Raban 1989, Fig.III.84)*

*Figure 2.34. The backwall of IAA vault 3, looking towards the east. (Photograph: A. Raban)*

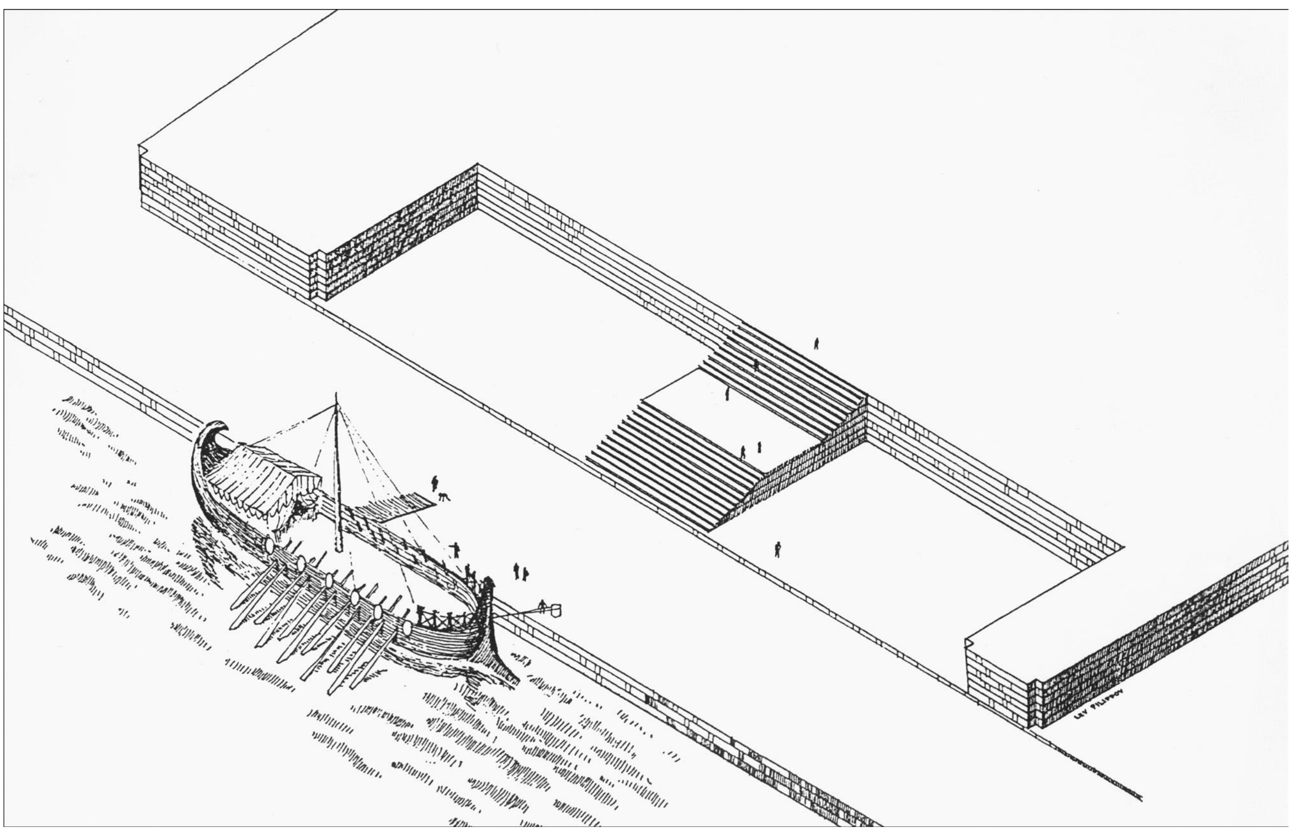


*Figure 2.35. Proposed reconstruction of the western façade of Herod's Temple Platform (after Porath1998, Fig. 10)*

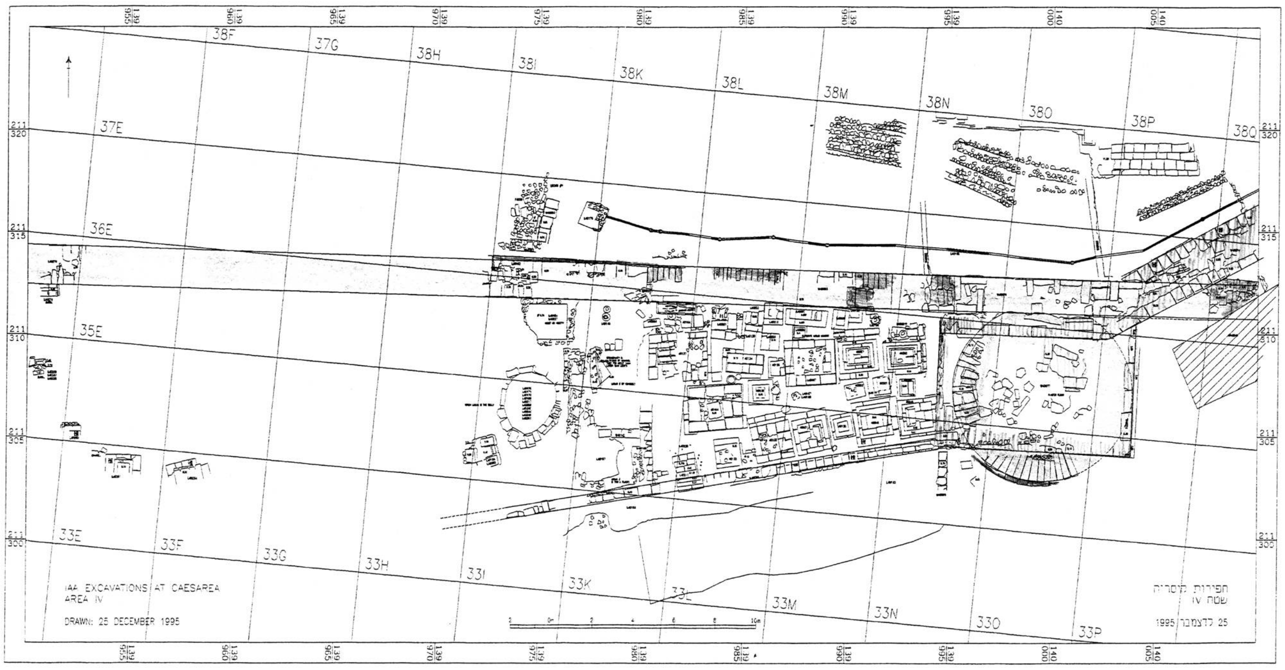



*Figure 2.36. Schematic top-plan of IAA 1995 excavations south of Caesarea's theater (Courtesy: Y. Porath)*

for more than 11 m above the MSL (Raban *et al.* 1993: 51). The attempt to reconstruct a wide staircase within this open court ignores the fact that in the central part of the western facade there is a vertical wall built of marginal drafted blocks. This wall is on the line of the enclosing "Revetment" which is over 30 m wide and contains a 20 m springer course for a parallel vault 7.6 m above the MSL. West of it and on the same line there is a 20 × 8 m pier of conglomerated matrix and ashlar confined edges that should be the only so-far known component of such a staircase (Raban *et al.* 1993: 37–41; Raban 1998a: 61–62). If Porath's hypothetical reconstruction is to be considered, it may fit the waterfront of the Hellenistic era, rather than the Herodian one.

During the later part of 1995, Porath excavated a limited area just south of the theater and to the west of the still-standing southern wall of the Byzantine "Fortezza" (Fig. 2.2; Prova.1965: 163: Fig. 229). Two superimposed city walls were exposed there, the later of which clearly went out of use before the end of the first century CE. The earlier wall (2 m wide) had at least two building phases: the first consisted of long ashlars, laid in header formation, and adjacent to it there was a round tower (8.8 m in diameter) incorporated into the wall from without (Fig. 2.36). Either during its initial building phase, as conceived by the excavator, or at a second phase, both the tower and the wall were formulated by courses of alternating headers and stretchers. Later, this tower was trimmed off and altered to be a 7×10 m rectangular one. The course of the even-later wall, which replaced the allegedly multi-phases earlier one, was diverted towards east-northeast, as if embracing the perimeter of the Herodian theater. This defensive complex went out of use after a burial ground that served the Roman garrison was established south of it (Porath 1996a).

According to the excavators only a handful of pre-Herodian sherds came from the crushed eolianite (*kurkar*) fill at the foundation courses of the tower and the earlier wall. Unfortunately, there is no well-defined occupational surface to date the original phase of either the round tower or the wall, and the only secure dating is that of the cemetery which contained a rich corpus of pottery dated to late first–early second centuries CE (personal communication). Accordingly, the excavator tentatively dated the early wall to Herod's time, considering it to be the southern perimeter wall of the newly established city of Caesarea that can be associated with the wall exposed by the Italian Mission on the north as part of the same defense system.

Apart from the intriguing arguments against Herodian dating for the North Inner Wall, which has been discussed above, there are specific difficulties in dating the southern wall to this phase. Why following Herod's death would one bother to rebuild that wall in a more confined perimeter? If this alteration was dictated by the existence of the Herodian theater, with the wall defining its publicly used perimeter, then why not consider both to be contemporaneous, i.e., Herodian? It seems that the first wall should be dated to a pre-Herodian phase, maybe to the time of Zoilus in the later part of the second century BCE. It is true that the only archaeological evidence at this southern part of the site are burials, such as the rock-cut cist graves which were exposed at the area of the Promontory Palace (Porath 1996a: 106). Other Hellenistic burials, mostly in second century BCE jars, were found below the cardo at Area KK. Similar burials were already found in the early 1950s east of the medieval city (Yeivin 1952). There are at least two basic arguments negating the assumption that the city walls of Straton's Tower never extended over such a large confined area: 1. The alleged fortified area of over 50 hectares (over 0.5 sqkm) would be 12 times larger than that of Dor and not much smaller than that of Herodian Sebastia (65 hectares; Avigad 1993: 1307). This area is far too big to fit anything known about this Hellenistic site, even if we consider the assumption that the city was not big enough to encompass the north shore (our Area J and JECM's Field G) with the medieval city (Roller 1983) as "Minimalistic". 2. The inclusion of cemeteries and burial grounds within the confinement of a city wall is very rare in this period in the Levant, although not without precedents, such as in Samaria, Tyre and even Dor (Raveh 1991:118).

Yet, long city walls, which would encompass a territory much larger than the actual built-up area, are known in several Hellenistic cities in Greece, Anatolia and in the Levant. This is considered by scholars as a protecting device which was aimed to serve the population of the Polis' hinterland at times of military upheavals and actual siege (Winter 1971: 72–84; Lawrence 1979: 117–125). Such a situation can be assumed for the time of Zoilus, who allegedly changed the status of Straton's Tower to that of a Polis, the capital of his agriculturally rich area of the northern Sharon plain (Roller 1982). The necessity of protecting this territory is clearly illustrated by the political and military situation Zoilus had to endure, with the Hasmonaeans on the one hand and his legitimate patrons, the Seleucid rulers, on the other, both seeking to capture his petty kingdom (JA 13: 324–335; Levine 1974a). All in all, in the present stage of the archaeological research in Caesarea, the following summation concerning Straton's Tower and its havens seems to be not too farfetched:

1. Most of the architectural remains and other manmade features can be dated to the second half of the second century BCE although the actual establishment of the city could not be later than the sixth decade of the third century BCE.

2. This town was fortified with a perimeter wall furnished with round and polygonal towers that encompassed an area over 1.3 km along the coast and 0.3–0.4 km wide. It probably continued over most, if not all, the northern half of the seaside, protecting two enclosed havens, but not the southern bay, which was protected only from the land side.

3. The actual built-up area was probably only in the northern half and there was a dividing wall separating the two halves running from the hillock called the Temple Platform westward to the promontory of the later Harbour Citadel.

4. Within the confinement of this wall, protected and well incorporated with it, were two anchorages, or rather harbour basins: The first was the northern, shallower one, with its Phoenician style quay, which might have served as a fisherman's haven and the second was the central one, which was partly quarried in the eolianite rock. It was artificially segmented from the south bay by an ashlar mole that ran under the partition wall, connecting the southwestern corner of the Temple Platform to the in-shore islet of the Harbour Citadel. Later, this basin was incorporated within the layout of the great Herodian harbour, the Sebastos, as its inner basin.

5. Straton's Tower's city wall, or at least its northern half, remained known and physically visible throughout most of the history of Caesarea and was used as the Halachaic benchmark for the boundaries of the Holy Land. Between 10 BCE and 70 CE, it marked the border between the royal, or stately, entity of Sebastos and the municipality of the city of Caesarea.

### E. Additional Hellenistic features

Some additional Hellenistic architectural features were exposed, representing what survived from the overall alteration of the site and its topography after Herod's project of building a new city was launched (Porath 1996b). Besides the North Inner Wall various constructions made of ashlar courses of alternating headers and stretchers were traced in the western facade of the Temple Platform adjacent to the eastern quay of the inner harbour basin and in its vaults.

# Chapter III

# Sebastos and Caesarea

### A. The Historical Background

Josephus stated that: "*He (Herod) dedicated the city (Caesarea) to the province (E'parchia) and the harbour – to the mariners (Pleizomenois) and the founder's honour – to the Cesar*" (BJ 1: 414). This is the only direct textual indication that the city of Caesarea was designated to be one entity, while the harbour, the Sebastos – another one. Josephus refers to Sebastos even without mentioning Caesarea when he wrote about Antipater, Herod's eldest son who, on his way back from Italy, "… *landed at the haven called Sebastus, which Herod had built at vast expenses in honour of Caesar, and called Sebastus*" (AJ 17:87).

Already in 1992, I fully presented the textual, numismatic and archaeological evidence to substantiate the notion that Caesarea and Sebastos were established as two separate entities (Raban 1992c). Later, based mostly on numismatic evidence, Barag (1996) made an additional contribution to confirm this notion. It seems that this initial differentiation between the city and the harbour was significant for both entities. Similar were the changes in status of the latter from a stately or royal entity to a mere municipal haven.

The harbour's name – Sebastos (the Greek equivalent to the Latin imperial title – Augustus) can be found also on coins minted in Caesarea up to 68 CE. It is true that King Herod's coins, which were minted during the last 6 years of his life, between 10 BCE (when Caesarea and Sebastos inaugurated) and 4 BCE, bear no place names. However, three different types bear maritime motifs such as a warship, an aphlaston and anchors. His heir, Archaelaus, minted five different maritime motifs among the total of six types issued during his ten years' reign (Meshorer 1967: 129–132, Nos. 530–553c, 55–60). Agrippa I, Herod's grandson, issued coins (43–44 CE) depicting the city goddess Tyché with her right hand resting on a rudder and with the interesting legend: ΚΑΙΣΑΡΙΑ Η ΠΡΟΣ ΣΕΒΑΣΤW ΛΙΜΕΝΙ, Greek for "Caesarea that is by the harbour called Sebastos". The same title was given to the city on coins issued during Nero's last year (67–68 CE). On the reverse of these coins Tyché is depicted in Amazon-like stance with her right leg posed over a prow of a ship (Kadman 1957: 98–100, Nos. 1–13).

Herod's selection of Caesarea as a city port was influenced by its geographical setting. The city was an outlet for both the cross-country transit trade and its own hinterland, and was set on the northern edge his kingdom's (Fig. 3.1). With the border between Judaea and Phoenicia at the nearby Crocodilon Flumen, the ample network of roads spread toward the Great Valley (and from there on to Syria), to Neapolis and Samaria-Sebaste (and from there to Amman-Philadelphia and the old Kings Way) through Antipatris to Jerusalem and farther south to Ashkelon, Gaza and Egypt (Fig. 3.2; Tsafrir *et al.* 1994; Roll 1996).

Herod used the harbour for exporting not only the surplus agricultural products of the city's vast hinterland, such as olive oil, wine and dried fruits, but also the products of his monopolistic farms of dates and balsam oil (Patrich and Arubas 1989) at Jericho and Ein Gedi, as well as the unexhausted sources of salt and bitumen from the Dead Sea (Schalit 1960: 172). Salt was an important staple throughout the Roman Empire and was used to pay salaries to the Legionnaires as a result of a critical shortage of salt due to the eustatic rise of the Mediterranean sea level during Herod's time (Bloch 1976: 944–5). Herod's political control over the trade routes between the Indian Ocean and the Red Sea and the Mediterranean, substantiated by his military supremacy over the Nabateans, enabled him to dictate the exportation of highly demanded luxurious goods via his royal port at Caesarea.

Caesarea and Sebastos were located in the southern third of the Levantine coast of the Mediterranean, halfway between Alexandria and Cyprus. This location was important considering the summer wind pattern which obliged the bulky Roman grain carriers and other larger merchantmen equipped with square rigs to take the circumferential sea route from Egypt to Rome along the Levantine coast, before attempting to reach Cyprus (most probably the harbour of Paphos; e.g., Hohlfelder 1995, 1996), or to the less friendly waters of Cilicia (Murray 1995; Pomey 1997: 25–31). This location for a harbour, which was large enough for the largest grain carrier to moor and even to winter in, had a great advantage in this part of the Mediterranean that lacked proper alternatives. It seems that even Josephus was aware of it when he stated:


*Figure 3.1. Map of Herod's kingdom (Holum, Hohlfelder, Bull, and Raban (eds.)1988, Fig. 31)*

"*Now this city is situated at Phoenicia, on the coasting sailing route down to Egypt, halfway between Dor and Joppa. These are two little towns directly on the coastline, and poor mooring places (dusorma), since they lie open to the southwest wind, which constantly sweeps sand up from the sea bottom onto the shore and thus does not offer a smooth landing. Most of the time merchants must ride unsteadily at anchor off shore"* (AJ 1: 333). As well as: *"For the whole coastline ... happened to lack a harbour, so that every ship coasting along Phoenicia towards Egypt had to ride out southwest headwinds riding at anchor in the open sea."* (BJ 1: 410).

Most of the reasons for which Herod chose Sebastos ceased to be viable soon after his death, and especially after his son, Archelaus, was deposed by the Romans, ten years later (6 CE). Caesarea became, then, the capital of the province of Judaea and its harbour was now in the hands of a low ranking governor under the supervision of the Roman governor of Syria. Apparently, neither of these was as highly motivated as Herod to see Sebastos operated at its full potential (Holum *et al.* 1988: 55–8; 108–9). The most crucial blow to Sebastos quite probably came in c. 71 CE, when Caesarea – the loyal city to the Romans and their base for the military operations against the Jews during their

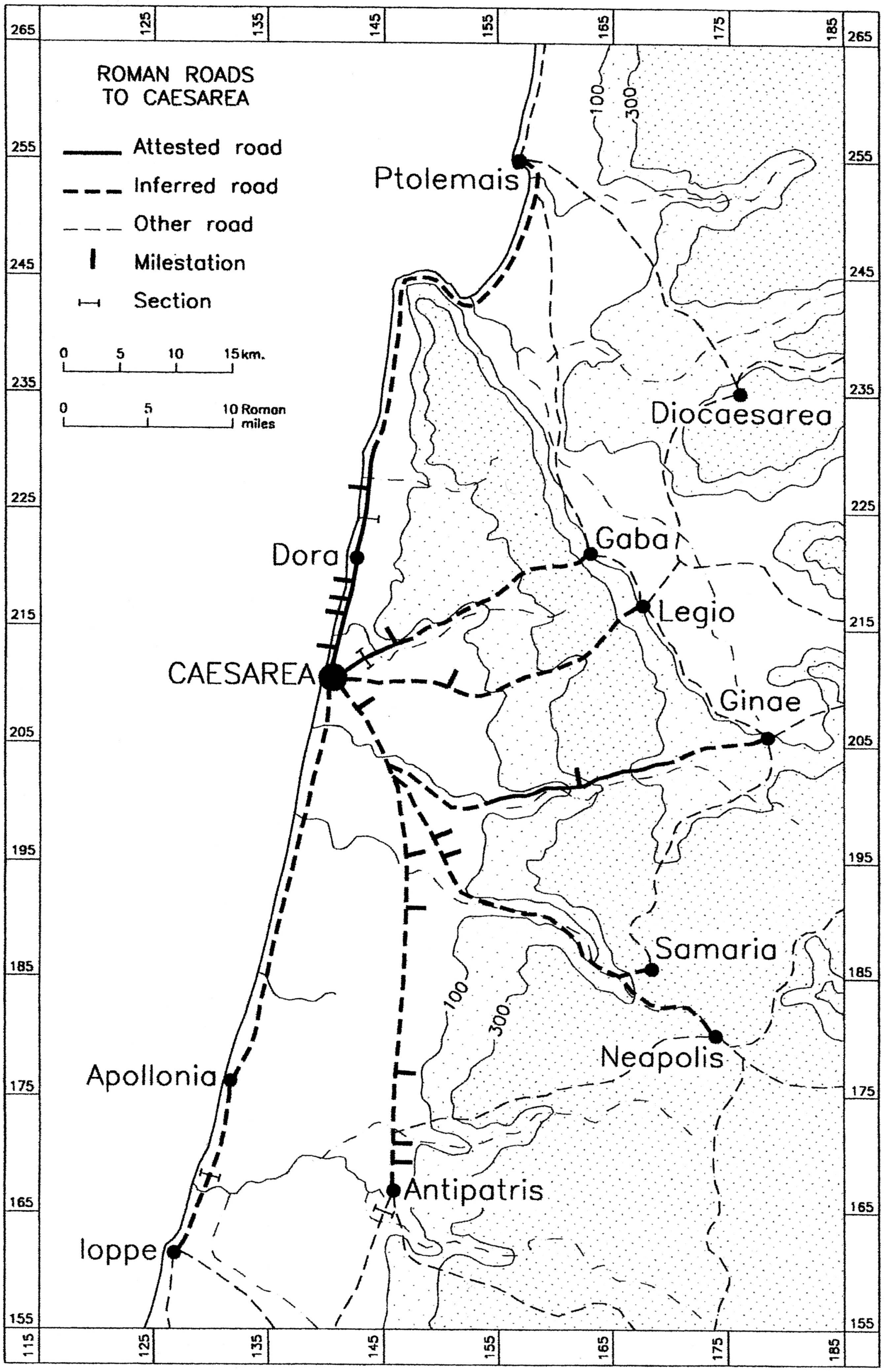



*Figure 3.2. Roads and trade routes in Roman Palestine (Roll, 1996, Fig.1).*

Great Revolt – was granted the status of Colonia Prima by Vespasian, who most probably annexed the harbour to its citizens (Raban 1992b: 74; Barag 1996).

From then on, the harbour became the municipal harbour of Caesarea. The city grew and expanded through time, retaining and thriving under its status as the major urban center of Palestine, the cultural and political counterpart of Jerusalem, and the almost exclusive sea gate of the country. As such, Caesarea needed a harbour, probably not of the scope Sebastos at its heyday, but sufficing the seaborne trade initiated by the city and adequately serving the needs of local government officials. The lesser scope of these demands and the reduced revenues engendered by the shift in commercial goods in its harbour, kept the people of Caesarea somewhat at bay, not being able to maintain properly this "White Elephant", as Sebastos had turned out to be. They could not make any real use of its extended berthing places and did not have sufficient revenues to cover the costs of proper restoration of its ailing, tilted, subsiding and eventually tumbling substantial moles. The demise of the harbour will be discussed in detail in the following chapters.

At this point it suffices to refer to Oleson and his colleagues' meticulous study, which processed the finds retrieved by the CAHEP divers on the seafloor in and around the confinement of Sebastos. Their analyses illustrate the rapid deterioration of the scope of seaborne trade through the harbour from early second century CE, through its partial revival in the first half of the sixth century CE and its final days following the Islamic occupation in 640 CE (Oleson 1994:159–61; Oleson *et al.*1996: 369–77).

It is true that Caesarea had lost much of its importance as a major urban center after Islam took over the country and the city. Yet, the general notion of total decline and of a non-functioning harbour (Holum *et al.* 1988: 204; Oleson *et al.* 1996: 377) is far from being accurate. Although the Mediterranean seaboard was split among Byzantine, European and eventually Islamic fleets, the seaborne trade continued, not only within each realm, but also between the rival powers (Lewis 1951). The direct archaeological evidence for actual harbour facilities that were constructed during the Early Islamic era are yet to be found, but there is certain circumstantial evidence to suggest that seaborne trade was a considerable economic factor of Caesarea throughout most of that period. Evidently, the harbour was deliberately silted-up, probably by its Umayyad population, following its capture by the Byzantine fleet in 685 CE and recapture by the army of the Caliph 'Abd al-Malik five years later (Holum *et al.* 1988: 206). This preventive measure was reversed and the silted harbour basin was dredged sometime later, probably during the Abbasid regime and no later than mid ninth century CE (Raban 1996b: 664–646). Imported pottery vessels from Egypt constitute much of the material culture of the city during that period, suggesting almost non-interrupted seaborne trade with the Nile Valley, at least from the mid eighth century CE through the thirteenth century CE (Arnon 1996: 93–95). The numerous commercial storage bins of extensive volume dated to the Fatimid era that were located near the harbour and adjacent to the streets leading to it, attest to the management and possibly export of agricultural products (Toueg 1996: 72–77). During the Crusader period (1101–1265 CE) there was some kind of maritime activity in Caesarea, mostly during its later part, when the Europeans lost much of the city's hinterland and it seems that it became a coastal bridgehead for them in hostile territory. Between 1228 and 1252 the city walls were rebuilt. The western part of these fortifications, as well as a protruding jetty, containing reused Roman and Byzantine columns, can still be seen in the water. The elevation suggests both some local displacement and eustatically lower sea level for that period (CAHEP-1: 181–3, 291–6).

**B. The Economic Advantage**

What was the reason to build a harbour such as Sebastos in the first place? Josephus explains that: *"For the whole coastline between Dor and Joppa, midway between which is where the city (Straton's Tower) lies, happened to lack a harbour, so that every ship coasting along Phoenicia towards Egypt had to ride out southwest headwinds, riding at anchor in the open sea. And even though these winds blow gently, such great waves are stirred up against the reefs that the backwash of the surge makes the sea wild far-off shore."* (BJ 1: 409), and also: *"Now this city is situated in Phoenicia, on the coasting route down to Egypt, halfway between Dor and Joppa. There are two little towns directly on the coastline, poor mooring places (dusorma), since they lie open to the southwest wind, which constantly sweeps sand up from the sea bottom onto the shore and thus does not offer smooth landing (katagonen ou meilichion). Most of the time merchants must ride unsteadily at anchor off shore."* (AJ 15: 333).

Josephus wrote his books about a century after Herod had built Sebastos and a long time after his kingdom became a mere province of the Roman Empire. Thus, his narrative is not always accurate as to the actual political and economic situations that prevailed during Herod's reign. First, although the site of Straton's Tower and Caesarea was indeed quite close to the southern limits of Phoenicia (with Dor as its southernmost haven), it was within Herod's territory. Second, it seems that in Herod's time the main problem for the merchantmen sailing along the Levantine coast of the Mediterranean was not so much the journey from Phoenicia to Egypt, but rather the tedious attempts of the bulky imperial grain carriers to sail from Egypt via Palestine and Phoenicia, on their circum voyage to Rome (Fig. 3.3). Prevailing wind patterns and the currents during the sailing season dictated the route (Meijer and van Niff 1992: 98–99, 165–167; Murray 1995: 33–38).

Even in Josephus' time some 60,000-70,000 tons of wheat were shipped from Alexandria to Rome every year (BJ 2: 386; Rickman 1980: 118). These grain carriers sailed

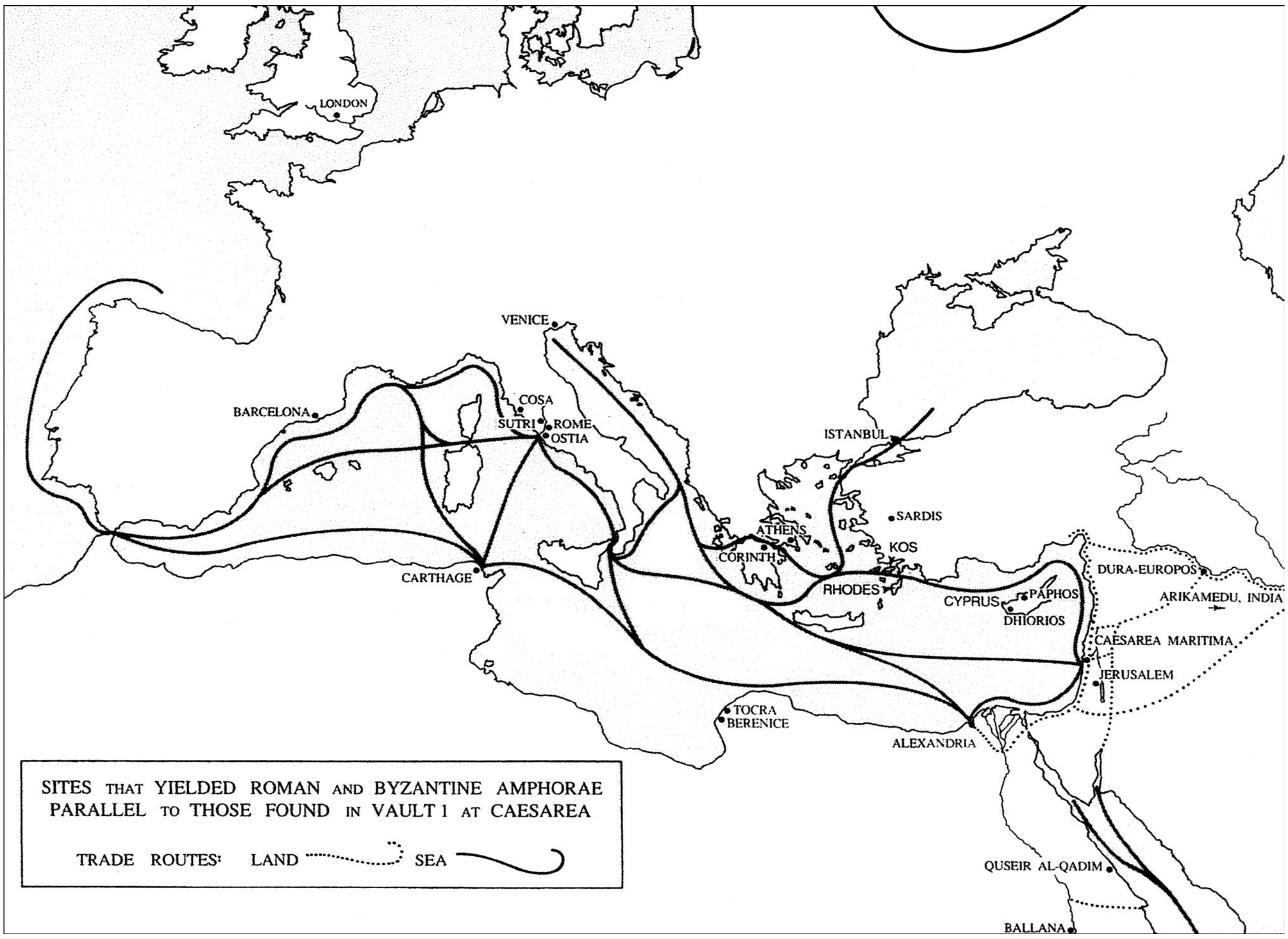



*Figure 3.3. Map of the sea routes in the Mediterranean in the Roman era (Holum, Hohlfelder, Bull, Raban (eds.)1988, Fig. 93*

during the period from mid-April to early October and could hardly accomplish two round trips within one sailing season (Casson 1991: 297–299). Beside the obvious demand for en-route stopover havens large enough to accommodate them and furnish potable water and a fresh supply of food, these carriers would seek a proper haven for forced wintering, sometimes even when fully laden with grain. These marketing demands were apparently in Herod's mind when he decided to build a harbour *"on a scale sufficient to allow large fleets"*(AJ 15: 334). Also, the fact that most of the harbour storage facilities were on the main moles rather at its land side, indicates that transit trade played a major role in its operation. Sebastos' location in the northern extreme of Herod's territory meant also that it was located a great enough distance from Alexandria, along the sailing route to Rome. The possible competition with Alexandria over the economic benefits of having grain carriers wintering in his own port encouraged Herod to build a port of an excessive size. This port gave the merchants the option to winter their ships in a haven, at least one week's sailing time closer to their final destination (Rome). The merchants, considering the potential extra profit gained from the higher price for the desperately awaited cargo in the markets of Rome in the spring, were encouraged to prefer wintering at Caesarea rather than in Alexandria. The Alexandrian model, as an emporium, a city and a stately harbour, serving as a bridge-head between autonomous state and the rest of the civilized (Hellenized, or Romanized) world, was acknowledged by many scholars (e.g., Rostovtzeff 1941: 262–264; Schalit 1960: 96; Levine 1975a: 13).

The location of Sebastos had other advantages. It was close to the fertile hinterland of the Great Valley (Plain of Esdraelon) and to the wine and olive oil producing hill countries of the Galilee, Samaria and Judea. It also served as a convenient outlet for the Nabateans' cross country trade routes via the "Kings Way", across the Jordan. Much of these export-destined products originated in Herod's own estates at Jericho (perfumes, ointments, opobalsam), or from natural resources of royal monopoly, such as the bitumen and salt from the Dead Sea (Richardson 1996: 188–189; Schalit 1960: 168–171, 515–516; Gaba 1990: 162–163).

Thus, Herod's main reasons for building Sebastos were: 1. To establish a base, or a bridgehead on the edge of his territory, between the Roman world and his Jewish kingdom. 2. To keep his harbour far from densely populated Jewish areas, with a location suitable as a convenient terminal for both overland roads and trade routes. 3. To allow for additional revenues from transit cargoes and shipping and

*Figure 3.4. Coin of Herod the Great depicting a warship (Ringel, 1975b, Fig. 39)*

wintering services for the Alexandrian grain fleet. 4. To imbue the adjacent city of Caesarea with a Hellenistic character which collaborated closely with the international "Emporic" type of port he had in mind (Roller 1998: 133–36).

### C. Sebastos and Herod's Navy

As mentioned above, Herod issued, towards the end of his reign, several types of coins with maritime motifs (Fig. 3.4; Meshorer 1967: 129–132, No. 55). According to Josephus, Herod had a new navy of his own built for him in the shipyards of Rhodes the renovations of which he financed (AJ 16:147). Josephus also tells that Herod sailed out in order to assist his friend and patron Marcus Agrippa in his campaign to Crimea during the summer of 14 BCE (AJ 16: 16–26). Some scholars refer to this episode and conclude that Herod reached the Black Sea with a fleet of warships (Richardson 1996: 264; Schalit 1960: 217 and others), but the actual text does not mention more than one ship.

If Herod did have a naval power and a fleet of warships, it is possible that its base was at Sebastos, although later the only naval base of the Jewish country was at Yaffo (Joppa), which had its roots back in the time of Simeon the Hashmonean (143 BCE; Macc. I, 13: 47–48; see also Radan 1988). The historical records bear information that Sebastos was a port of departure and of disembarkation for celebrities who traveled on specially dispatched warships (Ringel 1988: 64); however, there are no indications that the Romans kept any naval units there during the long campaign against the Jews (66–72 CE). This is even borne out by the fact that Vespasian sent his garrisons only by land when he attacked the Jewish "Pirates" at Joppa (BJ 3: 419–427), while a year earlier (66 CE) Cestius Gallus, the proconsul of Syria, did the same by using his naval power, which was stationed at Seleucia (Gichon 1981).

A naval base required facilities other than those provided by a commercial harbour. It usually had a secluded basin, properly enclosed and furnished with docking stations or shipsheds, in which the war galleys could be stored dry and well-protected (Blackman 1982: 204–206 with extensive bibliography). Josephus does not mention such facilities in Sebastos, nor any military use of the harbour, which was used by "*those who are sailing in these waters*" (BJ 1:414). Unfortunately, the archaeological evidence from Caesarea cannot contribute much information to answer this query. Yet, in the waterfront of Herodian Caesarea and the lee part of Sebastos there are three architectural complexes that might be considered relevant to this matter (Fig. 3.5):

1. The Paved Area in the Northwestern Corner of the Inner Basin (CCE Area S)

This area was surveyed and partly excavated by the team of the Hebrew University during the mid-1970s (Levine and Netzer 1986: 58–65, Plan 3) and by CAHEP ten years later (CAHEP 1: 173–177). The earlier team partly exposed what seems to be a storage unit (*horreum*) of the Byzantine era. However, CCE excavations revealed that this unit overlaid earlier, probably Herodian, broader ashlar walls that created three elongated, parallel confined spaces (5×40 m) sloping gently towards the waterfront at their south end and facing the northeastern corner of Sebastos' intermediate basin (Fig. 3.6; CAHEP1: Figs. III, 164–169). Only the westernmost space was exposed to bedrock with its closing wall at its south end, which seems to be a later addition, overlapping the ashlar headers' platform that might be of a pre-Herodian date (see Chapter 2, Fig. 2.27). This raised platform could serve as the sliding device typical in Greek, Hellenistic and Roman shipsheds, as found at Zea of Piraeus (Casson 1971: Fig. 197), Oeniadae, Akraninia. These shipsheds were comprised of a series of parallel spaces (5×40 m) that could accommodate triremes over 33 m long at their water line and 3.8m broad (Coats 1990: 115; Basch 1995: 52–55). The southward sloping bedrock at the base of this complex was quarried off as a sheer drop-off to the eastern side of its eastern confining wall. This quarry defined a considerable hollow on its lee (20×40 m) approaching the harbour basin. No structures earlier than ninth century CE (the Abbasid era) were traced within this hollow and it is possible that it served as shipsheds.

2. The Vaults at the Western Facade of the Temple Platform (Area I). The vaults at the western facade of the Temple Platform have been partly exposed since the early 1960s (Chapter 2; Negev 1993: 273; CAHEP 1: 138–142; Raban and Stieglitz 1988: 276; Patrich 1996: 150–153; Porath 1996a: 107–109, 1998: 45–46). The published excavation reports are of a preliminary nature and only CAHEP's includes plans, sections and pottery analyses (CAHEP1: Figs. III: 80–89; 1992b: 13–16). These vaults were discussed in detail at the end of the previous chapter, where a pre-Herodian date was suggested for them. There are other two groups of four vaulted chambers, each on both sides of the Herodian staircase that led from the waterfront

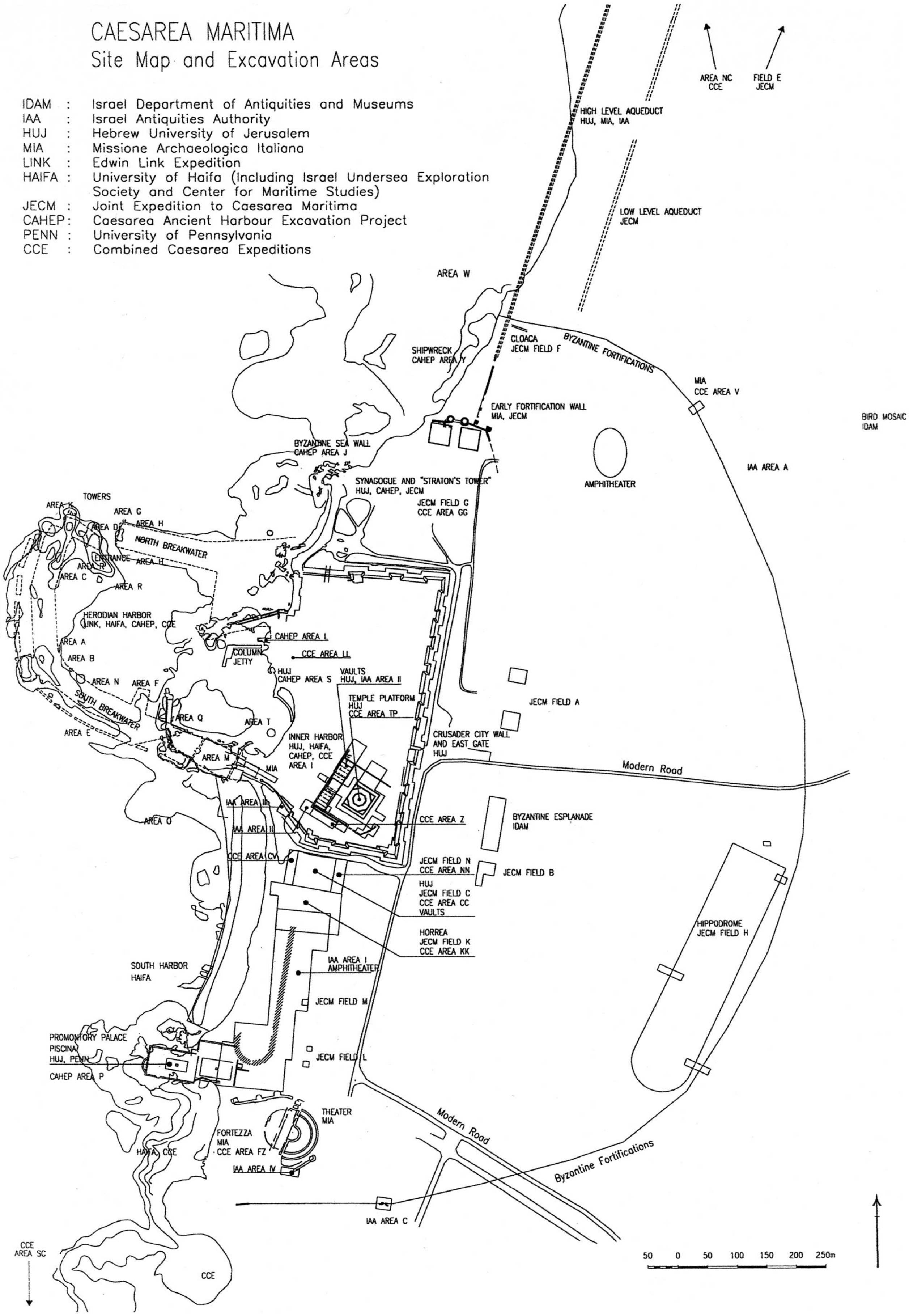



*Figure 3.5. Site map of the various excavated areas (Holum, Raban and Patrich, (eds) P .8)*

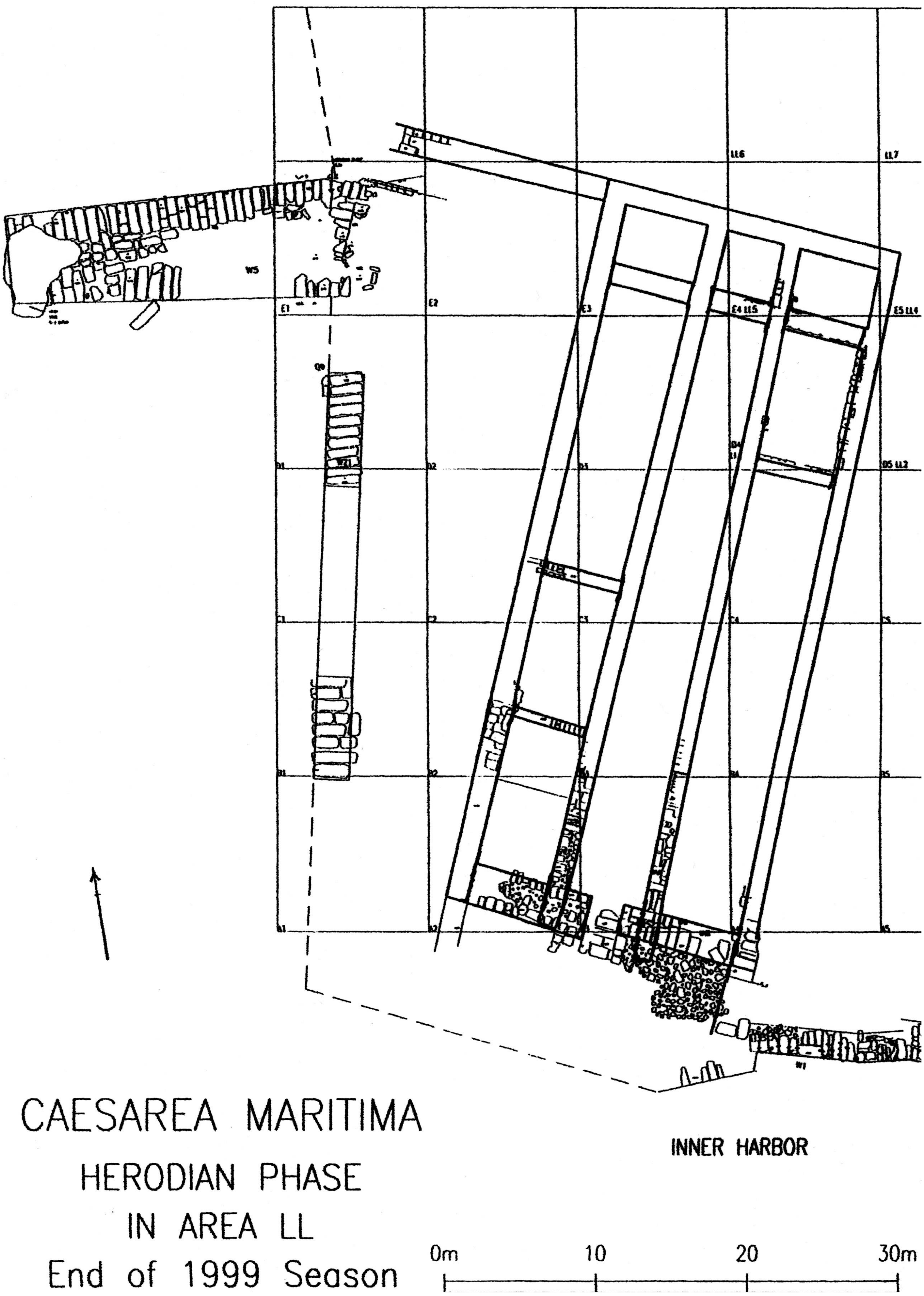



*Figure 3.6. Top plan of Area LL at the end of 1998 season (Raban, 2003, Fig.15.6)*

of the Inner Basin to the Temple Platform (Fig. 3.7). These vaults (5×21 m; 8 m high) are uniform from their original floor level to the inner apex of the vault (Chapter 2, Figs. 2.33, 2.34). All the eight vaults are facing the eastern quay of the inner harbour and although they were designated as *horrea*, it seems as if there was no closing wall in their western facades (Patrich 1996: 153), but only a low retainer wall built of marginally drafted ashlars (2 m above the MSL), over 1 m above the earliest floor, but almost at the level of the second floor. The vaults were studied by Porath, who dates them to the third century CE (Porath 1998: 46). However, it seems that there were earlier covered chambers, either vaulted or with a flat timber-based ceiling. The orientation and the open front of these chambers resemble shipsheds, but their length and the absence of any central rampart or "keel slots" (Blackman 1982: 206) would make these chambers unsuitable for storage of triremes. Yet, it is possible to reconstruct a very tentative set of timber runners and cradling devices that could accommodate smaller galleys, such as two-level Pentakontors (Coats 1990). Such hypothetical reconstruction should consider a timber infrastructure that fits the demanded seaward gradient at an elevation higher than the retaining courses at the chambers' front. Ambiguous as it is, at the present stage of field research these chambers closely resemble in their dimensions the slipways at nearby Dor (Raban 1995b: 307–310).

3. The Vaults in the Northwestern Part of the South Bay (Area CV; Fig. 3.5). The Mithraeum *horrea* is a series of four parallel vaults (c. 5×30 m) facing the seashore just south of the Sebastos, at the northwestern side of the area CC (Fig. 3.8). These vaults (marked 1, 2, 11, 12) went through a long and complicated series of modifications, much like the ones at Temple Platform. At least one of them (No. 1) was identified by the excavators of JECM as a Herodian *horreum* that was converted to a Mithraeum sometime between the mid-first and early-second centuries CE (Blakely 1987: 38–39). Later excavations suggested that the vaults should be dated not before the second or the third century CE and (Patrich 1996: 153). Yet, the evidence for a second storey courthouse on top, and the quantities of Herodian sherds found on the floors of these vaults and in the fill between them indicate that the complex had an earlier phase (Patrich 1997). For various reasons, among which is the lack of closing walls at the western facade of the vaults, Patrich did not consider these vaults as *horrea* (Patrich 1996: 151). The earlier floors of these vaults were exposed only in very limited probes, so their actual character is still unknown, but it seems that none had a seaward slope. Being at the waterfront, opening towards the sea, and being of elongated shape, these chambers were possibly shipsheds, although their location excludes the direct context of Sebastos.

The present state of research of the historic sources, the numismatic data and the archaeological evidence do not support any naval use in Sebastos; nor do they refute it. Deducing from other major harbours of the period, in general, and the imperial ones, in particular, one may find evidence to support both cases. There were exclusive naval bases, such as those of the Roman classis at Misenum, near Puteoli; Ravenna in the northern Adriatic; Cyricus in the sea of Marmara; Trapezus in the Black Sea; Pompeiopolis in Cicilia and Seleucia in Syria. But there were naval or military basins within commercial harbours, such as the famous one in Carthage; Forum Iulii in the Narbonesis (Provence); Piraeus; Apollonia in Cyrenaica; Alexandria; Phaselis and many others. An interesting comparison is the naval station of the Roman fleet at the harbour of Caesarea Mauritania, a city rebuilt on a site of a former Phoenician settlement by King Juba II who was contemporaneous of Herod and also a client King of Augustus (Levine 1975a: 13–14; Starr 1993: 117–119). Many historical sources discuss naval units or temporary naval stations in typically commercial harbours such as Ostia and Puteoli (Meiggs 1973: 302–303).

### D. The City of Sebastos

Most of the scholars describe the city of Sebastos as the "culmination of Herod's enterprises" and Herod as a "Master Builder" (Schalit 1960: 171; Levine 1975b: 11; Richardson 1996: 176; Roller 1998: 134 and others). There were several purposes for building it:

1. As a flaunting endeavor of a pretentious royal with an adapted Hellenistic code of honor. These traits are verified by Herod's other building projects in his Kingdom and even in other countries (Holum *et al.* 1988: 59–72; Roller 1998).

2. As a proper urban center of a non-Jewish character with a mixed, international, Hellenized population, and having typical Polis components as a "Fortress for the entire nation" (AJ 15: 297). It meant either a stronghold separating his Jewish citizens in Judea and Galilee, with Samaria-Sebaste as the collaborative urban center of the same type in the hinterland (Levine 1975b: 11), or as an alternative metropolis to Jerusalem, representing his realm in a better manner to his Roman patrons and to the surrounding Hellenized nations.

In fact, recent archaeological excavations showed that Herod's engineers did not build a full-scale city. It seems as if the city was hardly built up and was not fully populated, either by the time of its inauguration in 10 BCE, or by Herod's death, six years later. It is true that the Sebastos was already operating by 15 BCE, as probably was the main sports arena south of it (Porath 1995: 15–27; 1998: 39–41), but the actual street pattern was marked only by their drainage channels, left unpaved until a later phase and almost no residential complexes were constructed at that time (Porath 1996a: 106–112).

Josephus was accurate when he wrote "*But the underground conduits (hyponomoi) and sewers (laurai) received no less attention than the structures built above them. Some of the drains led into the harbour and into the sea at regular intervals (under the unpaved street), and one*

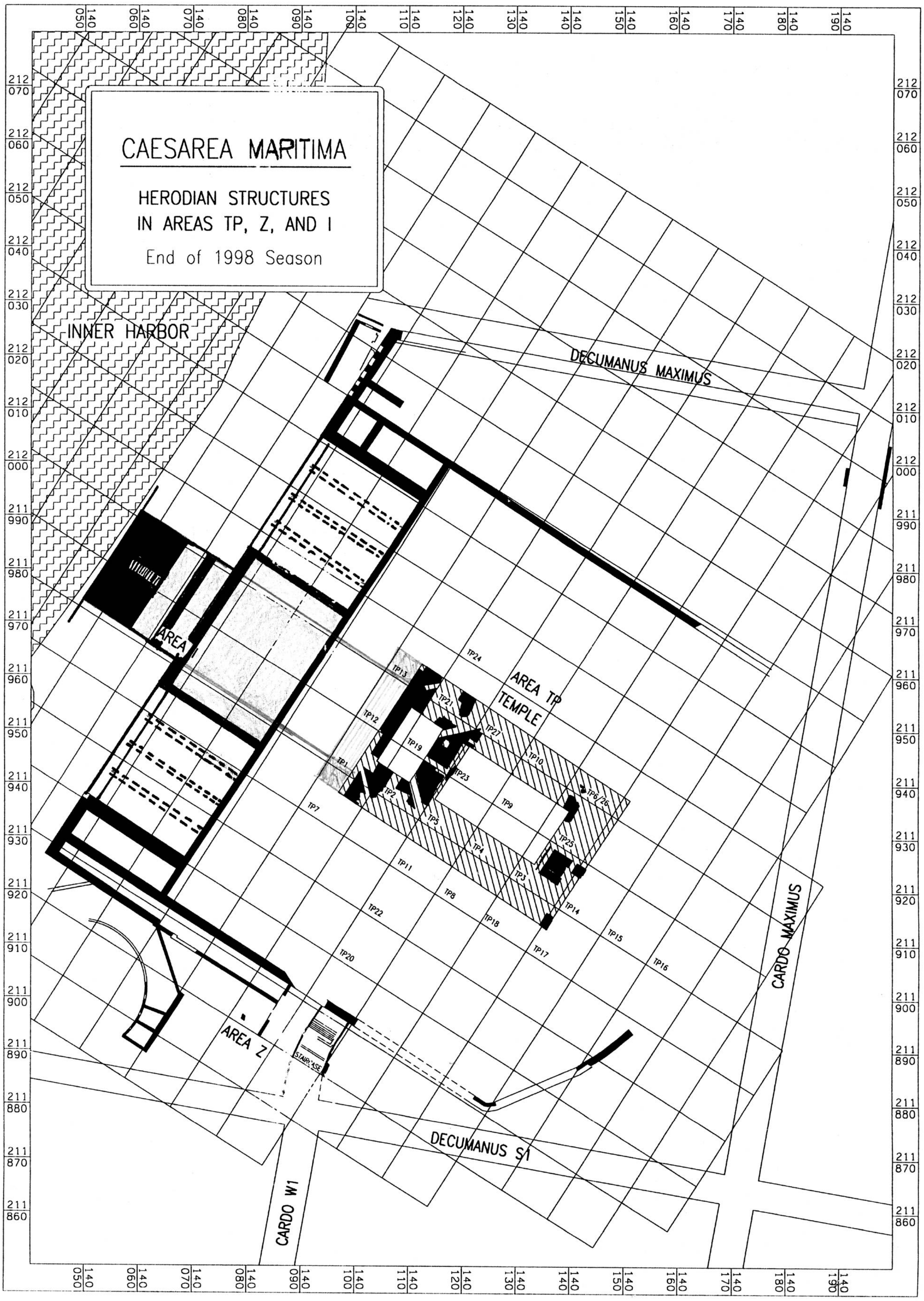



*Figure 3.7. Top plan of Area TP at the Herodian phase (Raban, 2003, Fig.15.8)*


*Figure 3.8. Top plan of Area CC. Raban, 2003, Fig.15.9*

*transverse tunnel connected them all, so that rain water and the wastewater of the inhabitants was all carried off easily together; and whenever the sea was driven in from offshore, it would flow through the network and purge the whole city of its filth"* (AJ 15: 340). We should bear in mind that Josephus wrote as much (only two paragraphs) about all the other terrestrial components of Herod's Caesarea mentioning the buildings around the harbour, the temple of Roma and Augustus, an Agora, theatre and amphitheatre (BJ 1: 414–415).

Taking into consideration what is now known about the site, we can say that the following urban components were constructed within the first 28 years after the works were launched until the Romans deposed Herod's son Archelaus from his throne when the Ethnoarchos of Judea and replaced him by a procurator (22 BCE–6 CE; Fig. 3.9):

1. The harbour of Sebastos was probably already functioning by 16 BCE.

2. The coastal area between the Temple Platform and the theatre, including the leveling of the undulating crest of the eolianite (*kurkar*) ridge as a base for the Cardo, W1, as well as the installation of the sewer system and its course and the *decumanus*, S2, probably functioned before 16 BCE.

3. The first phase of the great amphitheatre, first built as a hippodrome, along the "new" coastline south of the harbour, was probably in use when Marcus Agrippa visited Caesarea in 15 BCE (Porath 1995).

4. The theatre at the southern end of the city was built on the same orientation as the

great temple on the Temple Platform and the line of the Cardo, W1, connecting the northern addition of the theater (Prova 1965: 167–175) with the staircase which led up to the southern side of the Temple (Raban 1998a: 68; Stanley 1999).

5. The great temple to Roma and Augustus (Kahn 1996; Holum 1999) probably replaced an earlier, Hellenistic temple to Isis (Stieglitz 1996: 594).

6. Possible renovation of the city walls of Straton's Tower, either as a dividing device between Sebastos and the municipal entity of Caesarea (Raban 1992a) and/or at somewhat wider perimeter, encompassing also the southern section and the theatre (Stieglitz 1996: 600–602; Roller 1998: 143; see also Chapter 2).

7. The Promontory Palace, Herod's royal residence, the basileia (plural!) mentioned by Josephus (BJ 1: 408) and excavated by the combined project of the Hebrew University and the University of Pennsylvania (Netzer 1996), although its dating to Herod's days is still being questioned (Porath 1996a: 109, n. 11).

8. The first, eastern, high aqueduct. Many scholars date it to Herod's time (Negev 1963: 249; Ringel 1975a: 70–71; Olami and Peleg 1977: 136; Holum *et al.*, 1988: 78–79), but Josephus did not refer to it. Recently it was suggested that it was built later, maybe only after 70 CE, when

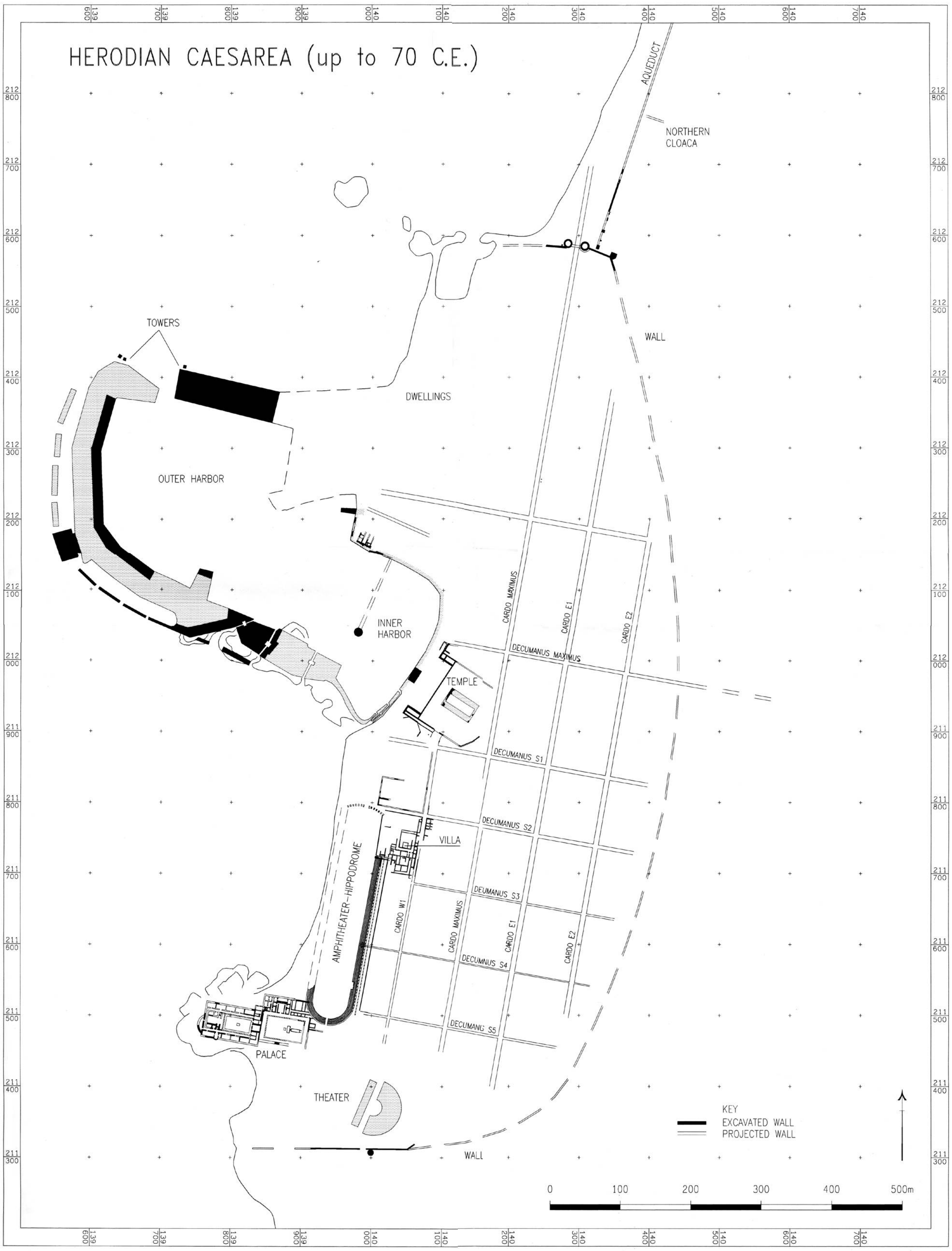



*Figure 3.9. General plan of Herodian structures at Caesarea (Raban, Caesarea Project)*

Caesarea became a "Colonia Prima" (Porath 1990: 106, n. 23).

9. The western terminus of a vaulted sewer tunnel (over 3 m high) that was exposed at the coastline north of the northern city wall (Bull and Toombs 1972: 180) may be the diagonal sea-flushed one mentioned by Josephus (AJ 15: 340).

The only component referred to by Josephus that has not as yet been located is the Agora, the market-place. As mentioned above, no other structures among those that were exposed so far at Caesarea can be dated to this first stage of the city's history. It seems as if the area between Cardo, W1, and Cardo Maximus east of it was empty of buildings during that time (Porath 1996: 109). Thus Netzer's assumption (1996: 164) that the Promontory Palace was built earlier than anything else at Caesarea, including Sebastos, is based purely on circumstantial logical deduction with no archaeological evidence to substantiate it.

The special status of Sebastos as a royal entity near to a new elaborate municipal one, which was contemplated by the same sovereign, and financed from the same pocket at the same time, is reasonable, yet not common in the Hellenistic tradition. It seems as if Herod had in mind the ever-growing demands in Rome for staples that would come from the east and above all, the Egyptian grain, when he decided to build a harbour on such an excessive scale as Sebastos. Despite the financial advantage, it was not intended to compete with Alexandria as a loading port for the Roman grain fleet, but rather as a more ample wintering station en route to Rome. By so doing Herod had a harbour "on a scale sufficient to allow large fleets to lie at anchor close to the shore [within its moles]" (AJ 15: 334) "equal to Piraeus in size" (AJ 15: 332), or even "larger than the Piraeus" (BJ 1: 410).

The royal status of Sebastos meant potential revenues to the king, but also royal or stately administration at the harbour including custom officials, harbour master and maintenance, salvage divers (*urinatores*) and sand diggers (*saburrarii*; Casson 1971: 370). In having a stately harbour near to a municipal entity Herod followed the pattern of Puteoli, a city with a harbour that turned to be a stately port already in the Republican era with a nearby newly established additional port at Portus Iulius (Rickman 1988: 258; Fredriksen 1984: 327–337).

The harbour of Puteoli continuously served the Empire as the main port-of-call for the Egyptian grain fleet even after the Claudian harbour was built at Ostia (Meiggs 1973: 56–57). Although this new harbour was imperial by all means, it was called Portus Ostiensis. In fact, Ostia remained a municipal entity and directly benefited from both the Claudian and the later and better harbour—the Portus—for a long period. It was only in the time of Constantine I in the fourth century CE that the urban entity that existed around the harbour basins was officially named Portus, and separated from the actual havens and their storage facilities by a well controlled wall (Meiggs 1973: 167).

As was suggested above, Sebastos was a royal entity separated from Caesarea in a way that enabled full control over goods and people passing across (Raban 1992b). The fact is that, so far, none of the storage complexes, or *horrea*, exposed in Caesarea, can be dated to the period prior to 70 CE, when the city became Colonia Prima and probably Sebastos became part of the city's realm, under its duumviri's responsibility. We believe there were features of Straton's Tower's city walls that were partly renovated by Herod's engineers. This might have marked the division between the urban unit and the stately harbour which raises the intriguing question as to who resided within these walls and what kind of citizenship did they hold?

### E. The Jews in Sebastos

Barag (1996: n. 2, n. 10) was skeptical about the assumption that the walls of Straton's Tower were the separating features. He considers the suggestion that the Jewish quarter was within these walls as "rather unlikely" without presenting any arguments to substantiate his reservations. However, if we consider the equation that Sebastos was actually the former Straton's Tower (within its city walls) and it turned out to be the Jewish quarter, we might find several indirect references that might be better understood:

1. The continuity of the appellation, "the walls of Straton's Tower", as the Halachic benchmark for the boundaries of Eretz Israel up to the end of the Byzantine era (Habas 1996; Sussmann 1976). The fact that this Talmudic tract was found on the seventh century CE mosaic floor of the synagogue at Tel Rehov (Sussman 1976: 252, n. 272; Habas 1996: 455–456; Stieglitz 1996: 596–597) refutes the argument that the written tract is an archaism and shows that these walls remained standing throughout Caesarea's history.

2. There are various discussions in the Talmud and other rabbinic sources concerning the Halachic status of certain parts of Caesarea. From Rabbi Aabbahu's notion that the harbour of Caesarea was not a part of the country and should be considered as "Abroad", unlike the city itself (y. Git. 1.43b; Habas 1996: 464–465), through the long discussion in t. Oholot, 17, 18 about the impure territories within the city east of the Tetrapilon, due to the existence of the Jewish cemetery there, and west of the Eastern Stoa (Cardo?) as being the "land of the Gentiles" (Levine 1975b: 38). One wonders whether these were not a practical consideration on the part of the Rabbis of Caesarea to extend the "released" areas within the city. By doing so they enabled the Jewish population to be free of the tithes and Sabbatical rules which apply only within the boundaries of Eretz-Israel and encouraged Jews to settle in the city for the meaningful economic benefits. The Halachic shift

of the "land of the Gentiles" from the walls of Straton's Tower eastward to the Eastern Stoa would extend the area of the original Jewish quarter, as was probably demanded by its growing population during the late second through the third century CE.

3. The most controversial issue relating to the suggested equation of the royal territory of Sebastos and the Jewish quarter is the critical argument between the Jewish and the Gentile communities of Caesarea concerning *isopoliteia*. This conflict started soon after the death of Agrippa I (44 CE), the last Jewish king of Judea, which eventually led to the Great Jewish Revolt against the Romans (AJ 20: 184). The actual reasons for this conflict, which differed from Jewish claims for *isopoliteia* in other Greek or Hellenized cities such as Alexandria (CPJ 1: 61–65), were viewed differently by modern scholars.

Josephus is the only historical source that describes this conflict. He claimed that because the Jews of Caesarea trusted their economic and numerical strengths they initiated hostilities (*en polemou tropou*). They not only wanted to gain equal citizenship in the Polis (Isopolitea), but also made a case for legal rights of priority in the imperial court at Rome (AJ 20: 173–178; BJ 2: 266–270). They argued that the city was founded by a Jew (Herod), while the Syrian (or Greek) people claimed that Herod built the city for its pagan citizens only, furnishing it with pagan temples, theatres, baths and other typical pagan components. Josephus claims that the Greeks won the case due to personal lobbying of Pallas, the brother of the accused procurator Felix for his mishandling the affair, before the emperor (Nero) and by bribing his Greek secretary, Beryllus (AJ 20: 183–184). Yet, it seems that they had a good legal case in also claiming that in the time prior to Herod the city was called Straton's Tower and there were no Jews living in it (BJ 2: 266).

Levine (1974b) tried to explain the Jewish initiation of the problems as an outbreak of "nationalism" which was led by the young Jewish extremists. They tried to regain Jewish sovereignty over the land as part of the growing hatred and rivalry between the Jews and the pagans all over the country. Levine (1974a: 395–397) acknowledged that since the city was controlled by the rich Jewish leaders, the conflict was not aimed against the Roman regime, but had other reasons of social and economic aspects.

Kasher (1978) explained the conflict as an attempt of the Jewish community at Caesarea, which enjoyed the status of *politeuma* equal to the pagan administration of the Polis, to gain superiority with all the advantages in daily practice of urban life that may derived from it. Kasher made an important observation in Josephus's work noting that a difference exists between the definition "People of Caesarea" (*oi kaisareoun* Hellenes; BJ 2: 284) and "The Jews who live in Caesarea" (*oi kaisarian loudai oi kataoikountes*; BJ 7: 361). Such a definition may indicate that the Jews did not actually have real citizenship in the city (Kasher 1978: 20–23).

It seems as if much of the difficulty in understanding the sources of the conflict over the *isopoliteia* can be resolved by considering that most of the Jews were not living in Caesarea proper, but at the stately or royal quarter of Sebastos. They initially were the citizens of the Jewish state and not of the pagan Polis. As long as Herod and his son, Archelaus, were kings of the Jewish state the Jews' special status obviously bore economic and social advantages, which were lost under the Roman procurators. These became relevant once more, and only for a few years, at the time of Agrippa I rule (37–44 CE). No wonder the Jews of Caesarea deeply mourned his death, while the pagans rejoiced and desecrated his memory (AJ 19: 343–359). It is from this time on that the Jewish residents of Sebastos were left without any definite status and they lived within an urban economic and social context in which they had no legal rights of citizenship. Under such circumstances, it is of no wonder they initiated a struggle in order to achieve civic rights, which were understandably refuted in the arguments of the pagan peoples of Caesarea, the so-called "Syrians" or "Greeks".

# Chapter IV

# Harbour Construction

**A. Types of Harbours**

Harbours established before the latter part of the first century BCE can be characterized by their topographic setting. Flemming (1980: 162–164; and articulated in Blue 1997: 31–32,) classified and described six typical sites for high rocky coastlines, exposed to high energy waves.

1. Natural bays with or without sandy beach at their lee were the most common type of setting for most of the ancient harbours from early antiquity.

2. Almost enclosed bays, such as in Alexandria (Goddio *et al*. 1998a) and the Cantharos of Piraeus.

3. Bays on either side of an "anvil-shaped" headland, such as Sidon, Phaselis, Iasos, Side, Larimna and others.

4. Lee of a promontory, such as Akko, Berytus, Assos, Cosa and Populonia.

5. Sheltered valley, such as river valleys between two coastal ridges that run towards the shore, flooded by the sea at their lower part. Typical examples are the harbours at the Meander Valley, such as Miletus, Priene, Myus, Heracleia and Magnesia.

6. The lee of a near-shore island or reef, such as Tyre, Arados (Arwad), Clazomenae, Corycus, Motya and others.

The other typological group is of harbour sites on low energy, low-lying coasts, usually in a topographic context of deltas, estuaries, river outlets, lagoons and artificially dug out coastal marshes. Such were the sites of Pelusium, Joppa (Yaffo), Ugarit, Tarsus, Aphesus, Argos, Oinidai, Camerina, Selinus (Selinuntae), Heraclea – Minoa, Corinth (the Lechaeon), Uthica, Carthage, Cosa, Graviscae (and other Etruscan cities), Massilia (Marseille), and most Phoenician and Roman harbours along the Mediterranean coasts of Spain and Narbonesse (Blackman 1982: 186–193).

The general conceptual layout of harbours that were built prior to the construction of Sebastos can be divided between "open" and "closed", and between "fore harbour" or "out port" (επίνεον) and harbours within the city itself. "Open harbours" did not have true seawalls, the entrance channels were too wide to be closed and had no defense towards the open sea. Such harbours, which represented Thalassocracies, were the Phoenician harbours such as Athlit, Arwad, Sidon (Frost 1995: 7–15), Tyre, the external harbour of Carthage, Tharros (Linder 1987) and Cadiz. Similar harbours were also built in Greece, usually by cities of secondary economic and political importance and in inner waters, such as at Palairos Bay (Murray 1985), Hermioni, the north harbour of Aegina (Knoblauch 1969), Anthedon (Blackman 1973a) and others. Some Etruscan harbours were also of the "open" type, such as in Cosa and Pyrgi (McCann 1987). The major ports of the Roman Republic at the bay of Naples, such as Puteoli, Baia and Nisida, also lacked any protective features towards the sea. Of similar type was probably the harbour of the most important Roman port in Spain, Ampurias (Nieto and Raurich 1997).

The "closed harbour" or "closable harbour" type (the Greek λιμη'ν κλειστὸς) was by no means the more common conceptual type throughout the Hellenistic era. It was better suited for the time when naval encounters and constant political and economic rivalries were common in the Mediterranean (Lehmann-Hartleben 1923: 65–74). The basic concept of these harbours was attributed by Herodotus to Polycrates, the tyrant of Samos, at the second half of the sixth century BCE (Herodotos III. 60). During the Persian wars of the early fifth century BCE the city of Piraeus was fortified by heavy ashlar walls that encompassed the three havens within it. Harbour basins enclosed by seawalls that are extensions of the fortifications of the city became common almost everywhere within the Hellenistic world and in many places included complexes in which the city walls encompassed both the commercial and military havens. Such were the harbours at Cnidos, Mytilene, Phaselis, Alexandria, Rhodes, Halicarnassos, Piraeus, Cyricos and many others. When the topography allowed, separated basins were connected by an inner navigation channel, as in Halicarnassos, Cnidos, Carthage, Mytilene (Blackman 1982: 193).

"Fore-Harbours" were developed whenever the urban center was situated inland, either for strategic and safety reasons as pointed out by Thucydides (I, 7), or due to local topography. Such harbours were the Lechaeon of Corinth, the Pireaus for Athens and even Ostia for Rome. The Lechaeon was connected to Corinth by long walls, as were Piraeus from the time of the Peloponnesian wars in the late fifth century BCE and Megara, which was attached to its fore-harbour at the same time. Other fore-harbours in the Levant were Anthedon, for Gaza and Seleucia for Antiochia—the capital of the Seleucid kingdom. In most cases the fore-harbours were originally independent cities (Piraeus, Colophon for Pergamon, Gortyn for Sparta, Ostia for Rome), or became so later on (Anthedon for Gaza when re-founded by Herod and renamed Agrippias; BJ 1: 87, 118; AJ 13: 357, Roller 1998: 128–129).

Although, in most cases the cities and their harbours collaborated as one urban unit, there were separating features between the two, either actual fortification walls or administrative means of controlling movements of people and the transferring of goods. Such means were probably harsher for naval basins (Lehmann-Hartleben 1923: 28–45, 120–121; Blackman 1982: 194). Similar means were present at the entrance channels to the harbours from the sea, usually as chains that could be pulled across (Lehmann-Hartleben 1923: 65–74).

### B. Building Techniques

Waterfront and underwater building techniques were experimented with, exercised and developed around the Mediterranean and beyond for a long period of time before Herod's reign. Yet, there are no reliable historical or other written documents referring to these practices prior to the Roman architect Vitruvius who wrote during Herod's era. Thus, when describing the technologies known to the engineers who planned and built Sebastos, we have to rely mostly upon the archaeological evidence from harbours that were constructed earlier.

The main problem with the data derives from the very tentative dating of most of the maritime structures that have so far been studied. It is almost impossible to date rock-cut features and in most cases also manmade ones, especially since these were exposed to marine elements and to turbulent actions of currents and waves for long periods of time. Therefore only some basic principles will be described below, leaving the comparative discussion for the next chapter. The following is based on Blackman's survey (1982: 196–204) with some additions, alterations and updating.

#### 1. Breakwaters

Breakwaters are designed to break the wave energy in order to retain calm waters on their lee. These features can function even when they reach just below water level and still allow ample circulation of water within the protected harbor basin which might reduce siltation. Although many ancient breakwaters survived, it is quite a complicated task to reconstruct their exact elevation at the time of their construction. One should take in account possible alterations in land/sea relations through time (either tectonic, eustatic or isostatic causes), subsidence of their volume if it was laid over a non-consolidated seabed, or later dismantling of their upper components either by wave action or by human hands (e. g., for secondary use elsewhere).

Breakwaters were either natural reefs (such as in Alexandria, Sidon and Joppa) or artificially built (such as in Cnidos' eastern harbour and in Paphos). In most cases a segmented series of reefs or offshore rocks were artificially filled by rubble spill or blocks of cement (Mouterde 1951). Artificial breakwaters were preferably installed over rocky seafloor when available, with a wide base and sloping faces, especially towards the weather, in order to prevent undermining and eventual subsidence, and for better breakage of the force of the waves. Breakwaters of rather extended length laid in water 20–30 m deep are known in the Greek world already in the Classical period (Cnidos, Eretria, Samos and probably Delos).

#### 2. Seawalls

Unlike the breakwaters, seawalls were built to protect the harbour from maritime foes. As such, the sea walls were constructed much like the terrestrial city walls, high above their base, vertical on both sides, furnished with towers along their perimeter and especially at their tips (Hohlfelder 1995: 197–204). Seawalls were probably mandatory features in every *Limen Kleistos* although none survived from the Hellenistic era to enable us to learn more about their actual construction technology.

#### 3. Moles

Moles were functional components in commercially active harbours. They facilitated ample berthing stations for the merchantmen, convenient transshipment of cargo and people and were even used as platforms for storage facilities and other superstructures. In order to fulfill their purpose, moles were vertical on their berthing side, of ample breadth and furnished with mooring devices, either bollards or mooring stones (as in Theos, Phaselis, Leptis Magna and other sites). Moles were, in fact, a combination of breakwater and/or seawall to which a quay was added along the lee side. The suggestion that moles with berthing facilities were a Greek innovation of the Classical era (Blackman 1982: 197) is refuted by data from earlier "open" type Phoenician harbours, such as Tyre, Athlit, Akko and others. These lacked breakwaters or seawalls, but had moles built of ashlars on both their sides, protruding into the open sea and functioned as detached jetties, or free-standing mid-sea quays (Raban 1985a: 30–40; 1998: 433–438). Although the study of the ancient harbours of Alexandria is still in its initial phases, the recently published data suggest a similar building concept for at least some of the moles, of which the earlier one may be dated to c. 400 BCE (Goddio *et al.* 1998: 29–31, 55–57, 248). Yet, so far there is no definite information regarding either the large eastern port of Alexandria, or any other pre-Herodian harbour that combined structure comprises seawalls, quays and storages.

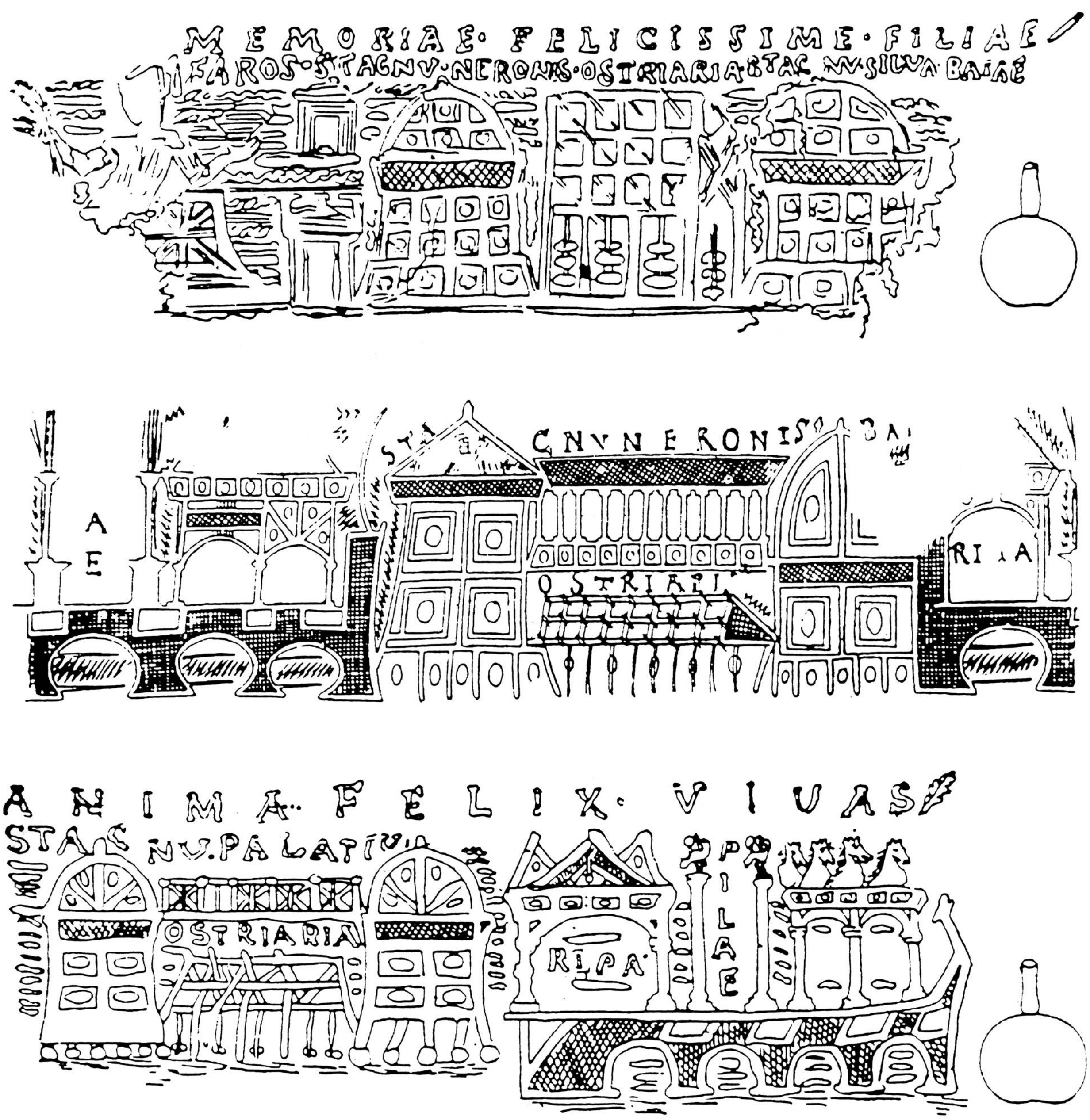



*Figure 4.1. Three artistic depictions of the waterfront of Baia and Puteoli from incised Roman glass from Populonia, Ampurias and the museum of Warsaw (after Felici 1998, Fig. 17)*

A special type of mole characterized the rather weather-protected bay of Puteoli. The moles there were based on a series of well-spaced moulded piers connected by arches (Gianfrotta 1996). These piers, or *Pilae* (10 × 16 m wide), are dated mostly to the second half of the first century BCE (Puteoli and Misenum, with Nisida somewhat later). A similar type of arched mole that would allow free circulation of water is also known from smaller harbours at Latium and Etruria (Cosa and Populonia). All these moles, as well as some other types of seawalls at Baia (Fig. 4.1; Di Fraia 1933) and Portus Iulius in the bay of Puteoli, were probably a daring feat of engineering that was facilitated by the introduction of better production techniques of hydraulic cement or the Pozzoluna (*pulvis puteolanus* of (Vitruvius 2.6.1) and raw materials from the nearby Phlegraean coast (Castagnoli 1977).

### 4. Quays and Jetties

As mentioned above, moles and seawalls had also quays attached to their inner and/or outer sides. But these were usually berthing in addition to the main quays which were on the shore. Quays were, when possible, quarried out of the rocky coastline as in the outer harbour of Sidon (Frost 1973), at Cnidos and Ognina, in Sicily, where the surface of bedrock was leveled at about 1 m above sea level. In the tideless Mediterranean it was easy to adjust the elevation of quays in accordance with the height of the freeboard of an average merchantman. Other quays were built of ashlar blocks as retainers for non-consolidated fill as in Hermioni, Larimna, Aegina (Knoblauch 1974), Athlit and many others. Similar retaining walls were also made of wood as in Marseilles or Masalia of the early Augustan period (Guery 1992: 114–115; Hesnard 1994: 207–210) and Alexandria, already in the fifth century BCE (Goddio *et al.* 1998: 29–30).

As mentioned above, hydraulic cement was introduced as the main building component in port structures in the bay of Naples in the first century BCE with possibly an earlier Etruscan precedent in Cosa (Gazda 1987: 74–81; Oleson 1988: 149–150). Such molded constructive components with wooden shuttering were found at the quay of the northern side of the Third Harbour at the Portus Magnum, or the eastern bay of Alexandria. This structure was dated by C14 tests of samples of the wooden shuttering to the first half of the second century BCE (Goddio 1998: 32–37). In Marseille, next to the retaining wooden wall for the quay, there was a series of upright wooden poles, projecting from the muddy bottom and aligned as if supported by a wooden jetty (Hesnard 1994: 202–207). A projecting jetty, probably of wood, inside a harbour, with an arched mole was depicted on a wall painting found at Stabiae near Pompeii, dated to the first century BCE (Fig. 4.2). Ashlar-built jetties were also in use well before Sebastos was constructed, not only in Alexandria but also in Sidon, the Διαζευγμα in Piraeus, and others.

Flushing channels were almost mandatory components in closed harbours that were located on coasts with a supply of wave-carried sediments as was the case in almost every exposed shore line and everywhere in the Levant. Flushing currents could be facilitated by an additional, narrow harbour channel located opposite to the navigational entrance, as in Mahdia (Fig. 4.3; Blackman 1982: 199) and Alexandria (Goddio *et al.* 1998: 51–52). Rock-cut and even artificially constructed flushing channels were fashioned to receive the upper ports of incoming waves with a threshold just above the high tide elevation, and equipped with settling basins along their course. These are found at Dor just north of Sebastos dated to the second century BCE (Raban and Galili 1985: 341–345) and at Sidon (Blackman 1982). When possible, drain water from coastal lagoons, fish-ponds or rivers were diverted to flow through the harbour basin in order to flush it. Such was the case in Cosa and other Etrurian harbours (Frau 1985) and in Seleucia (Poidebard and Lauffray 1951: 31–32). The awareness of the importance of keeping harbour basins silt-free seems to have been a major consideration of harbour engineers since the early beginnings, as silting-up was probably the main reason for the final demise of main port cities such as Ephesos, Miletos, Corinth, Leptis Magna and even the great Portus at Ostia. The fact is that the Mediterranean is practically tideless or with a tidal amplitude that is too small to initiate tidal currents strong enough to flush closed basins. This is even more valid in the Levantine coast, where the average tidal amplitude is no more than 0.5 m and where the long shore current carries vast quantities of sediments over the shallower part of the continental shelf, from the Nile Delta to the northeast. Other components in harbours such as slipways, shipyards, shipsheds and naval bases are not discussed here, because they are not relevant to what we have learned in Sebastos.

### 5. Summary of harbour construction

It suffices to conclude this survey with the full citation of Vitruvius' chapter 12 of the fifth book from his composition *De Architectura*, which was written just before the construction works at Sebastos had begun.

*"(2) However, if we have no natural harbor situation suitable for protecting ships from storms, we must proceed as follows. IF there is an anchorage on one side and no river mouth interferes, then a mole composed of concrete structures (structurae) or rubble mounds (aggeres) is to be built on either side, and the harbor enclosure constructed in this manner. Those concrete structures which are to be in the water must be made in the following fashion. Earth (pulvis) is to be brought from that region which runs from Cumae to the promontory of Minerva and mixed in the mortar used in these structures, in the proportions of two parts earth to one of lime. (3) Next, in the designated spot, formwork (arcae) enclosed by stout posts and tie beams (stipitibus robusteis et catenis inlusae; literally made of stout posts and braced around the circumference with chains") is to be let down into the water and fixed firmly in position. Then the area within it at the bottom, below the water, is to be leveled and naturally filled. But if on account of waves or the force of the open sea the anchoring supports (destinae) cannot hold down the forms, then a platform (pulvinus) is to be built out as firmly as possible from the shore itself or from the foundations of the mole (crepido). This platform is to be built out with a level upper surface over less than half its area. The section toward the shore is to have a sloping side. (4) Next retaining walls (margines) one and one half feet wide are to be built towards the sea and on either side of the platform equal in height to the level surface described above. Then the sloping section is to be filled in with sand and brought up to the level of the retaining walls and platform surface. Next a pier (pila) of the appointed size is to be built there, on this leveled surface, and when it has been poured is left at least two months to dry. The retaining wall which holds in the sand is cut away, and in this manner erosion of the sand by the waves causes the pier to fall into the sea. By this procedure, repeated as often as necessary, the breakwater (progressus) can be carried seaward. (5) However, in locations where the earth does not occur naturally, one must use the following procedure. Let double-walled formwork (i.e., offerdams; arcae duplices) be set up in the designated spot, held together by close set planks and tie beams (relatis tabulis et catenis conligatae), and between the anchoring supports (destinae) have clay packed down in baskets made of swamp reeds. When it has been well tamped down in this manner, and is as compact as possible. Then have the area bounded by the cofferdam (saeptio) emptied and dried out by means of water-screw*

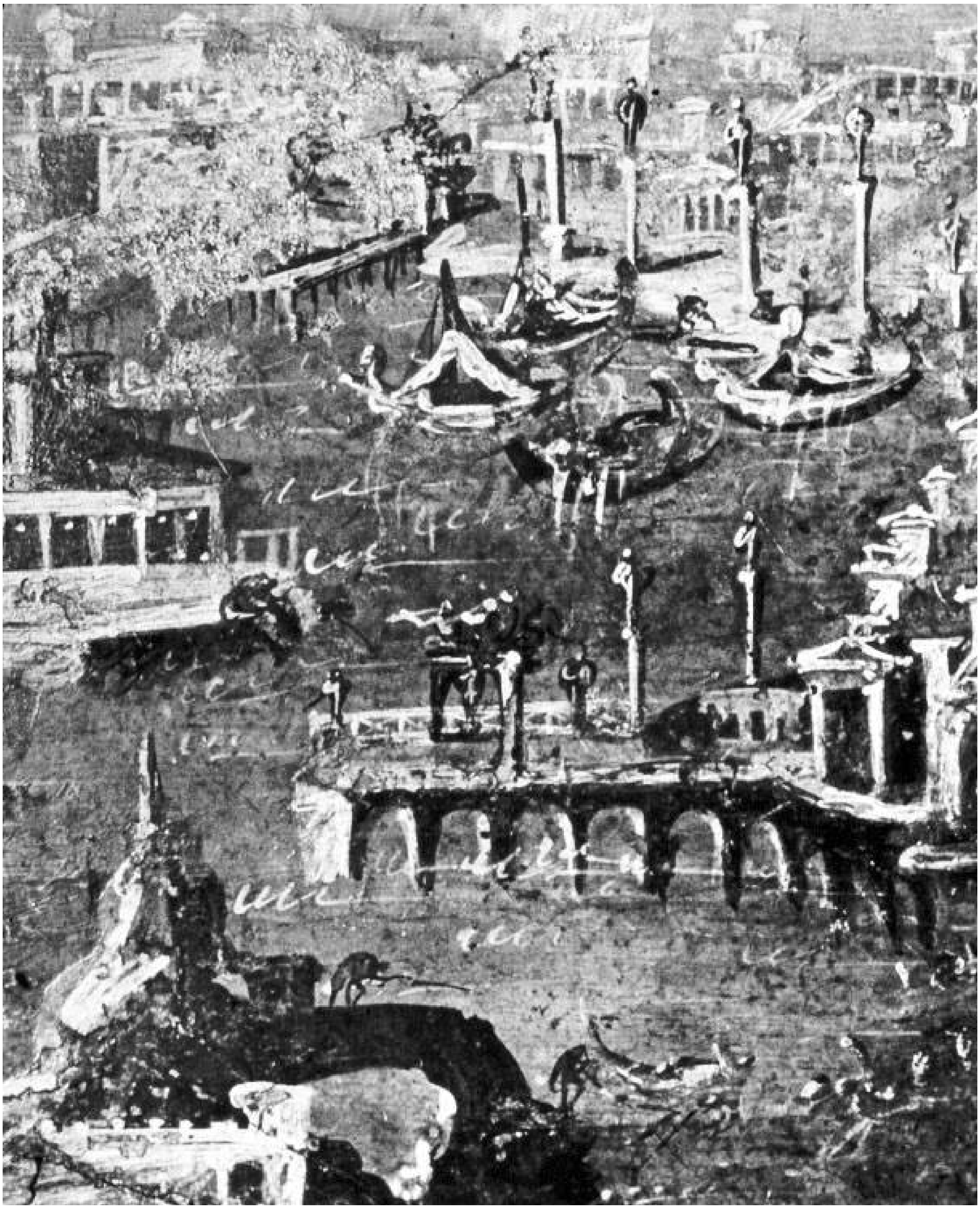


*Figure 4.2. Wall-painting from Stabiae, near Pompeii (Wheeler 1964,Fig.185)*

*Figure 4.3. The flushing channel at Mahdia, Tunisia (Photograph: A. Raban)*

*installations and water-wheels with compartmented rims and bodies. The foundations (fundamenta) are to be dug there, within the cofferdam. If the foundations are to be on a rocky, solid bottom the area to be excavated and drained is to be larger than the wall (murus) which will stand above, and then filled in with a concrete aggregate, lime and sand (tura ex caementis calce et harena) (6) But if the bottom is soft, the foundations are to be covered with charred alder or olive wood pilings and filled with charcoal, as described for the foundations of theaters and city walls. Then the wall is to be raised of squared stone (sacum) with joints as long as possible, so that the middle stones (medii lapides) may be well tied together by the joints. The space inside the wall is to be filled with rubble packing or concrete. Thus it may be possible to build a tower upon it."* (Vitruvius V.12, 2–6).

# Chapter V

# Sebastos

### A. The Environment of Sebastos

In order to evaluate and reconstruct properly the sequence of operations that were carried out by Herod's engineers when planning and building the Sebastos, one should survey first the physical and environmental features they encountered and had to deal with, as well as the building techniques they used and the various conceptual approaches towards harbour layouts in existence at their time.

The general character of the coastline in the area is well illustrated in Josephus' description which agrees quite nicely with the present day situation when writing: "*For the whole coastline between Dora and Joppa, midway between which this town lies, happened to lack a harbour, so that every ship coasting along Phoenicia towards Egypt had to tackle southwest head-winds, riding at anchor in the open sea. Even when this wind blows gently, such great waves are stirred up against the reefs that the backwash of the surge makes the sea wild far offshore."* (BJ 1: 409). And also: *"Now this town is situated in Phoenicia, on the coasting route down to Egypt, halfway between Dora and Joppa. There are two little towns directly on the coastline, poor mooring places (*δύσορμα*), since they lie open to the southwest wind, which constantly sweeps sand up from the sea bottom onto the shore and thus does not offer smooth landing (*καταγωγ `η ν ου μειλίχιον*). Most of the time merchants must ride unsteadily at anchor off shore."* (AJ 15: 333).

The overall pattern of waves, climate and sand transport along this coastline remained similar to today's (Carmel *et al.* 1985; Golik 1993). The annual average of wind direction is just north of the true west (Fig.5.1) but the typical winds during the sailing season in the summer are even more northwesterly (Fig. 5.2). These summer winds are of short-fetch and are usually blowing fresh only during the latter part of the day, as typical anticyclonic, high-pressure coastal sea breezes (Murray 1995: 40–43). This type of climate did not change from Herod's time, as Josephus observed it when describing the construction of Sebastos: "*The entrance channel (*ε'ίσπλους*) faced north, for in this region the north wind always brings the clearest skies."* (BJ 1: 413).

It is obvious that the ancient topographic features differed from the present ones, which were affected by a series of alterations that occurred after the completion of the harbour constructions and in part were by-products of it and its demise. It is doubtless that the series of near-shore rocky reefs and the rocky waterfront itself were somewhat more extensive, coherent and less eroded than at present, representing an eroded coast-line (Fig. 5.3). It is also quite probable that the configuration of the sea floor at that time consisted of a much shallower gradient, probably no more than 1–2% (compared to 4% and more at present). Such a shallow configuration would allow less erosion of the coast and excessive deposition of sand on the beaches. It seems that a series of tectonic events that occurred after Sebastos was built, caused that steeper gradient and enhanced its subsidence and the excessive erosion along the urban waterfront of Caesarea (Mart and Perecman 1996; Raban 1995a; Reinhardt et al. 1998). The elevation of the sea seems to have been similar to that of the present one, maybe a few centimeters lower. Besides the natural topographic features, there were the remains of the deserted city of Straton's Tower and its twin havens (Fig. 5.4), of which the southern one has been modified as the inner basin of Sebastos.

### B. Construction of Sebastos – Phase One

Herod found the site of Straton's Tower practically deserted (καμνουσαν), but there are indications to suggest that its two basins were more or less intact, although somewhat silted up. Thus, Herod's engineers selected the southern basin and incorporated it as the inner basin in their plans to build a new and larger harbour.

The available topography of the selected site comprised an inlet with the near-shore rocky island artificially connected to the mainland by the Hellenistic roadstead or a mole on its southwestern side. A low lying rock headland with its surface flattened at about 1.2 m above MSL was on its north side, perhaps a result of an uplifted ancient abrasive platform. Within the back area of this inlet there were the artificial features of the Hellenistic basin, including its seawall, which terminated in and was capped by a round tower (Fig. 5.5 and Chapter 2, Figs. 2.23, 2.24). At the northeastern part of this inlet there were probably already ashlar-built quays and a pier (see Chapter 2, Figs. 2.25–2.27). Based on these topographic features, the layout of the harbour was planned to be "*larger than the Piraeus, encompassing deep-water subsidiary anchorages within it.*" (BJ 1: 410). It seems that the main effort was put into

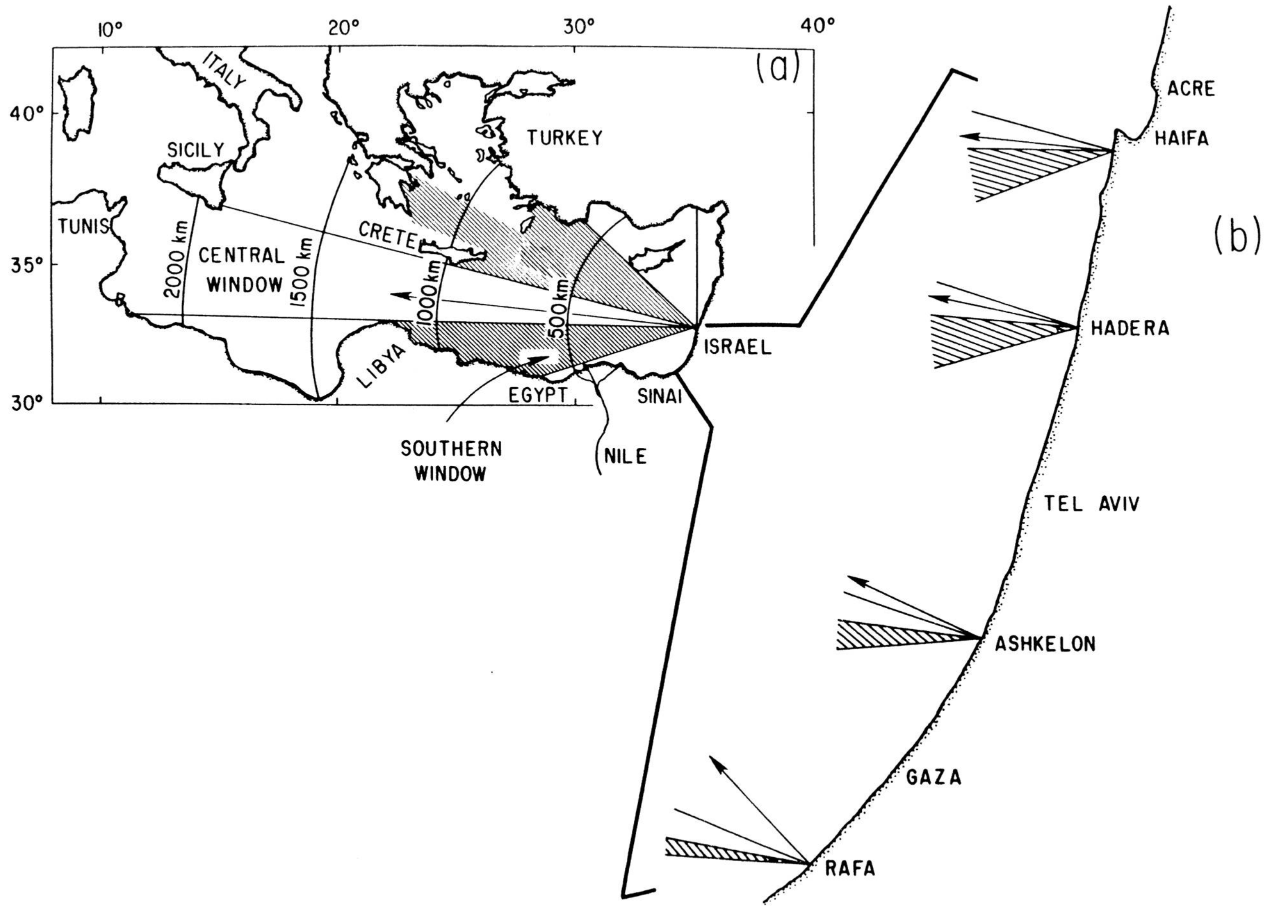



*Figure 5.1. A general (a) and detailed (b) map of the Eastern Mediterranean region showing the maximum fetch for stormy waves and the "Beach normal" (arrows) at various locations. Hadera = Caesarea (after Carmel et al., 1985, Fig. 1)*

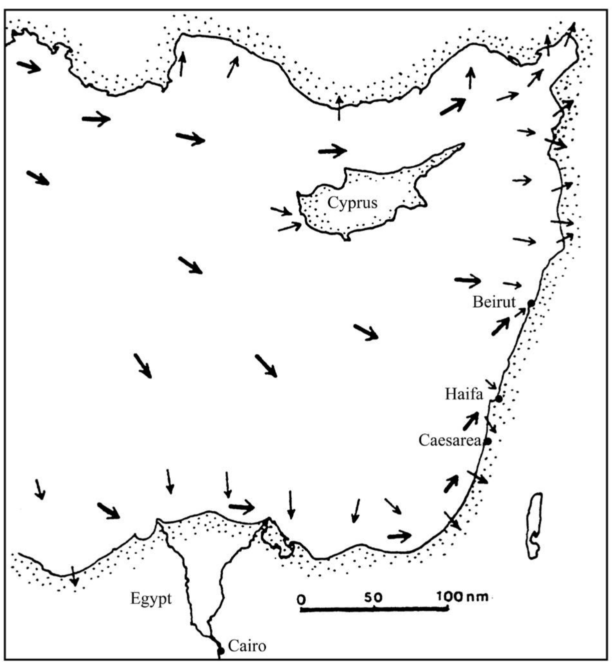



*Figure 5.2. Schematic map of the Eastern Mediterranean showing coastal currents and winds pattern during summer sailing season. (Drawing: A. Raban)*

the construction of the external basin, which was planned to be located in open waters. For this unprecedented endeavor the building materials and construction techniques were carefully selected, as Josephus described it: "*The remarkable thing about the construction was that Herod did not have any local supplies suitable for so great project, but it was brought to completion with materials imported from afar at enormous expense.*" (AJ 15: 332).

### 1. Artificial "Islands"

The first step in constructing the main mole planned to encircle the external basin along its southern and western perimeter was to establish two artificial "islands", or working platforms. One was halfway along the designated course of the mole (Area U), which originated at the western tip of the southern rocky promontory; and the other at the very end of that line—the northwestern tip of the designated mole (Area K; Figs. 5.6–5.7).

Of these two "islands" only the one in Area K was thoroughly studied and properly understood. Area K consists of a chaotic pile of enormous tumbled concrete blocks (average size of 1.5 × 3.5 × 4.5 m), many of which

*Figure 5.3. Aerial photograph of Caesarea, from the south. Ancient coastline marked by dotted line, and solid lines mark the two basins of Straton's Tower. (Photograph: A. Blantinschter, Caesarea Project)*

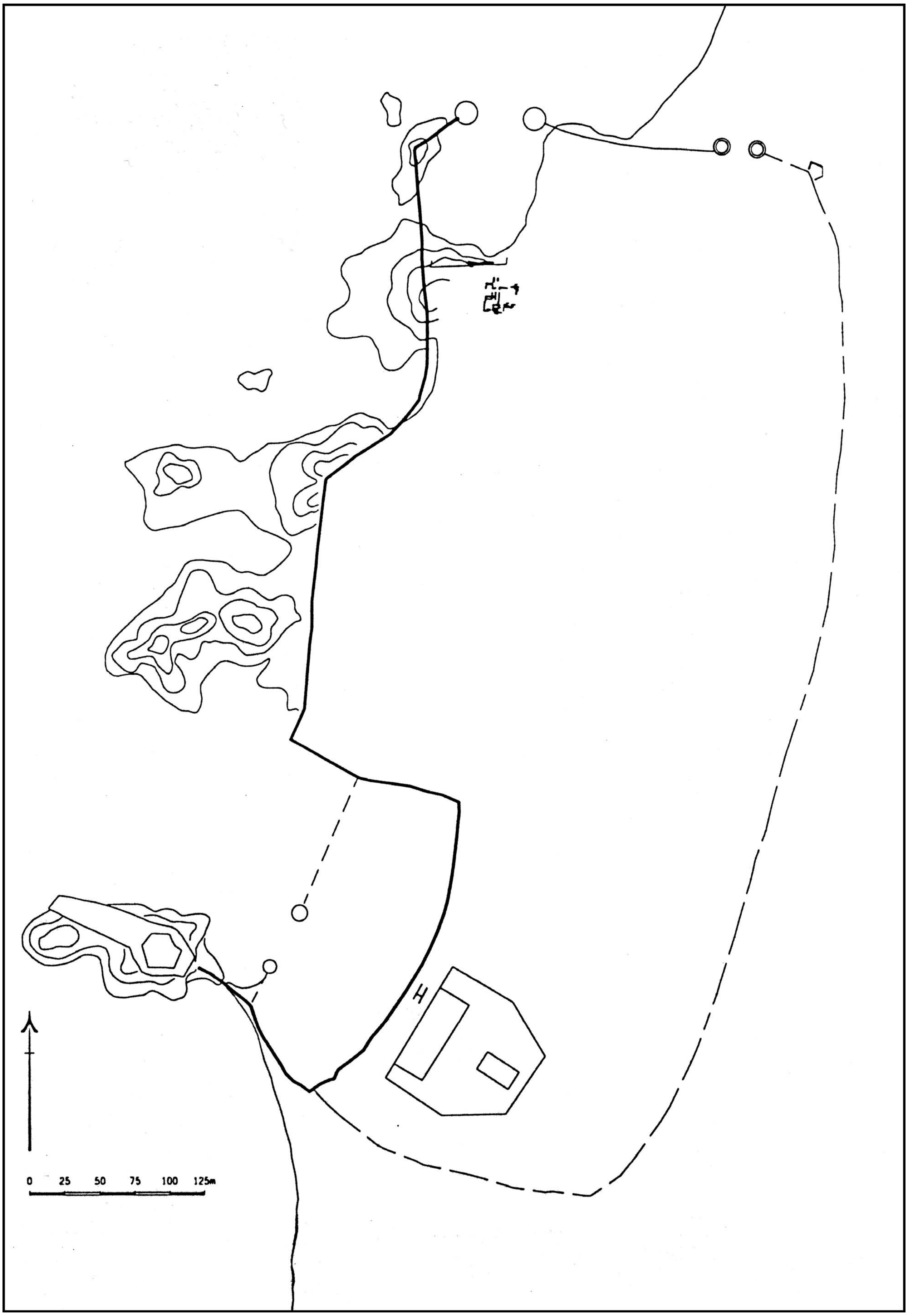



*Figure 5.4. Schematic plan of the central area of Caesarea before the Sebastos was constructed. (Drawing: A. Raban)*

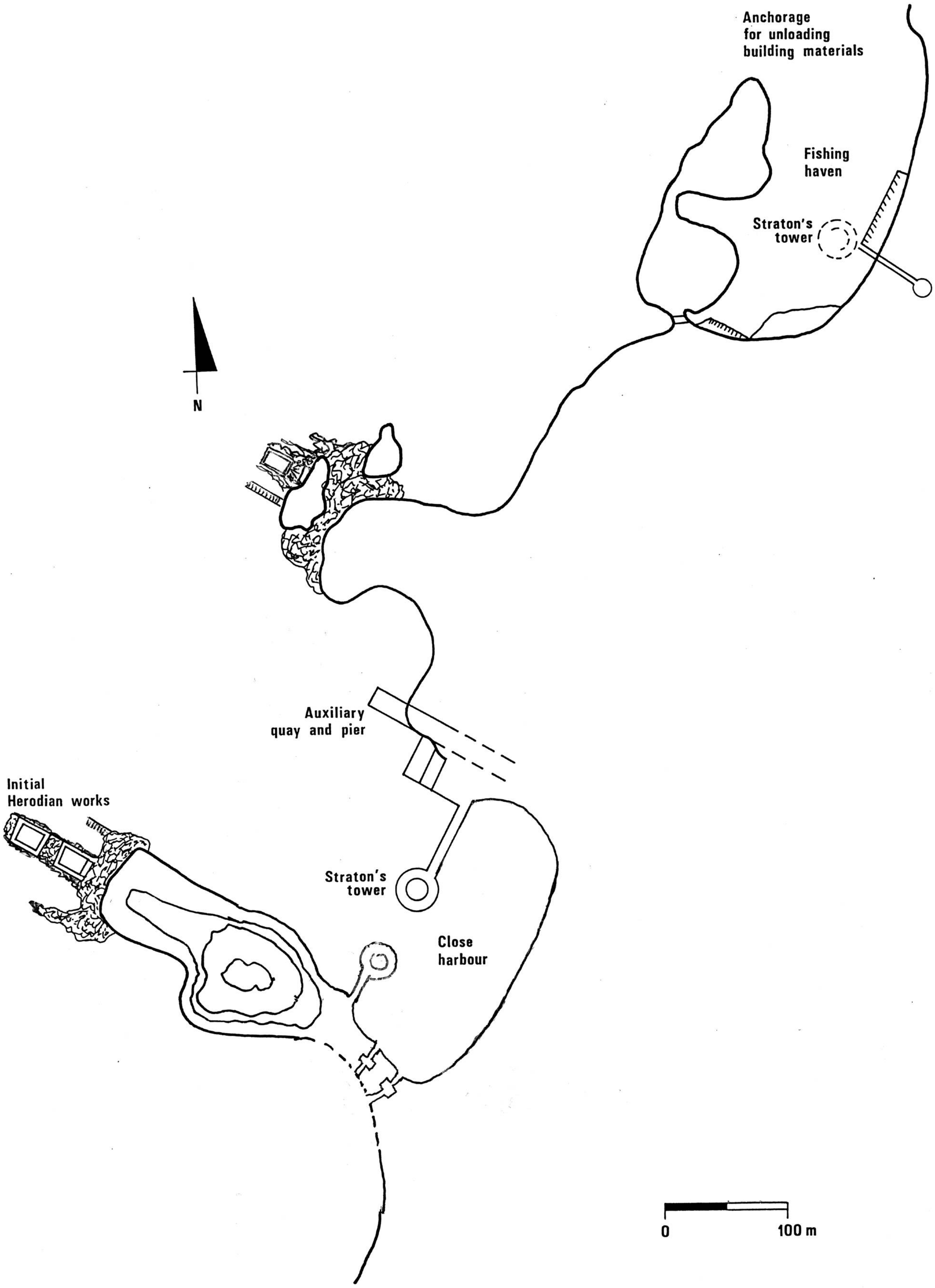



*Figure 5.5. A sketch plan of Sebastos site at the beginning of construction (21 BCE) (Drawing: A. Raban)*

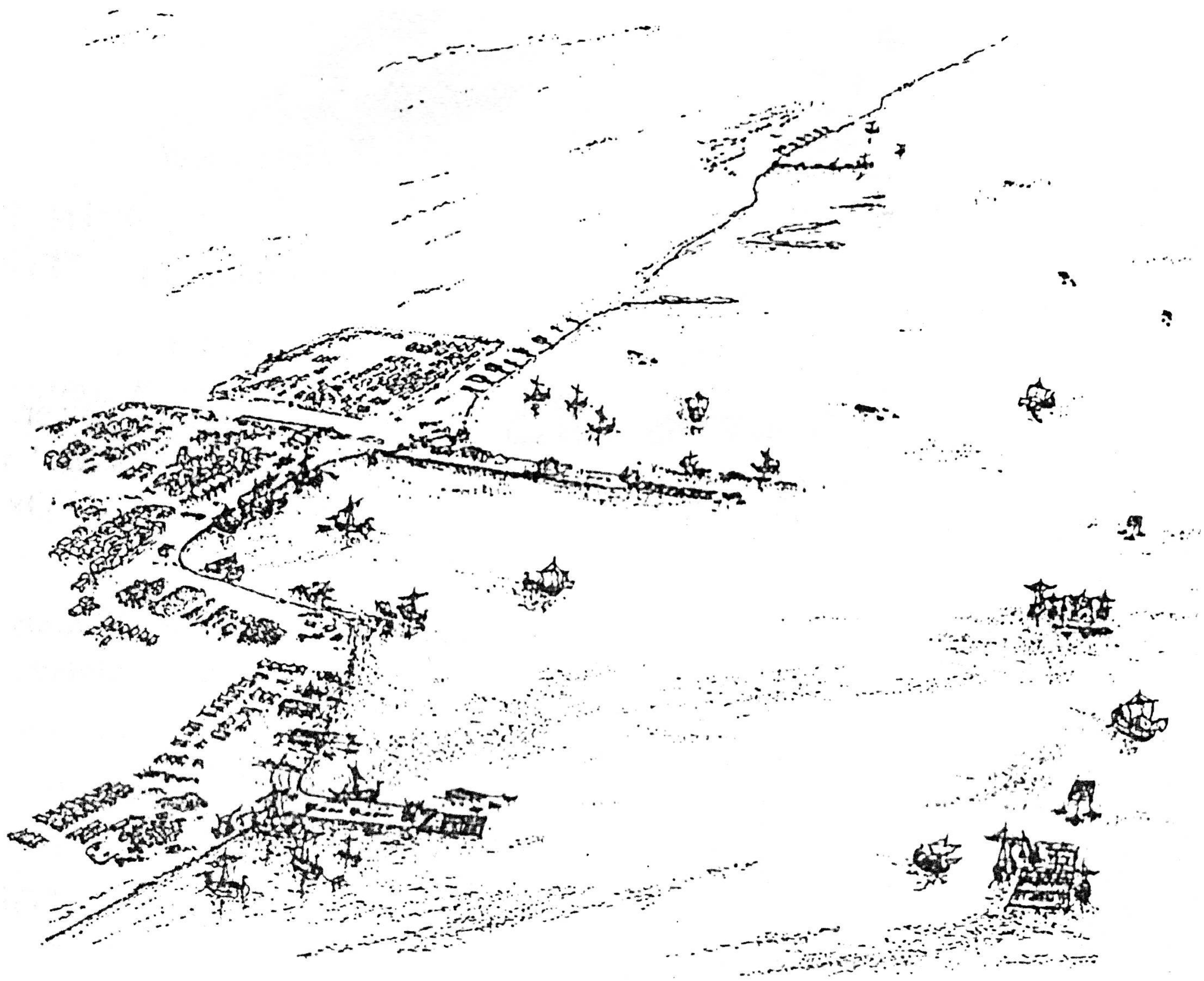


*Figure 5.6. Artistic rendering of the first phase in the construction of the external main basin of Sebastos (Drawing: C. Brandon,)*

still retain the impressions of timber formwork into which the concrete was poured, together with large *kurkar* blocks. This mound is spread across the site and rises from the current seabed (7–8 m below MLS) up to 2 m of the surface. It was assumed that this was the collapsed remains of the lighthouse structure or the Drusion (Vann 1991)

The details of a series of timber caissons (7×14×4 m) filled with concrete were revealed during the excavations. These caissons were set in a 'header' fashion (Figs. 5.8–5.9), although not in a straight line or uniform depth. Excavation techniques had to suit the terrain which was covered with massive concrete and stone blocks. The first excavated caisson, K2, was the simplest to understand as it was not completely buried beneath the mass of collapsed structure. However, in order to reveal the details of the timber elements that comprised the original formwork, it was necessary to dig 1.5 m through consolidated concrete (Fig. 5.10).

In the other areas to the south of caissons K2 and K3 the extent of the collapsed structure severely limited the areas where probes could be made. However, due to an erosion layer existing just above the floor limbers on caisson K5 it was possible to enter a labyrinth of tunnels, which ran under the tumbled structure. Following it, a large area of the caisson floor was uncovered, although unfortunately erosion obliterated all visible evidence of vertical structure (Fig. 5.11). Caisson K8 was very badly damaged and there was evidence that this damage may already have started in first century CE (Raban *et al.* 1999). There was no apparent timber formwork remaining of caisson K9; however, the concrete block substantially remained, although it was split in half. These concrete blocks were cast within a different design of shuttering than that found at area G (see below; Oleson and Branton 1992).

**2. The Caissons' Structure**

The designers planned the caissons rectangular barges, which could weather sea conditions and enable them to ship large quantities of concrete within them. Being rectangular they could be sunk side by side to form a solid foundation for the overlaying structure. The open bottomed caissons were not suitable for the open sea as the double walled floatation section was susceptible to being

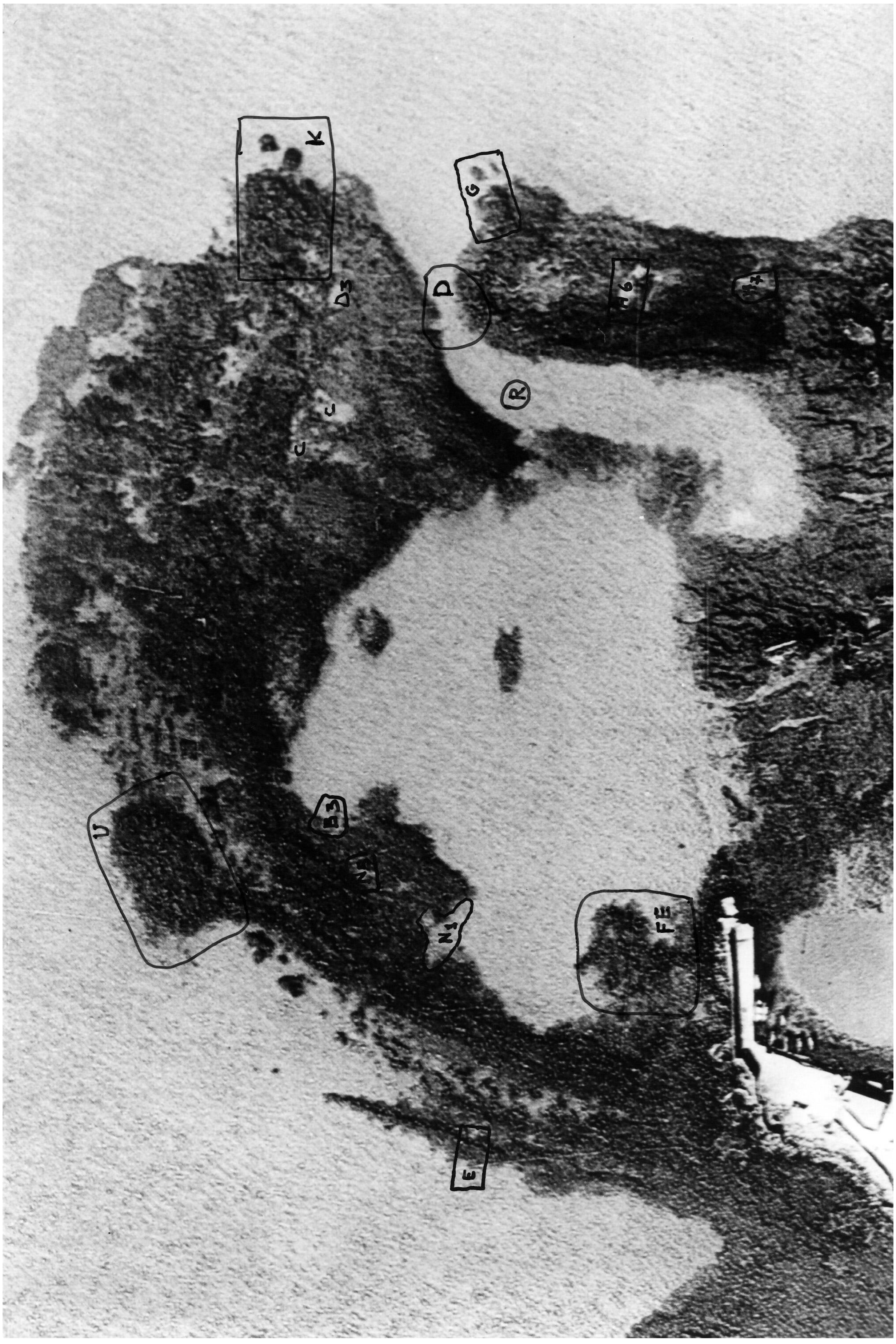



*Figure 5.7. Aerial photo of the main basin of Sebastos (Photoraph: A. Raban)*

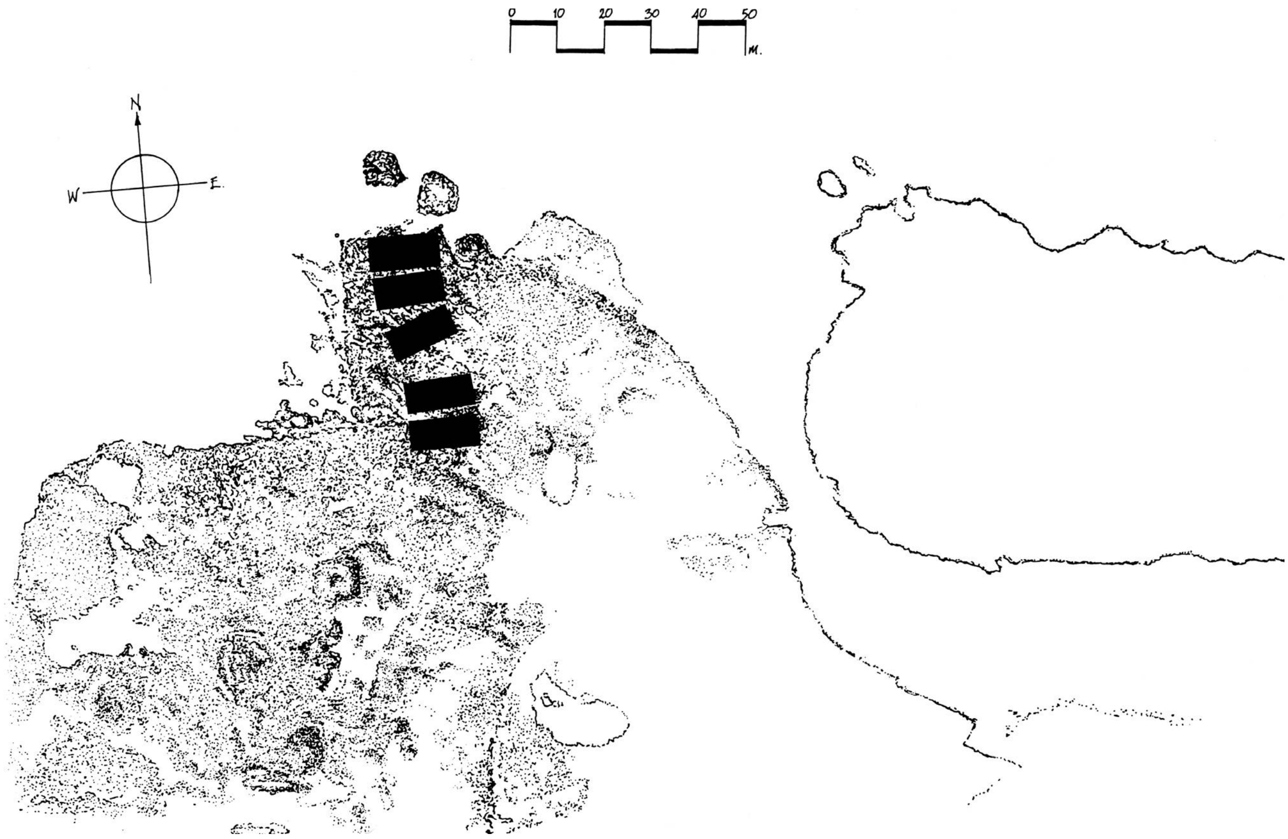



*Figure 5.8. Sketch plan of Area K, indicating the relative location of the five identified wooden caissons (Drawing: C. Brandon)*

swamped and flooded from swells and breaking seas, and were consequently restricted to protected areas such as the northern breakwater.

The development of this alternative design was a direct result of specific site-and timescale-related problems. The earlier completion of the main southern breakwater was crucial to the success of the development, making the northern breakwater and internal jetties much easier to build within its lee. The site at the terminus of this main breakwater was obviously a crucial point to establish a 'construction' base at the outset of the project. However, it challenged the designers with the particular problems involved in working at the extremities of the area and being subjected to difficult sea conditions of large swells and strong long shore currents.

There are minor variations in the construction methods of the three caissons that were studied, which could be due either to evolutionary improvements in design or simply to the fact that they were built by different shipwrights. These barges were rectangular, flat-bottomed crafts, 14 m long with a beam of 7 m and approximately 4 m high; at least one had an inner central compartment (2.5×6.5 m; Fig. 5.12). They were built with planking, edge fastened with mortises and tenons, which were transfixed with treenails in the same manner as traditional shell-first ship construction. The pine boarding was 19–26 cm deep and 8 cm thick on the sides of the caisson and thinner (5.5 cm) on the bottom and the walls to the inner compartment. End joints in the planking were not observed and therefore it is not clear if they were scarfed, as would be expected in this method of construction. The tenons (average 8 × 10 cm) were made of a hardwood and spaced 20 cm apart, although the upper boards on K5 had tenon spacing of 30 cm. The tenons were secured with treenails (11 mm in diameter) and arranged so that they were staggered from board to board. The planks were built one by one rather than prefabricated, this fact being confirmed by the way the ends of the individual boards were cut and let into the corner posts in sequence. There is no evidence of any caulking material between the boards, although there are remains of lime-based cement slurry, which seeped out through the joint between the chine beam and the first plank and was solidified, thus effectively sealing the gap.

A chine beam (20 × 60 cm) formed the junction between the side walls and the floor (Fig. 5.13). The planking on the sides was fixed to the chine beam with mortise and tenon joints secured with treenails. This also applied to the floor planking which ran parallel to the chine. However, the ends of the bottom boards were set into the chine beam at bow and stern. In the case of caisson K2 mortises were cut to take the projecting tenons which were cut into the ends of the boards (Fig. 5.14). Caisson K3 had a different design: the ends of the planks were rounded on section and let into a similar rebate on the side of the chine (Fig. 5.15).

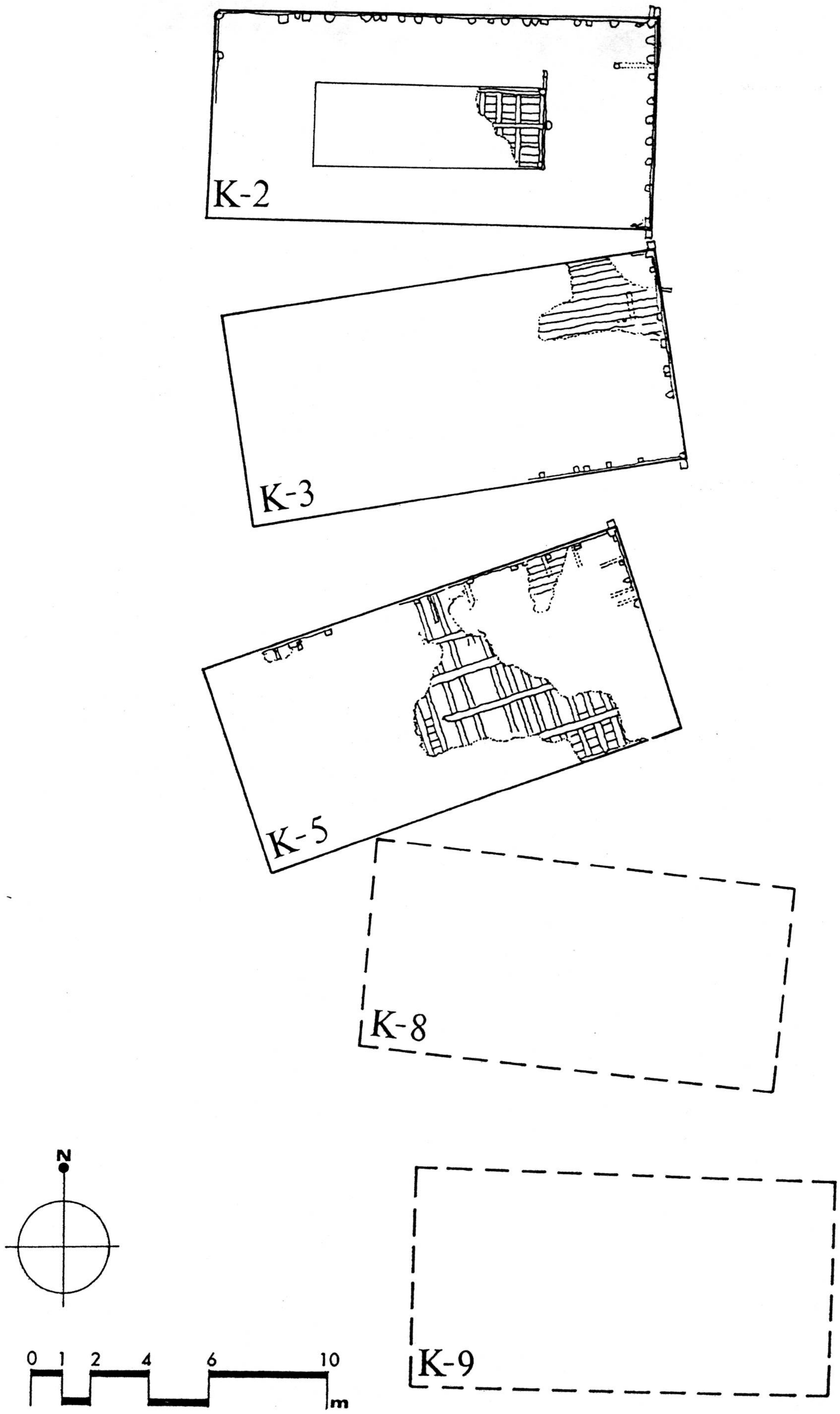



*Figure 5.9. Top-plan of the caissons at Area K at the end of the 1995 season (Drawing: C. Brandon)*

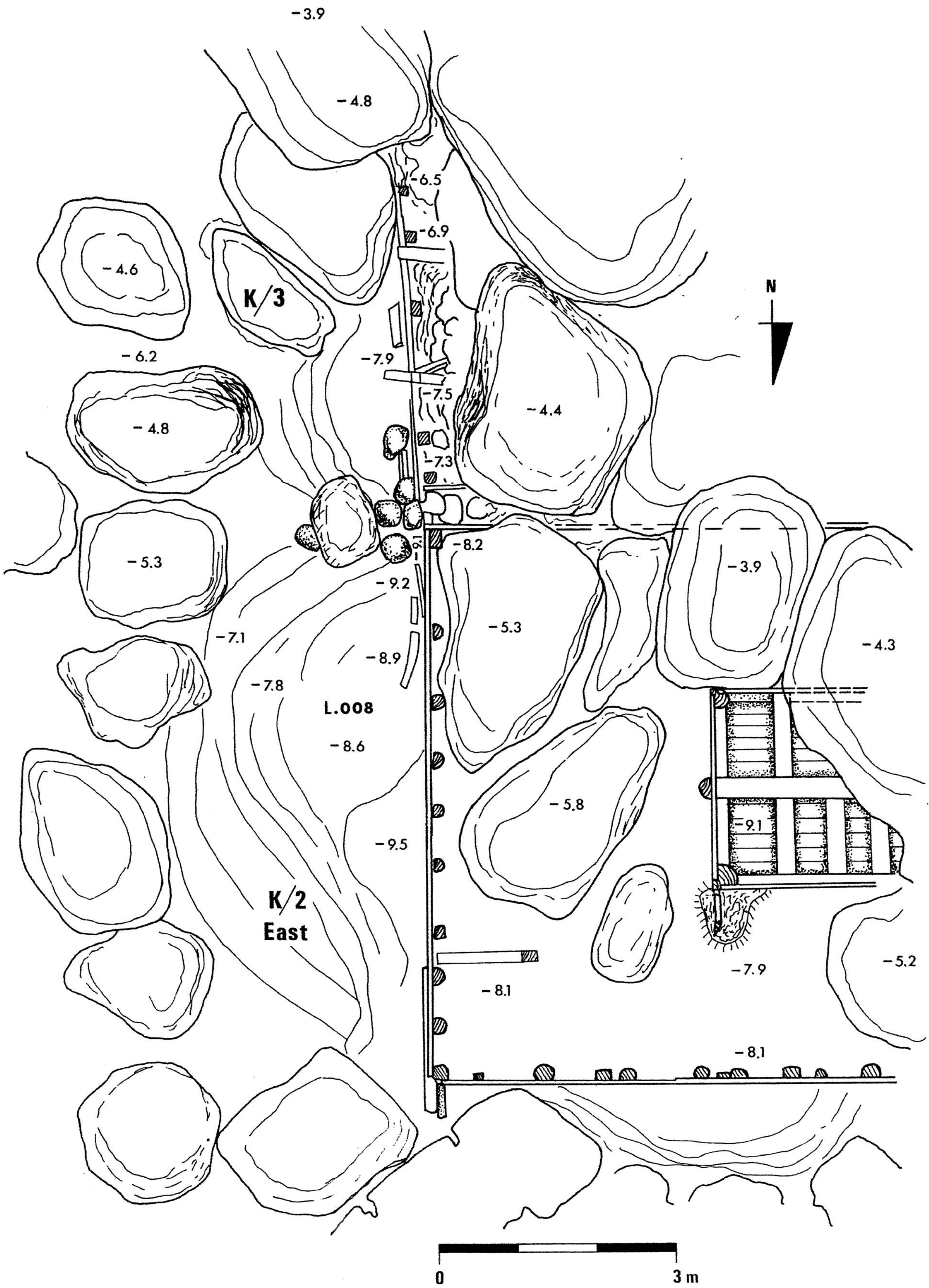



*Figure 5.10. Top plan of the eastern half of caisson K2 and the NE part of K3, at the end of the 1992 season (Raban et al. 1992, Fig. 6)*

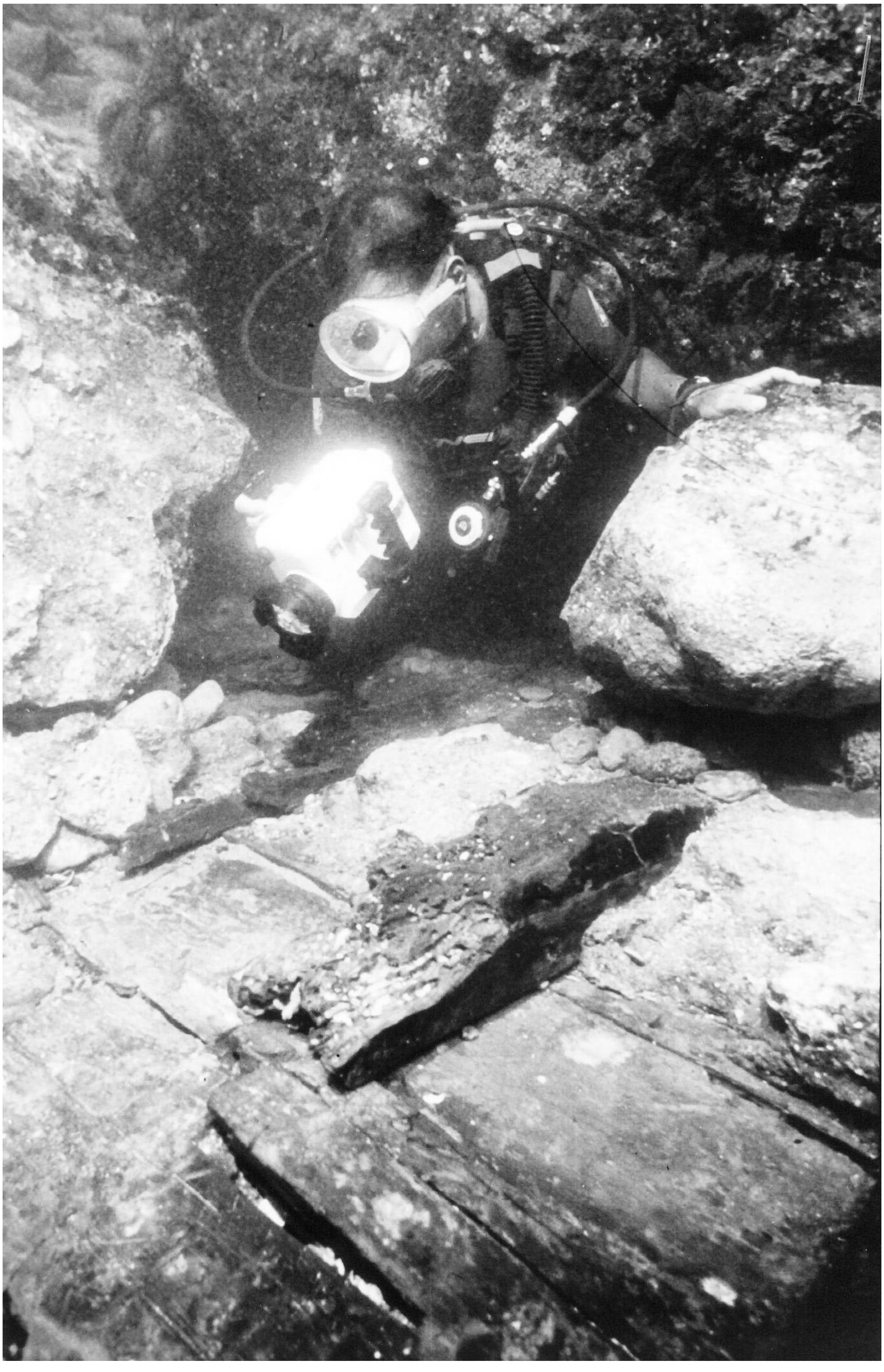


*Figure 5.11. Diver emerging from the "tunnel" in K5 (Photograph: A. Raban)*

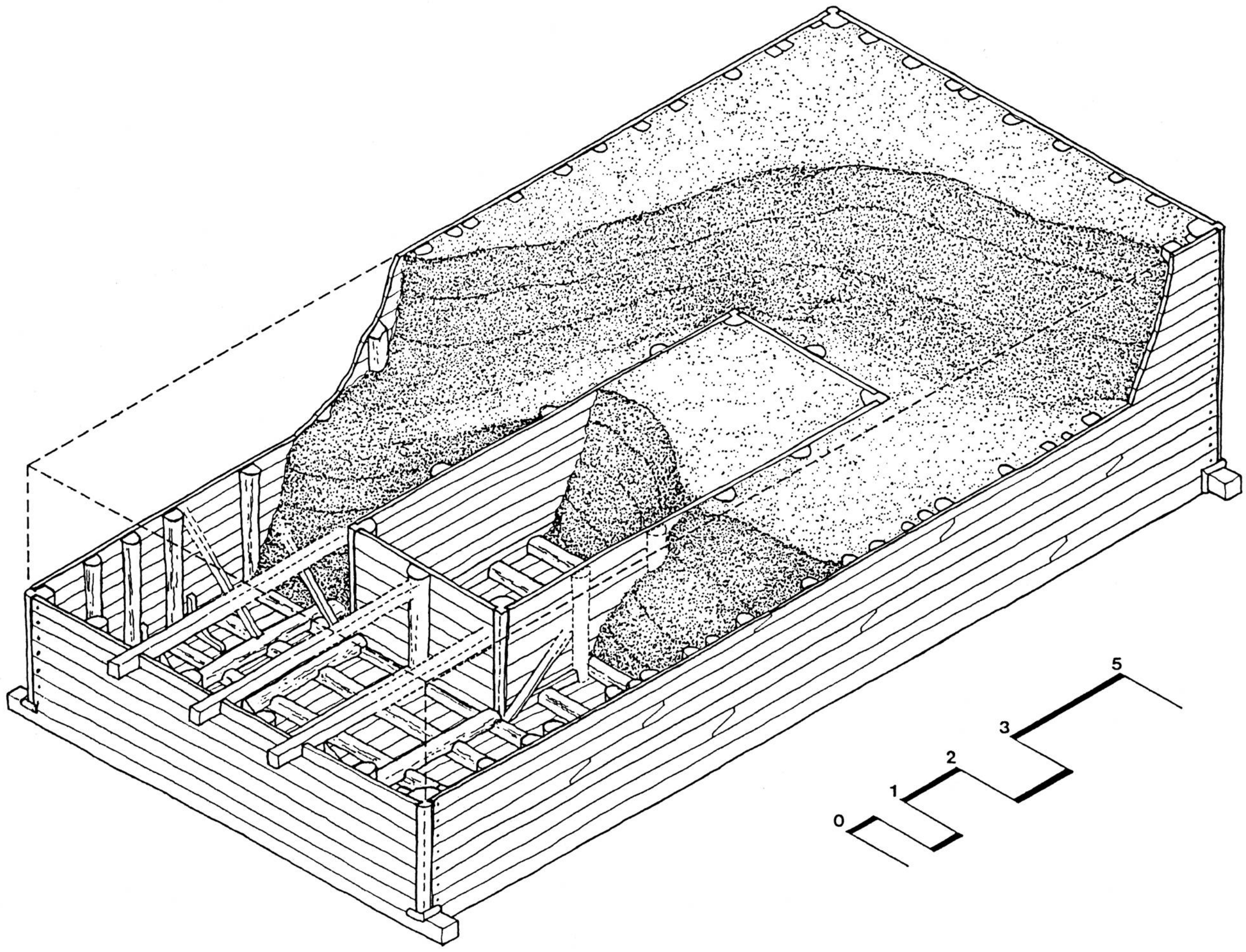



*Figure 5.12. Suggested reconstruction of caisson K2 Isometric view from NE (Drawing: C. Brandon)*

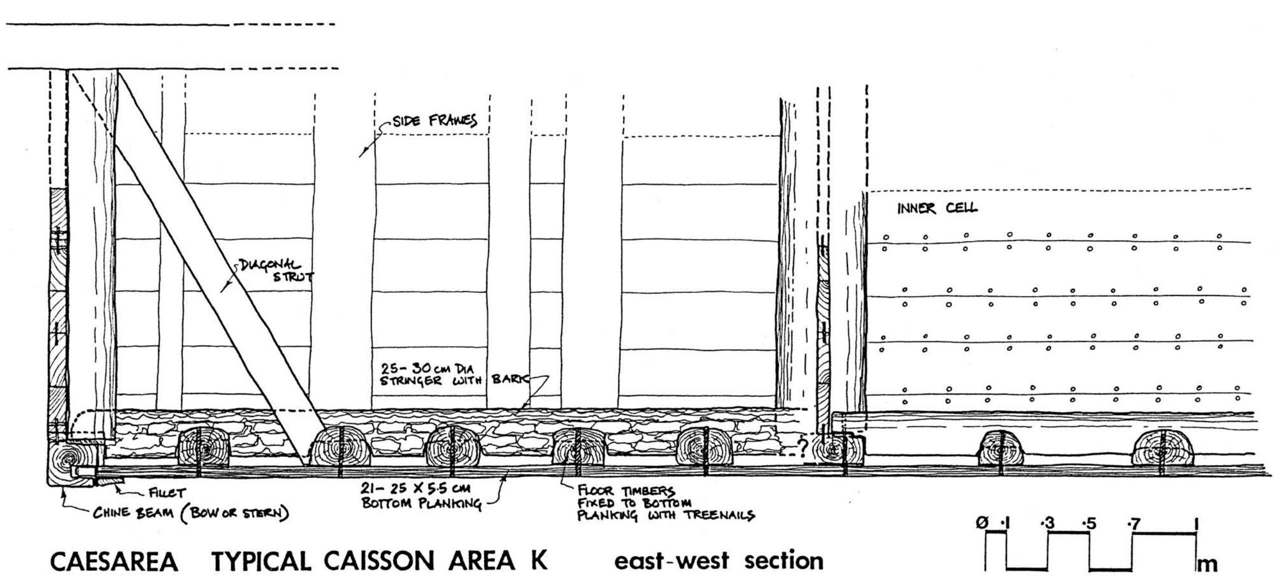



*Figure 5.13. E-W section of caisson K2 (Drawing: C. Brandon)*

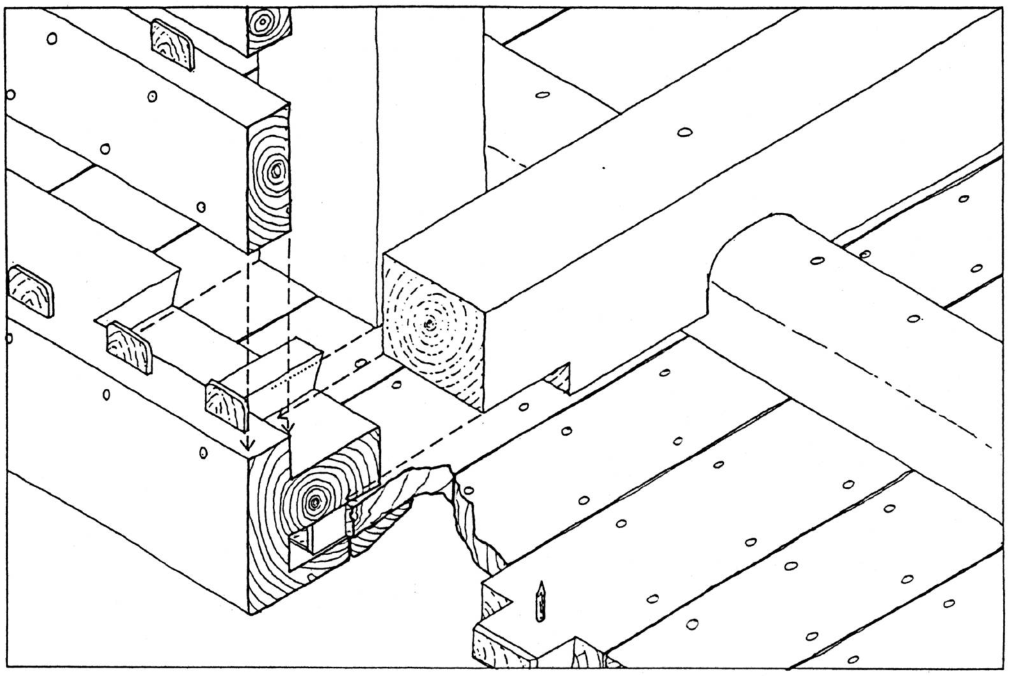


Figure 5.14. The eastern chine of caisson K2 (Drawing: C. Brandon)

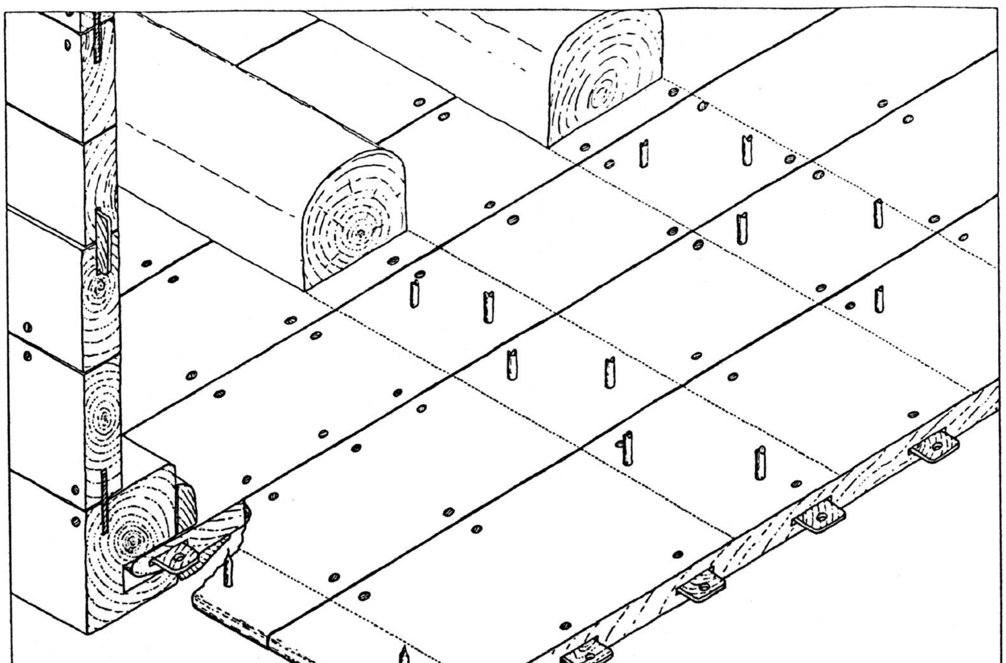


Figure 5.15. The eastern chine of caisson K3 (Drawing: C. Brandon)

The floor frames consisted of 20–25×20 cm roughly hewn pine sections set with an irregular spacing between each, of 30–70 cm. On some of these we found adhering bark, indicating that these were not timbers in secondary use (Fig. 5.16). The frames were fixed to the bottom planking with at least one treenail per board. The ends of the frames were set into the chine beam with a tenon, which protruded from the lower half of the frame (Fig. 5.17). It is therefore apparent that the frames were fitted before the chine beam was fixed to the sides.

The inner face of the chine beam at the bow and stern, which projected down below the level of the bottom planking, had a firing piece set against it to protect it from

*Figure 5.16. The floor frames at K5 (Photograph: D. Siyon)*

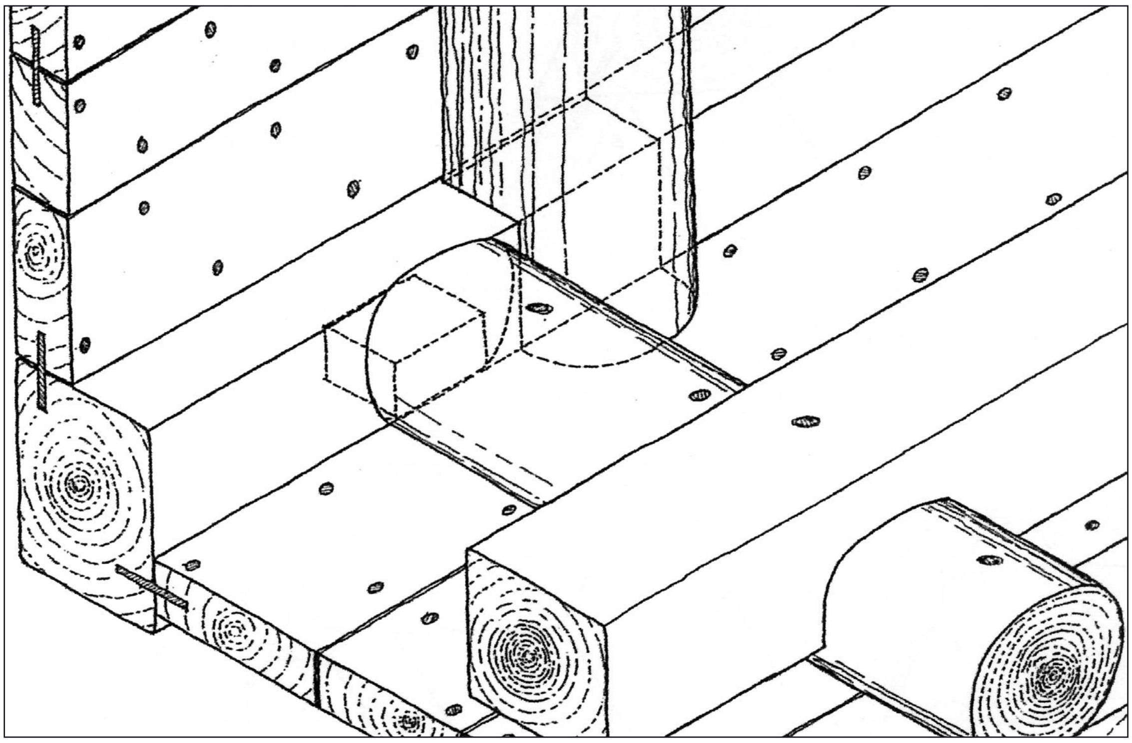


*Figure 5.17. The connection point of a floor frame to the chine of the long side of the caisson (Drawing: C. Brandon)*

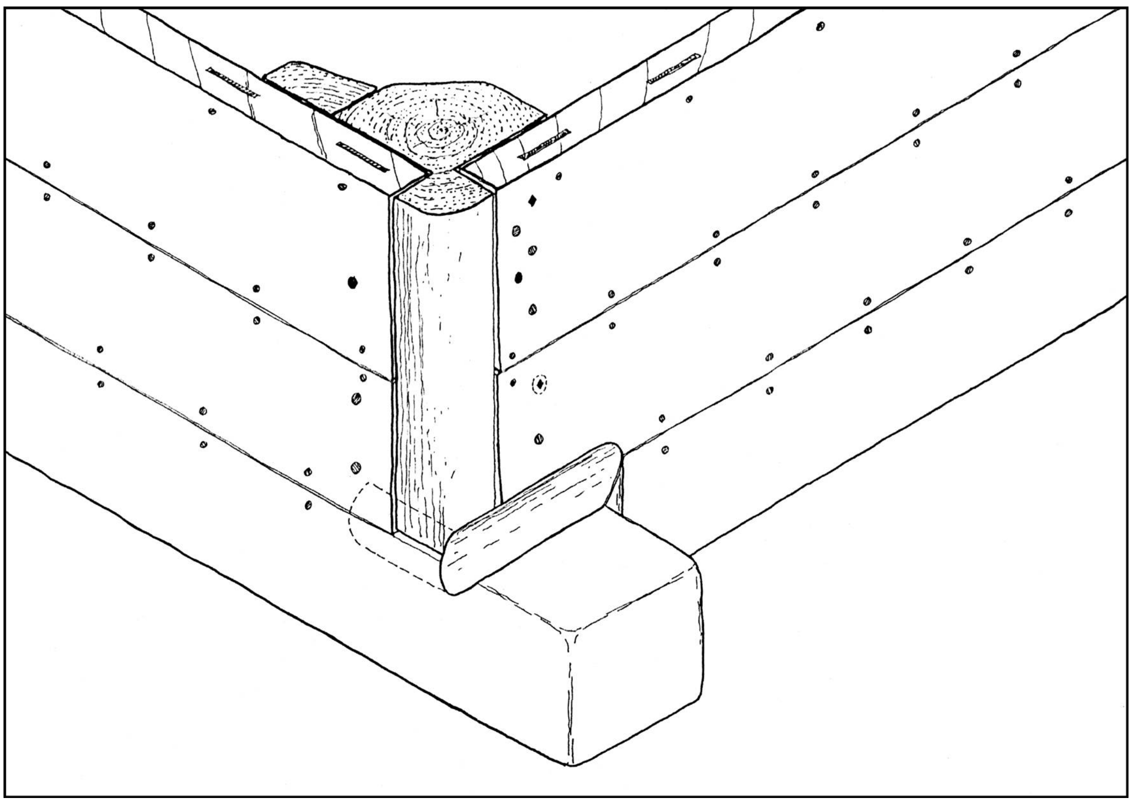


*Figure 5.18. The NE corner of K5 (Drawing: C. Brandon)*

damage when the structure was launched (Figs. 5.14–5.15). This detail did not appear on the underside of the chine beams, clearly indicating the direction and method by which the caissons were launched. The chine beam on the bow and stern projected out from the sides of the caisson by 20–30 cm, and the complicated joint between the junction of the chine beams and the side wall planking was capped with a timber (4 × 5 cm in section), which was mired and fixed around the chine beam (Fig. 5.18). Stringers (approximately 25 cm in diameter) with bark still adhering were nibbed over the frames and transfixed to them with treenails (Fig. 5.19). Timber knee sections

*Figure 5.19. Stringer over-rides the floor frames in K2 inner cell (Photograph: A. Raban)*

provided stiffness to the junction of the side planking, chine beam and bottom planking and were fixed in place with treenails and iron pins (Fig. 5.20).

Diagonal bracing or raking members provided rigidity between the inner compartment and the outer side wall planking. These raking props were braced off the frames, stringers or knees and secured at their heads by beams or directly onto the side frames. Beams positioned between the inner compartment and the outer frames were set at approximately 2 m above the floor frames and projected through the side wall planking (Fig. 5.13). This was above the water line of the barge when floating with an initial fill of approximately 0.5 m of concrete.

The inner cell, which was evident only in caisson K2, was formed directly off the bottom planking and the floor frames discontinued either side of it. The function of the inner cell, which was built in the same watertight construction as the main part, can only be surmised. It could have served as a central stabilizing chamber allowing control of the loading and sinking of the barge. Within the compartment the floor frames were similar to those on the outside, but were set into protruding edge beams onto which the corner posts and stringer were also fixed. A stringer ran on axis and was brought onto the floor frames and fixed to them and to the edge beam of the inner compartment with treenails. The corner posts were shaped from pine trunks into which


*Figure 5.20. A timber knee from the N side of K5 (Drawing: C. Brandon, Photograph: A. Raban)*

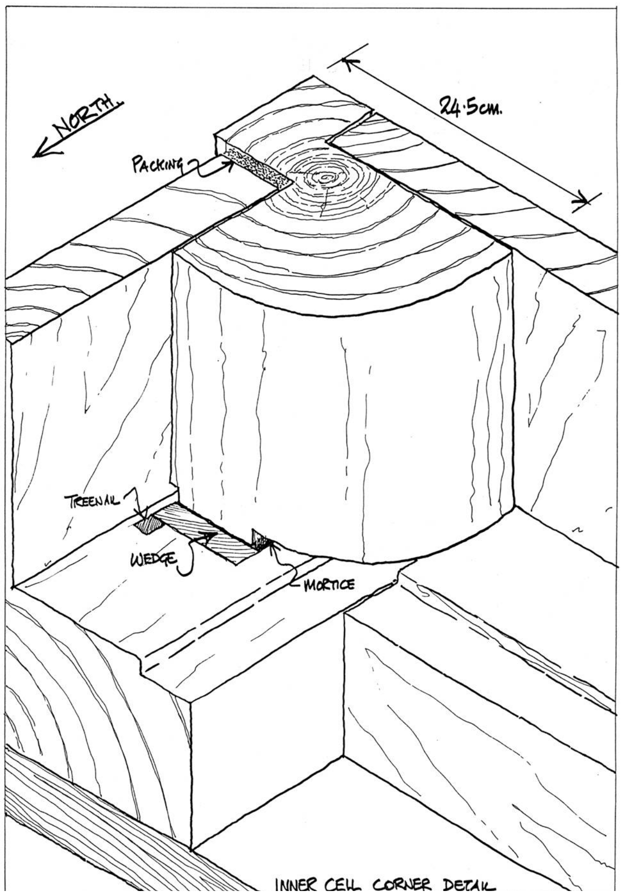



*Figure 5.21. Detail of the corner post at NE corner of the inner cell at K2 (Drawing: C. Brandon)*

*Figure 5.22. The NE corner of K5, from the north (Photograph: A. Raban)*

rebates were cut to take the side planking. The posts were set onto the edge beam with a tenon that was wedged in place (Fig. 5.21).

The exterior corner posts were designed in a similar manner to those found in the inner cell. The ends of the boards were let into the rebates running on both sides of the post and were fixed in place with a combination of metal pins and treenails (Fig. 5.22). This cutaway post, however, left a weak nib, which was broken off in most of the corners that were excavated, and it is likely that this damage occurred in antiquity.

The side frames ranged in size, spacing and shape, being either rectangular, square, semi-circular or quadrant shaped posts (approximately 18–20×18 cm), and were fixed to the side planking with both treenails and metal pins. These side frames were notched into and over the chine beams where they projected into the caisson. It is evident that not all the frames extended over the whole height of the sides and some did not reach the chine.

### 3. Building the "Island" – A Reconstruction

A possible site for the shipyard where the caisson/barges were built is on the foreshore beside modern Kibbutz Sdot-Yam to the south of the ancient harbour, where jetty-like structures were found (Galili, Dahari and Sharvit 1993). From there the barges could be towed with the long shore current to their destination around the harbour enclosure (Fig. 5.6).

There is no doubt that the bottom planking was constructed first, and was probably set out on a raised "trestle" to allow the treenails to be trimmed as each board was fixed in place (Fig. 5.23,1). Then, the floor frames were fitted onto the bottom planking and the chine beams offered up to the sides and fitted over the tenons on the frames (Fig. 5.23,2). The bow and stern chines were then added and the stringers let in on top of the frames, and were fixed into the beams (Figs 5.23,3; 5.23,4). The external corner posts were then erected and propped in place, while the side planking was built up board by board and cut to fit in between the corner posts (Figs. 5.23; 5.24). Once the side walls were completed and the side frames, diagonal props and cross beams added (Figs. 5.23,5-7), the barge was then launched probably on log rollers, bow or stern first (Fig. 23,8).

The estimated weight of an empty barge is 70 metric tonnes and it could float with a draught of approximately 0.5 m. The barges were then partially filled with a *pozzolana*-based concrete to a depth of approximately 0.5 m, at which point they would float with a draught of about 1.5 m, before being taken out to the site. The use of a hydraulic concrete in this lower portion indicates that the caisson was not entirely

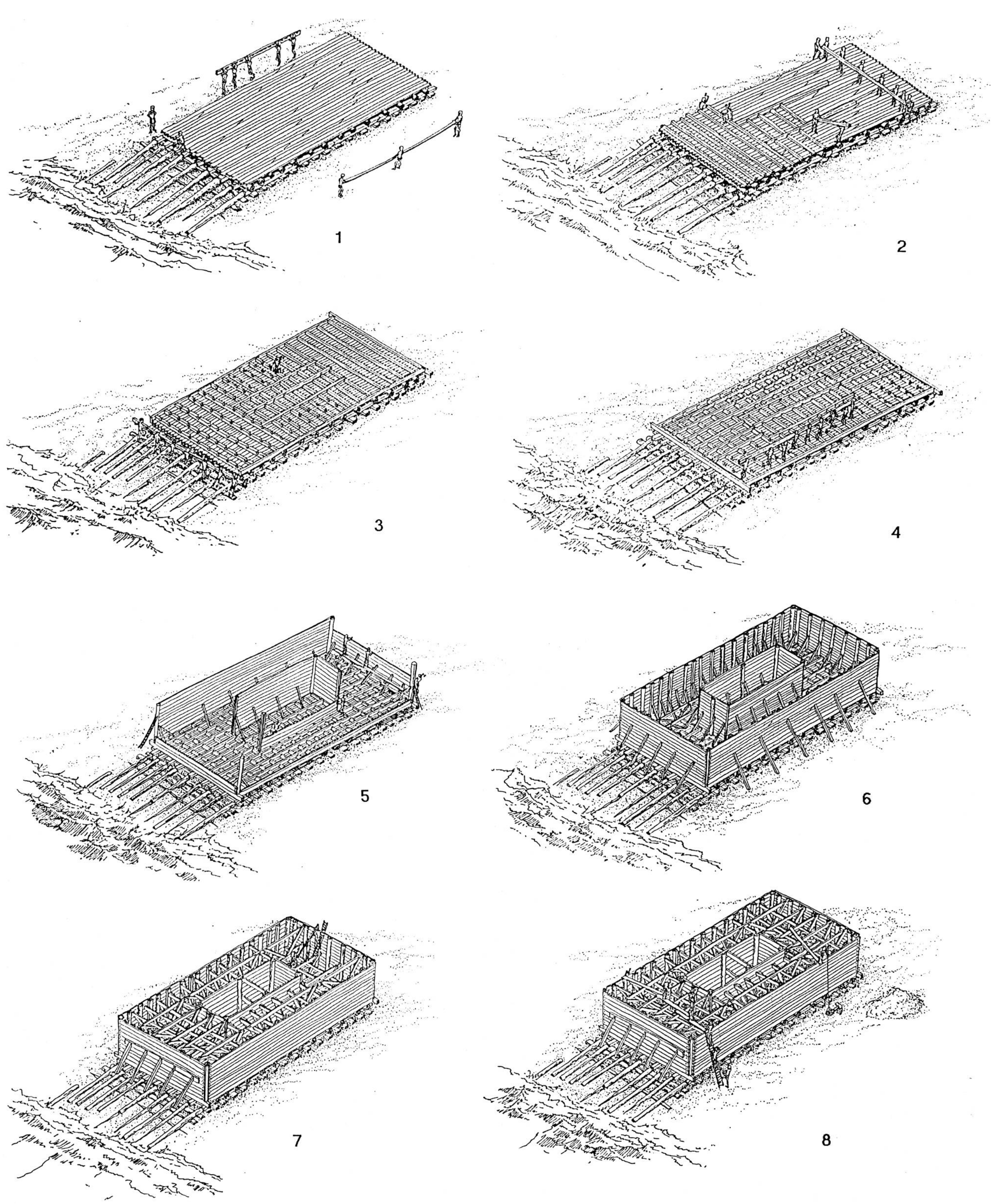



*Figure 5.23. Artist rendering of the construction stages of a caisson and its placement in position on the sea floor (35.1-10) (Drawing: C. Brandon)*

waterproof. The concrete provided ballast and helped to seal the joints, particularly around the edges of the bottom. After the concrete was hardened the barge was towed to its predetermined destination and moored in place while lighters transferred lime mortar into it, and lumps of *tufa* and limestone aggregate were placed manually (Fig. 5.20). This lime mortar concrete was loaded until the caisson settled onto the seabed, which was already prepared with a layer of rubble, concrete, *tufa* and stones. At this point the freeboard was minimal and a *pozzolana*-rich mix was used to complete the fill. It required only an additional 1.0 m of mortar and aggregate to sink the barge onto the bottom. The tipper layer of hydraulic material was used to seal in the non-hydraulic layer and protect it from the

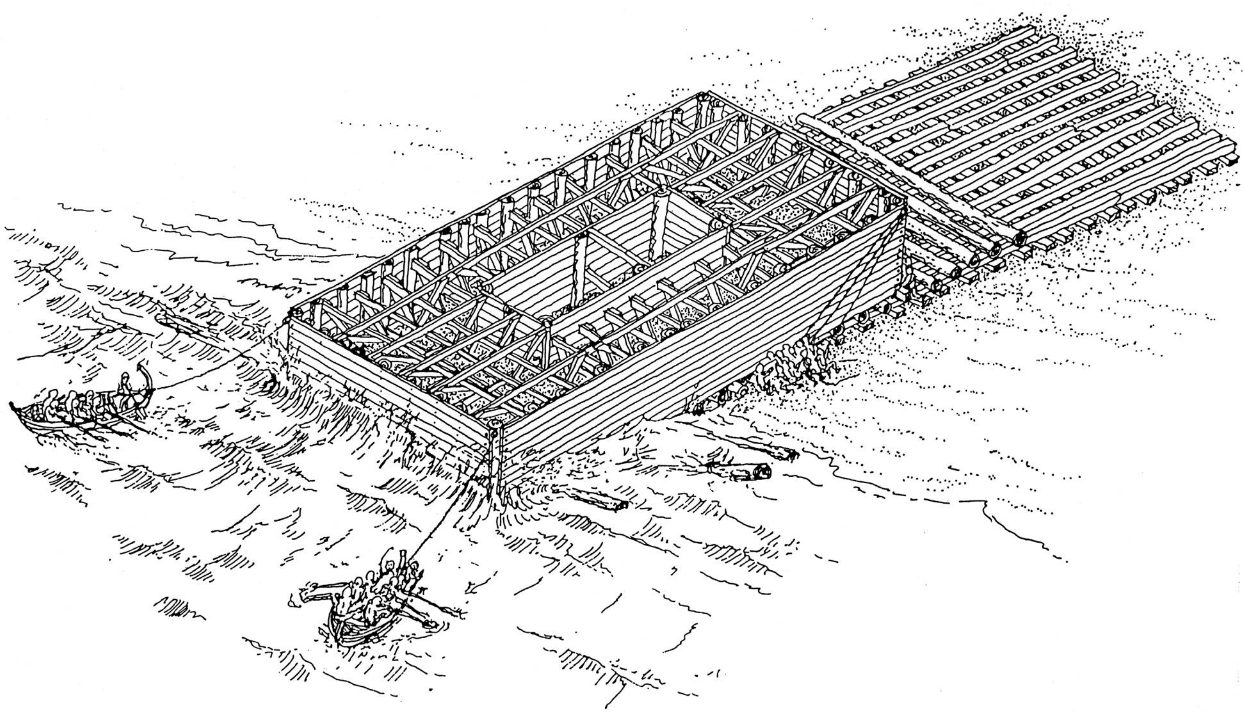


*Figure 5.23. Artist rendering of the construction stages of a caisson and its placement in position on the sea floor (35.1-10) (Drawing: C. Brandon)*

*Figure 5.24. Close-up view of the side planking at K5 (Photograph: A. Raban)*

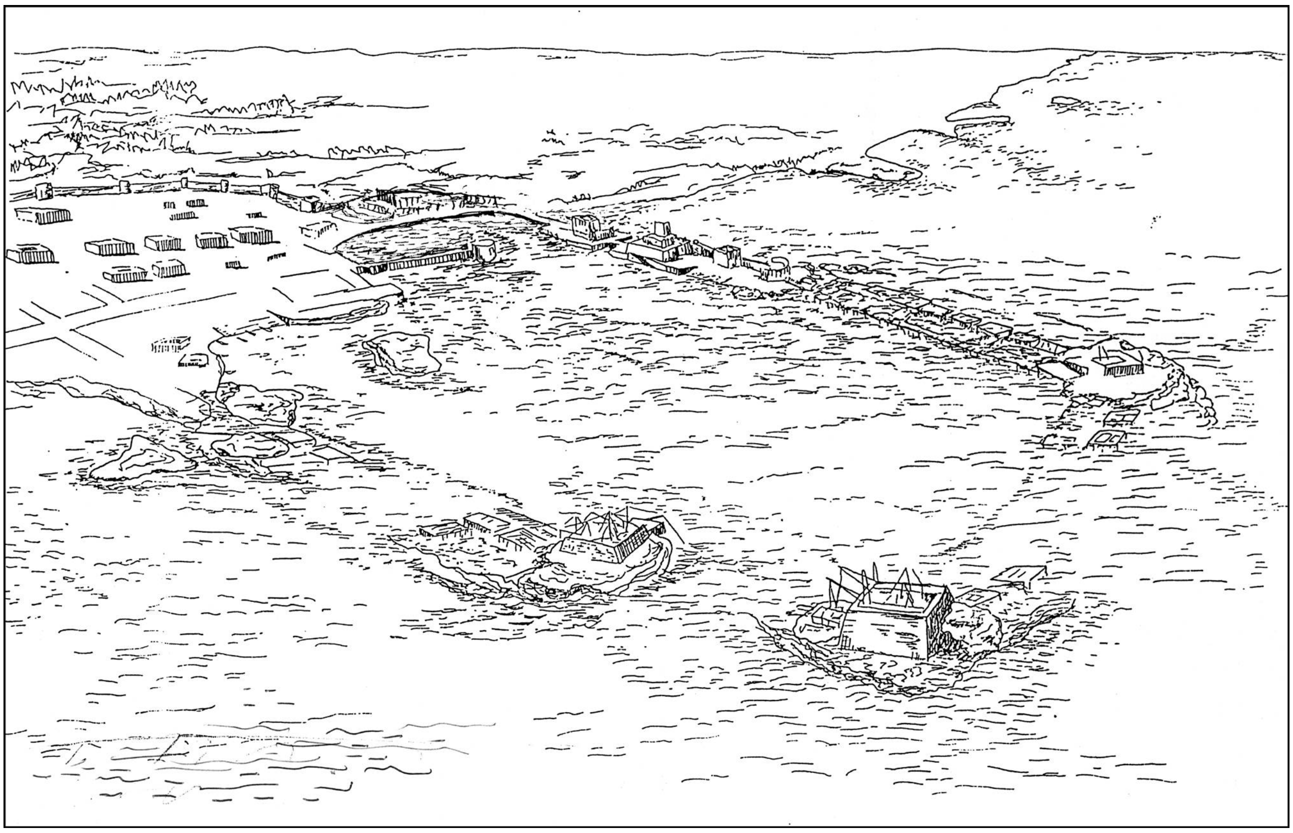


*Figure 5.25. Artist's rendering of the second phase in the construction of Sebastos. (Raban, 1998b, Fig. 24)*

sea, which would obviously break across it until the rubble breakwater was added and the overlaying structure built on top of it (Brandon *et al.* 1999).

It is likely that the engineers were faced at the outset of the project with problems of delivery of the material necessary for the construction. It took some time to ship in to Caesarea all the necessary *pozzolana* from the area of the Bay of Naples in Italy, and under the pressures of the program's schedule, decisions were possibly made to use deliberately a non-hydraulic lime mortar as means of reducing the amounts of imported materials.

Unfortunately, this method of construction had inherent drawbacks. The weak layer in the middle of the blocks was exposed due to seismic movements. They became a mass of concrete with little or no structural reinforcement. Thus, they had no tensile strength and any sagging or hogging action caused cracks, which allowed currents to wash through and erode the soluble centers undermining the overlaying structures. This partly explains why it was very difficult to maintain the harbour and its quick fall into disrepair (Raban 1992b).

We are not certain as to how many caissons composed this artificial island. Their state of preservation showed that their deterioration took place from north to south and from east to west. It seems that the entire complex already tilted, subsided, scattered and settled to varied degrees in antiquity. Area K was examined through aerial photographs and the underwater survey (Fig. 5.7), which suggests a rectangle of about 43 × 22 m that could have tightly accommodated a group of nine caissons. Only five caissons, of which only two (K2 and K3) were closely laid, were detected (Fig. 5.9). The other rectangle in Area U is twice as large (80 × 40 m), but none of the 12 probes made there yielded any tangible evidence for caisson construction (Raban *et al.* 1999a). However, it is quite likely that these two working platforms were constructed first, in order to enable four working teams to work simultaneously towards each other in constructing the formwork of the main mole.

### C. Construction of Sebastos – Phase Two

Phase Two of the construction included several components, which were carried out by different working teams side by side.

#### 1. The "Spinal Line"

It seems that the first and the prime constructive unit was the "spinal line" that connected the northern artificial island (Area K) with the rectangle artificial island in Area U and then with the western tip of the southern promontory (Fig. 5.25). This spinal line carried the seawall and the *"evenly spaced towers"* (BJ 1: 412; AJ 15: 336), and it is clearly visible in aerial photographs (Fig. 5.7). It consists of badly eroded, segmented and off-set large blocks of hydraulic concrete with no integral remains of their wooden forms, except the imprints of their cross beams (Fig. 5.26). In a

*Figure 5.26. The "Negative" grooves of wooden transoms at the surface of one of the segmented blocks of hydraulic concrete at Area C4 (Photograph: A. Raban)*

series of underwater probes in Areas C3 and C4 (Fig. 5.27) the eastern face of some of these blocks was exposed. Well-sorted laminas of sand were found embedded against these blocks, topped with rubble and displaced rectangular paving slabs of *kurkar* (Fig. 5.28). The blocks were laid at least 2–3 m apart and spilled rubble was used to retain them on both sides, as well as a binding fill for the gap between them. It is possible that the gaps were retained by wooden sidewalls on either the external or the internal face, as was the systems in the North African harbours of the Roman period (York and Davidson 1985) as well as Lauron, near Marseilles (Ximenes *et al.* 1985). Here, no such timber was found *in situ* except for very fragmentary pieces of wooden chips incorporated with the upper layers of the sand just below the rubble.

### 2. The Inner Quay

The most prominent feature along the inner side of the middle section of the main mole was a 165 m long platform made of large ashlar slabs laid in a header formation. This feature, or at least parts of it, was first noticed by Link's expedition who misinterpreted it as a series of columns (Fig. 5.29), and later in 1976 by the IUES and CMS teams as the Inner Quay (Raban *et al.* 1976: 45–47; Raban 1989: 83–84). This point is near an area of the breakwater that slopes towards the harbour basin and is surrounded on its outer face by a higher mound of badly eroded and tumbled concrete blocks. This assortment of blocks was termed the Inner Quay and is visible at the concave part of the main mole, just north of the curve point.

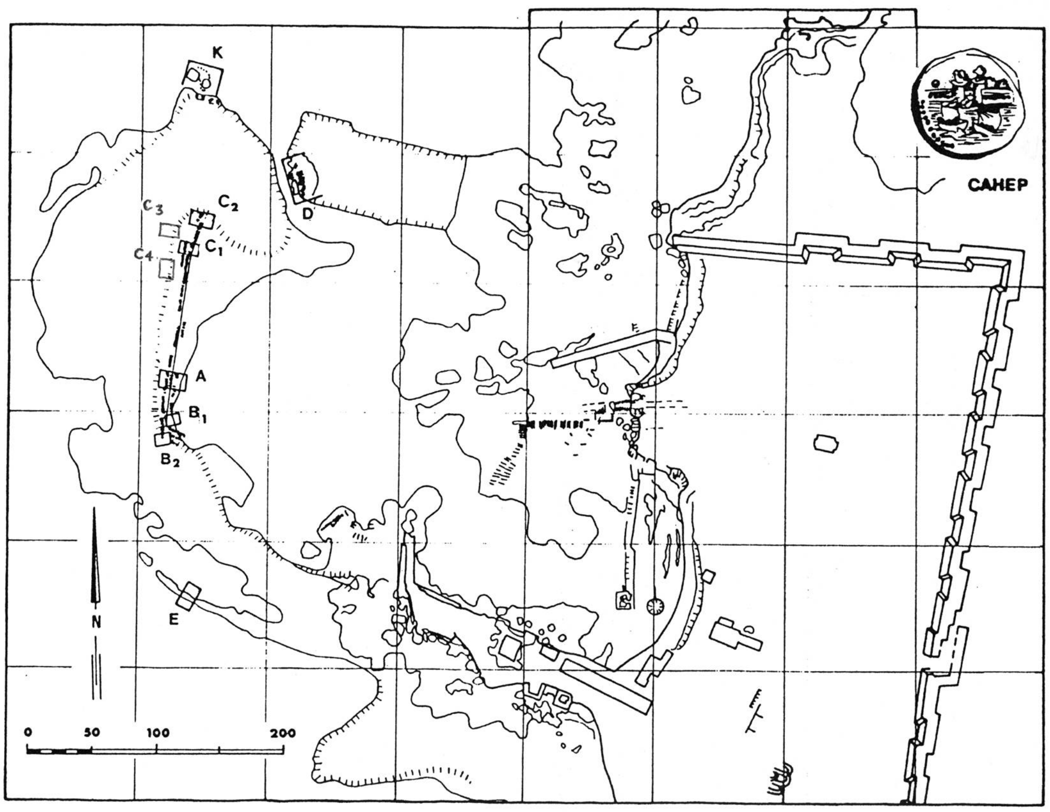



*Figure 5.27. A locator map for CAHEP's probes along the astern side of the main mole of Sebastos (A. Raban, Caesarea Project)*

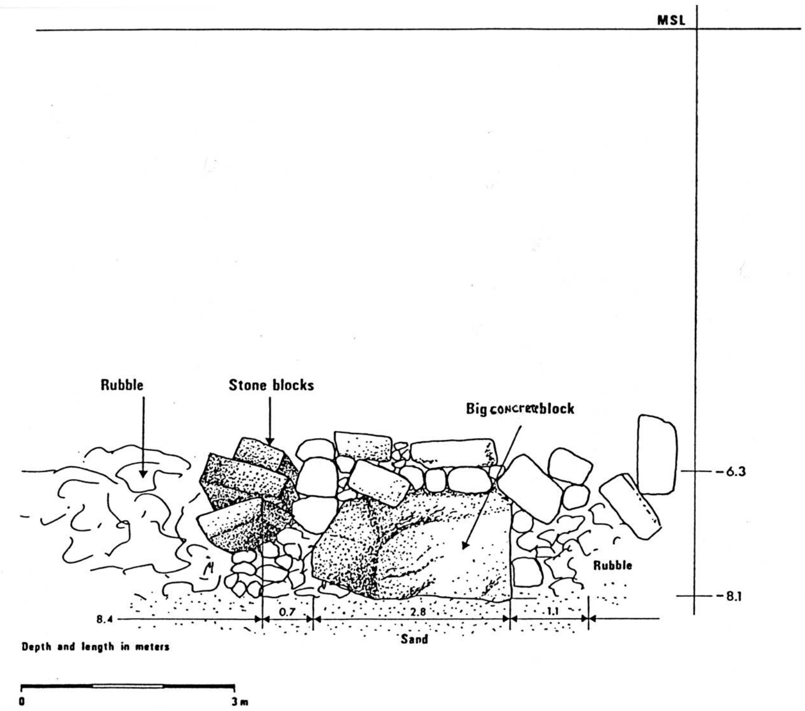



*Figure 5.28. Section from the east towards C4 (A. Raban, Caesarea Project)*

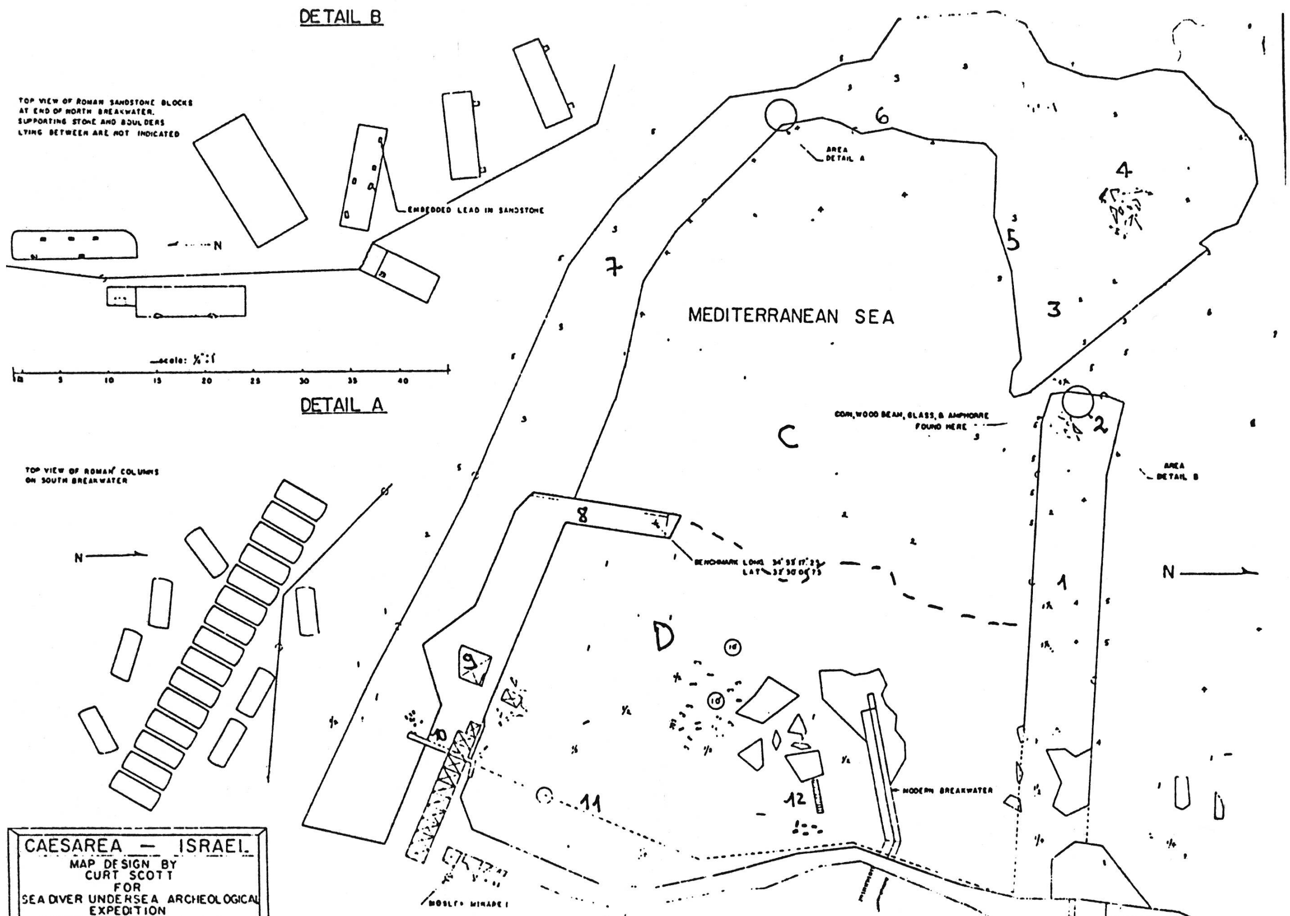



*Figure 5.29. General plan and details A, B of Link's mission of 1960 (A. Raban, Caesarea Project)*

The ashlar slabs along this line were of *kurkar* and were of almost standard dimensions (0.6 × 0.7 × 1.8 m). Some segments were so extensively coated with marine organogenic encrustation they could hardly be distinguished, and in some instances the additional cemented spill of small rubble made it virtually impossible to distinguish any individual blocks. Many slabs were abraded by wave carried sand or broken, so their dimensions were much reduced. Although most of the blocks were horizontal, their upper surface slumped gradually toward the south (4.95–7.92 m below MLS). It seems that additional submergence was a gradual process that occurred after the original bedding of rubble was carried away by the waves and the underlying sand exposed to the open water.

The total width of this slab-paved platform did not exceed 8–9 m and some segments further toward the harbour basin probably slumped out of their position or carried off by the sea. At least three points there were ashlars oriented in a direction perpendicular to the main course. In many sections there were clearly two or three parallel courses of slabs whose present arrangement may indicate that they were originally on top of each other. In other cases, such as Areas A, B1, C (see below), it is quite obvious that they belonged to the same surface (Oleson *et al.* 1994a: 212–216).

Excavations were conducted along this feature in three areas (A–C; Fig. 5.27), in order to find whether there were additional courses underneath, or what sort of foundation these slabs were and how they related to the original layout of the mole. It was assumed that these areas might yield datable finds in an undisturbed stratigraphic context. The base-line (BL) was installed with a fixed rope marked every meter to a total length 165 m with the zero point at its north end.

a. Area A

The excavation (10×10 m) went down 0.4 m below the bases of six blocks, revealing that they were resting on sand and occasional piles of small rubble and pebbles. Deepening the trench exposed another layer of greyish sand with some clay and many *Glycymeris violacescens* shells under 0.3-0.5 m of sand. Many of the amphorae sherds that this layer contained were badly eroded and un-datable, except one combed Late Roman piece and the lower part of an Early Byzantine juglet. Below this layer (8.05 m below MSL) there was a thin but very marked layer of compacted clay, with no shells or pottery that might signify that it was the original floor of the Herodian harbour basin. Beneath it (8.2–8.6 m below MSL), sterile sand with some coarse particles but no shells or potsherds was traced. In view of the absence of foundations underneath this course, the presence of abraded late pottery and the proximity of the possible floor of the harbour basin, it is reasonable to assume that this segment of the Inner Quay is not in its original place but has slumped down and inward from the breakwater.

The western part of the next trench was dug by hand to remove the lower extension of the steep spill of what seems to be the breakwater's mass. Below, there was a compacted mass of rubble (7.6 m below MSL) and underneath there was nothing but fine greyish sand with no potsherds at all. This virgin substratum was traced deeper as far as the probes could be continued. Two water-jet probes were made at this section (a total of 12.3 m below MSL) penetrating through sand without consolidated layers. The absence of the clay layer at this point and its coinciding with a superimposed and better preserved layer of compact rubble might indicate that this was the original inner line of the breakwater. In this case, it can be assumed that the entire southern segment of the quay is now offset over 5 m eastward and over 1.5 m deeper than its original position (see also Area C below). Yet, the almost horizontal present position of all the slabs and the close resemblance and proximity of most of the blocks within the course seems to contradict a displacement of such magnitude.

According to Josephus (AJ 15: 337) a perpendicular wall faced the inner side of the mole, facilitating transshipment of goods from moored vessels to the storage vaults on the quay. Thus, these ashlar headers may actually be remnants of such a perpendicular wall, known also from neighboring Phoenician harbours at Athlit, Akko, Tyre and Sidon (Raban 1985b: 30–40). The only reason for locating the base of such a wall in Area A is either its being at the foot of the rubble ledge (4.5 m to the west), or on top of it (1.4 m further back). This proposal is based on the assumption that the clay layer accumulated on top of the basin floor when the harbour was still intact. Thus, it is possible to attribute these slabs to the paved surface of such a perpendicular quay that originally was on top of rubble fill. Estimating the minimum required depth of water for such a perpendicular quay as 2 m, and another 0.5 m as its minimum height above the water, there were 600–800 missing blocks in the present vicinity of the main course.

In a survey around the harbour we traced about 180 blocks in secondary use that resembled in dimensions and shape those from the Inner Quay. These were mostly at the lowest above-water courses of the northern and southern faces of the Crusader Harbour Citadel (Raban 1989: 78). Considering the lower sea level of the Medieval era (Raban 1989: 294) and the limited resources of the Crusaders, who always sought building material for secondary usage (as is so clearly visible for the case of the column drums), one can attribute the plundering of these blocks to this late stage in the history of Caesarea.

*b. Area B*

This area (subdivided into B1 and B2) was at the southernmost point of the Inner Quay, at the best preserved and largest area of close-set courses of ashlar headers (Fig. 5.30).

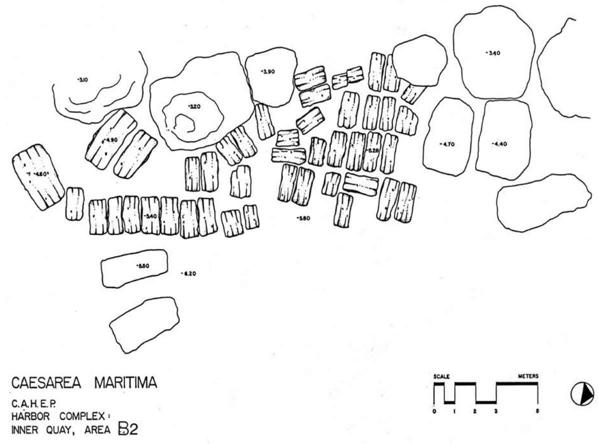



*Figure 5.30. Detailed plan of the ashlars in CAHEP's Area B2 (A. Raban, Caesarea Project)*

A pile of concrete blocks (3 m below MSL) and some large, tipped chunks of concrete (1.6 × 3 × 3 m) covered the edges of the paved area on its southwest and northwest sides. Two pairs of larger than usual blocks of *kurkar* (0.9 × 1.1 × 2.2 m) lie west and east of the southern part of the paved area, and three still larger blocks (2.6× 1.5 × 1.2 m) lie north of it, separating the group of ashlar slabs from the southern end of the Inner Quay.

In Area B1 there was a line of three ashlars the first two of which rested on rubble and the third on a sandy bottom at a depth of 8.2 m and 8.7 m away from the Base Line. The excavation was carried out as a series of probes among the blocks.

A few abraded potsherds underlying the base of the first block indicate that this part of the ashlar structure is offset from its original place. No potsherds were found in the second and third probes. The depth at which the slabs currently lie and the absence of underlying clay or other stable sediments indicate that this part of the sea-bottom went through repeated trenching by currents and its stratigraphy was badly disturbed.

In Area B2 (Fig. 5.30) similar stratigraphy was found with no pottery or other artifacts. As a whole, the data gathered in Area B were similar to that recovered from Area A, and tended to confirm several earlier, tentative conclusions:

1. The ashlar slabs of the pavement were originally laid on a cushion of rubble.

2. The westernmost part of the pavement is actually on the breakwater and although not necessarily *in situ*, it indicates the relative elevation within the subsided mass.

3. The most intact segments of the ashlar courses are placed almost directly on sand and shells. This may indicate that there was already sand fill almost to sea level so far from the shore line when the breakwater was built. Even the assumption that all the ashlar courses are of post-Herodian attempt to reconstruct the breakwater, does not agree with the fact that there are no potsherds in the substrata of these slabs.

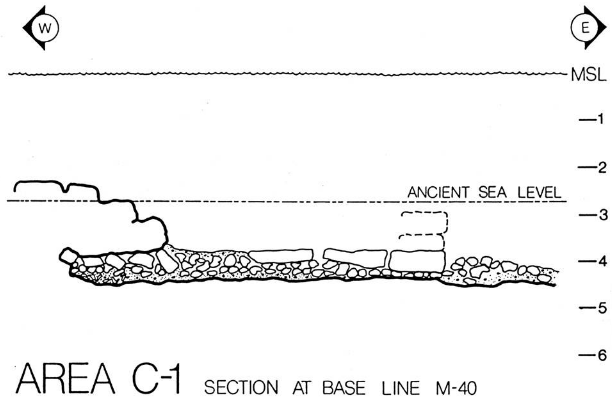



*Figure 5.31. An east-west section across CAHEP's probe C (Raban 1989, Fig. III.13)*

4. The absence of underlying clay in Area B2 probes might indicate that the area was within the original outline of the breakwater mass and the various ashlar courses were not carried away as far as the harbour's floor.

### *c. Area C*

The area is located next to the northern part of the line of the Inner Quay (Fig. 5.27) and subdivided into two areas (C1, C2). In Area C1 (10 X10 m) a trench was dug along the stretch of three consecutive blocks of ashlar headers (0.3–0.6 × 0.7 × 1.8–2.15 m) in three parallel courses (Fig. 5.31). The facade of these slabs was extensively abraded and they seemed to lack as much as 0.10 m of their original height (currently 5.8–5.9 m below MSL).

Under the blocks and the sand (Fig. 5.31) there was a layer of angular rubble and below it either the side of a huge ashlar block, or a further concrete mass. At a depth of 6.6 m below MSL, three sherds of the Late Hellenistic era were found: a spindle-shaped juglet, a glossy Red Eastern Sigillata bowl and a "Megarian" bowl. Below this level and down to 8 m below MSL there were layers of different sediments with no artifacts.

Another trench in Area C1 revealed a mix of spilled rubble and tilted blocks. North of the designated grid, there was a course of four ashlar headers on an east-west line, perpendicular to the main course. These blocks were broader but thinner (2.2 × 1.05 × 0.35 m) than those of the Inner Quay. No underlying course of stones was traced anywhere in the area, and no artifacts were found below the layer of shells (6.8 m MSL).

In Area C2 the last offset blocks of the Inner Quay were surrounded by heaps of rubble and partially decomposed concrete blocks. This uneven surface continued for about 6.0 m farther to the east of BL. At that point there

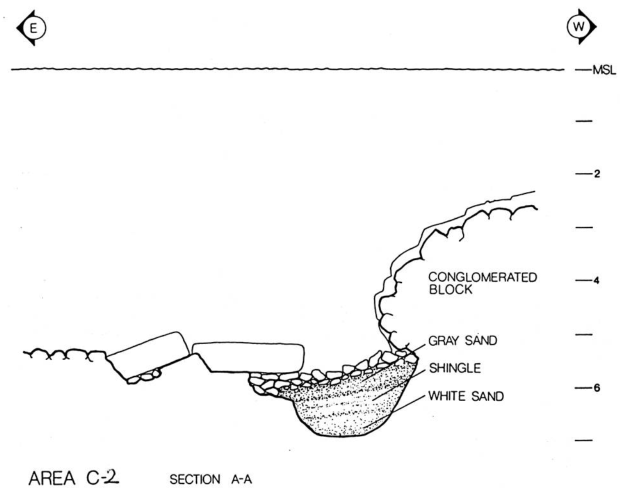



*Figure 5.32. An east-west section across CAHEP's probe C2 (Raban 1989, Fig. III.14)*

is a large stone block (2.2 × 0.8 × 0.7 m) tilted sharply eastward towards the sandy sea floor along some other blocks underneath. In order to determine as to whether this feature was part of a vertical wall of ashlar headers, a probe was dug on the lower part of this block (Fig. 5.32). A second ashlar block (2.1×1.1×0.8 m) was exposed lying horizontally in the sand and another block (1.2 × 1.5 m) was recovered to the south; it had rounded edges and a recessed face on one side with a 1.2 m deep hole (0.3 m) in its centre. The hole was filled with naturally concreted shells and pebbles. This ashlar stone was cleared to a depth of 1.5 m below the sandy sea floor and over 3 m of it were exposed. It is unlikely that none of the three ashlars is *in situ* and they fell from a structure on a higher ground. The uniquely shaped half-buried slab could be a long mooring stone that was once incorporated within the vertical face of the Inner Quay, like the one found later in the Inner Basin (see below), or a component in the base of a tower similar to those comprising the debris on the tip of the Northern Breakwater (see below; Raban 1981b: Fig. 11). It was clear that there were neither underlying course of blocks nor artifacts at this point.

Additional probes (C3, C5, C6, D3, D4, D5) were dug at the northern part of the main mole. These probes yielded data well represented by the finds revealed in the largest probe D3 (Fig. 5.33; Oleson 1989: 119–120; Raban and Stieglitz 1988: 273–275). This area revealed blocks laid on a cushion of rubble (5.4–6.0 m below MSL) with well stratified, single deposition of 12 layers of sand under it

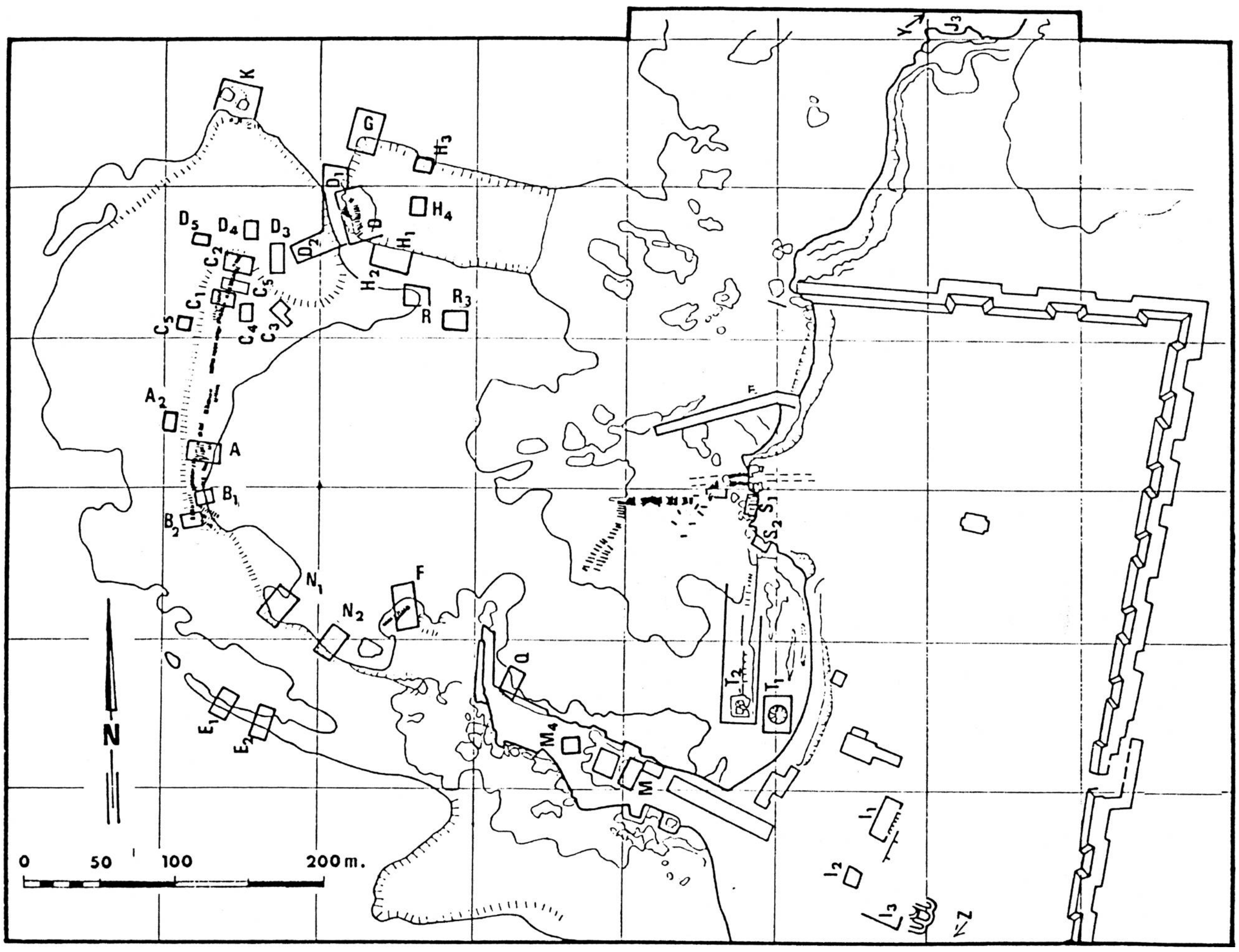



*Figure 5.33. Locator map for CAHEP 1986-1987 excavations (A. Raban, Caesarea Project)*

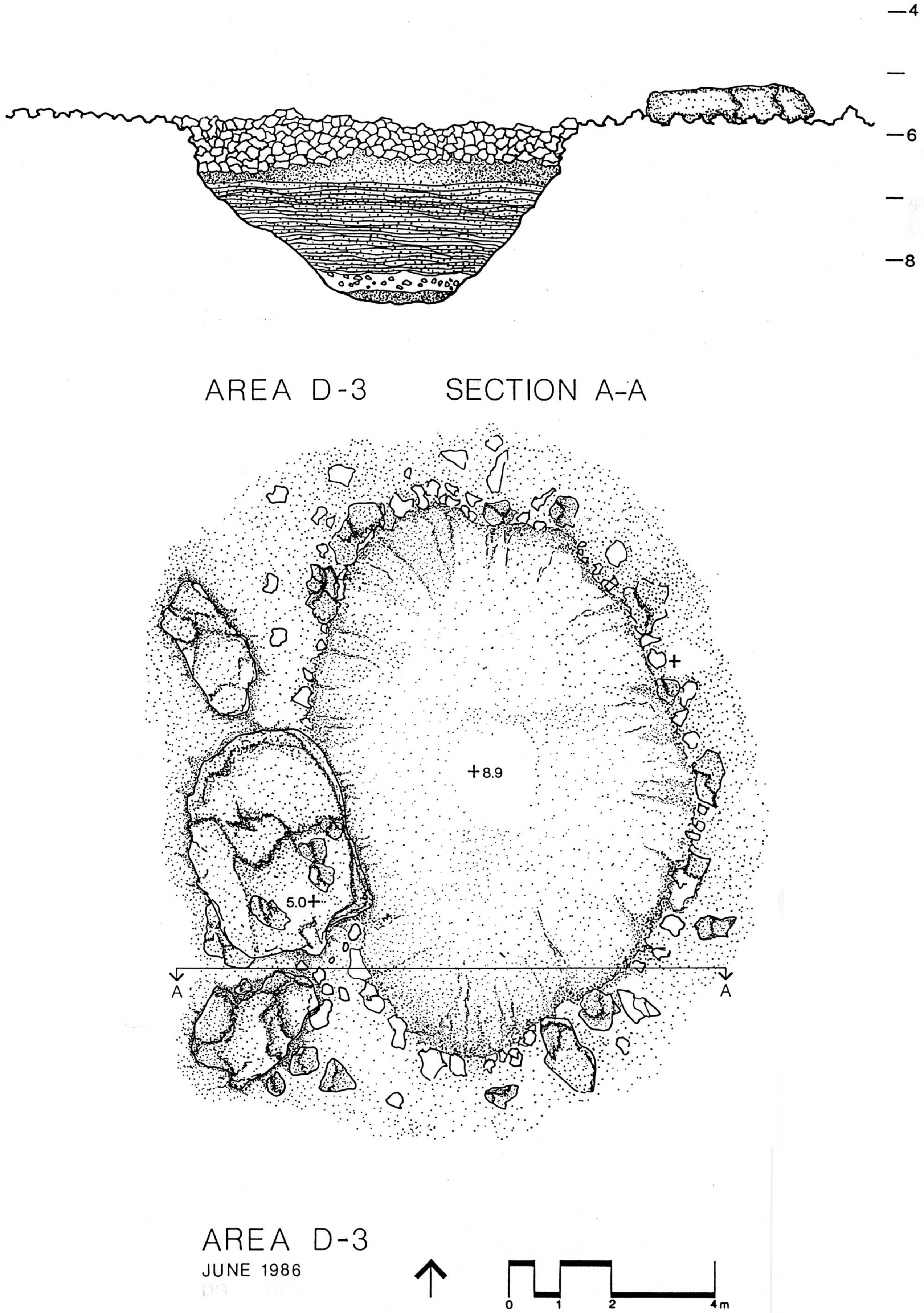



*Figure 5.34. Plan of probe D3. + Fig. 50 E-W section across D3 (A. Raban, Caesarea Project)*

(Figs. 5.34; Raban 1989: Fig. III, 37; 1998a: Fig. 28). This sequence of deposition took place well off the surf zone and almost half a kilometer into the open sea. It indicates that the artificial cells in the southern mole, between Areas U and K, were exposed long enough to allow the surge to fill them through natural process of deposition. This could happen after the wave-carrying capacity decreased with its breakage over the artificial barrier of the external wall (Raban 1985b: 155–158). It is assumed that such a process occurred over two or three winters with three to four big storms each year.

Only the lowest layer of this deposition (8.4–8.7 m below MSL) contained badly wave-eroded sherds among which were fragments of Late Hellenistic glossy bowls (probably late second century BCE), an oil lamp and unidentifiable amphorae. This lowest layer may represent the original sea floor at the time of the construction of Sebastos in the Late Hellenistic period.

*d. Summary of construction*

The data gathered along the Inner Quay facing the inside of the Southern Breakwater can be summarized as the following:

1. The main feature is segments of courses of ashlar blocks, all arranged as headers. Some of the blocks were pulled from their original position and others subsided through the fluidization of the underlying sand. There were two types of blocks: the first, almost equal in its dimensions, was found along the edge of the Inner Quay and may have faced the quay as a retaining wall; the second type was thinner and broader, like paving slabs, and likely originated from the paving of the promenade held by the retaining wall.

2. The ashlar paving was laid on a cushion of rubble above a sand fill. The thickness of these layers probably represents the depth of the sea at the time of construction. In most places the bulk of this fill was dissipated by the action of the sea from the time of the decay of the retaining wall.

3. There are no indications of the exact configuration of the Inner Quay or the manner of its construction. It is unlikely, but still possible, that its base was built of the now-decomposed concrete blocks, topped by one or two courses of ashlar headers. There is no evidence of adjacent secondary quays or jetties along the inner face of the Southern Breakwater within its 165 m preserved section.

4. There is no architectural, stratigraphical or ceramic evidence for any later building construction of the post-Herodian period.

### 3. The Northern Mole

It seems that at the end of the construction of the second phase and after the filling of the cells by sediment carried by waves to the ancient MSL, a scaling and stabilizing cushion was laid over them. It consisted of rubble and large pebbles that served as an ample base for the superstructures, such as the paving slabs of the quays, the spinal wall, the vaulted chambers and the "Promenade" (Fig. 5.35) mentioned by Josphus (BJ 1: 413; AJ 15: 337). Only after the main mole was built and was in functioning order, keeping off the force of the waves, could the construction of the northern mole be commenced at its lee. Here too, the course of the structure was planned from the tip of the northern promontory and extending westward for about 240 m.

### 4. "The Artificial Island"

At the western edge of the mole another type of "artificial island", or working platform, was installed. This was supported by hydraulic concrete blocks formed by wooden structures, as were the other two "islands". Of these blocks only one was found and studied and the others were buried under a heavy spill of tilted large stone blocks from the massive crowning structure at the tip of the mole. The surviving block (2 × 15 m) is located at the northwestern corner of the mole (Area G; Fig. 5.7). It is missing its northeastern corner and was eroded along its eastern face. It is surrounded on all but the northern side by a trench (0.4–0.8 m wide) left by the decayed upper portion of the wooden formwork. Along the east and south faces the wooden frame was destroyed above the level of the sleeper beams. The decay of the wood left a form of tall, free-standing oblong blocks (Fig. 5.36).

Excavation revealed that the gaps were filled with a mixture of rubble, sand and artifacts, mostly badly eroded body sherds of amphorae, fragments of fine wares, lead fishing weights and even a corroded bronze statuette of Zeus. These were clearly not a coherent deposit, being the result of the accumulation of harbour debris, which was randomly swept over time into these gaps. Remains of the blue-green mortar that was poured into the hollow walls of the frame were exposed within the trench along the west face of the block. The upper surfaces of the surviving planks and uprights were seen hidden deep within the recesses around the masses of mortar. Prior to the excavation, the northern face of the block was covered by a sloping pile of *kurkar* and limestone rubble (0.3–1.0 m) laid directly against the exposed concrete face. When the rubble was removed it was revealed that the upper portion of the formwork along this face and above the main sleeper beam was taken away in antiquity, before placement of the rubble berm. The rubble survived along the eastern and the northern half of the western faces as well, thus preserving the wood from decay and damage. Several paving slabs survived on the upper surface of the block (3.4–3.6 m below MSL; Fig. 5.37). Traces of an iron chain were found fused by corrosion to the *kurkar* blocks adjacent to the southeastern and northeastern corners of it. The outer face of the trench was composed of irregular packing of boulders and eroded blocks (Fig. 5.38). The sloping berm around the eastern, western, and northern

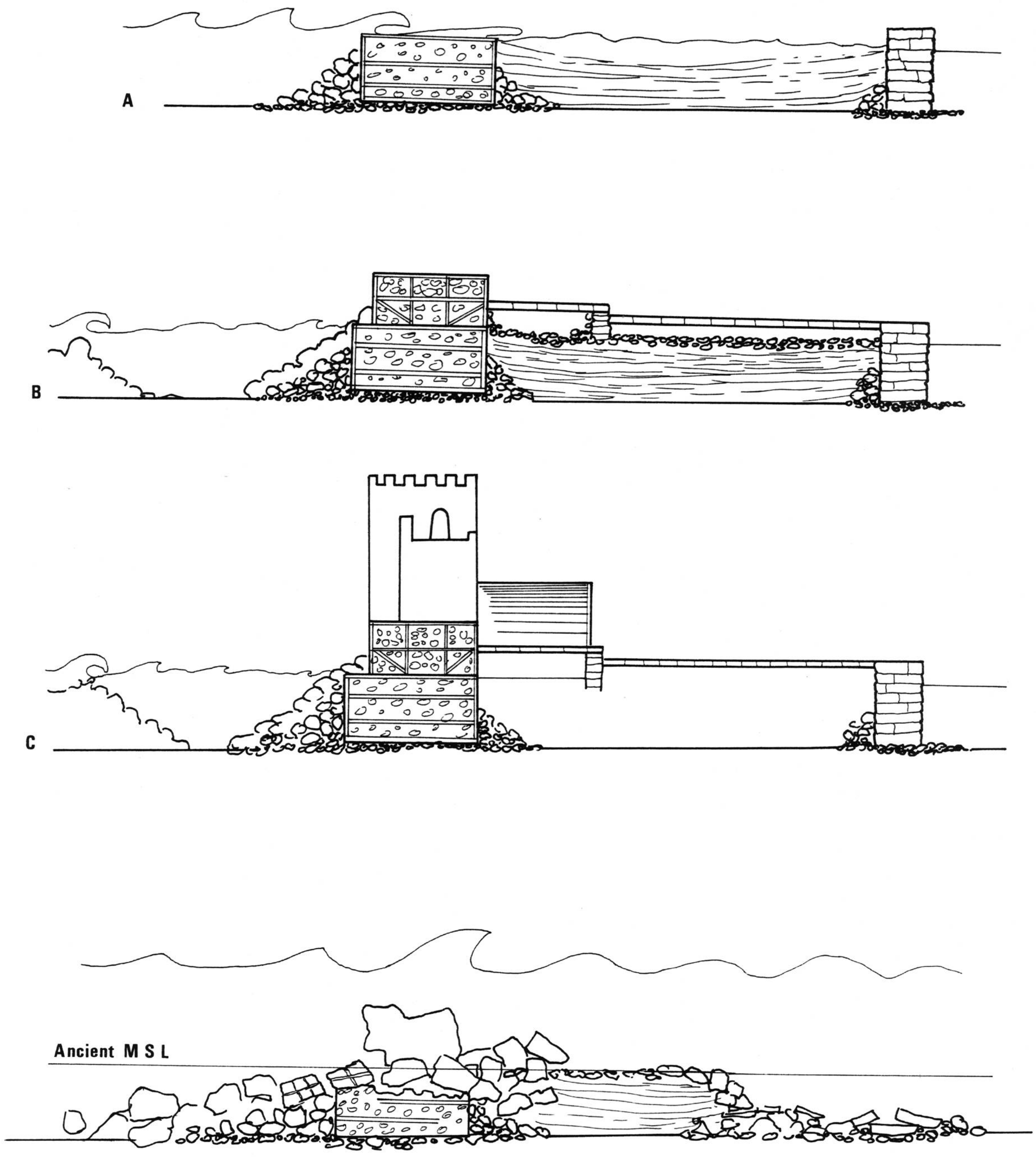



*Figure 5.35. Schematic rendering of the building stages of the main western mole of Sebastos, in section (A. Raban, Caesarea Project)*

faces was probably intended to weigh down and buttress the form during placement of the concrete and to prevent subsequent erosion of the sand foundation on which the block was placed. The larger blocks and rubble around the southern face may represent packing placed between the finished northwestern block and adjacent blocks of *kurkar* or concrete laid or poured earlier.

There seemed to have been three courses of large *kurkar* blocks along the southern face that are now incorporated in the naturally concreted mass of the northern breakwater (Raban 1983b; 1984: Fig. 2). Such packing was necessary in order to prevent the erosive waves funneling through the crevices created by removal or decay of the wooden forms between the blocks. The installation of several courses of blocks and paving stones made this precaution even more essential, since waves funneling between the blocks would have forced the capping slabs out of position.

The lower surface of the block was smooth and leveled. Excavation beneath it showed that it was poured directly on sterile white sand that formed the original sea-bottom. Careful examination of the lower surface of the block (Fig. 5.39) showed that there was no evidence for flooring planks.

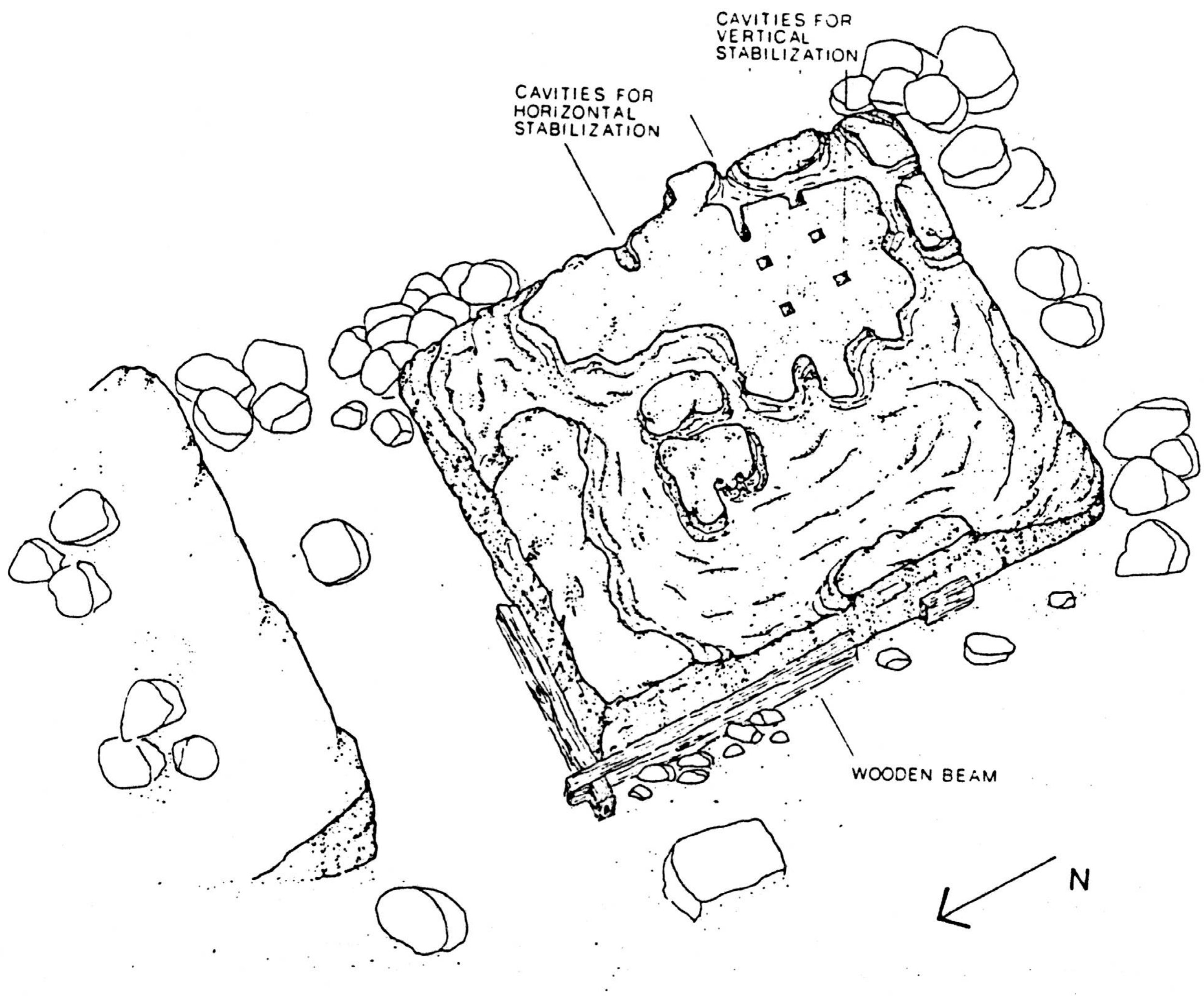



*Figure 5.36. Area G: isometric actual state drawing (Raban 1989, Fig. III.51)*

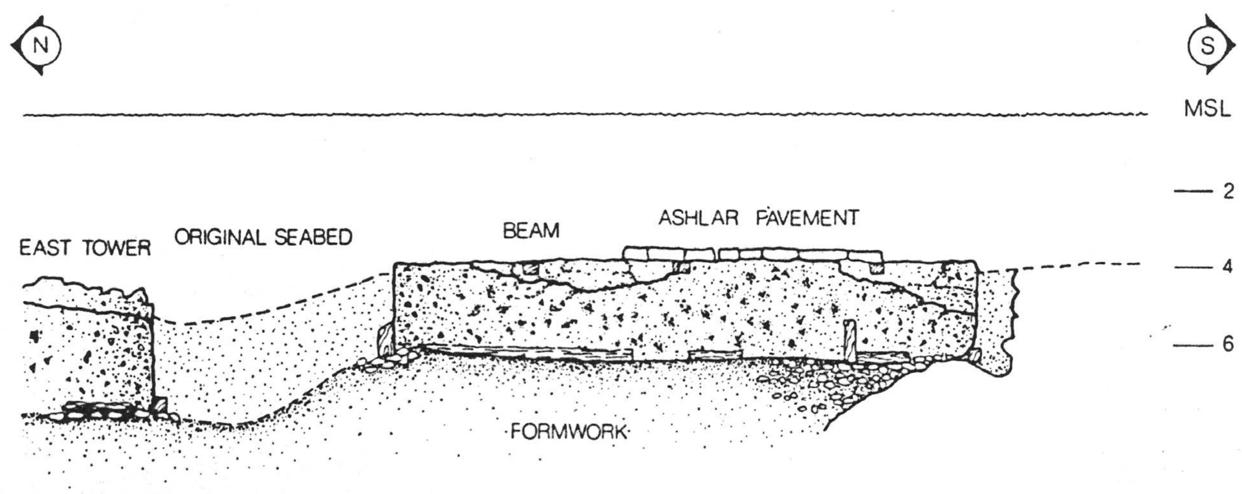



*Figure 5.37. Area G: N-S section (Raban 1989, Fig. III.52)*

A regular series of channels and holes (c. 0.18×0.18 m) were observed in the upper surface of the block. These channels were made by the horizontal wooden tie beams that crossed the formwork at intervals of approximately 1.6 m, and by uprights (possibly spaced 1.3 m apart) intended to reinforce them until the placement of the concrete. Although no traces were found, it seems that there were north-south tie beams as well, designed to brace the other

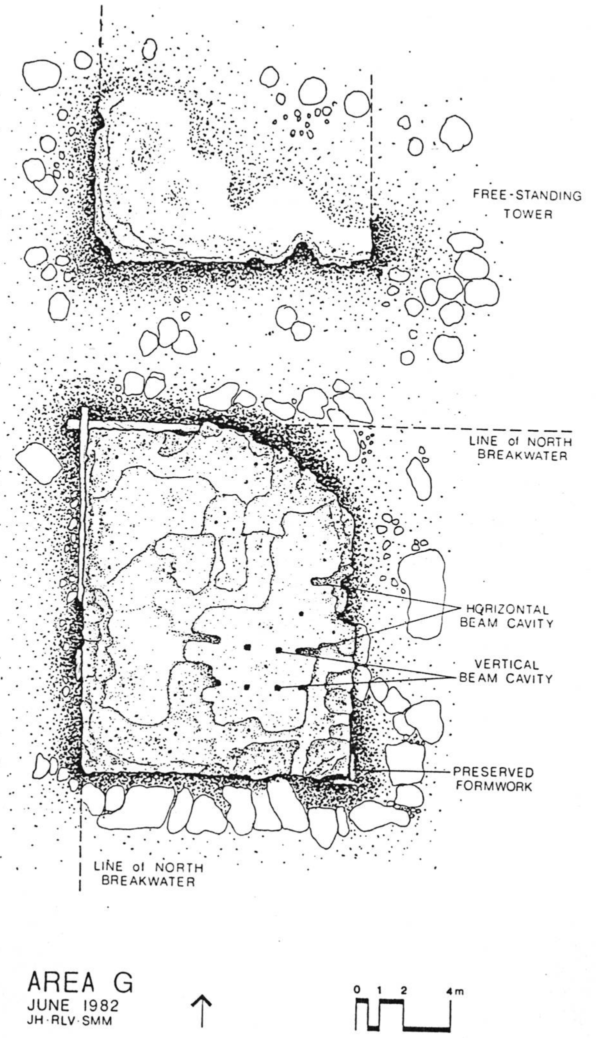



*Figure 5.38. Area G: Top plan (Raban 1989, Fig. III.50)*

*Figure 5.39. The north face of the block and its sleeper beam from the west (Photograph: A. Raban)*

two sides of the form. Apparently, these braces were necessary only at the upper portion of the form, since the holes left by their decay were not observed along the lower portions of any of the exposed faces of the block, nor did the exposure of 4 m of the northern sleeper beam reveal any joints other than the lap joints at either end, bonding it with the adjacent sleeper beams.

Further excavation provided information on the design of the form (Figs. 5.40–5.43). The formwork, best preserved at the northwestern corner, was built on massive pine (*Pinus*) and fir (*Abies*) sleeper beams (c. 0.29×0.29 m) that ran along the base of each face of the block and interlocked at the corners with simple lap-joints. A series of pine and possibly fir uprights (c. 0.12–0.15 × 0.23 m) mortised into the horizontal beams at 1.60 m intervals carried an external and internal wall of horizontal pine planks (8×14 cm). The lowest plank on the inner face of the formwork was inset slightly into the upper surface of the large sleeper beam and fastened with mortise and tenon joints. In the recovered samples the tenons were of oak (*Quercus*) and poplar (*Populus*). Mortise and tenon joints were also reported from formwork around inundated concrete structures in North Africa (Yorke and Davidson 1985). The planks must have been nailed to the uprights, but it was not possible to examine any surviving joints for verification. Interestingly, the wood species are not indigenous to this area and had to be imported.

At present the seams between the various planks and beams that made up the formwork are filled with a sandy white mortar. This substance may be intentional packing designed to seal the seams, but it could also be cement that was forced into loose seams when the interior of the formwork and its hollow walls were filled with concrete and mortar. A translucent material resembling gypsum crystallized over time on some of the wooden surfaces through reaction with the seawater.

The hollow spaces formed by the lower beams, uprights and double wall of planks were filled with a blue-green sandy mortar containing large particles of *tufa*, pumice and lime. Striations in the mortar show that the substance was poured in quickly in a semi-liquid state and padded as it filled the cavities. The fabric of the block is composed of the same material, but with the addition of a high proportion of aggregate consisting of irregular chunks of *kurkar* and sea-worn boulders of a harder limestone. Chunks of the greenish, granular *tufa* (concreted volcanic ash) and fibrous pumice used in the mortar were recovered from

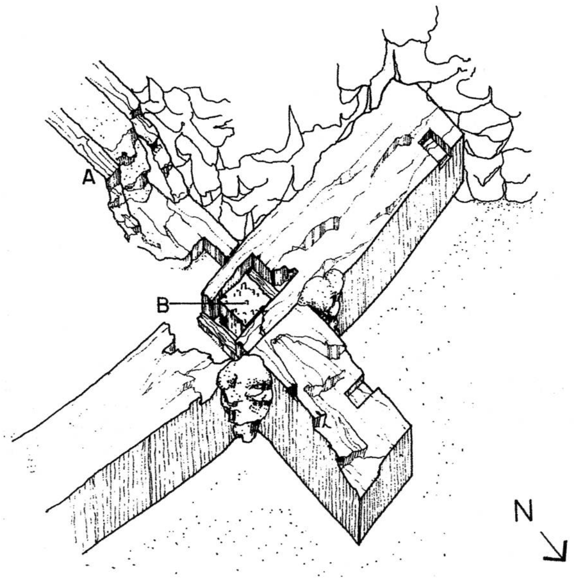



*Figure 5.40. North-west corner of formwork, actual state drawing (Raban 1989, Fig. III.55)*

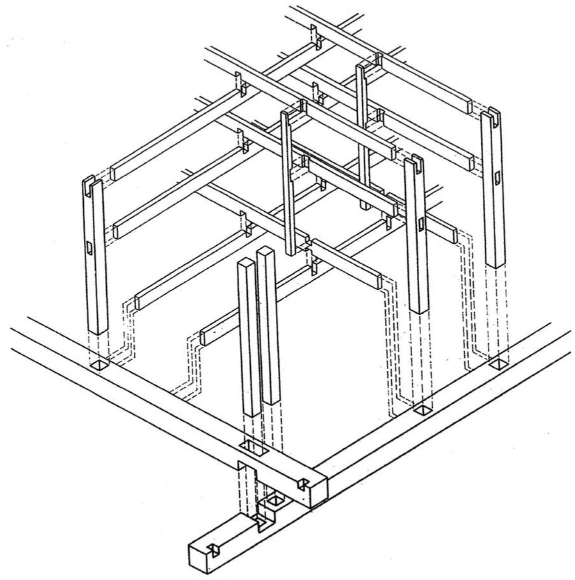


*Figure 5.41. Area G: hypothetical reconstruction of formwork framing (Raban 1989, Fig. III.59)*

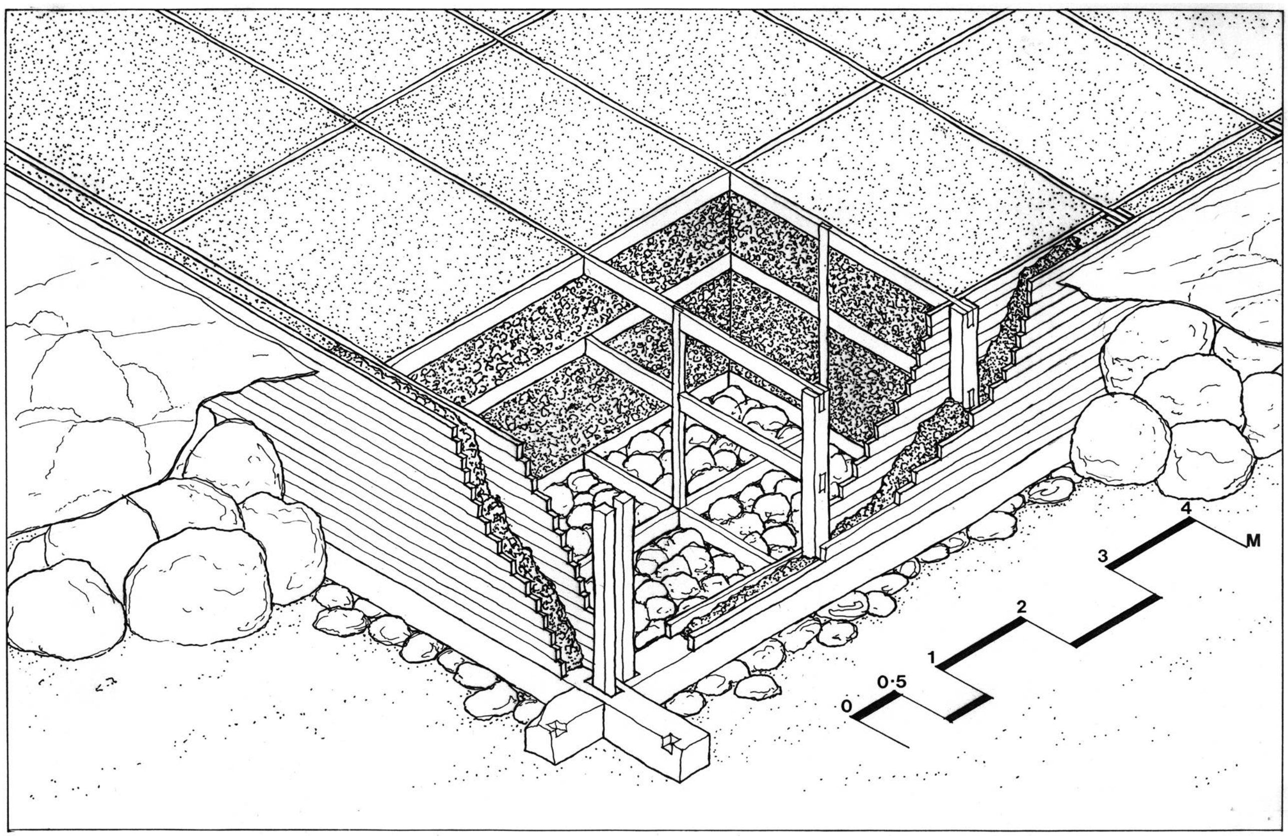



*Figure 5.42. Reconstructed state of the NW corner of the formwork at Area G (Raban 1989, Fig. III.61)*

the fill in the harbour channel. For details of the chemical analysis of the mortar, *tufa*, and pumice, the concrete and its constituents, sources of materials and technology see: Oleson and Branton 1992: 56–67 and Brandon 1996.

The wooden formwork, or prefabricated caisson, in Area G was placed at a site already partly protected from the elements. Thus, its designers preferred to work out a lighter type than the bulky and rigid ones used in Area K (see above). There is no doubt that the double walls form was fabricated and assembled on shore. The *tufa* rich matrix (over 60% of the volume) was poured as a liquid mixture with the sleeper beam as its base. Once the mixture dried up and petrified (still on land) it added some rigidity to the rectangular form and being of low specific gravity (0.68) when dry, it would not have affected the buoyancy of the

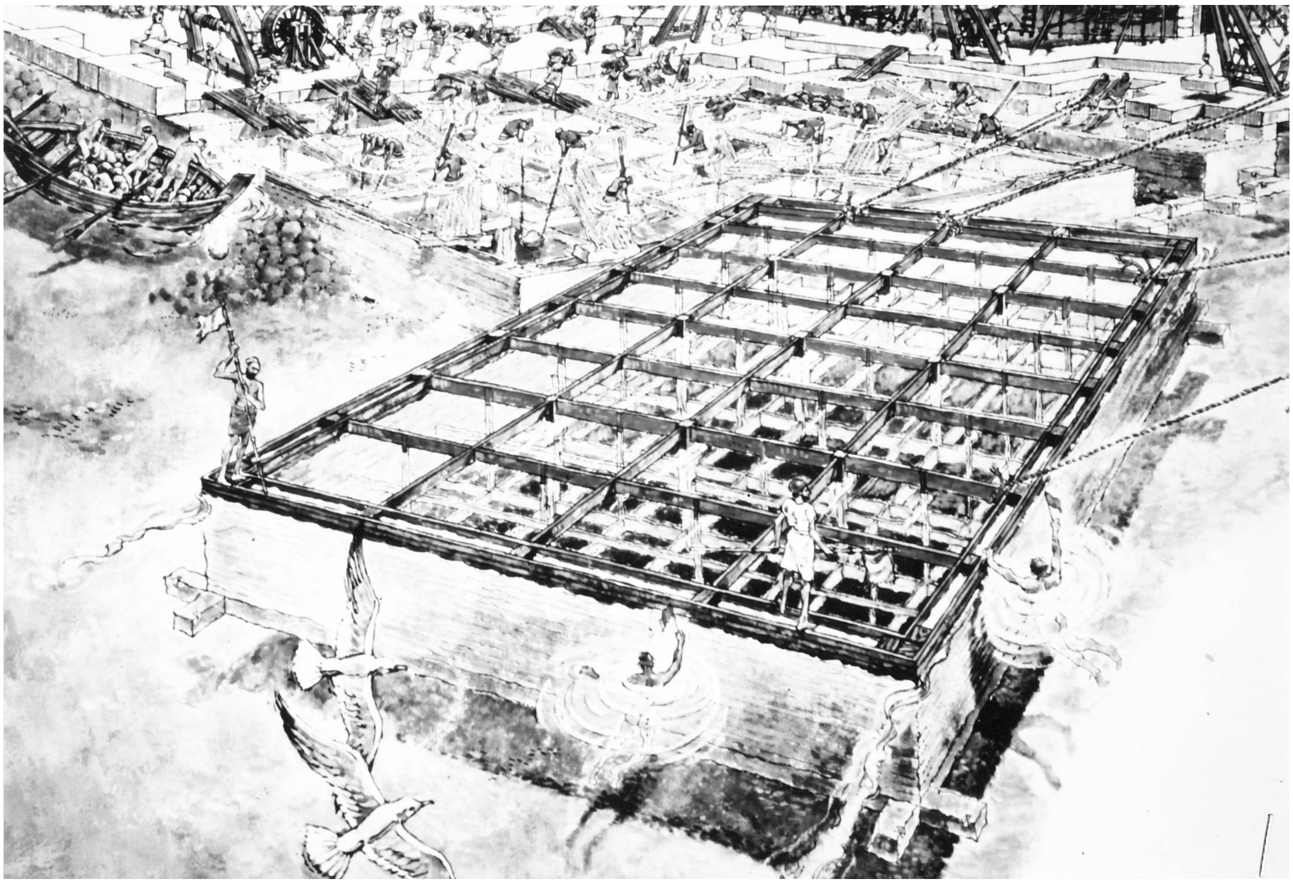


*Figure 5.43. Reconstruction of the building. (Holum, Hohlfelder, Bull, and Raban (eds.) 1988, Fig. 65)*

caisson when towed to the working site (Fig. 5.43). At this location the form was moored at its corners by iron chains to the sea floor. The seawater would then percolate and soak the matrix, causing it to become heavier, and eventually the entire form would lose its buoyancy and subside to the sea floor. Then the hollow compartment could be filled with a mixture of rubble and concrete, becoming a proper working platform.

A second concrete block was discovered projecting from the sand 6.6 m north of Area G, separated from the rest of the breakwater mass (Figs. 5.36, 5.38). Excavation revealed that this block (5.8–7.7 m below MSL) was built of the same materials and in the same manner as the first one, and that the blocks had approximately the same orientation with their western faces aligned. Although traces of what may be a rubble brim survived around the block, only a few pieces of wooden formwork were preserved and the concrete mass itself was badly fractured and incomplete. The lower surface has an 8 percent tilt to the west. The west face of the block was exposed for 6 m uncovering several holes left by horizontal tie beams. It seems likely that the block tipped and was fractured during the fault slippage or bottom slumping, which affected much of the outer harbour during the second century CE. This block was probably the foundation of the single tower mentioned by Josephus as standing to the port side of a ship entering the harbour (AJ 15: 338; BJ 1: 413). As at the main mole, the distance between the artificial island at the tip of the northern mole and the rocky shore was confined by two parallel walls or ramparts – one along the external, northern side and the other 60 m south of it which supported the inner face of the mole.

The configuration of the northern mole is much more coherent than the western one with its steep sloping, rubble covered sides confining a well-defined rectangle (60×160 m). Its eastern half was established over a rocky sea floor and mass of the building materials, and construction components are still *in situ* (Fig. 5.7).

The southern part of that mole seems to be covered by a later rampart of piled rubble, probably what was left from the harbour renovation carried out by the Byzantine emperor Anastasius I c. 500 CE (Raban 1985b: 155–159; Raban and Stielitz 1988: 273–274; Raban *et al.* 1990: 245–247). Probes carried out through this rampart did not yield any concrete evidence for such a quay at Sebastos (Oleson in Raban 1989: 130–131). Yet, the overall extensive width of the northern mole cannot be understood unless it had quays and storage facilities on it.

The quantities of scattered blocks of hydraulic concrete which were exposed in every probe (H3–6) made in this mole indicated that its main component of construction was a wooden formed *pozzolana* confining infrastructure (Raban and Stieglitz 1988: 273–274). The meager remains of cut blocks from the preserved context of the mole pointed

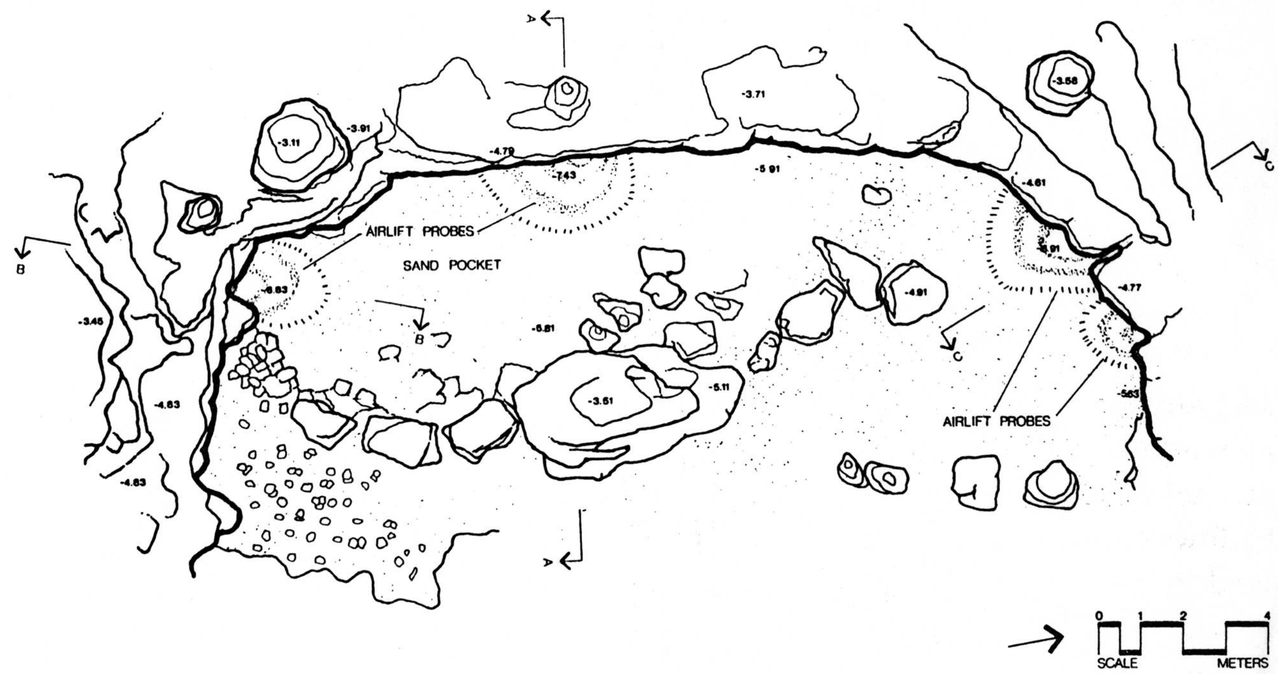



*Figure 5.44. Top plan of Area H/6 (A. Raban, Caesarea Project)*

towards extensive robbing of building materials from its overall northern perimeter. Such stripping activity, which took place following the initial demise of Sebastos (Raban 1992c), can account for the absence of ashlar blocks along the inner edge of the mole and its southeastern side (Area N; Raban 1989: 157–160).

Both, aerial photographs and underwater surveys carried out by CAHEP across the northern mole indicated that at present it has a concave section (Oleson 1989: 224–226). The aerial photographs suggested that these parts within the mole comprised sand pockets. Probes carried out in the northern mole aimed to study the sediments and the stratigraphy of these pockets and to compare the northern and the main mole (Fig. 5.7). The central rectangular hollow sand pocket (H6) did not yield intact vertical inner faces of concrete blocks, but tilted and segmented blocks of *pozzolana* were encountered at the perimeter (Fig. 5.44; Raban *et al*., 1990: 245–247). The sand pocket itself was breached and disturbed by the surge, probably from antiquity on, and contained finds both ancient and modern with the earliest artifacts dated to the third–fourth centuries CE. For that reason it is hard to tell whether the original sand deposition process was a natural one, as it was in the main mole, or that these hollow compartments were filled by the constructors of Sebastos (Oleson 1988: 154–155).

An extensive probe was made over the concave central part of the northern mole (H7), 70 m east of H6 (Fig. 5.7). Under the rubble and scattered building blocks, there was a 2 m thick sand layer devoid of any shells or pottery and laminated in a single deposition. At its base (6.8 m below MSL) there was a thin continuous horizontal bed of rather compact *Glycymeus* shells, under which there was the regular open water sandy depositions with some shells in it, but no sherds or other manmade artifacts down to the *kurkar* bedrock (7.7 m below MSL). This stratigraphic sequence indicates that the sand fill at the northern mole was wave-perpetuated rather than artificially pumped-in, much like over the main mole.

In summation, it seems that the concept of using sand as a major fill component was exercised on both moles to a similar extent. Having the present elevation of the base of the topping rubble, which once sealed in the sand fill at only 4.5– 4.8 m below MSL and the base of the fill at just below 7.2 m, may indicate that the rate of eventual subsidence of the mole at that point since antiquity was about 1 m less than at the western mole.

### D. Construction of Sebastos – Phase Three

This phase in the construction of the moles of the external basin of Sebastos commenced with the addition of the so-called *prokomia* (BJ 1: 412), or *prokumatia* (AJ 15: 336). This term, which was an *hapax legomenon* in ancient Greek texts, can be translated, literally, as "before the waves", or "against the waves", namely "protection against the waves" or "encountering the waves", in other words: "breakwater". These structures existed in many harbours in the Greek and Roman sphere, but none was similarly called. Based on Josephus' textual context this breakwater was installed on the seafloor outside the spinal seawall at a distance of hundreds of feet in order to defend the main moles along their external edges facing the sea.

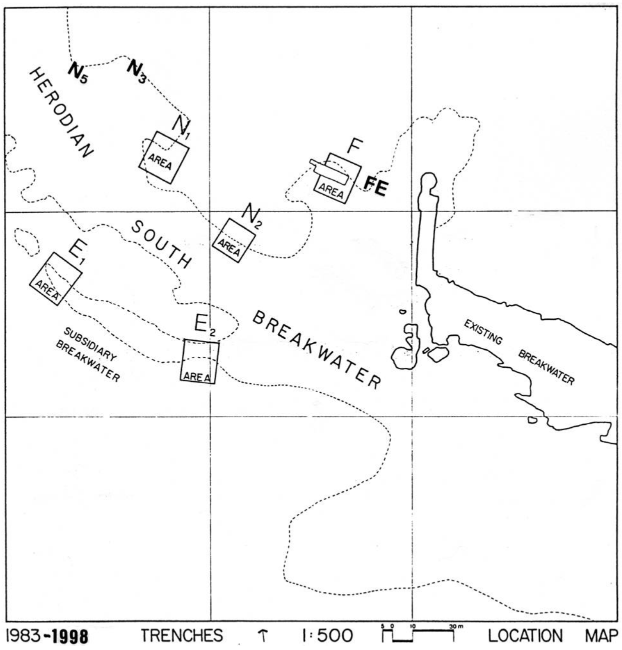



Figure 5.45. Locator plan for CAHEP excavation at the southern mole (A. Raban, Caesarea Project)

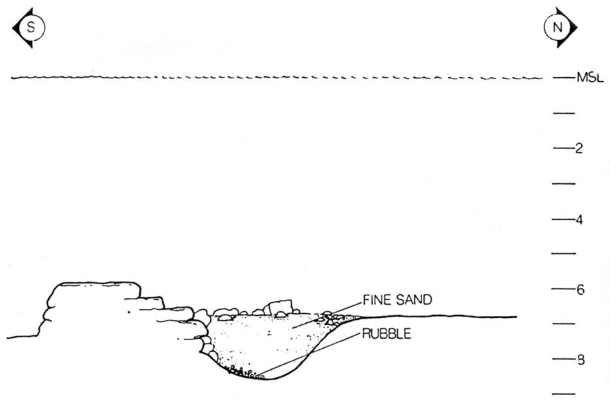



Figure 5.46. N-S section across probe E1-a of CAHEP+ N-S section across probe E1-b of CAHEP (Raban 1989, Figs. III.39-40)

### 1. The "*Prokumia*" (Area E)

In 1976 a special type of man-made structure was traced on the southeastern side of the main mole. It was a sunken rampart of debris that split into two parallel lines; the main one formed the mole itself and the other, much narrower, was 20–30 m to the south (Fig. 5.7). It was 2–3 m high; the width at its base was 5–6 m tapering to less than 3 m at its tip. The highest crest of this "wall" was 4.8 m below MSL and it was built of alternating segments of concrete blocks, topped by presently displaced ashlars and rubble conglomerated with cement. A trial trench was carried out by using a device called "Blasting Knee" that pushed off the non-consolidated sand from the seafloor. The base of the "wall" (7 m below MSL) was exposed. It consisted of roughly laid courses of large rubble with a wider regular cushion of pebbles over 8 m below the MSL (Raban *et al.* 1976: 47–48). Following additional probes along this "wall" (Raban 1989: 121–124) it was concluded that it is unlikely that this "wall" was created by the destruction of a portion of the southern breakwater through wave action. The missing segment and the depth of sterile sand on the inside were too large and the resulting pattern too regular to match such a process. Furthermore, sections across the main breakwater in this area showed the same patterns of material and construction were found farther along its length.

If this feature was in fact an intentional construction, it was designed to serve as a subsidiary breakwater that broke the waves at some distance from the main breakwater. In order to function this way, the "wall" should not be at sea level to cause swells to crest and break dissipating most of their energy, and thus its relatively low relief and flimsy structure were not impediments. This design was used elsewhere in the Mediterranean in antiquity where these subsidiary breakwaters brought about this same "premature" breaking of waves, and the principle is still applied in harbour design today (Quinn 1961: 153–54, 205; Cornick 1959: 116, 118–222). The excavation and water and air-jet probes carried out around the subsidiary breakwater (*prokomia*) yielded the following results.

#### a. *Area E1*

Two locations were selected along the western part of the *prokomia* (Fig. 5.45); the first (Area Ela) was located 105 m west of its base and the second (Area Elb) was placed 10 m eastwards. In Area E1a the subsidiary breakwater seemed to be more coherent and better preserved (Fig. 5.46). It had a flattened crest and the southern side sloped steeply, almost vertically, and was partially buried in the sand 1 m below the crest. The upper part of the northern face was missing, but the rest seemed to be built of roughly cut *kurkar* blocks (average 0.3 × 0.6 × 0.8m). The fallen stones are now scattered on a bed of sand (7.2 m below MSL; 1 m below the present level of the sea-bottom) and the base course was laid on top of what seems to be a concrete block (7.6 m below MSL). The probe encountered a thin layer of pebbles and chunks of *kurkar* (8.5 m below MSL) under which fragments of weathered concrete mixed with quantities of sand were found.

In Area E1b a trench was excavated across the *prokomia* subsidiary breakwater from north to south (Fig. 5.46). In a layer of rubble and pebbles laid on clear sand (8.5 m below MSL) fragments of two Herodian lamps were found along with three fragments of Eastern Sigillata A. Strangely, the width of the breakwater here did not exceed more than 3 m, although the sloping debris of the decaying upper portion spilled out 3 m beyond the northern face.

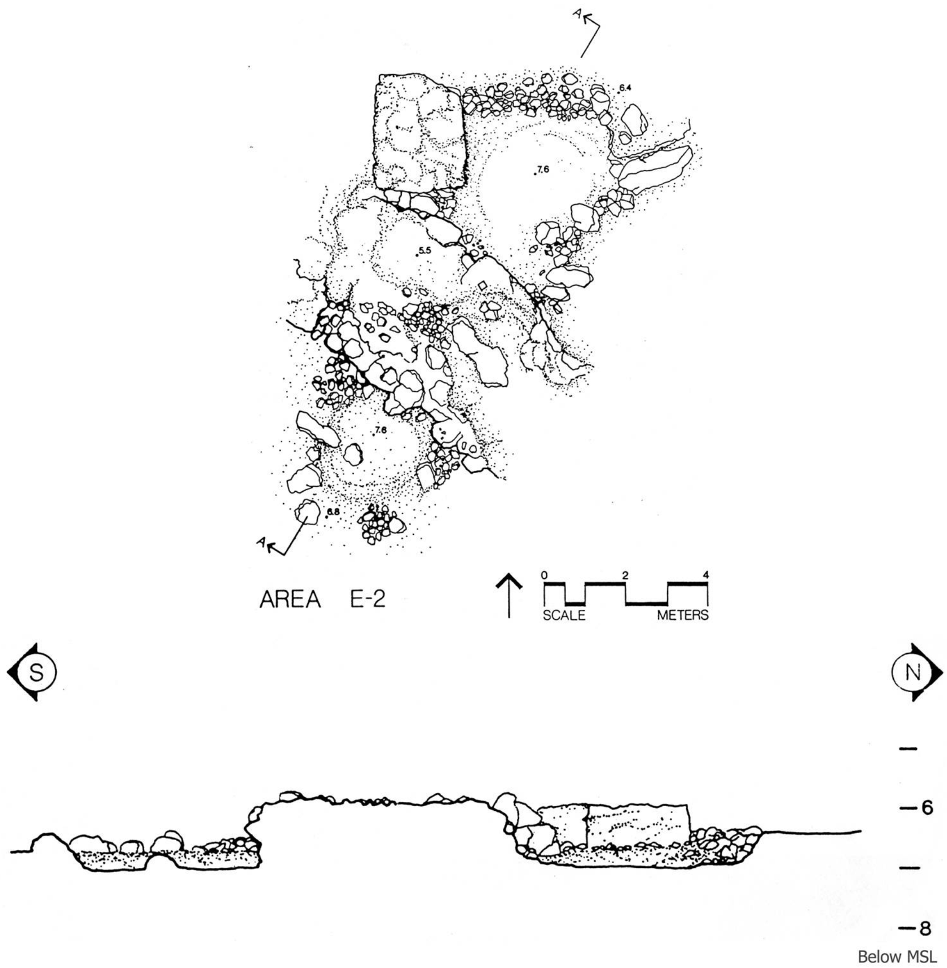



*Figure 5.47. Top plan of CAHEP Area E-2 (1980) + N-S section across Area E-2, CAHEP (Raban 1989, Figs. III.41-42)*

**b.** ***Area E2***

This area was 70 m west of the base of the *prokomia* subsidiary breakwater, where the wall was easily visible and best preserved and most coherent. Trenches (approximately 5 m wide) were marked on either side of the visible portion of the wall (Figs. 5.45–Fig. 5.46) whereas the midpoint of the wall is 5.0 m below MSL. All of the blocks rested on sand and thus, the scattered chunks of *kurkar* and seaworn sherds must have migrated here from elsewhere, possibly from the south, off the crest of the *prokomia* subsidiary breakwater.

The upper surface of the breakwater, approximately the top meter, was built of irregular eroded *kurkar* blocks (0.30–1.2 m long; Fig. 5.47). There was no sign of mortar or concrete and no identifiable coursing of the stones. Immediately below was a layer (0.40 m thick) of small wave-worn *kurkar* rubble (0.1 m) including occasional rounded lumps of the characteristic blue-green Herodian mortar (Figs. 5.47). These lumps probably represent debris from the construction of the large concrete blocks on the adjacent outer face of the main breakwater. The lumps were spilled and lodged in the structure until it hardened and then rolled into the foundation of the subsidiary breakwater during its construction. Alternatively, chunks were broken or trimmed off the large blocks and transported across the sea-bottom in the same fashion. The outer edge of this layer and the surrounding sand were filled with wave-worn pottery, mostly amphorae body sherds. This deposit continued in the northern trench beneath the adjacent large concrete block on its west and the *kurkar* masses on the east. There was significantly less pottery along the more exposed southern face of the structure, but its character and deposition were the same.

The lowest structural deposit lay directly on virgin sand of the sea-bottom (8.05 m below MSL) and it consisted of small *kurkar* pebbles and the dark sand (1.10 m thick) produced by the decomposition of *kurkar*. Since this type of material was very different from the white quartz sand of the original sea-bottom, it probably points to construction activity. In view of the wave-worn chunks of mortar in the upper layer, this lowest stratum may be composed of the smallest type of debris generated by the dumping of *kurkar* rubble for the foundation or core of the main breakwater. Wave action around the new structure would have further reduced its size and spread the layer seaward, while sorting the particles by density and size.

The present remains of the *prokomia* subsidiary breakwater, if totally cleared of sand, would undoubtedly be of a very

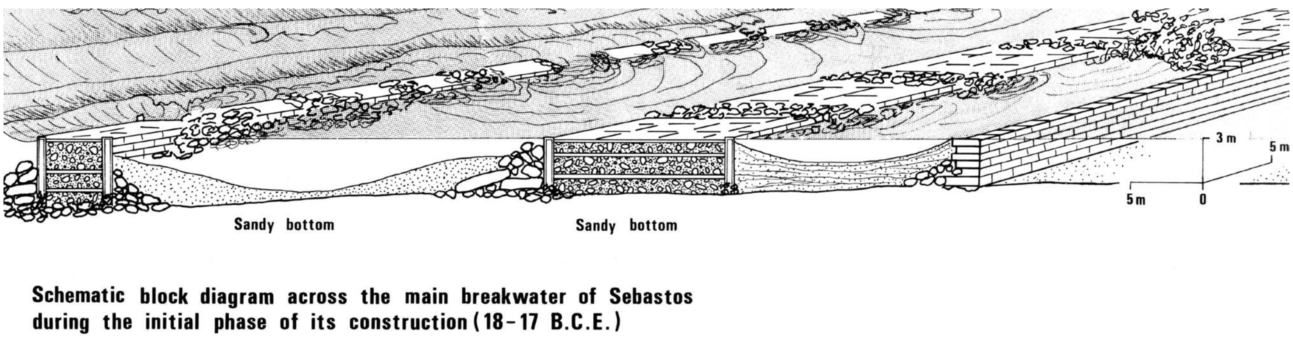



*Figure 5.48. Schematic block diagram of the main mole during phases 2, 3 (A. Raban, Caesarea Project)*

ragged outline. The layer of dark *kurkar* sand extended north and south beyond the limits of our trenches, while the layer of rubble above it seemed to have sloped outward from the outer face of the courses of eroded blocks, at the crest of the feature. Some of this material tumbled before the construction of the structure and other material was eroded and mixed more recently, during its decay. In its present disturbed condition even the substantial *kurkar* blocks forming the main body of the wall did not keep their original position. It may well be that due to its exposed position and lack of routine maintenance, most of the upper portion of the original structure was lost. Blocks of convenient dimensions may have also been removed during the nineteenth century CE for local reuse or export to Akko (Acre).

The large concrete block adjacent to the northern edge of the wall in Area E2 is more of a puzzle. It is unlikely that such a large block could have gradually migrated 30 m seaward from the main breakwater over the centuries, yet no other concrete blocks of similar dimensions are visible at present along the *prokomia* subsidiary breakwater. Tumbled rubble and blocks and thick marine encrustation might well obscure these. The inclusion of large concrete blocks of this type at regular intervals along the structure could have helped in anchoring the smaller *kurkar* blocks and the prevention of the total disintegration of the breakwater at times of particular stress.

### c. *Air-Jet Probes*

In 1982 air-jet probes were used to plot the configuration of the sub-bottom. The outlines of the *prokomia* subsidiary breakwater were cleared, standing about 1.0 m above a field of scattered *kurkar* rubble that sloped gradually towards the core of the structure. The wide spread of the rubble does not necessarily indicate the original dimensions of the structure. On the south, sand covered what seemed to be a continuation of the rubble spill. The core of the wall was broken and scattered, covering the original sloping foundation cushion of small rubble with a thin layer of larger fragments. This layer could not be penetrated and consequently gave the impression of a solid mass.

At the point where the survey line crossed the *prokomia* subsidiary breakwater, its visible portion was only 3 m across, and the sub-bottom profile did not provide any clear indication of the original dimensions at that point. There was, however, a 0.7 m drop-off within 1.0 m of both visible faces and a further 0.9 m decline over the next 5 m to the south, which suggested an original width of 8–9 m for the wall. North of the wall, the sub-bottom profile fluctuated 1.0–1.7 m below the present bottom until it sloped upward to meet the outer face of the main breakwater.

In 1983 air-jet probes were done from Area E1 along the *prokomia* subsidiary breakwater for 30 m, beyond the point where it disappeared below the sand. The probes were at 1.0 m intervals and revealed that the structure continued along the same orientation at approximately 1.0–1.6 m below the present surface. Between Base Line marks 14 and 24 the structure was actually visible as piles of rubble on the surface.

This general consistency of depth over the sampled stretch suggested that it might have extended almost as far as the main body of the breakwater, some 70 m beyond the end of our survey. Nevertheless, a small opening somewhere along the course of the *prokomia* subsidiary breakwater should have existed since it would have allowed water to escape from the waves that broke over it. It is particularly important to note that the probes to the north of the Base Line marks 10 m and 20 m encountered sand in depths greater than 2 m at their outer ends. These circumstances suggested that there was no structural connection between the *prokomia* subsidiary and southern breakwaters other than at their base.

### d. *Summary*

Based on the results of these probes, it is quite safe to reconstruct a segmented low-lying and relatively narrow breakwater that ran parallel along the southern half of the main mole. Its course would have been from its stem to the weathered edge of the half-way artificial island (Area U; Fig. 5.7) and from there, farther north, to the southwestern corner of the other breakwater in Area K. The segmented

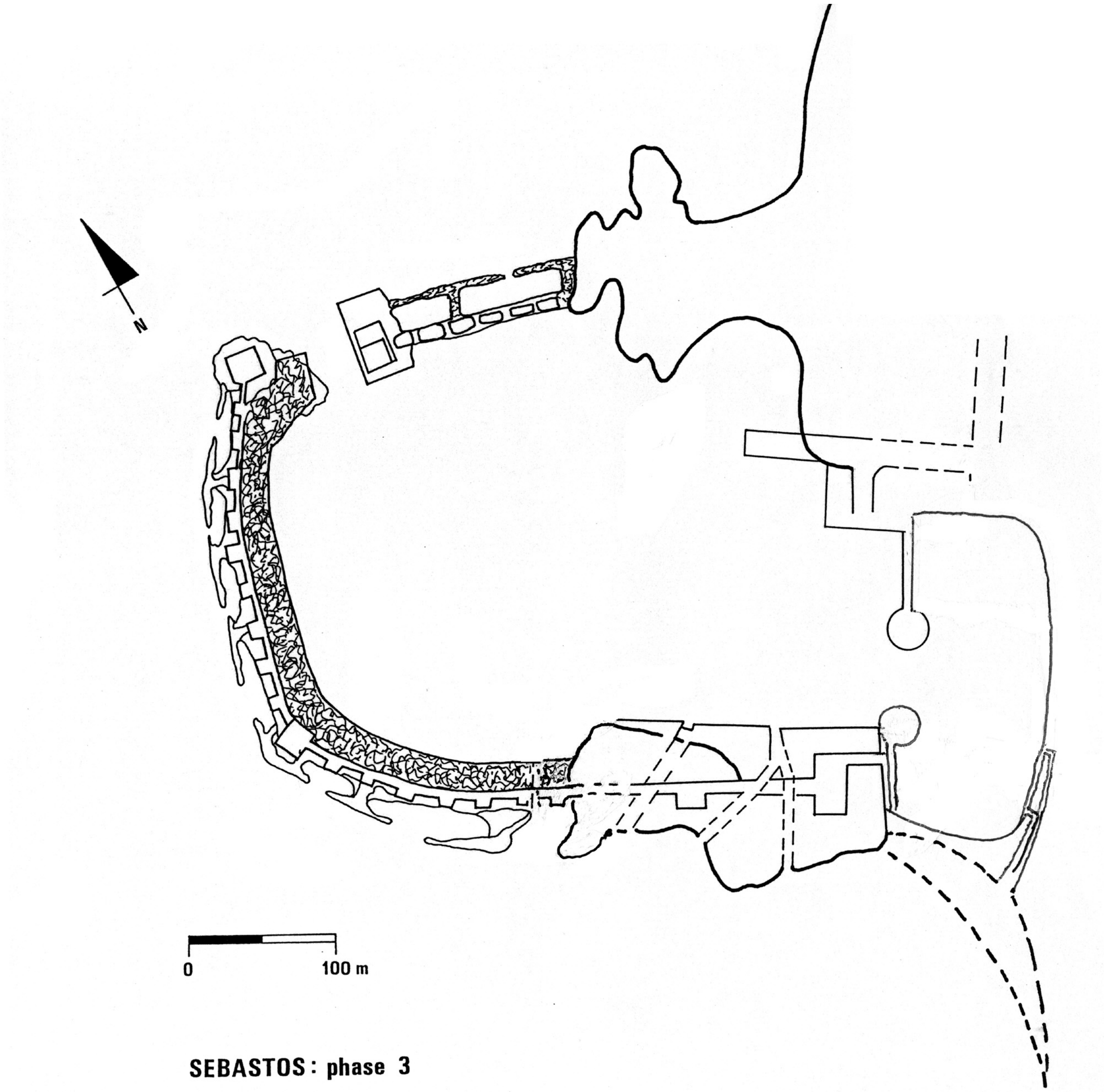



*Figure 5.49. Schematic plan of Sebastos under construction, at the end of Phase 3 (A. Raban, Caesarea Project)*

course of this subsidiary breakwater allowed openings for rip currents, which carried out the overflow of the wave-driven seawater and some of its load of sand particles back to the open sea. Thus, the area between the *prokamia* and the main mole was an inundated hollow, never fully silted and properly functioning as a settling area for the wave energy (Figs. 5.48, 5.49).

When viewing the present day seawall at the fishermen wharf during rather typical mid-summer weather (Fig. 5.50), the necessity of such a subsidiary breakwater is obvious. It was a relatively cheap measure for preventing piling-up of wave-carried masses of seawater against the mole itself. Splashing of excessive quantities of water over the spinal wall would have made it impossible to operate the vaults within it as safe and dry storage for goods, or a boarding place for the sailors, as indicated by Josephus (BJ 1: 413; AJ 15: 337).

One might argue also that such a subsidiary breakwater would reduce much of the under-trenching flow of currents at the external base of the main mole, preventing its potential subsidence due to scouring. Being rather poorly built and flimsy, the *prokomia* of Sebastos had to be constantly maintained and renovated on an almost annual basis. But such an effort would have been by far cheaper and simpler than the maintenance of the well-built complex of the main mole with all its upper structures.

*Figure 5.50. The fisherman's wharf at Caesarea in typical mid-summer moderate sea conditions (Photograph: A. Raban)*

**2. The "Towers"**

Remains of large chunks of concreted units were traced along the mid-section of the main mole at intervals of about 25 m. These were clearly visible in aerial photographs (Fig. 5.7) and in underwater surveys (Raban 1989: 228–230). Small scale probes yielded preliminary data pointing to at least some of these units being made of formed blocks of hydraulic concrete that were built over with cut stones of *kurkar* (Raban and Stieglitz 1988: 273). These units were not thoroughly studied, but it is possible that they can be associated with the towers mentioned by Josephus: *"... towers (pyrgois) set in intervals along a wall that encircled the harbour basin"* (AJ 15: 338; BJ 1: 412).

3. The Inner Edge of Southern Breakwater

Unlike the central portion of the southern breakwater, which had many courses of blocks along its inner part, the southern section had no remnants of either horizontal paving or a vertical wall that might once have faced its inner edge. Additionally, no later renovations were shown for the southern breakwater, and the data from the casual surveys indicated that concrete blocks with formwork impressions, considered as the original construction, appear over all the upper portion of the sunken structure.

A special feature on the inner edge of the breakwater was a 50 m wide rectangular projection that extended 30–35 m into the basin (Fig. 5.7) and was easily distinguished in aerial photographs. Its surface was an elevated platform of debris somewhat less prominent and of different components than the breakwater itself. Our working hypothesis was that this submerged feature might be the remains of an inner platform, or a landing stage that was added to the southern breakwater in order to increase its docking capacity (Oleson *et al.* 1984: 289–90).

**a. *Area N***

In 1983 efforts were made to recover more information about the rectangular feature described above. The first trench (Area N1) was placed 12 m along the southeastern edge of that rectangular feature, toward the edge of the breakwater itself and for an additional few meters to the west, along its inner facade (Fig. 5.51). The platform consisted of two sections; the one closer to the breakwater was about 1 m higher than the other and composed of larger pieces of rubble. The portion extending into the basin of the harbour was raised about 0.8 m above the surrounding sand and was composed of a spill of *kurkar* rubble (0.3-0.9 m; 6.3 m below MSL). The surface of the

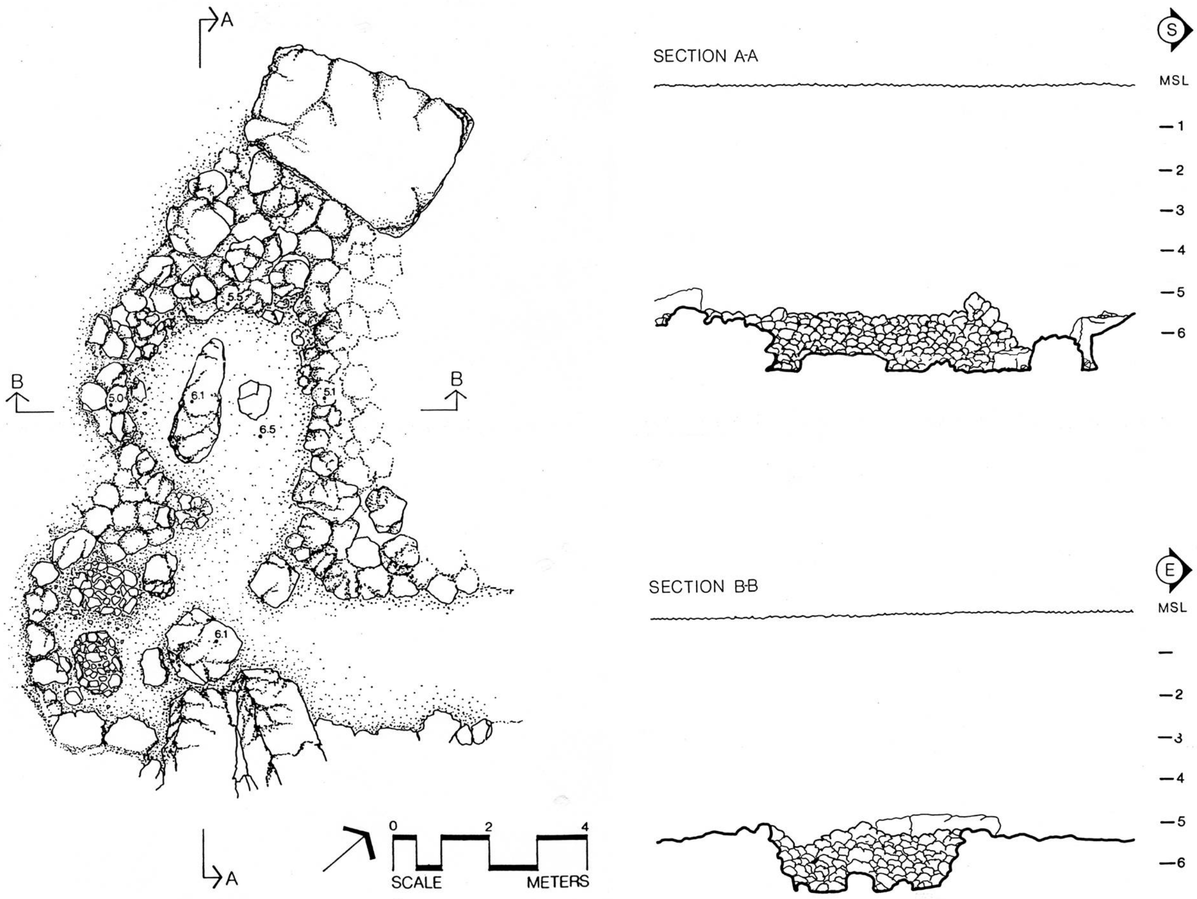



*Figure 5.51. Top plan of CAHEP trench N1+ Schematic sections across trench N1 (Raban 1989, Figs. III.132-133)*

rubble was encrusted by marine fauna and contained some badly worn sherds. At a depth of 8.1–8.3 m below MSL, a thin and well defined layer of gray clay was encountered with some well preserved pottery incorporated in its upper surface (Raban 1989: Fig. III.134). The sherds included a few pieces of Terra Sigillata A and a lamp of Herodian type, suggesting a deposition during the reign of Herod, and at a stage when this area was covered by calm water. Similar stratigraphy was found along the lower part of the entire trench as far as the edge of the breakwater itself.

At the base of the structure a steep spill was revealed consisting of larger rubble mixed with crumbling pieces of concrete. Tumbled *kurkar* blocks (Fig. 5.51, section A–A1) were along the steep sloping mass with their crest at a depth of 3.8–4.2 m below MSL. The base rested on clear sand (7.3–7.8 m below MSL) with no clay layer or man-made structures visible.

Although no coherent structural features were revealed, the excavations exposed some regular blocks (1 × 1 × 3 m) tilting down so that their lower edges are now at a depth of over 7 m. It is very probable that these blocks are remnants of the face of the Inner Quay and that the slabs that paved the top of it should be sought under the spill of rubble. Their present tilt might have resulted from either the submergence of the breakwater or the flow of the sand underneath (or both).

The limited data allowed two reconstruction and dating alternatives for the platform:

1. The projection represents an additional landing stage that was built either in the final stage of the construction of the original Sebastos, or later, early in the first century CE, when the harbour was still functioning at its full capacity.

2. The projection is actually a spill of building materials from the upper structures on the southern breakwater that was thrown into the water by wave action during the early stages of the harbour's disintegration. This might have occurred at some time during the second or early third century CE, when there were no longer resources or economic justification to maintain such a complicated, expensive and probably already subsiding harbour.

The second trench (Area N2; 5 × 5 m) was 60 m southeast of Area N1, along the inner face of the southern breakwater and 90 m west of the modern mole (Fig. 5.45). The sea-floor in the area (5.75–6.83 m below MSL) was covered by a layer of scattered rubble, partially overlaid by wave-carried sand. The excavation penetrated a layer of

*Figure 5.52. Top view of the northern trench in N5 (Photograph: A. Raban)*

*kurkar* rubble (1 m thick) and three or four scattered blocks (0.5×0.6×1.5 m) overlay clear sand with some shells and badly-worn potsherds. The compact gray clay layer (0.04–0.05 m thick) similar to that of Area N1 was encountered at a depth of 8.05–8.12 m below MSL containing fine pieces of broken shells and Herodian and early first century CE potsherds, similar to those from Area N1. The clay layer was around the bottom of the northern part of the square, but on its southern side, at the foot of the sloping debris of the breakwater, there was a hollow where the clay layer was missing altogether. The sand underneath the rubble, mixed with some small stones and wave-worn potsherds, continued down to over 9.6 m below MSL. After clearing the debris no single block of the type found in Area N1 nor any man-made artifacts were found. Apparently, the sandy hollow between the inner face of the breakwater and the clay layer was a robber's trench from which the original ashlar blocks were salvaged after the harbour went out of use. It seems that this plundering affected also Areas A–C.

**b. *Summary of area N***

Although the data acquired from Areas N1–2 were limited and did not allow for better understanding of the original layout of the inner side of the main breakwater, several hypotheses could be proposed:

1. Assuming that the clay layer represents the original floor of the functioning harbour basin, its scattered missing pieces could be due either to later salvage activities or to a current that flowed around the basin from the flushing channels in Area Q (see below). Such a circulation could gain velocity when flowing in a curved course dictated by the topography near the bottom of the harbour. In this case, the flow could be strong enough to carry and dump silt only when losing velocity again, at sites such as the outer portion of the entrance channel.

2. The inner face of the southern breakwater either lacked the features of a quay or its characteristic components, such as ashlar paving slabs and courses of headers, were all already plundered in the past.

3. The quay was built of materials, easily lost, such as wood or badly mixed concrete. Although both techniques are known in Roman harbour construction in the west, there is no architectural or textual evidence for their use at Caesarea or elsewhere in the Levant for that matter.

Finally, additional probes (Areas N3 and N5) did not reveal decisive evidence, but the general stratigraphy of sand deposits and rubble was similar to that found in Areas N1–2. The overall picture suggested a setting at the base of the main mole, just inside its internal perimeter quay,

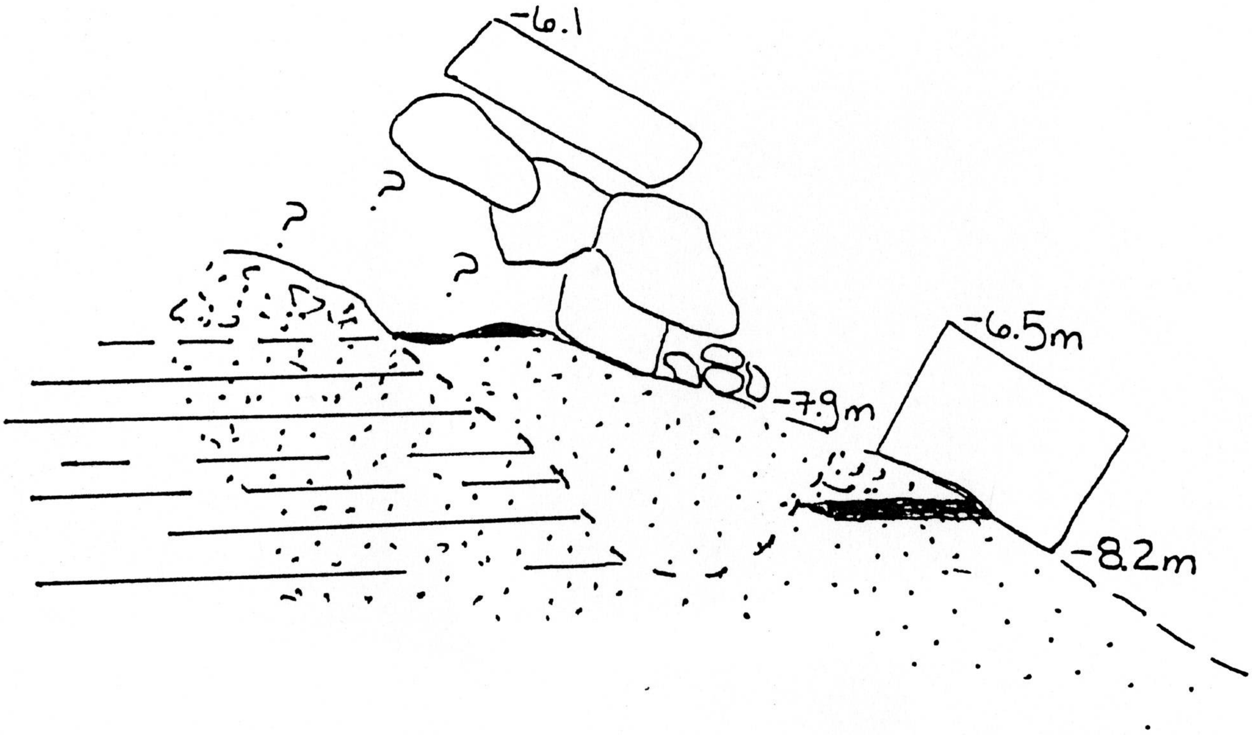



*Figure 5.53. A cross-section sketch at N5 (A. Raban, Caesarea Project)*

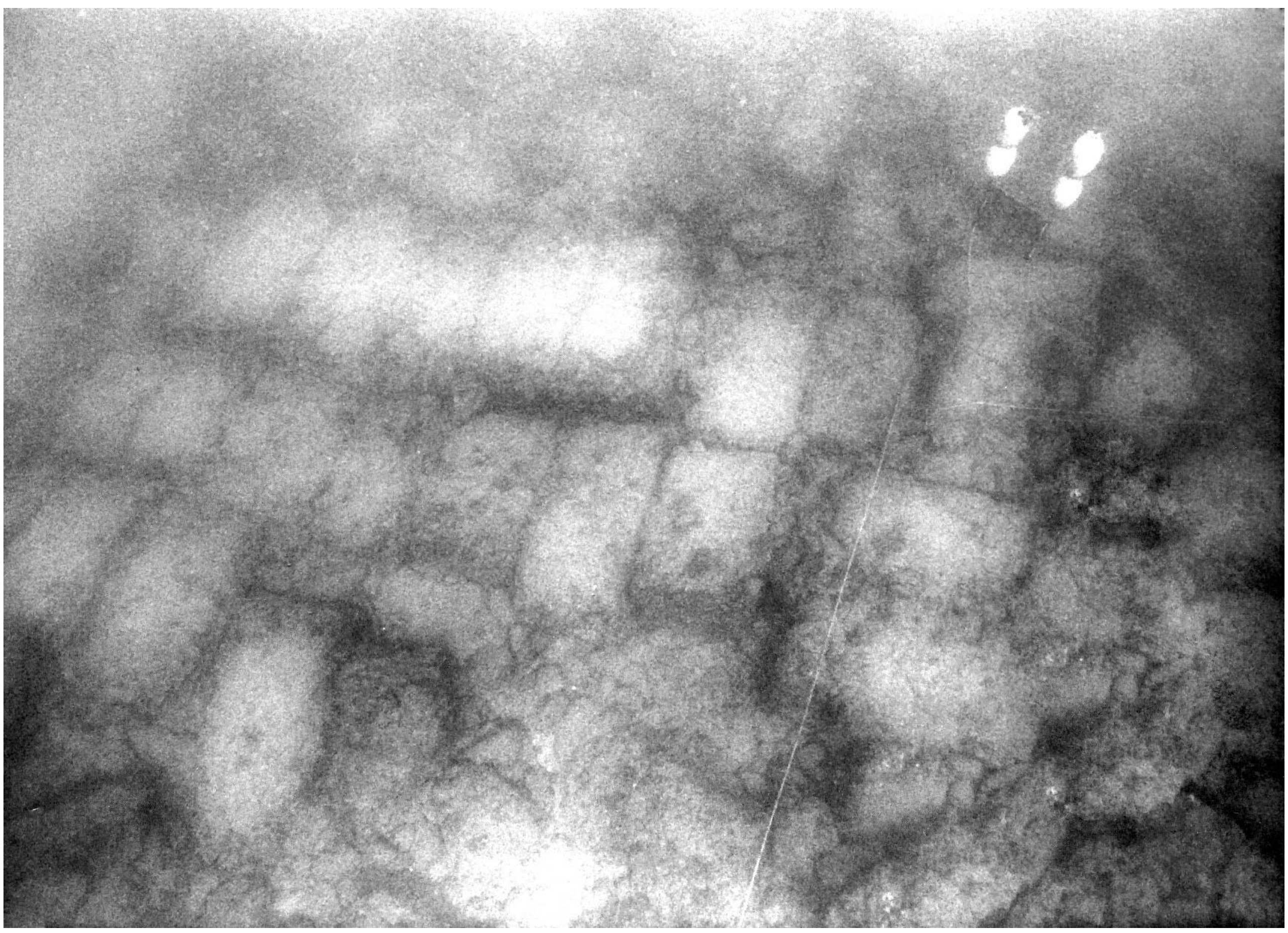


*Figure 5.54. Part of the sunken pavement at Area F, looking west (Photograph: A. Raban)*

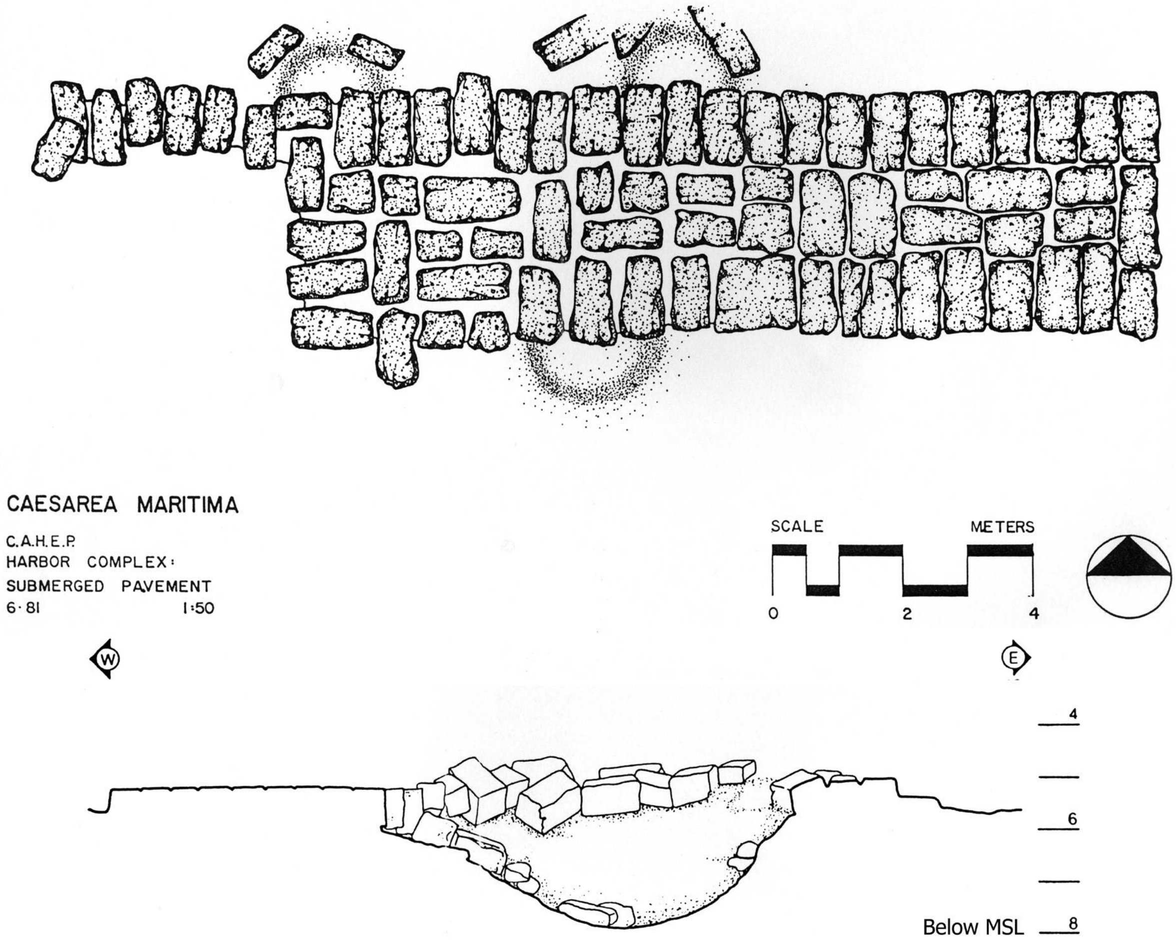



*Figure 5.55. Top plan of Area F&E-W section along the south side of Area F (Raban 1989, Figs. III.44,47)*

which is missing altogether. The tilted ashlars originated from either pavers or the substructure of the mole's promenade mentioned by Josephus (Figs. 5.35, 5.48, 5.49). The alleged missing ashlar headers of the quay were possibly plundered causing the neighboring pavers to be re-deposited eventually in the robbers' trench (Figs. 5.52, 5.53).

**4. The "Sunken Floor" (Area F)**

This structural feature is one of the best-preserved components of the presently submerged part of Sebastos. It is located near the southeastern side of the harbour's outer basin, 50 m west of the tip of the modern quay (Figs. 5.7, 5.45). It was preserved for 17 m along its northern face and 8.2 m along the southern face with an intact width of 4.2 m (Figs. 5.54, 5.55), and upper surface at a depth of 5 m below MSL.

This feature is a section of a pavement that was first noted in 1965 in surveys (1973, 1976; Raban *et al.* 1976: 42–43, Figs. 45–51, Plan 2). The pavement was built of *kurkar* standard slabs (c. 0.45 × 0.50 × 1.05 m), laid with no binding means such as mortar, cement or clamps. The slabs were placed as headers along the northern and eastern edges of the paved area, with a more varied order in its center. Apparently, these sides were the original edges of the pavement. The slabs were laid on a thick cushion of small *kurkar* rubble (0.3 m; 0.1–0.25 m in diameter), which in turn was bedded on a layer (0.1–0.2 m) of gray sand mixed with some small pebbles and abraded potsherds. Below that and down to the bottom of the excavated pit only sand with no pottery or other artifacts was found.

In a probe dug on the northern side of the pavement a series of large ashlar headers was traced on a deeper level to the east and additional blocks were found on the southwest (Figs. 5.55, 5.56; Oleson *et al.* 1984: 290, Fig. 7; Raban 1985c: 163, Figs. 6–7; Raban 1989: 94). These blocks (0.6 × 0.7 × 2.0 m) were still *in situ*, but their western ends are presently incorporated within well-concreted debris below the eastern edge of the pavement. Considering the fact that the headers are now tilted gently eastward to a depth of almost 6.5 m below MSL, it is very likely that originally they were part of a supporting wall of the pavement. Several blocks of similar size and shape, also deeper than the pavement, were found scattered southwest of the westernmost part of it. They are possibly remnants of the opposite (western) supporting wall of the pavement. Probes were carried out in the sandy sea bottom along the northern side of the pavement down to over 8 m below MSL.

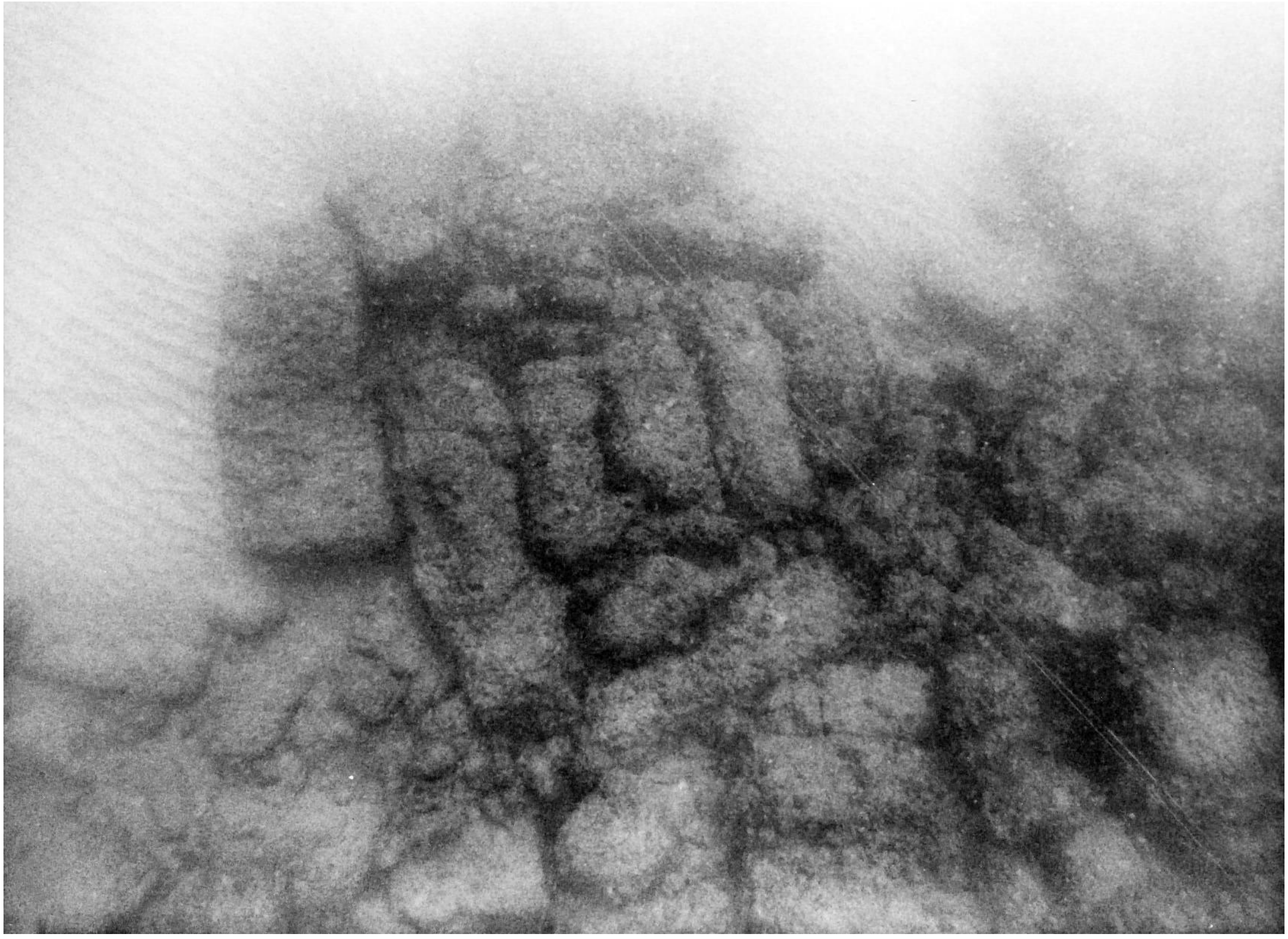


*Figure 5.56. Over-view of the eastern part of Area F, looking eastward (Photograph: A. Raban)*

It is intriguing that no blocks associated with the northern supporting wall of the pavement were traced in the probe. The fact that the pavement remained relatively even and intact over a considerable area, despite the absence of any substantial support but sand, is strange and unlike the condition of other submerged structures in the harbour. The absence of such a support can be explained by assuming that plundering took place in later antiquity, or that it was constructed substances that decomposed easily such as wood or concrete blocks of poor quality.

Another probe was made in the southern side of the pavement, in a sand-filled hollow (2 × 3 m). This area was covered by the debris of large tilting blocks encrusted together at a higher elevation than the pavement itself. Several loose slabs of a similar size as those of the pavement that were found at the southern edge of the trench could be remnants of its continuation toward the main breakwater. Other slabs were found scattered in the excavated area within a rich deposit of broken pottery, mainly amphorae, dating from the Herodian to the Byzantine periods. Beneath this surface was a layer of rubble of well cemented by marine encrustation (6.2 m below MSL).

Still deeper, another hollow was found filled with tumbled ashlar slabs and large quantities of potsherds, most of which were evidently pushed into it by the surge and currents (7.3 m below MSL). The ceramics are dated from the Early Roman to the Late Byzantine periods. At the depth of 7.9 m below MSL there was a layer of clay typical to the original bottom of the harbour basin in the Herodian period, which seems to be far deeper than the foundation of the pavement (Fig. 5.55; for the pottery see Oleson *et al.* 1994a: 107–116). The multitude of wave-carried potsherds found below the pavement could indicate either that it is a post Byzantine addition to the harbour, or that it had already shifted from its original position in antiquity. The second assumption might be explained by the close proximity of the proposed fault line that ran parallel to the coast just east of this location.

Other probes that were made farther south in search of additional segments of the pavement yielded only scattered debris. Among these was a pile of very large and badly eroded marble blocks (1.8×2.1 × 4 m). It is likely that they were components of some superstructure that once stood on the quay of which the nearby pavement might be the sole remnant.

The area south of the sunken pavement is now occupied by a rectangular spill of debris (20–22 m wide), projecting 50 m northward from the inner side of the southern breakwater

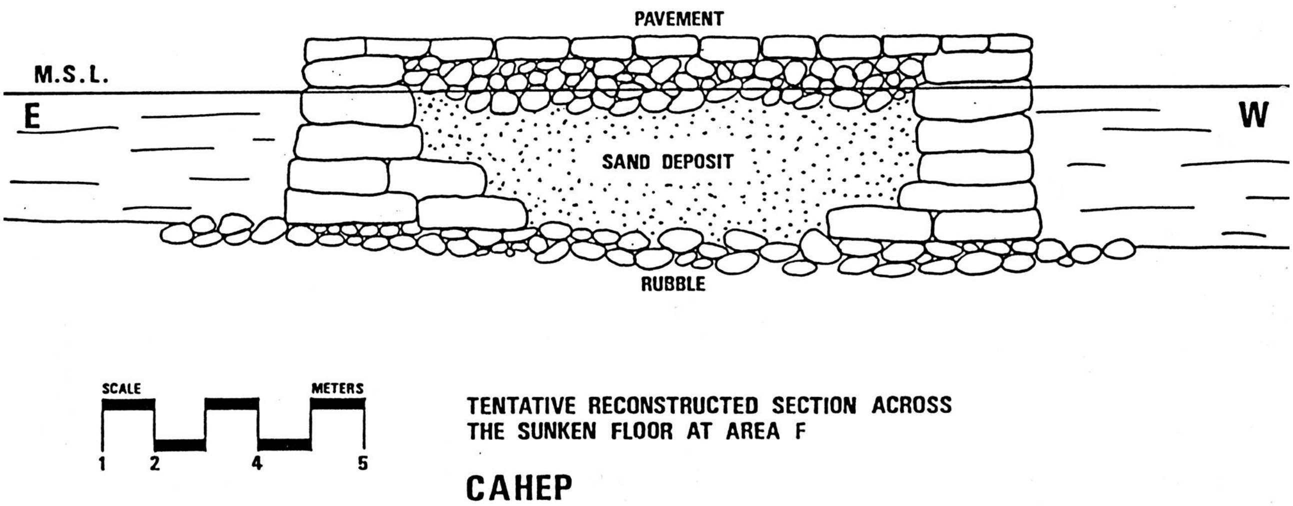



*Figure 5.57. Tentative reconstructed section across the sunken floor at Area F (A. Raban, Caesarea Project)*

base (Fig. 5.7). It has vertical sides built of several courses of large headers above water level and contained a sand fill between them. This fill was covered by a layer of rubble-like base for paving. It is possible to consider this feature as a secondary pier topped with pavement, which divided the outer and intermediate basins of the harbour (Fig. 5.49). Josephus might have referred to a subdivision of the Herodian harbour by the so-called "secondary anchorages" (AJ 15: 332). Such a subdivision existed also at Cantharus and the ancient harbour of Piraeus, to which Josephus compared the Herodian harbour of Caesarea (Judeich 1931: 446–48).

In 1992 the eastern and southeastern side of the sunken floor was surveyed (Area FE), where the existence of a vertical wall of ashlar headers was noted. It was suggested that these might retain the lee edge of the paved platform (Fig. 5.56). The paving slabs were apparently set over a vertical retaining wall built over a rubble cushioned sandy seafloor, filled by sand over which another layer of rubble was laid, in order to seal it (Fig. 5.58 compare with Fig. 5.35).

Area FE (Fig. 5.45) was just at the site dissected on a north-south axis by an eventual fault line that caused the subsidence of the external basin of Sebastos (Neev *et al.* 1978; Raban 1989: 293; Reinhardt and Raban 1999). For that reason most of the constructive components in the area were tilted, displaced and/or tumbled. In order to understand the present architectural situation better, a complicated three-dimensional survey of each block was carried out and a calibrated oblique view of the various building components was created (Fig. 5.58). Following a comparative study of structures within the architectural complex of Sebastos, it seemed probable that the sunken floor was a pier paved with ashlars. It was built on massive side-walls comprising large rectangular headers with artificial sand fill within them superimposed by the pavers. This pier was incorporated into the main one of the southern mole, and possibly served as a dividing unit between the two harbour basins. The excessive size of some of the blocks at the southeastern side of the sunken floor is similar only to those at the western tip of the northern mole, at the alleged base of an administrative building for the harbour master. It is therefore quite likely that the pier in area FE also carried a sizeable building. Large bases of temples and administration buildings were found in similar locations at the harbours of Portus (Ostia) and Leptis Magna (Raban *et al.* 1993: 3–4).

### 5. The Towers Outside the Harbour Channel (Area K)

Two massive concrete towers stood 50 m outside the harbour entrance and 10 m beyond the spill of the northern breakwater (Raban 1989: 149–151; Raban 1983b: 245–248; Oleson *et al.* 1984: 293–294). Both are 6 m apart and badly eroded, but clearly visible in aerial photographs (Fig. 5.7) and from the surface when sea conditions are calm. The two towers were roughly square in plan and protruded from the deep sand fill that now overlies the ancient sea bottom (Fig. 5.59). The larger eastern tower (5.10×6.80 m) is 6.10 m above the sand and rising 1.65 m above MSL (Fig. 5.60). The western tower (7.00×7.50 m) is much lower—3.30 m high and rising 3.10 m above MSL; it had a large slot (0.70×0.90 m) on its southern side (Raban 1989: Figs. III.106–107).

The twin towers were built of concrete and poured into place at the present location. A close examination of the

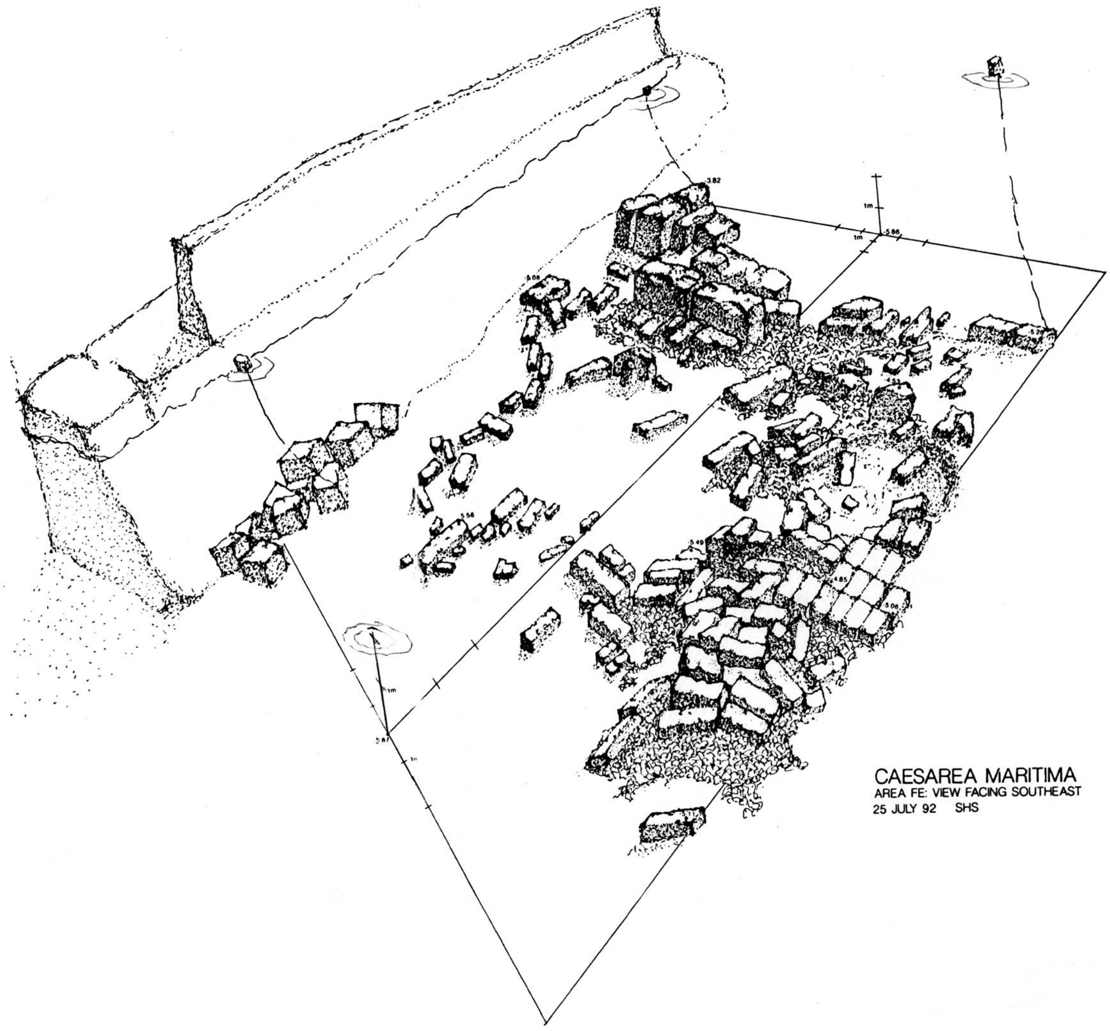



*Figure 5.58. A compiled oblique view of Area FE, facing southeast (Raban, Reinhardt, McGarth and Hodge (eds.) 1999, Fig. 5)*

vertical facades revealed roughly horizontal cavities (0.20–0.30 sqm), presumably left by decayed tie beams used to stabilize the formwork during construction. The fabric is a peppery gray-green mortar containing irregular limestone and *kurkar* rubble aggregate. This material was laid in wooden caissons that were constructed elsewhere and then towed into place, sunk to the sea bed and stabilized on a previously prepared building site (Oleson 1985a). Airlift excavations did not uncover any remains of the wooden formwork, but a hollow walled construction similar to that found in Area G (see above) might have been used here, as well. Cavities between the inner and outer planking were filled with concrete, so that the added weight would help counter the buoyancy of the wooden formwork and helped in sinking it.

Air-probe surveys ascertained that there was no structural connection between the two towers (Raban 1983b: 245–250). The material goods found in the trenches were mixed in character (second to the sixth centuries CE), probably representing secondary deposits by wave action (Oleson *et al.* 1994a: 158–162). The coins found were more uniform in date, with a single badly corroded Roman imperial issue of the second century CE and eight Byzantine bronze coins (Hohlfelder 1985). The large number of sixth century CE coins suggests that the repair of the harbour by Anastasius (491–518) may have resulted in a considerable amount of new trade.

It is quite obvious that the twin towers in Area K and the single tower in Area G were part of the harbour entrance, described by Josephus (BJ 1: 413): "*At the harbour entrance there were colossal statues, three on either side, set up on columns. A massively-built tower supported the columns on the port side of boats entering the harbour; those on the starboard side were supported by two upright blocks of stone yoked together (sunezeugmenoi), higher than the tower on the other side.*"

The twin towers were probably faced with ashlar masonry and might be easily described as monoliths of stone. Yet it is more difficult to understand the meaning of Josephus' term *sunezeugmenoi*, "yoked together". Oleson *et al.* (1984: 293–94) suggested that Josephus could have meant

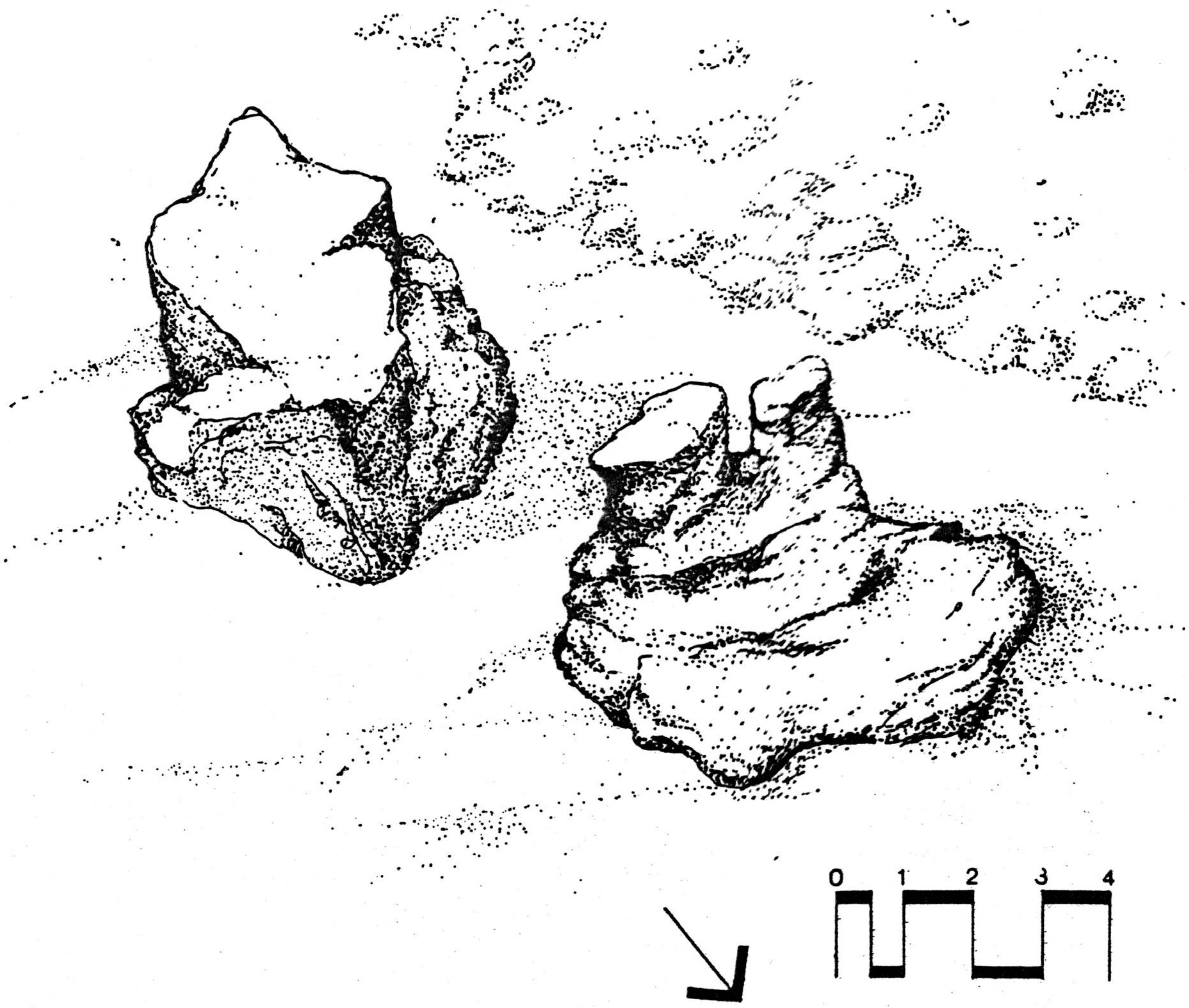



*Figure 5.59. Isometric drawing of the twin towers at Area K, from N-NE (A. Raban, Caesarea Project)*

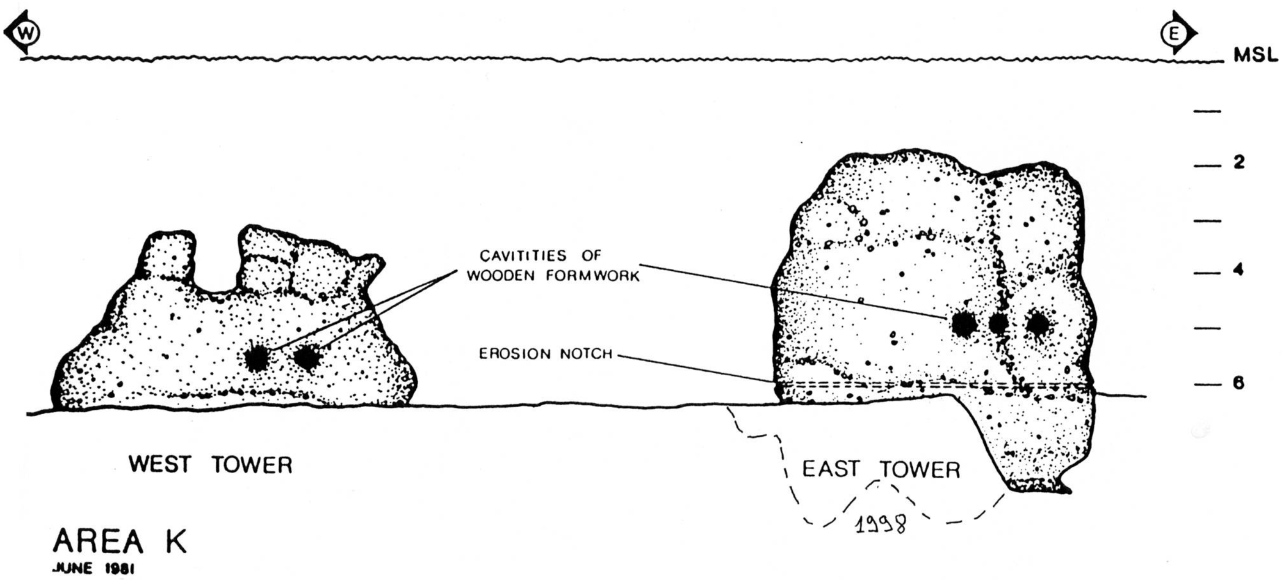



*Figure 5.60. Schematic view of K towers from SW (A. Raban, Caesarea Project)*

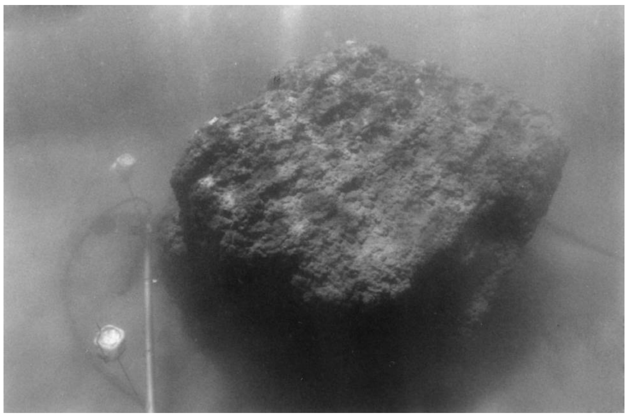


*Figure 5.61. The present top of KE from the east (Photograph: A. Raban)*

that the towers were "paired", but added that it would be difficult to divide three statues between the two pairs of towers. However, the span of ca. 6.0 m between the towers could be bridged by a shallow vault, similar to the one suggested for the lighthouse of Leptis Magna (Bartoccini 1958: 59–65).

In 1998 probes were made in the southern part of the base of the southeastern tower (Area KE). When looking from above, it seemed that it had a parallel pattern across in the north-south axis (Fig. 5.61). These were either the imprints of the wooden formwork within which the tower base was molded, or microtopographic results of different erosion and abrasion of layers of hydraulic cement of various physical characteristics and durability. In both cases the patterns might suggest that it toppled and is presently not in its original position.

Further excavations underneath the southern and western sides of tower KE and below the present-day base of the northwestern tower (KW) along its eastern side exposed a secondary deposition of sediments that seemed to be a later fill of a scouring trench, post dating the toppling. The abundance of sherds and coins at the various levels of these heterogeneous depositions are dated (from top to bottom) to the late sixth mid-third and late first centuries CE and may indicate that there was more than one tectonic and/or other traumatic natural upheaval at that site.

Of special interest was a large cut block (1.5×1.8×3.4 m) of white hard stone that was exposed in the sandy seafloor, 5 m south of tower KE. The block bore remains of two iron-clamping devices on its vertical western face, two pin-holes for bronze square shafts and twin sole-shaped depressions for what seems to be a larger than life-size statue. The size and shape of the iron clamping resembles those found at the tip of the northern Herodian mole (Area D), and substantiated the suggested date for that feature (Fig. 5.62). These remains may indicate that the block was a component of the superstructure of the connected towers, as was described by Josephus (see above). It can also be suggested that it served as a base for one of the three statues that crowned these towers.

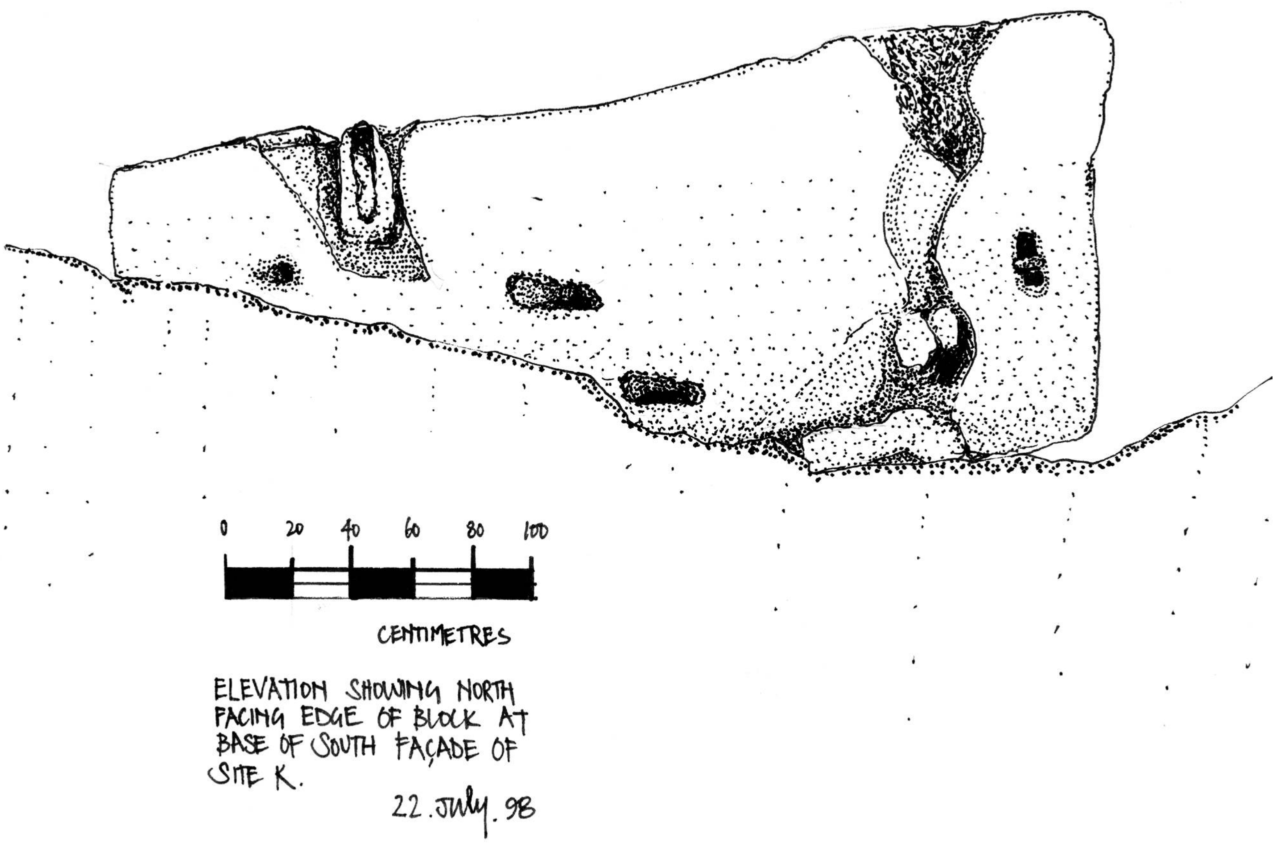



*Figure 5.62. Drawing of the west side of the ashlar block next to KE (A. Raban, Caesarea Project)*

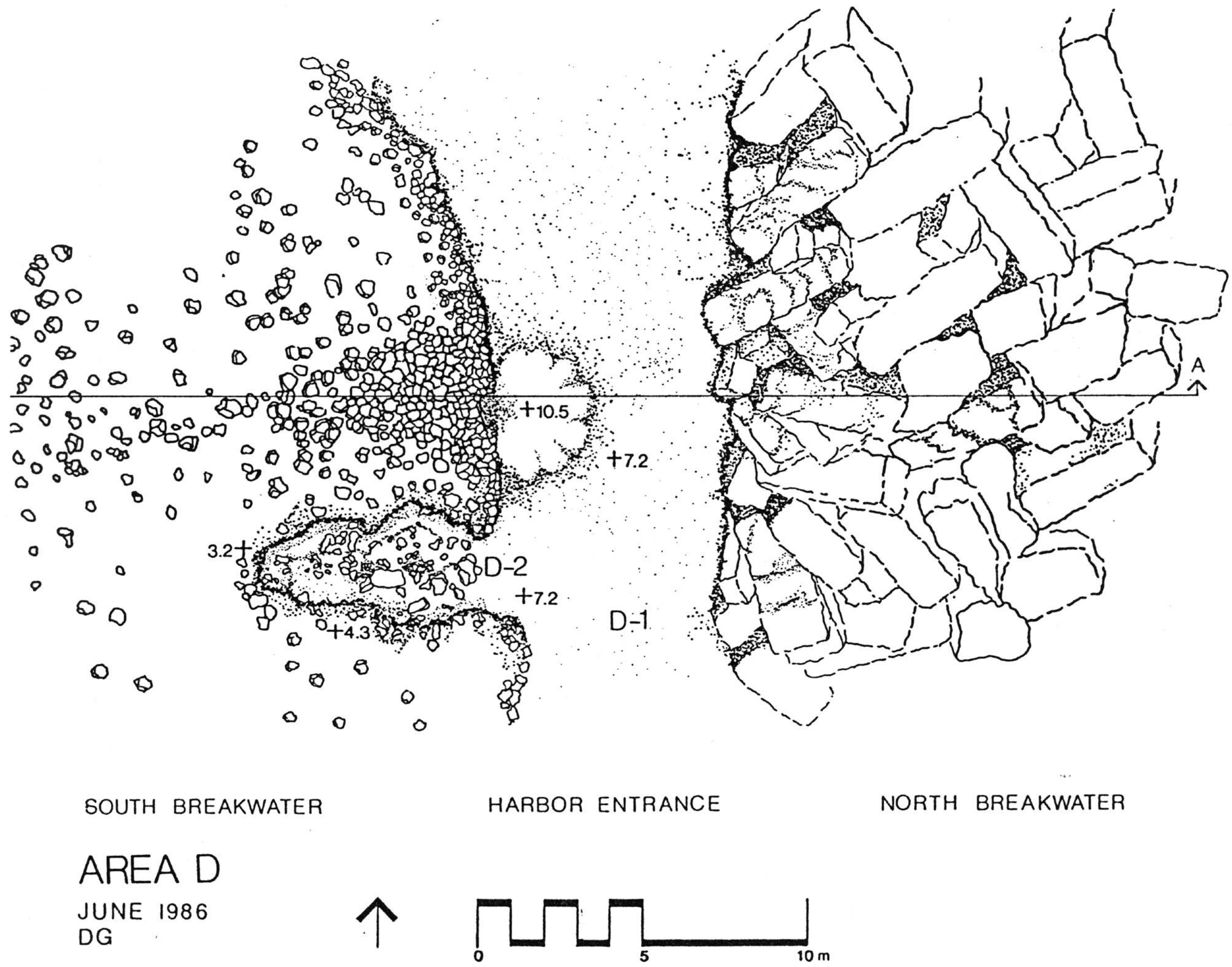



*Figure 5.63. Top plan of Area D (Raban 1989, Fig. III.19)*

6. The Edges of the Main Mole and the Superstructures on Top (Area D)

The western edge of the northern breakwater can clearly be distinguished from the air (Fig. 5.7: D) or from a high viewpoint on the shore. It was originally traced, in 1860, by the surveyors of the anchorages of Palestine (Mansell 1863). This feature includes two adjacent elements: the first is a deep area of debris described above as an "artificial island" (Fig. 5.7: G). The second feature is a semi-circular pile of very large blocks (2.0×5.5 m) rising to less than 2 m below the waves that were originally laid side by side as headers (Fig. 5.63). The pile has a crescent shape with ends tapering eastward along both edges of the breakwater. Its widest part is its southern third, due east of the narrowest passage in the entrance. At this point several crowning blocks reach a total height of over 6 m.

The main section of the tumbled structure extends 20 m from north to south and over 12 m east to west and it is now at a depth of 3.8 m, although here as well the blocks moved and tilt westward. Discounting the possibility that they were carried up by the waves, during or after their submergence, their present shallow position (1.5–3.3 m below MSL) indicates an original elevation of at least 3–4 m above the ancient sea level.

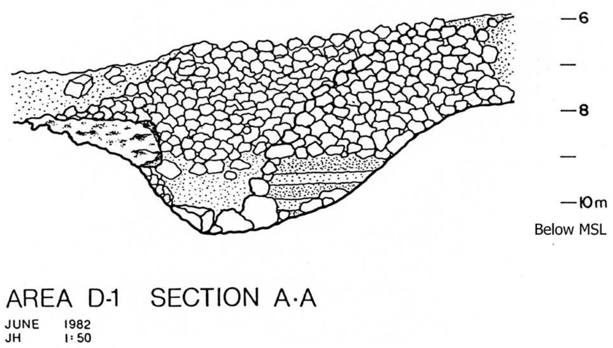



*Figure 5.64. Section A-A across the entrance channel (Raban 1989, Fig. III.33)*

There are three courses of *kurkar* headers, but it is impossible to know their arrangement or lengths. The lowest series of blocks projected farther out than the blocks above, due likely to the combined effects of wave action, tectonic submergence and the fluidization of the substratum. The blocks of this series were partially or entirely buried under the sandy sea bottom of the entrance channel. The deepest

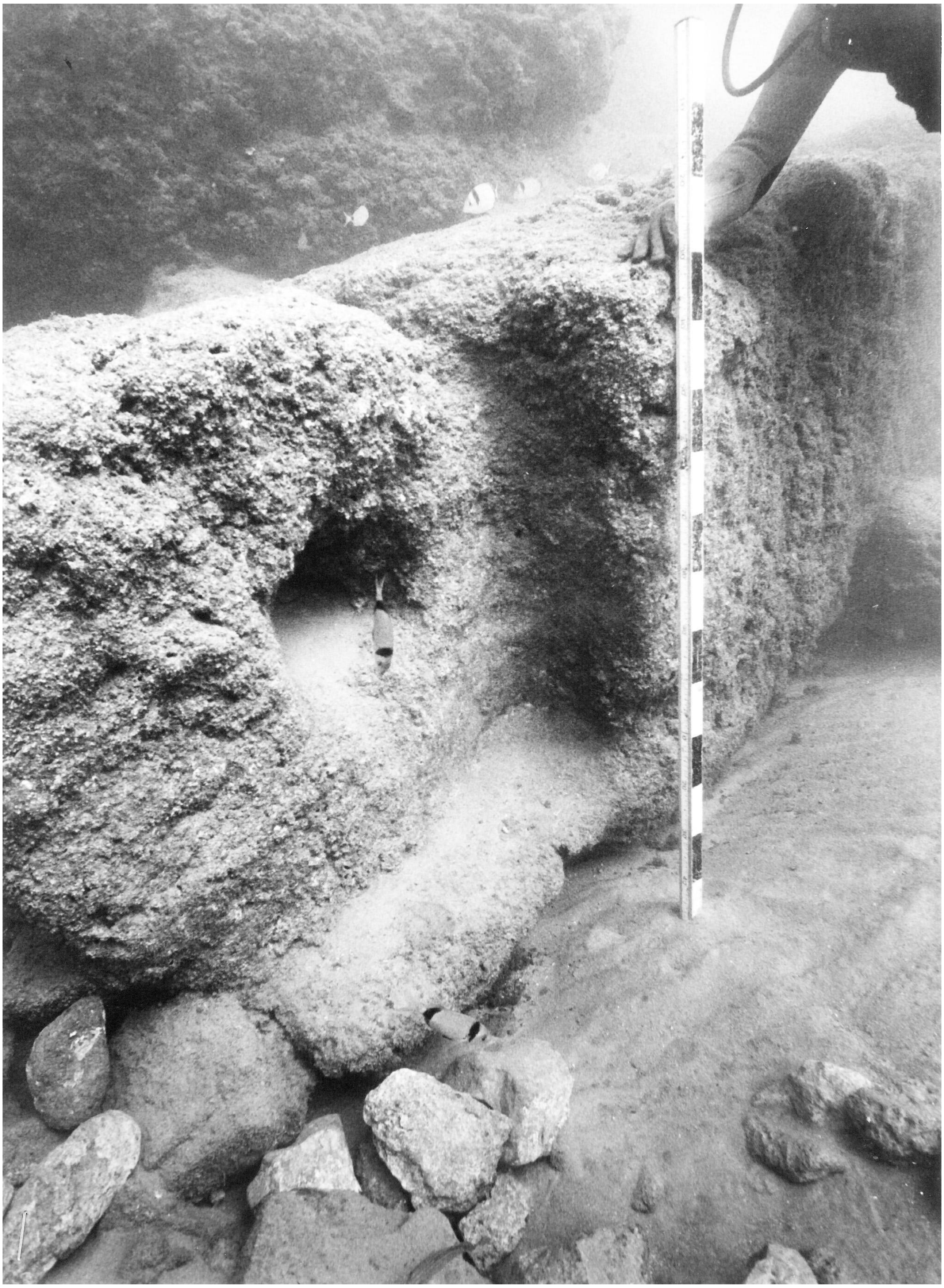


*Figure 5.65. One of the blocks of the structure at the tip of the northern mole (Photograph: A. Raban)*

*Figure 5.66. The lead casting for the binding iron clamps from the blocks at Area D (Photograph: A. Raban)*

point to which these blocks sank is 8 m below MSL (Fig. 5.64). Those blocks, which seemed to have retained their original length, vary from 4.5 m to 5.5 m with a likely standard section of 1.25×1.25 m. Some of the blocks had a distinctive shape (Fig. 5.65); at one end (probably the end that originally faced towards the entrance) they had a flat, recessed facade where a deep round hollow (0.4 m) was carved. Oleson *et al.* (1984: 295) proposed that these were half-lap joints intended to help to interlock the blocks as a stable breakwater head.

Cleaning the blocks, a groove was traced across the base of the trimmed part and a series of four cuttings for iron C-clamps was observed, two on each edge of the same side of a block. On some of these ruts the lead casting poured around the clamps to hold them in place was still visible. These castings look like rectangular sockets, preserving the form of the corroded iron clamps (Fig. 5.66).

Grooves for clamps are quite common in different buildings at Caesarea attributed to the Herodian period (Frova *et al.* 1965; Raban 1983a: 250, Fig. 20) as well as the pre-Herodian era as well (Area I3). This technique had a long tradition in Greek construction and it was also used in various structures in the Neronian and the Severan harbours of Leptis Magna (Bartoccini 1958: 20, Fig. 4). Caesarea, however, is the only site where such clamps were installed under water such as in the case of the northern breakwater, where it was carried out in order to bind its head. Although it is possible that the molten metal in some of the lead-filled clamp sockets was poured into grooves which were at the time above sea level, those on the west side of the breakwater are now almost 8 m below MSL. They were installed in a structure, which was originally built below the water level by means of cofferdams.

The function of the recessed facades of many of the blocks of the western course is not entirely understood and no close parallels are known from other Roman ports. Oleson assumed that they served as lapjoints, although other explanations are viable. If the hollowed recesses were originally facing upwards, they could be sockets for bollards for mooring tugboats or for temporarily tethering or guiding approaching ships (Blackman 1982: 203–4, n. 100). Alternately, if the hollows were horizontal, they could be an anchoring device for fixing a wooden gangway or staircase leading down to the waterline to facilitate easy access to merchantmen that stopped there on their way in or out, for proper check-up of documents, credentials, bills of landing and the actual cargo (Oleson 1989: 115). Another possible function was to receive and anchor a wooden formwork for a large windlass or a similar mechanism for pulling an iron chain used for closing the harbour entrance channel. Nevertheless, no actual device for such purposes was ever found in any of the commercial harbours of the Roman era, and the device proposed and reconstructed by Jameson (1969: 335–337, Fig. 7) for Halieis was challenged by Blackman (1982: 194–196) and Frost (1985).

Whatever the function of the recessed facades was, it is remarkable that the Roman engineers felt the need for additional means of fastening such huge blocks, which weighed over 20 tonnes each. These were held tightly in place not only by massive iron clamps, but also by friction against the adjoining blocks over an area of about 13 sqm. This reaction suggests some function that imposed a considerable drag and stress upon these blocks.

**7. Harbour Entrance Channel (Area D).**

At present, the harbour entrance channel is a funnel-shaped passage with a sandy floor (Fig. 5.7). The apparent shape and width of the channel, as seen in aerial photographs, is being changed from year to year, depending on the transport of sand by winter storms. Because of the low relief and gentle slope of the rubble forming the present termination of the southern breakwater, even a relatively slight change in the depth of sand in the channel significantly changes its outline. For example, in 1982 the surface of the sand was 7.6 m below MSL, but in the summer of 1991, rubble and ashlar bocks were visible across the channel on its inner end (Fig. 5.67).

The location of the entrance channel has never been questioned since the harbour was identified; it is clearly visible and corresponds to the channel described by Josephus (BJ 1: 413; AJ 15: 337). The exact dimensions and construction of the original entrance, however, are more difficult to determine. The east side of the channel seems to have retained its approximate, original configuration, although some of the rubble brim around the blocks in Area G was destroyed and the blocks forming the termination of the northern breakwater moved from their structural positions. Because of the massive dimensions and the careful reinforcement of the materials used at these locations, the blocks did not move far, if at all. As a result, the profile of the remains of the edge of the northern breakwater is still steep and easily traceable. The adjacent portion of the channel, too, although filled with sand, is more or less unencumbered by later debris. One large block

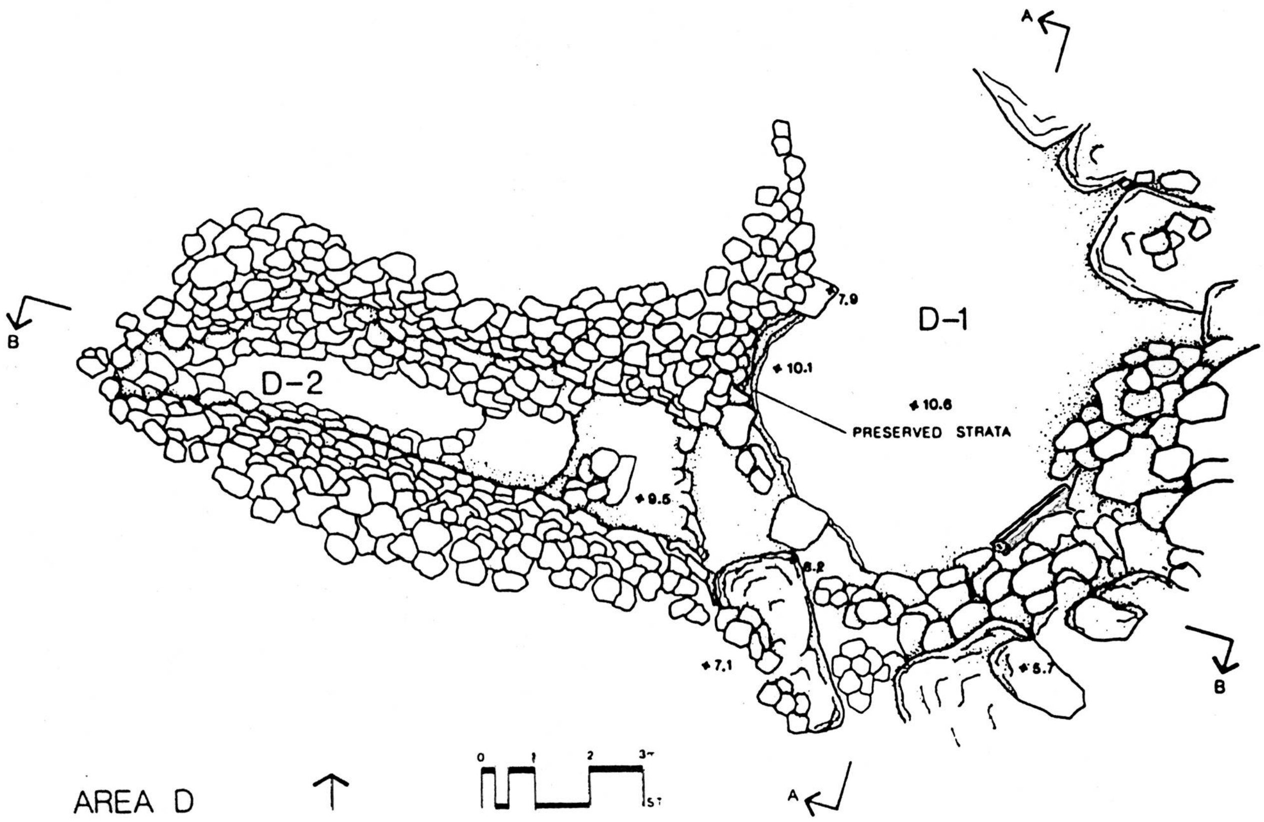



*Figure 5.67. Plan of Area D in the 1991 season (Raban 1989, Fig. III.31)*

slipped from the northern breakwater into the channel at the south end of the area (D1; Fig. 5.63) and another at the northern end of the area may have dropped there during renovation of the harbour, in the reign of Anastasius.

It was difficult to determine the location of the west side of the channel, and it is still problematic following the last 20 years of surveys and excavations. The uncertainty stems from the exposed position of the southern breakwater and the consequent movement of its superstructure and core after the submergence and decay of the outer part. Since the storms in the harbour arrive from the southwest, the movement of smaller building materials tended to be towards the northeast. The present low, sloping profile of the edge of the southern breakwater adjacent to the entrance may be the result of this phenomenon. No large blocks of concrete or *kurkar* are presently visible here, only rounded pieces of concrete or *kurka*r rubble (c. 0.15–0.40 m).

***Area D2***. Link's expedition carried out some probing in this area in the 1960s (Fritsch and Ben-Dor 1961). Excavation with airlifts of the sandy fill in the channel began in 1980 attempting to reveal the structural design of the head of the northern breakwater. Upon removal of the loose white sand the large *kurkar* blocks of the breakwater head were exposed, and we had hoped that the original channel floor was shallow enough to allow easy identification. However, only a few small isolated blocks of *kurkar,* a large quantity of wave worn sherds and scattered small finds were found in the loose fill, along with two large *kurkar* blocks projecting into the channel from the face of the northern breakwater. The larger of the two blocks was similar in size to the blocks of the breakwater head (1.2 ×1.6 × 3.2 m) and probably fell from its original position. A somewhat smaller *kurkar* block (c. 1.2 × 1.3 × 2.0 m) was found on the rubble spill. Several timbers (c. 0.15 sqm) lay crushed beneath it in a pattern looking like a lifting frame or pallet (Fig. 5.67). The timbers yielded a C14 date of 1470±50 B.P. (462–562 CE). Thus, the block may have been dropped during the reconstruction of the harbour carried out by emperor Anastasius (491–518 CE; Raban 1989: 281–283; Carmi 1987).

The pottery from the sand fill is dated to the first through seventh centuries CE and included amphorae, utilitarian ware, lamps, and Terra Sigillata. The trench also yielded bronze fishhooks, cosmetic instruments, spikes, nails, vessel handles, numerous lead fishing and net weights, and a Late Roman inscribed ring—the only piece of gold jewelry found in the entire series of CAHEP campaigns. The uniform character of the sand fill and the unstratified arrangement of the finds (including modern objects) indicate that the upper fill was a secondary deposit (Oleson *et al.* 1994: 87–106).

An irregular, sloping stratum (c. 1 m thick) of concrete and *kurkar* rubble that washed off the body of the southern breakwater overlay a series of irregular layers and lenses of sand and pebbles (0.9 m thick). These contained shell and wood fragments and rich deposits of wave-worn pottery dated from the early Empire through the Byzantine period.

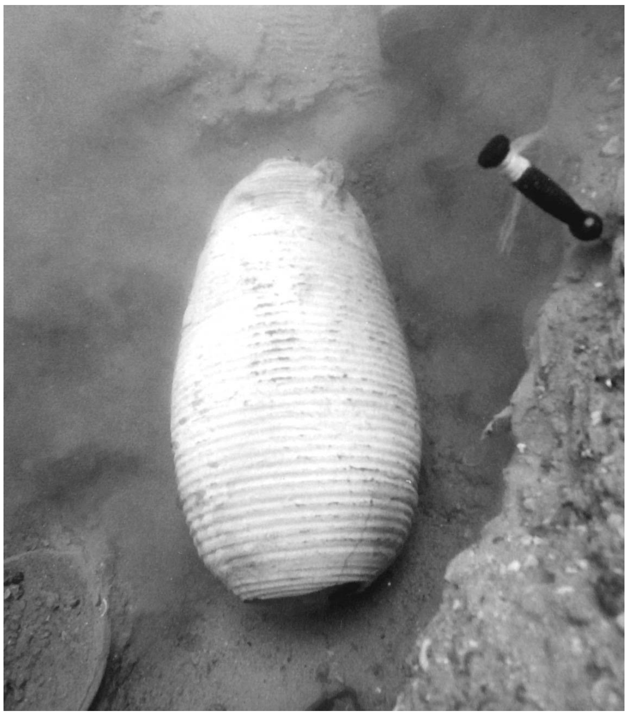


*Figure 5.68. A first century CE jar lays intact in the mud layer at the base of the entrance channel (Area D1) (Photograph: A. Raban)*

The worn character of the pottery indicated that it, too, like the pottery found in the sand fill of the channel, traveled for some time along the harbour floor before being covered by rubble swept off the southern breakwater.

The original channel floor was marked by very fine, viscous gray clay (c. 1.0–0.25 m) incorporating lenses of gray sand that sloped 10.5–11.0 m below MSL. It overlaid fine, clear white sand, which presumably marked the original sea bottom, The upper surface of the clay revealed a large number of intact or nearly complete pottery vessels dated, for the most part, from the late first century BCE through the second century CE. These included a Herodian lamp, local coarse wares, amphorae and a variety of wares imported from Italy: stamped terra sigillata, volute lamps, kitchen and coarse wares (Fig. 5.68). One group of ridged amphorae was Byzantine in date. Well preserved pieces of rope, miscellaneous bits of worked wood and an intact wooden sheave block were also recovered along with a bronze aryballos, bronze spikes, and lead sheeting and fishing weights (Oleson 1983; Oleson *et al.* 1994a: 87–106, Figs. 24–39). Some of this cultural material sank into the clay, while other pieces, possibly Byzantine ceramics in particular, were found on the upper surface. All the ceramics had light gray stains caused by the associated sediment, but the mechanical properties of the clay saved them from being broken, dispersed and worn by the action of waves and currents. Unfortunately, the intersection of this layer with the heads of the two breakwaters could not be traced. To the east, the stratum disappeared beneath the large fallen blocks from the northern breakwater and to the west beneath the rubble that had rolled off from the southern breakwater. It is clear that this stratum can be associated with the first two centuries of harbour use. The fine particles, of which the clay is composed, were markedly differed from the crisp, white quartz sand forming the sea bottom, and they may have stemmed from building activities and dredge and fill operations associated with the construction of Sebastos. The same clay layer was observed in other areas at Caesarea 8.0 m below MSL (E2, H1, H2, N2). The clay may also be the product of harbour pollution associated with maritime trade, nearby craft activities, and general human occupation.

The present location of the clay inside the harbour entrance channel and within the outer basin indicates that it originated somewhere inside the harbour when the breakwaters still provided a calm anchorage. Whatever the source of the clay, calculating the relationship between the level of the structural remains and the present sea level provides invaluable information on the original configuration of Sebastos and the process of its destruction.

In 1982 an attempt was made to determine the original width of the harbour channel through isolation of the structural termination of the southern breakwater. It was assumed that this feature, like the head of the northern breakwater, was constructed of large regular blocks of *kurkar* or concrete. The dimensions of these blocks were not as colossal as those across the channel, since the head of the southern breakwater, facing east, was distant from the full force of the sea, and the bonding arrangements were not as elaborate.

The naturally concreted rubble was cleaned in steps down to c. 10.0 m below MSL. It overlay a layer of stratified inter-bedded sand, shells, pebbles, and clay. More work yielded only negative results, namely occasional small *kurkar* blocks and unclear spill of *kurkar* rubble that were always sporadic and unconnected with any coherent structure. The very meager number of sherds was heavily abraded by the sea and encrusted with marine growth that seems to have been formed in antiquity.

Summing up the data presented above, it is quite likely that the large massive structure on the edge of the northern mole was built in order to serve a significant portal function. At first it was suggested by Hohlfelder *et al.* (1983: 139) that the original width of the harbour entrance channel was less than 30 m, but later he argued that the channel was 85 m wide (Hohlfelder 1996: 88–91). The wider entrance would have caused severe problems and hampered proper monitoring and controlling of the harbour's entrance. Such a wide entrance would have been exposed to the prevailing northwesterly winds during the summer navigation season and too broad for chain lockers. It is hard to accept Hohlfelder's comparison of Sebastos to parallels such as the wide entrances in Roman harbours (1996: 88: n. 24), which refer to more protected locations (Alexandria, Kenchreai), or harbours with one mole overlapping the other (Portus, Leptis Magna). His other

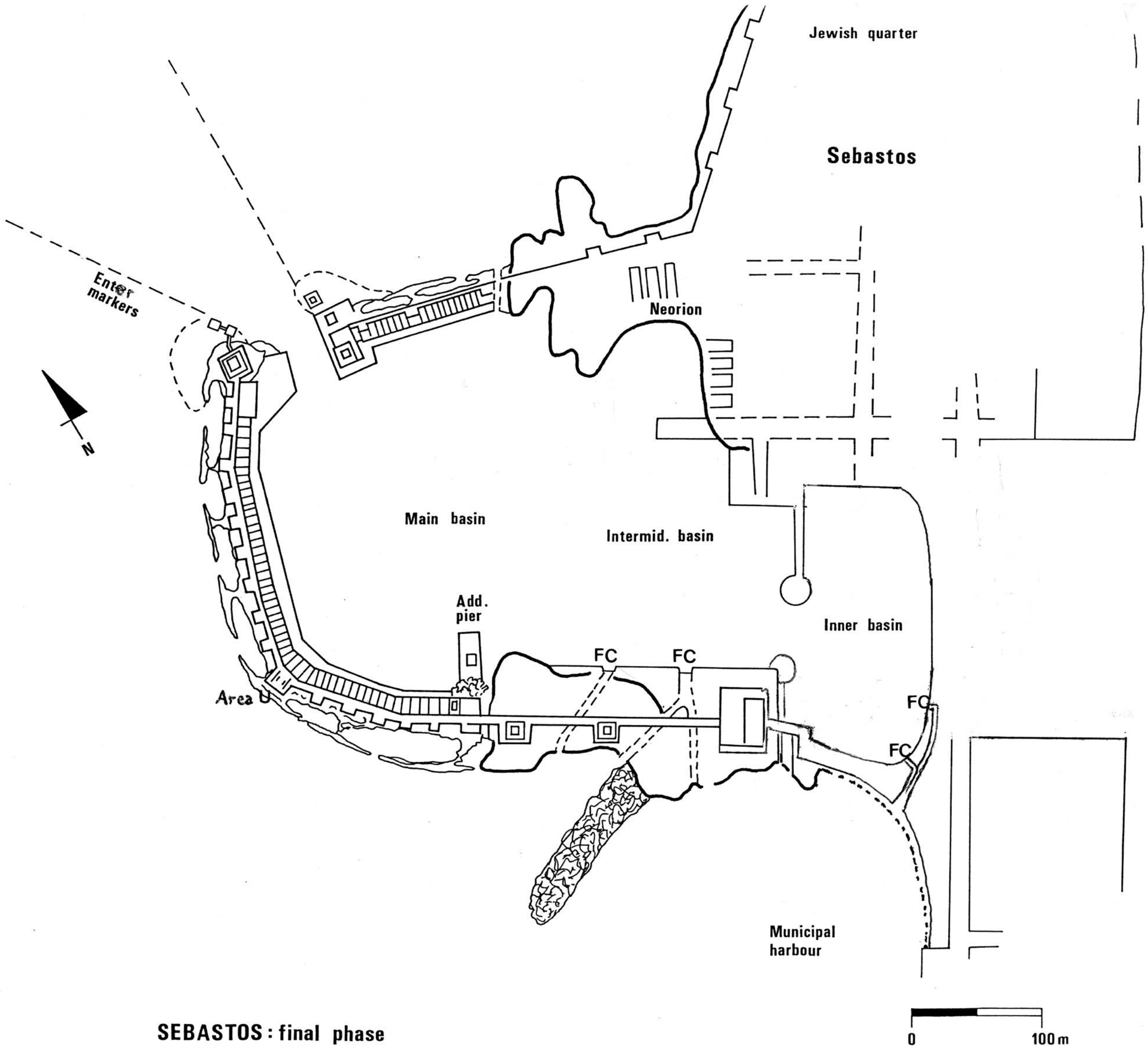



*Figure 5.69. A suggested sketch plan of Sebastos at its final phase of construction (A. Raban, Caesarea Project)*

suggestion (Hohlfelder 1996: 88–91), that the northern tip of the western mole was a post-Herodian addition, does not agree with the archaeological evidence. It also contradicts his own claim that the freestanding twin towers in Area K "posed a serious hazard to the passage of larger ships into or out of the outer basin" (Hohlfelder 1996: 84). Although the exact width of the entrance is not known, it can be assumed to be less than 50 m. This width is similar to the width of the harbour channel at Paphos, which was just over 40 m (Leonard and Hohlfelder 1993: 375).

Oleson and Branton (1992: 56) suggested that the function of the twin towers (Area K) and the matching one at Area G was as a navigational aid. Studying the topography and the relative position of these towers within all other features, it seems indeed, that they served as landmarks, or "verticals" that designated the eastern and western limits of the entrance to the harbour basin for proper and safe navigation (Fig. 5.69). Moreover, modern harbours along the Israeli coast are of similar configuration with their mouth facing north (Ashdod, Tel Aviv and Herzeliya). Evidently, the sand carried by the waves and the long shore current is being deflected by these off shore manmade structures and tends to accumulate as bars on both sides of the entrance, just outside and next to the tips of the enclosing moles. Thus, the external towers at Sebastos marked the edges of these sandbars at the sides of the deeper and properly flushed harbour channel.

### 8. The Drusion

Vann (1991) suggested that the series of wooden formed blocks at the northern tip of the western mole that comprised one of the "artificial islands" (Area K2; Brandon 1996, 1997a, 1997b; Brandon *et al.* 1999; Raban *et al.* 1999a: 159–166) were a platform that supported the base for the Drusion. This structure was mentioned by Josephus as the "*most magnificent and the tallest*" of a series of towers that were set in intervals along the stone wall that encircled the harbour (BJ 1: 411; AJ 15: 335). Vann's argument in favour

*Figure 5.70. The silver tessera found by Link's expedition (Photograph: A. Raban)*

of identifying the Drusion at that place was based on the preliminary data acquired during the 1990–1991 seasons of excavations (Holum *et al.* 1992: 84–87). Based on a rather extensive comparative study of other prime towers built by Herod (Vann 1991: 136–138, Figs. 20, 21) he estimated that the Drusion was 50 m high. The arguments in favour of reconstructing a lighthouse at the edge of the western mole can be summarized as follows:

1. Sebastos was built on an imperial scale and was likely furnished with such a device, especially when considering the historical and cultural context of Herod as Hellenistic royalty. As a port compared with the harbours of Alexandria and Rhodes, Sebastos was crowned with a magnificent lighthouse, even if it was not as large as the two of the "seven wonders of the ancient world"—the Pharos of Alexandria and the Colossus of Rhodes.

2. Although Josephus did not specify the function of the Drusion, it could have served as a lighthouse, and maybe even the only one (Vann 1991: 134).

Lighthouses as navigational aids served two distinct functions. The first was to mark the position of the port from a great distance, either by light at night and/or by smoke during the day. This role was almost imperative wherever the coastal topography was flat and obscured the horizon for ships sailing in. These were the cases of the Portus of Ostia, Leptis Magna and above all—Alexandria. To reach the latter from the open sea one had to measure water depth at a distance of three days of sailing, as far as the smoke of the Pharos could be detected (BJ 3: 614). In the case of Caesarea, the southern tip of Mount Carmel (4 km to the north; 2 km inland and over 100 m high) could be used as a landmark, except for ships sailing in from Egypt. The second function was to mark the location of the harbour entrance channel. For the first function the site of the lighthouse had to be as high as possible and not necessarily on the mole or by the entrance, as it was in Dover (Rigold 1969), La Coruña, northwest Spain (Hütter 1973) and Paphos, Cyprus (Hohlfelder 1996: 85, n. 20). Josephus' description of the Drusion as one of the towers on the mole may indicate that it served the second function, and in this case it should be located next to the entrance channel. Josephus conveyed that the temple Herod built for the Caesar was on a hill and "*visible from afar to those sailing towards the harbour*" (AJ 15: 339). Hence, it is possible that this temple was the landmark from a distance and the Drusion was therefore the demarcation of the entrance itself. Hohlfelder (1996: 89–91) suggested that this platform was a later addition to Sebastos and argued against Vann's reconstruction of the Drusion at the tip of the western mole and a functioning lighthouse at that place (Hohlfelder 1996: 84–86).

However, most of the arguments do not favour the identification of the Drusion as a lighthouse. Excavations in area K2 (Raban *et al.* 1999a: 159–166) indicated that the width of the supportive platform was too narrow for substantiating a major structure of such magnitude as the Drusion was according to Josephus' description. The twin towers (Area K) on the *"right side of those sailing into the harbour and the one on the port side*" ([Area G]; BJ 1: 413; AJ 15: 338), were almost undoubtedly the necessary navigational devices for the harbour channel, so a lighthouse would be redundant. The assumed line of the spinal stone wall mentioned by Josephus incorporated two better locations for the Drusion: one on the largest artificial island in Area U (27 × 44 m; Figs. 5.7, 5.69; Raban *et al.* 1999a: 166–168), half way along the western mole, extending seaward from the spinal wall. The other is the rocky outcrop (over 8 m high) at the stem of the southern mole (Area M; Raban 1989: 154–156). On a silver tessera (Fig. 5.70; Fritsch and Ben-Dor 1961; MacLeish 1981), a depiction of the harbour entrance of Sebastos appears (Oestreicher 1962). Some scholars suggested that it was Alexandrian in origin (Hohlfelder 1989: 70), but others argued that this artifact was locally produced at the time, or soon after the inauguration of the harbour in 9 BCE (Hamburger 1986: 192, n. 73). One might question whether the initials KA on this object necessarily refer to the date (year 21 of the Augustian era = 9 BCE). Following the contemporaneous Phoenician tradition of depictions on coins, these letters could either be the first and last in the name of the inaugurated city: KAISARIA, or its first two letters for that matter (in Greek). Whether depicting the entrance to Sebastos or to the harbour of Alexandria, the towers on both sides of the channel carried three statues each, but there was no lighthouse, nor other large tower at that site that could be identified as the Drusion. In light of the present evidence, it is highly unlikely that the Drusion's location was at the tip of the western mole (Area K2), and there is no solid and direct evidence to suggest that it served as a lighthouse.

### 9. The Intermediate Harbour Basin

The ancient intermediate basin of Sebastos was the confined body of water, which spread over the area of the present

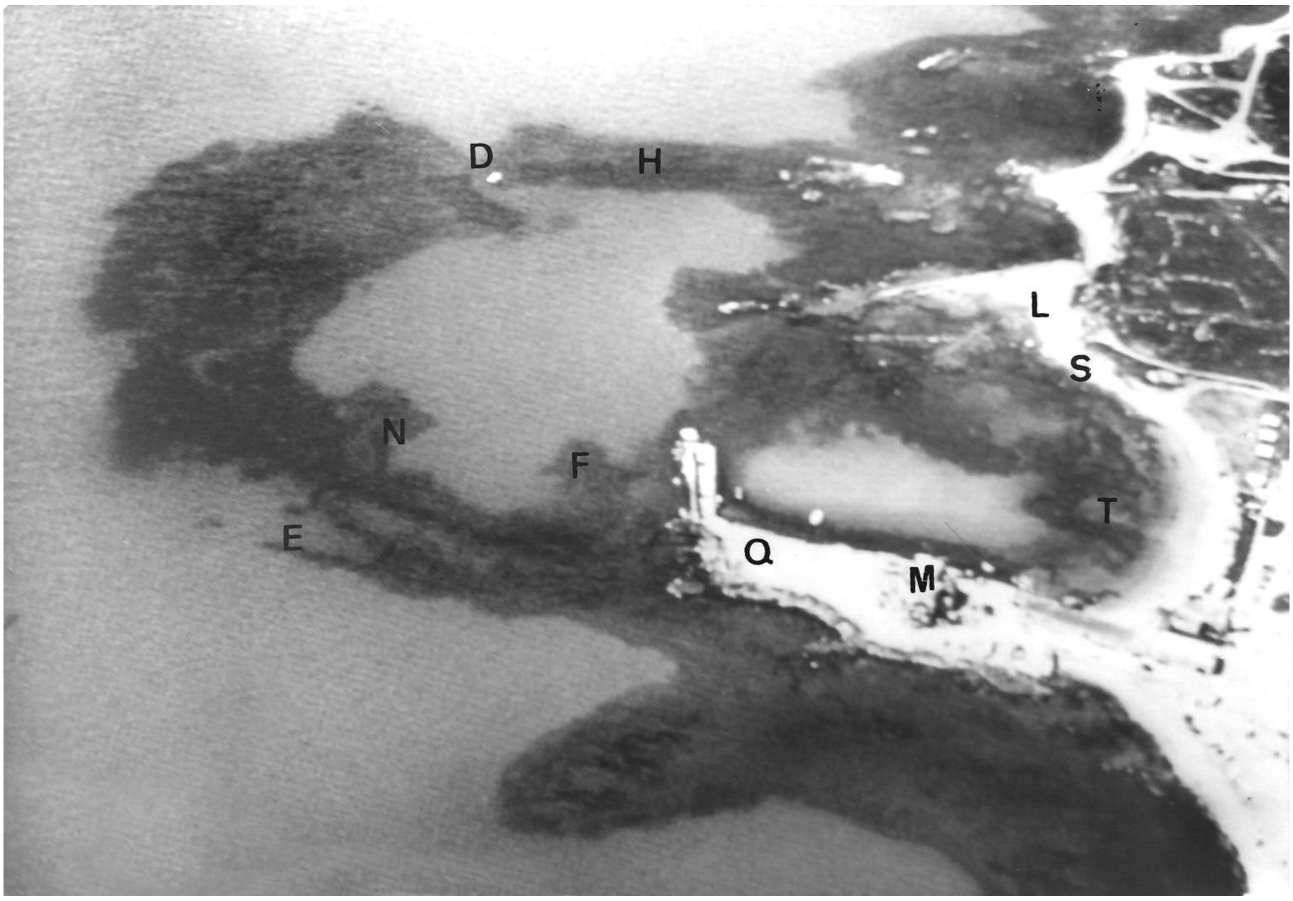



*Figure 5.71. Aerial view of Sebastos from the south with the demarcation of the studied areas in the intermediate basin (Photograph: A. Raban)*

day fishermen haven. This area (Fig. 5.71) is delineated on its southern side by an overbuilt modern promontory (30–40 m wide) protruding from the shoreline for over 200 m towards west-northwest. Originally this promontory was a near-shore rocky islet that was connected to the mainland by a seawall that probably existed already in the Hellenistic period. On the east, it is defined by the seawall and the submerged round tower (Area T) that was in existence when Sebastos was constructed. This seawall enclosed the southern harbour basin of Straton Tower and was incorporated into the overall plan of Sebastos as its inner basin. To the north there is an extended rocky platform just above the waves and the nearby higher ground (Areas L, S; Fig. 5.71). The original defining structures on its west are presently covered by the modern pier and are badly segmented by the alleged tectonic hinge line. Yet, as specified above, the "sunken floor" (Area F) might be a component of a dividing pier between the main and the intermediate harbour basins.

This part of Sebastos was used throughout the modern era, but with several interruptions. Due to the fact that it did not subside nor silt-up over time, it was renovated, altered and robbed of its building materials more than once. Its exposure to the ever-agitating elements at the water line added extensive erosion and abrasion to it. For these reasons it is difficult to discern the scattered remains of its original layout and features and only a few components that might be dated to the time of Herod were detected and studied.

Field research was carried out in the southern promontory (Area Q), at the western side of the Crusaders' harbour citadel. The rocky outcrops projected at the westernmost tip of the promontory well above the modern pavement, where most of the bedrock was removed by the Crusaders and much later, in modern time. The highest leveled surface of the bedrock was exposed 1.6 in above MSL along most of the northern edge of the modern breakwater.

This surface is set back 3-4 m from the present northern edge of the promontory, where it is outlined by Crusader and modern stone walls (Fig. 5.72). To the south, there is now a wide platform of concrete laid in 1951 that covered an area where the *Survey of Western Palestine* plan (Conder and Kitchener 1882: 16) showed a configuration much like that of today, with presumed bed rock covered by Crusader floors and seawalls (Schumacher 1888: 132; Schiller 1981: cover, figures on pages 3, 47, 55, 57, 71). It is possible that the base of the promontory was not formed by bedrock, but by some kind of a tombolo. The bedrock above the present MSL was not reached in recent trenches dug for infrastructures along the eastern half of the promontory. CAHEP's excavation in 1982 also showed

*Figure 5.72. The northern edge of the promontory at Area Q, from the east (Photograph: A. Raban)*

*Figure 5.73. The sluiced rock-cut channel, from the NE. (Photogrpah: A. Raban)*

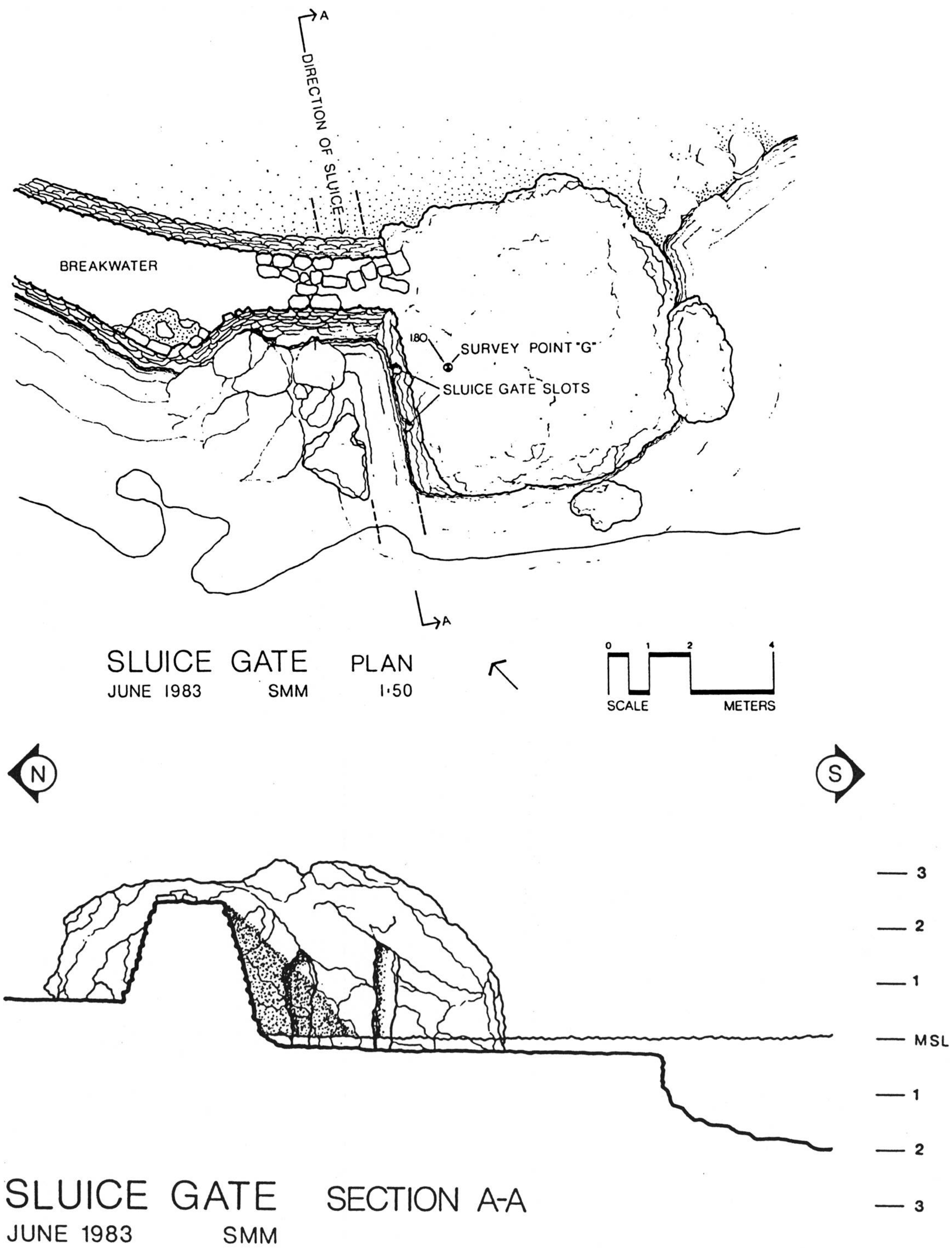



*Figure 5.74. Top-plan (a) and section (b) of the rock-cut channel at Area Q (Raban 1989, Fig. III.156-157)*

that the Crusader moat separating the harbour Citadel from the rest of the town was not cut in bedrock—at least as far down as present MSL (Oleson *et al.* 1984: 302–4).

Although extensive Crusader and modern building activities did not leave much of the earlier man-made or natural features, two locations on the westernmost part of the promontory seem to still bear some traces of ancient structures in the area (Raban *et al.* 1976: 30–31, 34–35). In the course of a systematic survey of the promontory, the rock-cut flushing channel was drawn and studied (Vann in Raban 1989: 154–156). The western side of this channel was partially destroyed, probably during preparation for the construction of the new mole in 1949, leaving only the southern 4 m of the channel visible (Figs. 5.73, 5.74). This section was 1 m wide and cut into a bedrock projection; its upper surface stood at 3.2 m above MSL. The present floor of the channel lies just below the abrasive shelf, but considering the extensive biogenic encrustation, it is hard to determine its original elevation.

*Figure 5.75. The protruded ledge along the north edge of the promontory (Phtograph: A. Raban)*

There are two pairs of vertical grooves cut into the sides of the channel. The first pair, 2 m north of its seaward opening, was preserved on both sides and the second is 1.4 m farther north, along the eastern side (the western side is missing). The grooves were preserved to c. 2 m above the base of the channel and, although partially filled by marine encrustation at their base, they seem to continue down to the floor of the channel at 0.25 m above present MSL. These grooves were undoubtedly designed for the insertion of sluice gates so as to control the flow of water into the channel. Such devices are well known in the Mediterranean from at least the early Roman period. They were very common whenever a controlled inflow was needed for the circulation of water in *piscinae* (Schmidt 1972) or harbour installations (Blackman 1973a: 177; 1982: 199–202; Poidebard and Lauffray 1951: 31–32).

The possible existence of a *piscine* is less likely for several reasons. It would hamper the transporting of goods along the inner quay when the Herodian harbour was still, even partially, functioning. In the Roman and Byzantine period there was a large *piscine* elsewhere to the south (Flinder 1976). No rock-cut tank was traced on the promontory in early illustrations, and nothing was found during the excavations in Area M4.

Looking for the other alternative, a harbour installation, the other side of the promontory was examined for signs of such a function. Unfortunately, this side is now covered by late structures, including the Crusader seawall. In one place, however, a gap in the platform underlying this wall was observed and it seems to be, more or less, in same line as the course of the channel. Consequently, the channel was 40 m long across the stem of the breakwater and most likely functioned as a flushing device to keep the harbour silt-free by trapping enough surplus water within it to allow a continuously out-flowing current through its entrance. For such an operation the base of the channel should have been just above the low tide level, namely 0.05–0.10 m above present MSL. This figure agrees well with the elevation of the faunal remains and the abrasive notch on the face of the quay in Area I1 (see below).

This circumstantial evidence advocates dating the channel to the same period as the inner quay at its later phase. Since this channel alone would not have been sufficient to supply the needed quantities of water for keeping such a vast basin free of silt, more channels must have existed. The position of the surviving channel was suitable for capturing silt-free waves. The surviving channel faced a section of the coast that was on the lee of the line of

*Figure 5.76. Close-up view of the ashlar paved quay at Area Q, from above (Photograph: A. Raban)*

breakers during stormy sea. This, together with its shallow rocky bottom, caused the waves that reached the channel to drop most of their burden of solid particles en route. Thus, the other channels were likely located on this part of the southern breakwater. A second possible channel may have existed at the southwestern corner of the main building of the Crusader Citadel, just east of the high rocky outcrop. A tunnel-like element that was found there during a survey made by the Israeli Navy in 1949 led from the sea underneath the Crusader walls into the harbour basin. Yet a third channel may have pre-dated the Crusader moat on the eastern side of the citadel. These proposed channels might have been even wider than the one at the western tip of the promontory. Being placed farther to the lee of the breakers, it was easier to control their intake and keep sand from entering with the water.

The northern edge of the promontory retained better preserved features, the most prominent of which was a segment of an abrasive shelf with a straight edge that ran for 20 m along the base of the modern paved road and 2 m farther north (Fig. 5.75). Examination of the surface with its regular shape indicates that it was likely manmade. Under the cover of marine encrustations, lines separating individual *kurkar* ashlar blocks were clearly visible (Fig. 5.76). These were usually long, slim headers (0.4–0.5 × 0.55–0.60 × 1.3–1.5 m) of which the eastern ones became shorter and a second course was visible behind them.

The excavated trench reached a maximum depth of 5.8 m below MSL without exposing the actual base of the structure. Below the paving course of the platform a second course constructed of large ashlar header blocks was exposed. Beneath this course, at a depth of 1.3 m of water, the upper surface of a third course, exceedingly worn and cemented by marine encrustation, was revealed. Following its concave face, the excavation entered the same type of overhanging hollow that seemed to be higher, as if most of the bottom course of headers was missing. The material of the inner face of the recess resembled the concrete of which the towers in Areas G and K were constructed. The sediments below the modern dump of gravel consisted of clean sand with some wave-carried ancient and modern artifacts and seashells, down to a depth of 3.2 m below MSL. Still deeper, the recessed hollow was filled with small pieces of rubble, dark gray sand mixed with clay and various particles of volcanic ash and *tufa*, possibly the decomposed remains of a concrete block. At the bottom of the trench, the recess became shallower, as if below that depth the concrete block was less worn and better preserved.

The excavations in Area Q contributed to the clarifications some issues. The rectangular abrasive platform along the western 20 m of the north edge of the promontory was part of a man-made marine structure that pre-dated the Crusader period. Thus, it could be a remnant of the inner quay of the Herodian southern breakwater and, if so, the fact that its continuation was missing farther west, in Area N is elucidated. This quay was apparently built of a substructure consisting of concrete blocks with two or three ashlar headers topping it. The Crusader builders used these topping ashlars as a base for their sea-wall and thus partially preserved the Herodian foundation, while in Area N plundering of these topping blocks caused the loss of the rest of the wall.

Although bedrock is visible only at one point next to the platform, it is possible that it served as the foundation for most of this section of the southern breakwater. The man-made features were only an additional fill in building an even platform with the breadth and elevation necessary to match the demands of the general layout of the southern breakwater. This base, built on bedrock, confined the intermediate basin of the harbour and its continuation beyond the alleged additional pier (Area F), which confined the external, main harbour basin. If this reconstruction is correct than some architectural and technical differences should be anticipated regarding the construction of the two basins.

Although it is possible that the artificial platform in Area Q was added at a later stage, after the completion of the Herodian harbour, and although it cannot be directly dated, it is reasonable to assume that it was constructed in Herod's time. It is improbable that volcanic ash and *tufa* were imported in post-Herodian period. Both the delineation of the platform's edge and its building style agree well with Herodian structures elsewhere within the harbour complex.

It is obvious that the present surface of the platform is not the original one. Wave action and later salvage efforts reduced the original platform to MSL and it is no wonder that no mooring stones or access staircases were found along the preserved segment of the quay. A staircase was observed along this line, about 30 m farther to the east before the main structure of the Harbour Citadel was blown up at the turn of the twentieth century (Schumacher 1888: 136). Thus, it is now completely lost

***a. Seawall to Northeast of Intermediate Basin (Area S)***

Different teams have studied the northeastern side of the intermediate basin since the mid-1970s, both on land (Levin and Netzer 1986: 16–131) and along the water line (Raban *et al.* 1976: 34–36; Stieglitz 1987; Raban and Stieglitz 1988: 275). Some issues were discussed within the context of the Hellenistic harbours of Straton's Tower (Chapter 2), or the alleged location of the naval shipsheds of Herod's fleet (Chapter 3). Following is a detailed description of the structures along the present-day water line that are considered to be an integral part of the harbour of Sebastos (Figs. 5.77–5.79).

An ashlar wall preserved to the height of 1.2 m above MSL, extending along the water line in an east-west direction was observed (Raban *et al.* 1976: 35, Figs. 38–41). Bloch who had noticed the wall earlier (1965: 15–16), claimed that the presence of boring holes of *Lithophagae* on its upper surface might indicate that it was covered by an MSL at least 1.3 m higher than at present. The southern side of the wall consisted of seven courses of blocks.

The first five courses are attributed to the Byzantine and Crusader periods. The sixth and seventh courses were constructed of ashlars almost 0.7 m high. A horizontal line of *Ostrea* encrustation was found in the middle of the lowest course, at 1.77 m below MSL. This course was placed on a layer of fine compacted gray clay overlaid bedrock, 0.4-0.6 m underneath, and was reached with an air-jet probe. The potsherds recovered from the top of the clay were dated to the first century CE. Although the early stages of the wall seem to have been built at an early stage in the history of Caesarea, there are no clear indications for its precise dating.

The earliest structure on the western part of Area S was undoubtedly platform 220 or a paved road leading toward the water of the Inner Basin (Figs. 5.78, 5.79). This pavement was reused and partially dismantled. In its original form, it was probably a line of long, narrow ashlar blocks 1.6 m wide, inserted into the surface of the flattened bedrock, with its upper surface 0.23-0.37 m above MSL. This course was bordered on both its sides by long, narrow stretchers of uniform measurements (1.6 × 0.5 × 0.27-0.32 m; Raban 1989: 179). While clearing the northern, better preserved part of the pavement, some Late Hellenistic potsherds were recovered. A later chamber was placed above this early pavement comprising three parallel spaces of similar width from a similar date as that of the rectangular structure in Area L, while the earlier cross wall along the waterline is of the same date as the Herodian pier there (Levine and Netzer 1986: 60–63).

Summing up the main features of Area S, the following chronological sequence is suggested:

1. The original form of pavement 220 might be pre-Herodian in date. Its orientation does not agree with the Herodian structures in the area or in the adjacent Area L. The original function of this pavement is not clear and cannot be defined without further excavations (see the suggested naval function in Chapter 3).

2. The main seawall, W 1 (Fig. 5.77), was laid in the water, perhaps in order to serve as a retaining wall or a base for a vertical quay wall that continued farther west, and perhaps made a right angle with the southernmost tip of the quay in Area L. If the original stage of this wall is pre-Herodian, then pavement 220 (Fig. 5.78) might have led to it. This seawall provided significant evidence for securely dating

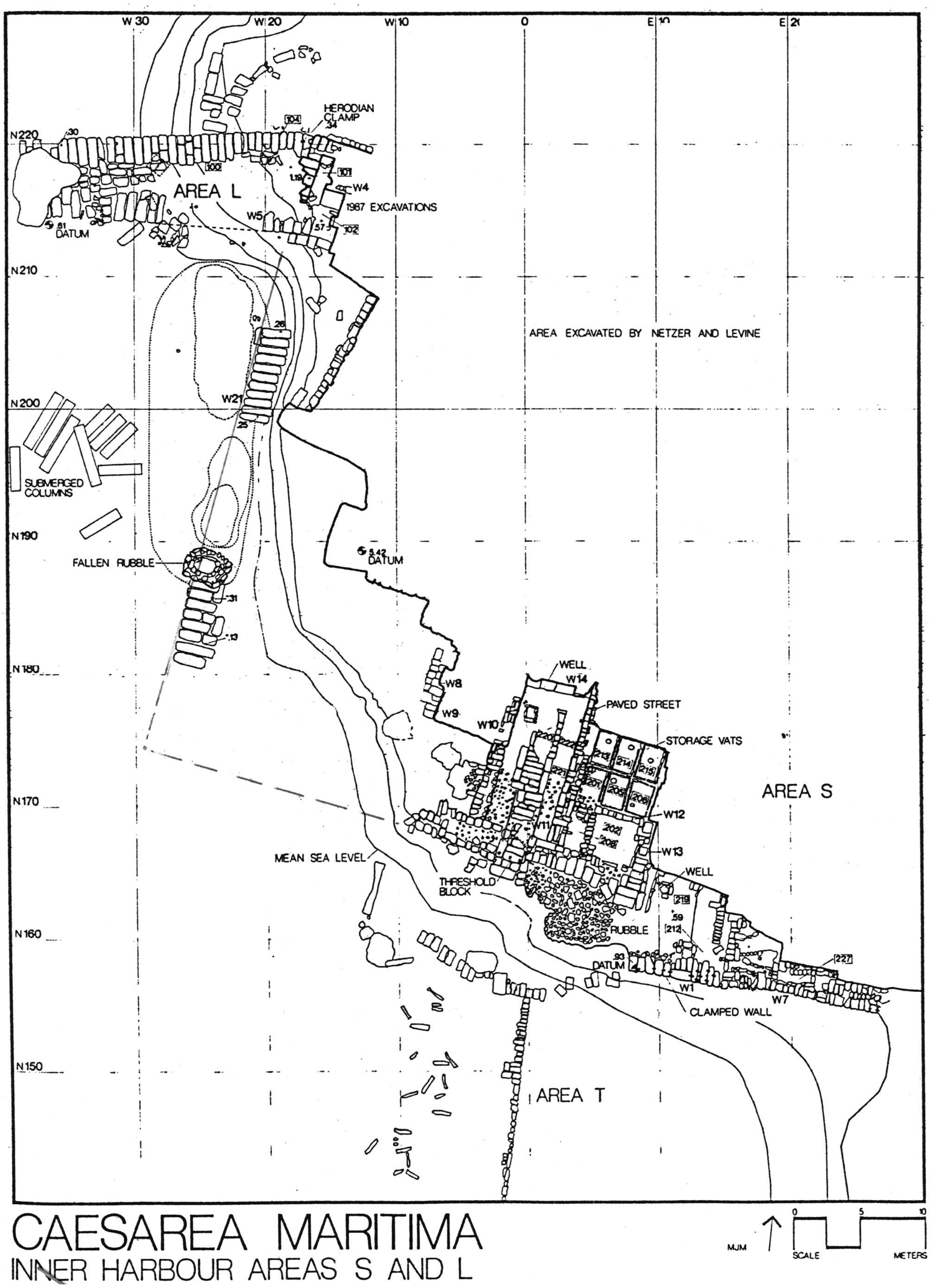



*Figure 5.77. A general top plan of CAHEP's Areas S and L (Raban 1989, Fig. III.109*


*Figure 5.78. The sea wall at Area S, from the north (Photograph: A. Raban)*

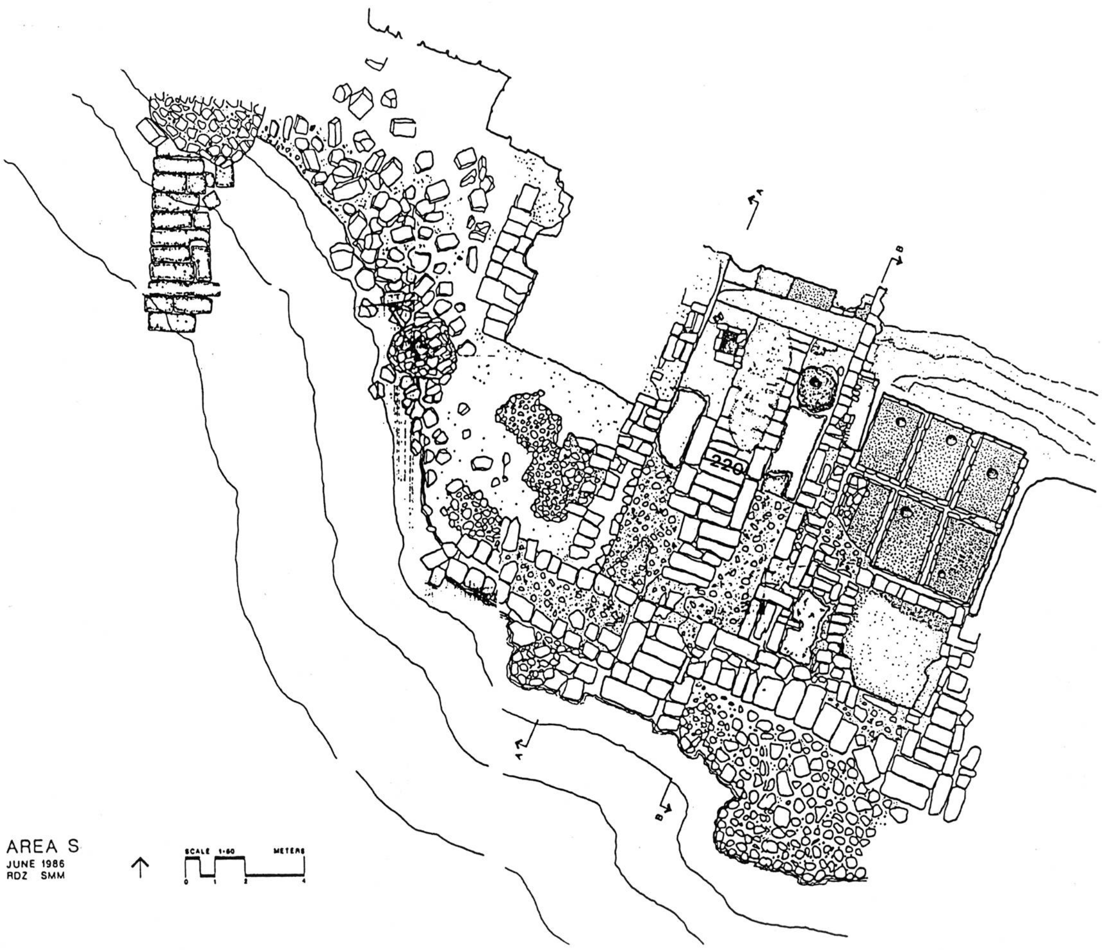



*Figure 5.79. Top plan of Area S (A. Raban, Caesarea Project)*

*Figure 5.80. The ashlar "Headers" pier at Area L, from the east (Photograph: A. Raban)*

sea levels to the Roman, Byzantine, Early Arab, and Crusader periods. Accordingly, the sea levels were at about the present MSL in the first century CE, 0.6–0.7 m higher during the later Byzantine period, another 0.4 m higher in the ninth–tenth centuries CE, and at least 0.4 m lower in the mid-thirteenth century CE.

3. The three rectangular chambers are clearly post-Herodian in date. It is possible that there was a series of storehouses here of the later Roman era (Levine and Netzer 1986: 65), but later use of these structures removed all artifacts that could document such a proposal.

4. During the Early Islamic period most of the area was leveled to about 1.5 m above MSL, at a working surface that was provided with many freshwater cisterns. One chamber contained storage bins or rectangular silos for large quantities of olive oil or some other commodity for export.

5. During the Crusader period, the course of the fortification along the waterfront covered the westernmost part of Area S and extended out to the south. At that time the sea must have been farther away, as can be deduced from the western addition to W1 and the now submerged wall that stems from this addition, leading south across the bay.

***b. A Pier and a Quay (Area L)***

A unique structure along the coastline is an ashlar platform, projecting from the foot of the present cliff just north of the modern harbour basin (Figs. 5.71, 5.77, 5.81). The structure was first observed and studied in 1975 (Raban *et al.* 1976: 33–34, Fig. 24). It was later studied by Levine and Netzer who concluded that the structure was "*apparently a pier connected to the port system of Herod's time*" (Levine and Netzer 1986: 65; Plan 3, 11c, 11d; Illust. 73). Subsequently it was excavated by CAHEP in 1986 and 1987.

The structure, preserved to a maximum height of two courses, was framed by two side-walls of long blocks arranged as headers (Fig. 5.81). It is 6.4 m wide at its western tip, which is now partly covered by beach-rock (0.37 m above MSL). The beach rock indicates that deposits covered the pier's tip long after it went out of use, when the sea level was slightly lower than at present. The northern side of the pier is better preserved and still retains all the blocks of its foundation course. There are 38 headers extending for 23.7 m; the better-preserved blocks are 2.2 × 0.61–0.63 × 0.42–0.53 m. On the southern side of the pier, only the western 11 headers were preserved in their original configuration. At this point there are remnants of a crosswall built of alternating headers and stretchers. The

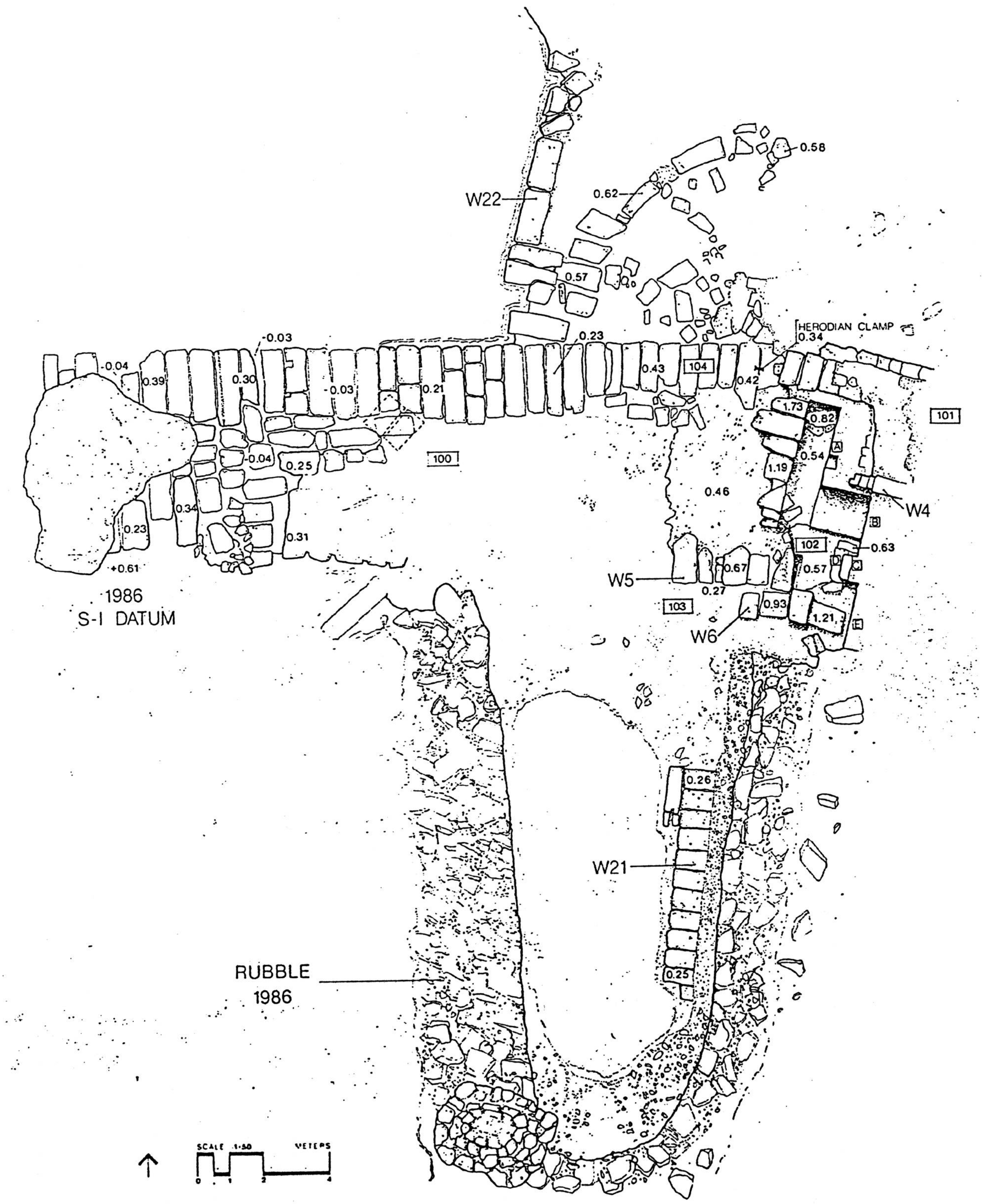



Figure 5.81. Top plan of Area L (Raban 1989, Fig. III.111)

size of the stones, the order and the incorporating matrix resemble those of the Crusader seawall on the northern side of the harbour citadel.

During the excavations, the eastern part of the pier was cleared to bedrock, and the architectural complex on top of its eastern stem was excavated. The debris covering the waterline to the south of the pier was cleared by a mechanical shovel, exposing an ashlar quay perpendicular to the pier (Fig. 5.82).

The main structure excavated in 1986 was a rectangular building, of which only its western end was exposed; the rest was buried under later structures. The northern wall

*Figure 5.82. The quay at Area L, looking from the south (Photograph: A. Raban)*

*Figure 5.83. Dovetail grooves for metal clamping at the stem of the pier in Area L (Photograph: A. Raban)*

(1.05 × 0.52 × 0.52 m; four courses high) comprised blocks laid in alternating courses of headers and stretchers. The ashlar blocks are bound by a cement of compacted red loam (*hamra*), mixed with small rubble. At its western end, directly on top of the northern edge of the pier and 22.3 m east of its western tip (Fig. 5.81), the wall formed a corner with a similar wall that ran southwards. Just west of this corner, blocks of the pier buried in partly calcified sand were exposed. The top course of the pier is 0.34 m above MSL and matching grooves for dovetail clamps, characteristic of the Herodian phase at Caesarea, were found on the edges of two neighbouring blocks (Fig. 5.83).

Excavations inside the rectangular building revealed sand fill with some Late Roman potsherds (second–third centuries CE) on a gray cement floor (0.92 m above MSL). Some of the vessels found smashed on this floor can be dated to the mid-second century CE. The western wall survived for only two courses; its original width was at least 1.52 m, but its western face was badly affected by the sea. As a result, the southwestern corner of the structure could be calculated only to 7.8 m south of the northwestern corner and on top of the southern side of the pier (Levine and Netzer 1986: 65). The fragmented, *in situ,* blocks of the southern wall showed that its width was 1.05–1.10 m (Levine and Netzer 1986: 52). According to Levine and Netzer, one floor was found within this rectangular

*Figure 5.84. The southern part (from east) of the ashlar quay in Area L. Note the pairs of grooves on the left hand block (Photograph: A. Raban)*

building (2.13 m above MSL) and probably another one (0.13 m higher) and these were dated to late second–early third centuries CE (1986: 52,65).

The southern wall of the pier extended underneath the southern part of the rectangular structure, where the blocks of the pier were covered by a later floor of compact gray mortar with rubble base. This floor was clearly beneath and earlier than the western and southern walls of the rectangular structure and the ceramics found on it were dated to late first century CE, the latest possible date when the pier went out of use. Since the foundation trench of the rectangular structure was dug into a heavy layer of beach deposits, it seems that there was a period of abandonment between the cement floor on top of the pier and the rectangular structure. The coarse components of these beach deposits and their steep gradient indicate that at this period the beach was formed by waves with considerable energy. We thus assume, that the main breakwaters of the Herodian harbour had already lost their integrity and the main basin was no longer well protected at that time (Raban 1992a: 115–119).

South of the pier, along the water line, an ashlar quay was exposed in 1986. Its entire surviving part, bedrock below it, and an ashlar wall, which retained the fill to the east, were revealed (Fig. 5.81). One of the ashlar blocks had grooves for metal clamping on its underside, similar to those of the pier (Fig. 5.84). The orientation of the quay was perpendicular to the pier, but the retaining wall was diagonal to the quay, similar to the rectangular structure. The quay included 11 long blocks embedded in a rock cut trench dug into a flattened *kurkar* platform sloping very gently to the east. The edge of the quay was even along its outer face, but the blocks vary (2.2–2.7 m) causing the inside face to be uneven. The maximum surviving width of the quay was 2.8 m, but it seems that originally it was greater.

The 6.6 m long quay was 5.6 m away from the southern edge of the pier. The hollowed cuttings in the bedrock along this gap indicated that the two structures were originally one unit and the missing blocks were removed by human agency or by the sea. Another segment of the same quay was visible just above sea level 14 m farther to the south (Fig. 5.77). It is composed of 11 header blocks over 6.6 m long. Here too, the western face was straight, while its backside contains some additional paving slabs laid as stretchers.

There can be little doubt that this long pavement was some kind of waterfront quay. At present the sea adjacent to it is silted up, and it is impossible to determine the original depth of water along the quay without further excavation.

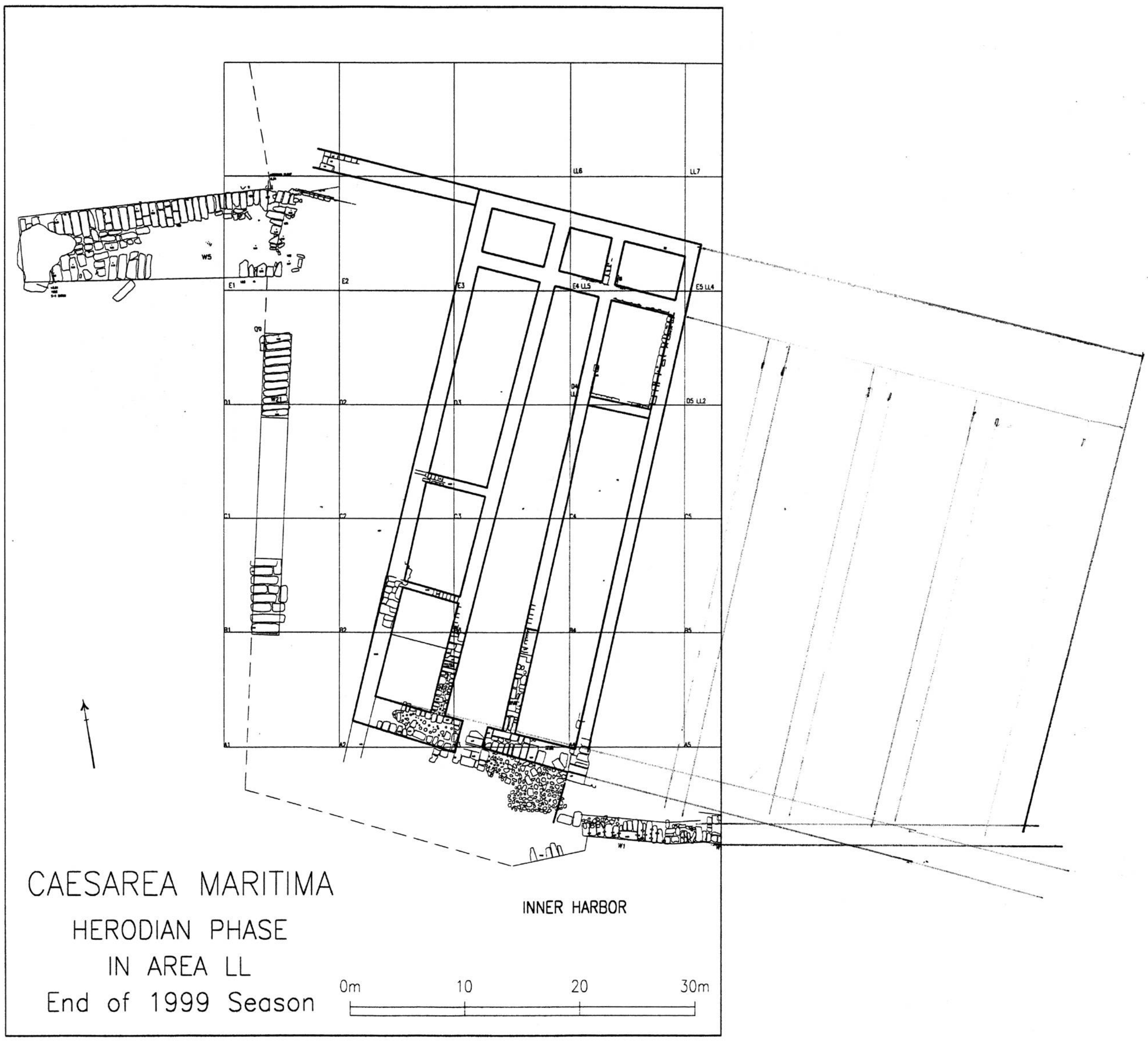



*Figure 5.85. Schematic plan of Area LL in the Herodian period. CCE 1999 season (A. Raban, Caesarea Project)*

Nor is it possible to distinguish the original function of this structure, whether was it a true quay against which vessels could moor or a paved road leading to the adjacent pier. Projecting the line of this quay 14 m farther south, it meets the projected western continuation of the massive sea-wall in Area S at a right angle. The missing sections lay in an area now covered by 1.2 m of water, exposed to the surge and not protected by later Byzantine and Crusader structures, and likely lost to erosion.

The retaining wall behind the northern segment of the quay seems to show at least two different stages of construction with missing blocks above the second and the third courses (Fig. 5.81). Two foundation courses (the lower 0.37–0.42 m high; the upper 0.6 m high; 1.3 m wide) were inserted into a trench that was dug into bedrock through 1 m of beach deposits. The foundation trench was then filled with rubble and *hamra* in a similar manner to that used in the construction of the nearby rectangular structure. The same red loam was used to bind the higher courses of the wall, which was preserved to seven courses high (2.1 m) on its southern side.

It seems likely that this retaining wall was built in an area in which there are beach deposits typical of wave action indicating that prior to its construction the area was exposed to the surge, much as it is at present. Judging from the similarity in orientation, foundation elevation, and construction technique it is most likely that this wall was of the same date as the nearby rectangular structure.

Based on the data, one might claim that by the late second or early third century CE this part of Caesarea was a beach exposed to the surge of the open sea and had no apparent harbour function. Evidently, the breakwaters of the Herodian harbour began to be submerged at this early date. This conclusion was substantiated by the archaeological data exposed in the southeastern side of Area L. There, at

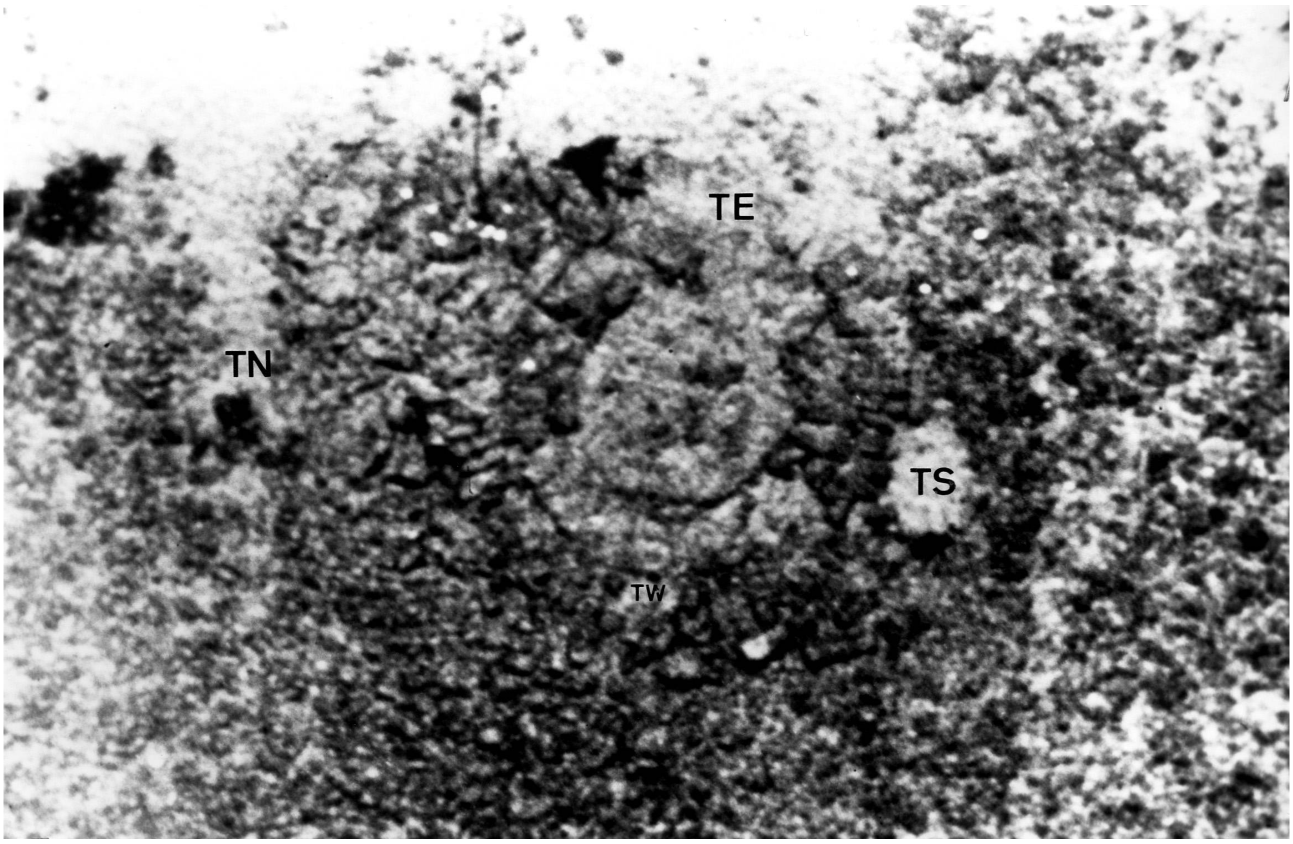



*Figure 5.86. Aerial view of the sunken round tower, T-1, with demarcation of the probes, 1989-1990 field seasons. (Photograph: A. Raban)*

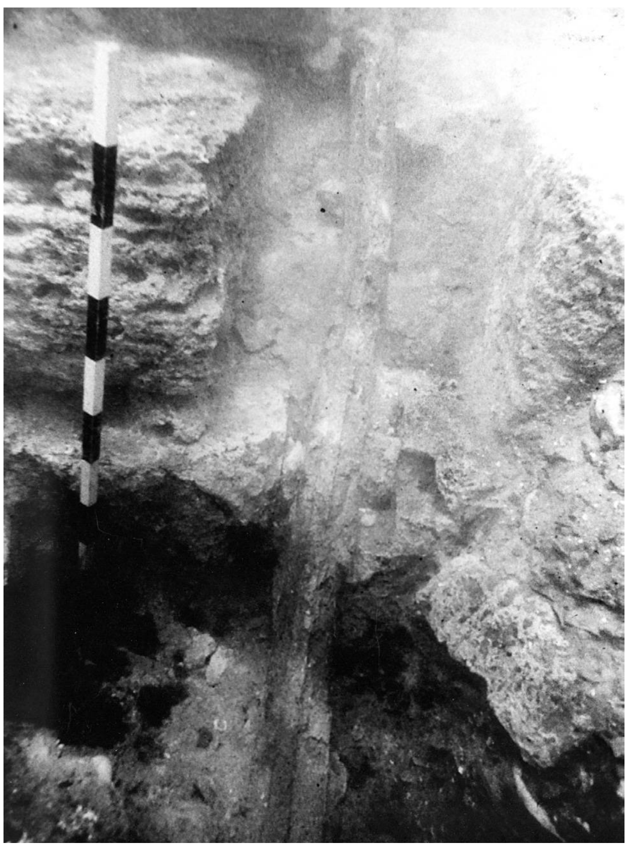


*Figure 5.87. The ascending tip of the lead water pipe in the eastern side of the round tower (TE), from the east (Photograph: A. Raban)*

the alleged rock-cut slipways or "Warehouse" (Fig. 5.85; Raban and Holum 1999: 11; see chapter 3 above), the filling dump over the quarried bedrock consisted mostly of late first early second century CE sherds, indicating the period when these slipways went out of use.

**c. *Summary***

1. The altering orientation of architectural features such as the Herodian phase of the "Warehouse", in comparison to the pier and quay at Area L and the seawall at Area S, may indicate that this area was originally built during the Hellenistic period by the master builders of Sebastos.

2. The dimensions of the elongated "corridors" of the "Warehouse" and the slotted rock-cut units resemble the standard shipsheds of naval units of the trireme type. This may substantiate their function.

3. The dovetail grooves over the top two courses of sea wall at Area S were first considered as a datable technological "benchmark" of the Herodian era. However, stratigraphically and in comparison with a similar wall in the inner basin, these should be dated to c. 500 CE.

4. The round, presently submerged tower at Area T (see chapter 2) was pre-Herodian in date, as was probably the original phase of the seawall that connected it to the north shore (Area S; Chapter 2, Figs 2.19–2.22). This tower

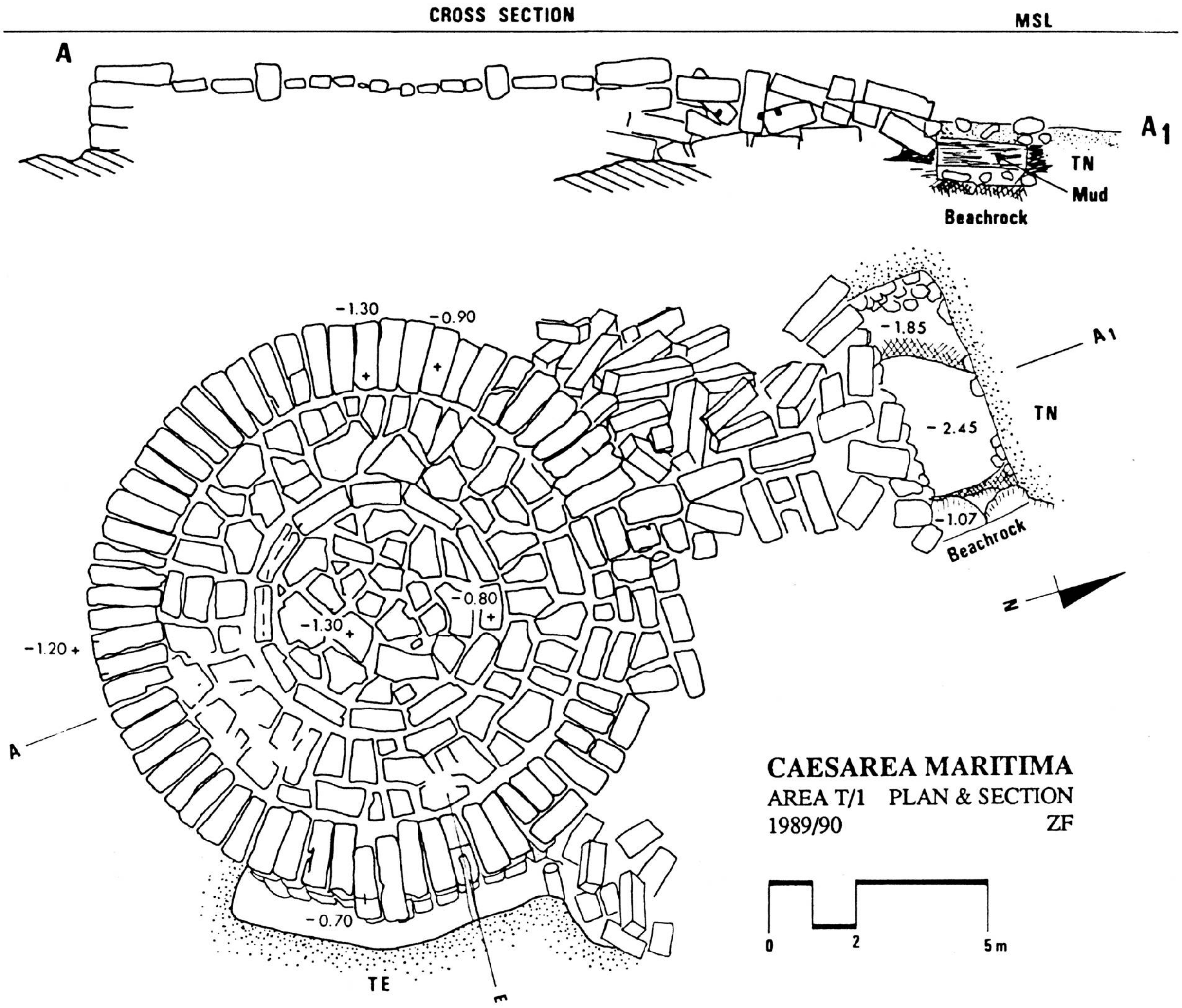



*Figure 5.88. Top plan and N-S cross-section at T-1 (1990) (A. Raban, Caesarea Project)*

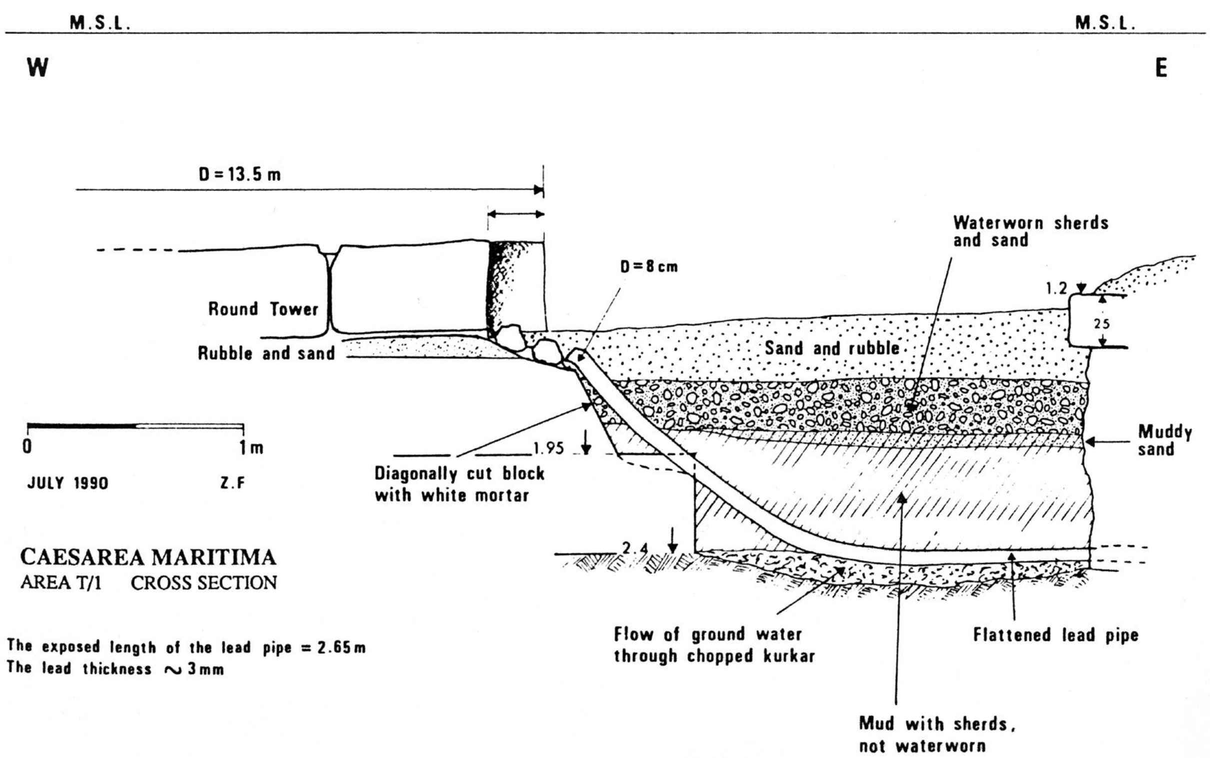



*Figure 5.89. Cross-section (E-W) at TE (A. Raban, Caesarea Project)*


*Figure 5.90. Aerial view of the NEW side of the Intermediate Basin of Sebastos, with demarcations of CCE Areas LL, S and SE, from the SW (Photograph: A. Raban)*

was renovated and altered throughout the centuries as the following:

a. It was rebuilt using smaller ashlars, some of which were retrieved from dilapidated terrestrial structures yet still carried plaster on their sides (Figs. 5.86).

b. The eastern side of the tower was modified to receive an ascending lead pipe, which, even today, carries fresh water from the land (Figs. 5.86–5.89). Similar lead pipes are known from various land probes at Caesarea and dated exclusively to the second third centuries CE, or later (e.g., Porath 1996a: 112–113; Patrich *et al.* 1999: 75). Furnishing the tower with fresh water supply was possible when much of the inner basin was already silted up and the tower accessible by foot from the city itself (Raban 1996c: 644–656; Chapter 6 below).

c. The probes along the northern side of the tower indicate the existence of a seawall towards the northern side of the harbour basin, with a broad quay and a door leading to the intermediate basin (Holum *et al.* 1992: 79–83; Fig. 5.88). The area of the tower is substantiated by bedrock at the present depth of 2.5-2.8 m of water. Maybe there was a narrower deeper channel, either natural or man-made, now buried under deposits of building materials and wave carried sand.

**10. The Inner Harbour Basin**

The inner basin went through the longest and most extensive sequence of functional, constructive and environmental alterations (Raban 1996c). Its existence may be historically surmised by the indirect passage in Josephus, referring to "*subsidiary anchorages within it"* (BJ 1: 410 and AJ 15: 331). It was argued that the origin of this harbour basin predated Herod's building project by at least a century.

The study of the inner basin of Sebastos was based on the presumption that it was during Herod's time that the entire complex of the harbour and its basins was established, formed and executed as the initial part of the urban master plan described by Josephus (BJ 1: 408–414; AJ 15: 331–341). For that reason, any wooden formed cemented compound of rubble and *pozzolana*, which could be related to the quay and adjacent structures at its lee, were considered Herodian, unless proven otherwise. Two additional elements for dating the original building phase of Sebastos are: the formed cement walls that settled directly on the bedrock; and the remains of wooden planks from the forming caissons that are dated by calibrated C14 analysis to over 2000 BP.

Whatever the state of this alleged late Hellenistic *Limen kleistos* was at the time of Herod, it is quite obvious that the round tower (Area T) was still pretty much intact,

Figure 5.91. The face of the northern seawall, or a quay at SE (Photograph: A. Raban)

as well as the seawall north of it, which defined the western enclosure of the basin. As described above, the northwestern side of the inner basin was confined by a retaining wall built of massive cut blocks bound by “dove tail” clamps and “dry” courses. Although it was suggested that “dove tail” clamping was a dating “benchmark” for Herodian structures (Raban 1989: 145–48; 1992c: 11–12), later excavations in the eastern part of the inner basin revealed a similar binding technique that cannot be earlier than fifth century CE (Area I6; chapter 6 below). In an additional probe, 60 m east of Area S, along the northern confinement of the inner basin (Area SE; Fig. 5.90), it became rather obvious that the structure was rebuilt to its entire height sometime during the Byzantine era, probably as part of Anastasius’ renovation of the harbour (Fig. 5.91, and see Chapter 7 below).

In the light of the above, we can summarize the relevant data exposed in the inner basin from north to south (for the locations of probes, see Fig. 5.92).

a. Area I11 was the probe made at the northeastern side of the inner basin (Raban *et al.* 1993: 44–46). There, a caisson formed cement wall (1.85 m high; 1.2 m wide) was exposed, cast on gently sloping bedrock, with its surface at 0.16 m below MSL. This wall was laid along what was then the water line of a bay with a thin layer of fine sand covering its rocky beach. At the lee of this wall there was an artificial fill of fine sand mixed with carbonates and

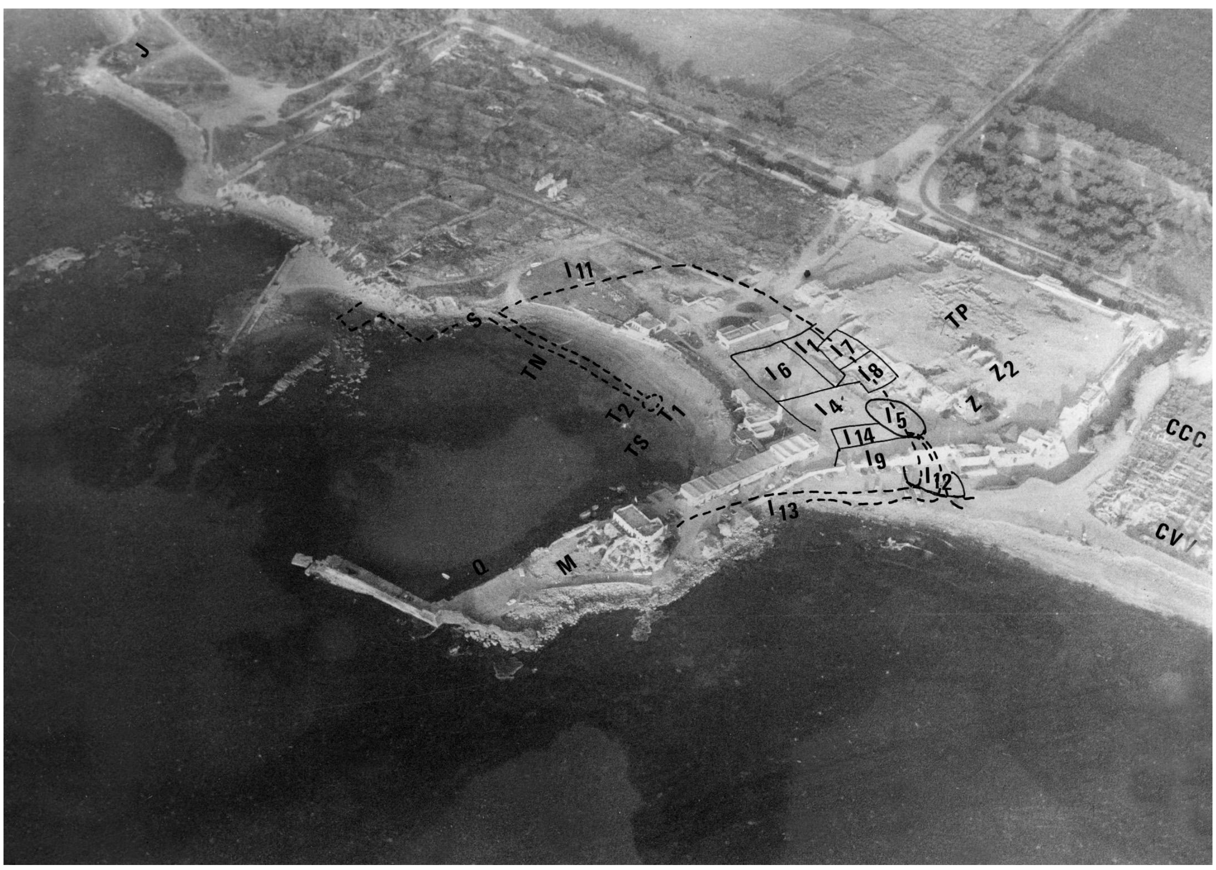



*Figure 5.92. Aerial photograph of Caesarea from WSW, with the demarcations of trenches and excavated areas of CCE, up to 1995 (Photograph: A. Raban)*

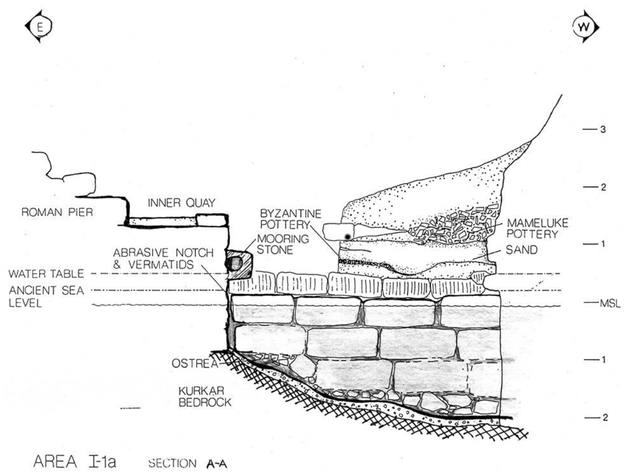



*Figure 5.93. E-W section next to the eastern quay at Area I1 (Raban 1989, Fig.III.70)*

dissolved lime. The large quantities of typical molluscs of brackish water indicate that this fill was saturated by a mixture of fresh groundwater and seawater, open to the air and close to sea level. Later, but still before mid-first century CE, both the fill on its lee and the top of the cement wall were covered by a very coherent concrete floor (0.2 m thick). On top of that floor there were sherds of the Herodian era.

b. Area I1 was at the mid-section of the eastern quay, west of the northwestern corner of the temple platform (4.95; Raban 1989: 80–81, 132–137). Its original phase is covered in many places by later renovations and additional structures. However, it clearly revealed a vertical seawall, of which only its western face was exposed, which was installed on a leveled edge of crumbling *kurkar* (0.85 m below MSL). A pierced stone slab was incorporated in its upper part, with the horizontal hole for mooring at 0.7 m above MSL. The formed mixture of rubble and hydraulic concrete (*pozzolana*) was topped by a single course of ashlar headers to a height of 1.65 above MSL (Fig. 5.93). The highest elevation of *ostreae* shells on the face of this wall indicates that the level of seawater was about 0.2 m higher than the present MSL, probably in the second or early third centuries CE.

c. The excavations in Area I7 confirmed that the Herodian quay at that part of the inner basin was covered and overbuilt by a much broader quay, paved by ashlar slabs (1.8 m above MSL). This later construction phase should be dated to the Byzantine era (the first half of the sixth century CE; chapter 6), and it covered the earlier phases, extending farther west into the basin. This building phase was incorporated with, but in an alternative manner, with the so-called “reflection pool” and the additional quay in Area I1, in front of the broad staircase of the temple platform (Fig. 5.94). In order to prepare the southeastern

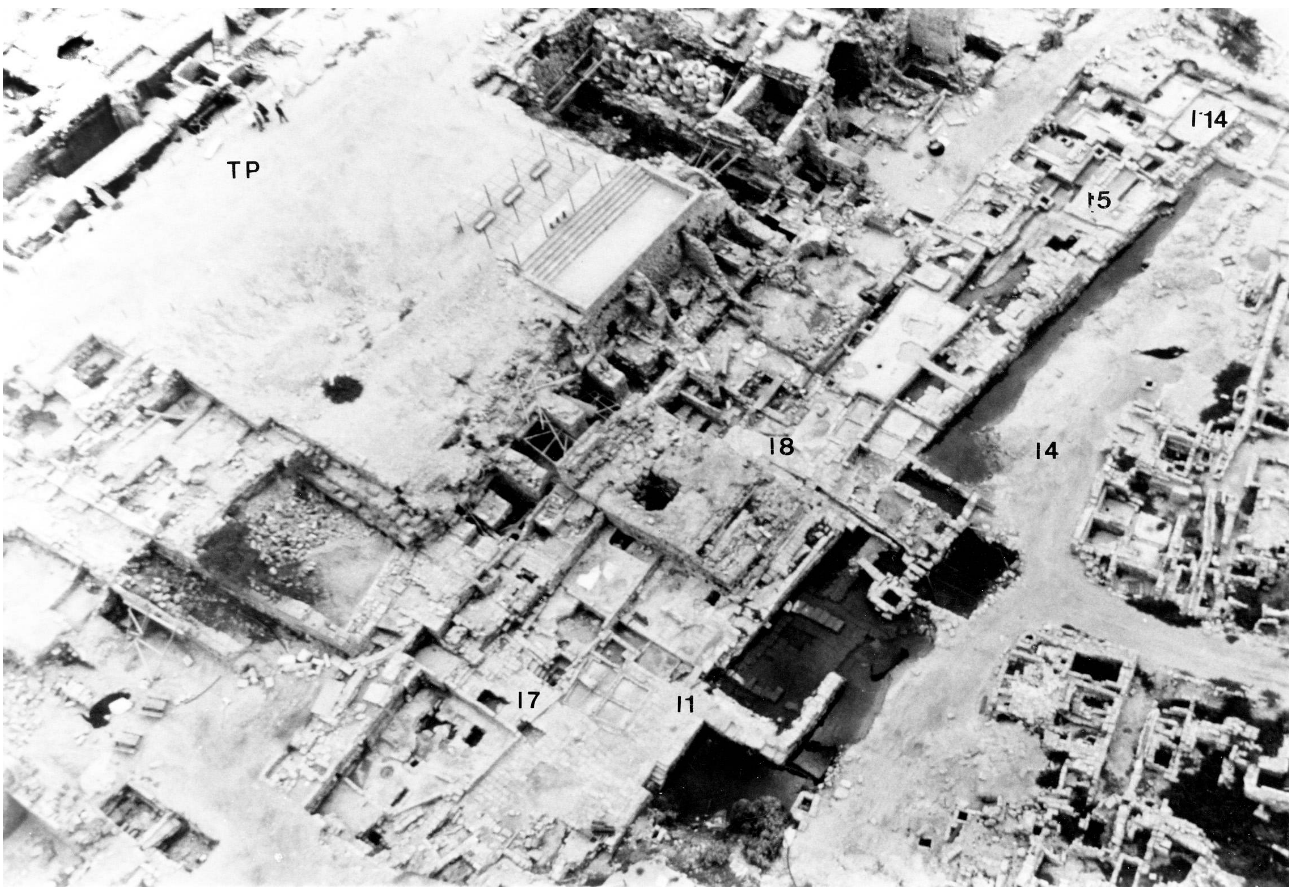



*Figure 5.94. Aerial view from the north of the area of the eastern quay of the Inner Basin, at the end of 1996 excavation season (Photograph: A. Raban)*

*Figure 5.95. The eastern quay of the Inner Basin during 1996 season. Looking from S-SW (Photograph: A. Raban)*

*Figure 5.96. The northern-most surviving section of the flushing channel in Area I5, looking southward (Phtograph: A. Raban)*

quarter of the inner basin as a modern tourist site, most of the post-harbour structures were excavated and removed, exposing 80 m of the eastern quay (Fig. 5.95).

d. In Area I4A a probe was excavated across the width of the quay and continued down to its base and bedrock underneath (Holum *et al.* 1992: 89–90). The remains of the original Herodian quay were cast *pozzolana* (2.6 m wide), which was laid directly on the quarried ledge of *kurkar* sloping bedrock. An interesting broad channel (0.8–1.0 m wide) was exposed under later structures at the lee of the quay. It was incorporated into the living surface beyond and paralleled the waterfront, 6 m inland. It was composed of rubble mixed with hydraulic cement of *pozzolana* type (e.g., Tsatskin 1999, sample No. 23). This channel was extensively damaged by later constructive activities, but much of it survived to enable its original delineation and its gently northerly sloping floor to be discerned. Its edges were smoothed and rounded, probably just above the elevation of the Herodian surface of the quay (Fig. 5.96). In the better-preserved segments of the channel it was filled and deliberately sealed by a mixture of fine clay, marine molluscs and manmade artifacts (sherds, glass vessels, coins etc.) dated to the early third century CE (Raban *et al.* 1993: 27–31). It is doubtless that the dump originated from the bottom of the inner basin, probably during dredging works, to maintain it in a silt-free condition. The deliberate silting of the channel took it out of use, as if it was no longer needed or not functioning properly. The channel's gradient, its location parallel to the quay, its composition of *pozzolana* and mostly its continuation at the southern Areas I9 and I12 led to the conclusion that its function was to flush the inner basin. This flushing channel was fed by seawater that entered through its southern opening at the water's edge of the south bay, outside the confinement of Sebastos.

The wash-in of each breaker brought an ample volume of seawater that streamed into the channel, first upward, toward an alleged settling basin, dumping its load of solid particles carried in suspension, and then down, towards the outflow at the lee of the inner basin. This additional volume of water within the inner basin perpetuated an out-flowing current that allowed the body of water to be kept from becoming stagnant and, gradually, silted. Such flushing also carried off the overflowing sewer and other urban run-off that would have spoiled this encircled body of water (Fig. 5.97).

e. Area I9 was next to the base of the southern medieval city wall, just east of the "Jaffa Gate" (Porath 1998: 48–49). There, the eastern quay crossed underneath the foundation of the early Islamic wall, and was topped by three courses of ashlar slabs incorporated in a floor of beaten soil. This

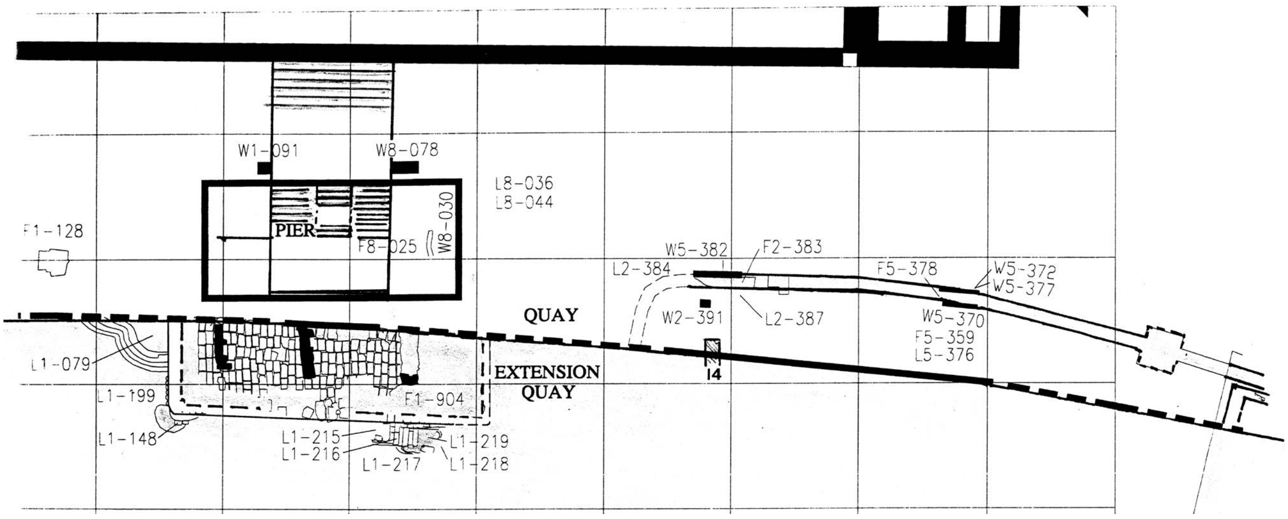



*Figure 5.97. Schematic top plan of the eastern quay and its flushing channel (A. Raban, Caesarea Project)*

floor and the fill that supported it covered two channels. The form, size and elevation of the western channel resembled the flushing channel exposed in Areas I4 and I5, although its floor is somewhat higher (0.95 m above MSL). The original quay incorporated three courses of cut stones, the upper one consisting of headers of considerable size and its base was well abraded by the sea; *ostreae* shells were found up to its base (Fig. 5.98; 0.3 m above MSL). The lower course was embedded in the cast mixture of rubble and *pozzolana*, which was laid on bedrock (1.4 m below MSL)

*Figure 5.98. The eastern quay at I9, from the west (Photograph: A. Raban)*

f. Area I12 was on the southeastern corner of the inner basin. The excavation followed the course of the eastern quay toward the southern bay and exposed its curved turn toward the west (Fig. 5.99). The original quay survived to a maximum height of only 0.6 m above MSL and was topped by blocks added later. The only surviving course of the headers, which are very eroded, was originally incorporated with molded concrete, composed of rubble and *pozzolana*, much as in Area I9 (Fig. 5.100). The rate of abrasion on the surface of the quay indicated that it was exposed to extensive water energy for a rather long period. The cast quay was laid directly over a gently sloping surface of beach rock (0.9 m below MSL). Under the beach rock there was sand with no sherds, or any other artifacts. At the lee of the quay, to the east, a wide and shallow flushing channel was found, a continuation of the channel found in Areas I4, I5 and I9. The floor of the channel in I12 is over 1.4 m wide and it gets wider, shallower and lower toward the south (Fig. 5.101).

It seems that the flushing channel was fed from the wash of the waves over the rocky beach of the nearby southern bay (even today there is no deposition of sand in that area). The incoming water rushed into the ascending channel to a point between I5 and I9, presumably where a settling basin existed, with sluice gates and a threshold (1 m above MSL). From this alleged basin the flushing water ran down through the channel and flowed into the back of the inner basin, at Area I4. This part of the quay went through a series of modifications in later periods, so the exact whereabouts of the turn of the course did not survive. Based on the above evidence, we reconstructed the inner harbor as it was incorporated by Herod's engineers within the overall complex of Sebastos (Figs. 5.102, 5.103).

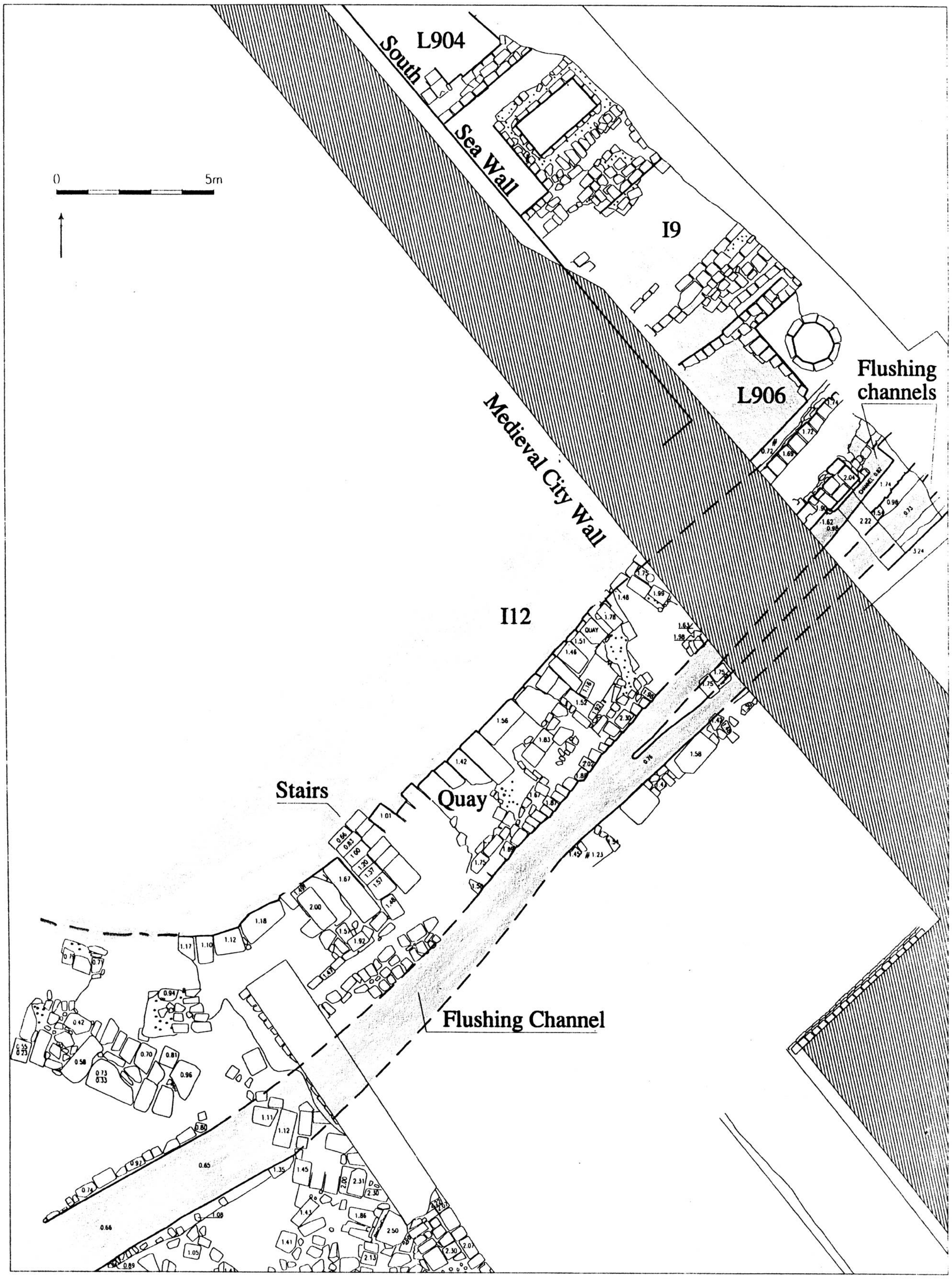



*Figure 5.99. Schematic top plan of Areas I9 and I12 (A. Raban, Caesarea Project)*

*Figure 5.100. The quay at Area I12, looking from the SW (Photograph: A. Raban)*

**11. The Western Facade of the Temple Platform**

Although the western facade of the Temple Platform had no maritime function, it was perceived as part of Sebastos and was well incorporated within its master plan. In chapter 3, we suggested that this facade consisted of eight compartments, either for the storage of goods (*horraeum*) or as shipsheds for naval units. This hypothesis was disputed by Y. Porath (1998: 45–46, Fig. 10), who claimed that during the time of Herod the facade was a *pai* shaped open court with marginal drafted ashlar walls 6.8 m above MSL.

Beside the topographic discrepancy in having such a restricted elevated retainer for a platform, at least 5 m higher (Holum 1999: 21–26), there are various factors that suggest a pre-Herodian date for these walls (chapter 2, above). The broad staircase, which connected the eastern quay of the inner basin and the western facade of the Temple Platform, is almost the only architectural element in this area that is not questionable. At present the remains of the staircase are mostly of its Byzantine phase (Raban *et al*. 1993: 37–42). It is laid over a broader pier contemporary to the quay itself. This pier was exposed and observed in Areas I7, I8 (Figs. 5.94, 5.104) and it was based on a wooden formed block of concrete, of *pozzolana* type, which was installed into the ground water. The details of these foundations, including some timbers of the wooden form still *in situ* (radiocarbon dated to 2070n

*Figure 5.101. The broader flushing channel in I12, from the south (Photograph: A. Raban)*

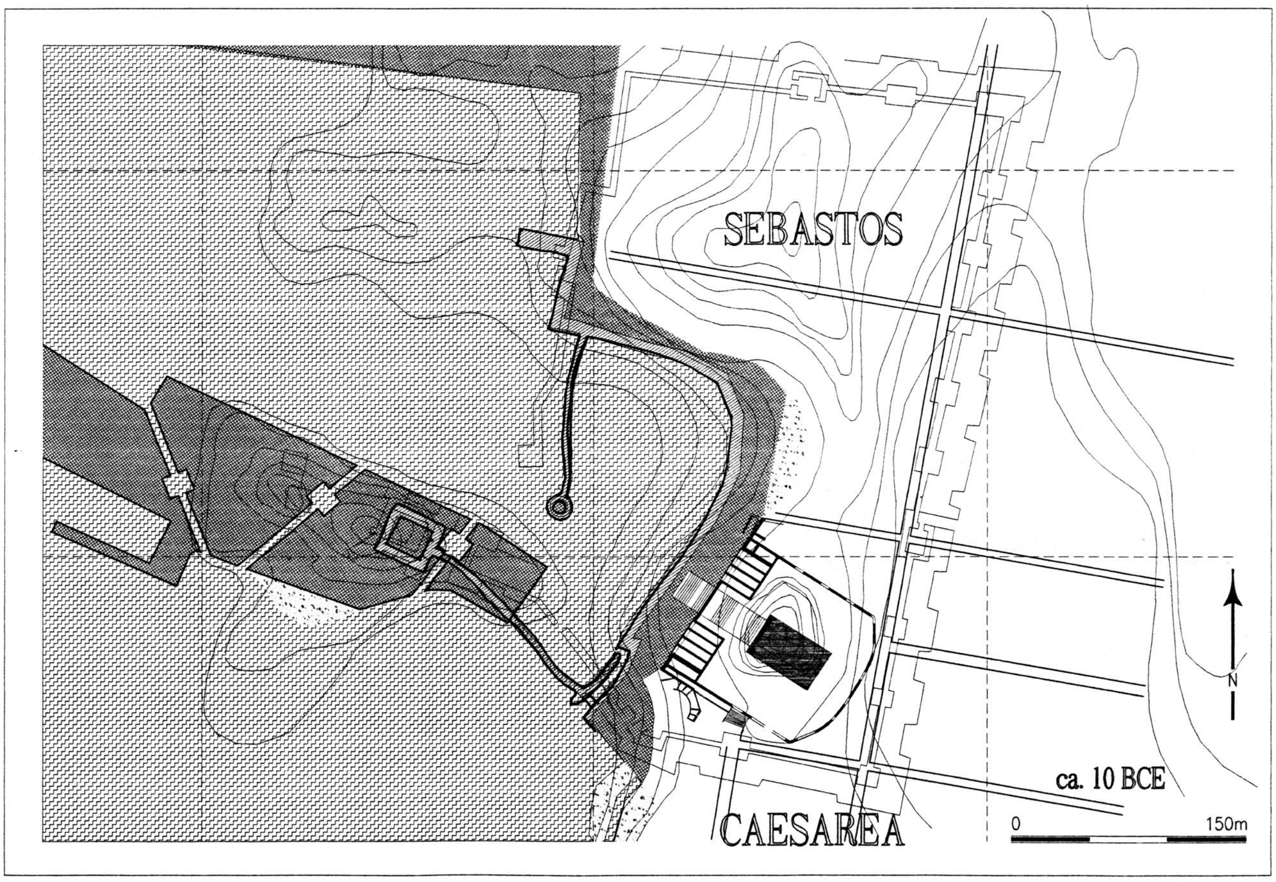



*Figure 5.102. Schematic top plan of the eastern half of Sebastos at its original phase (Raban 1996b, Fig. 17)*

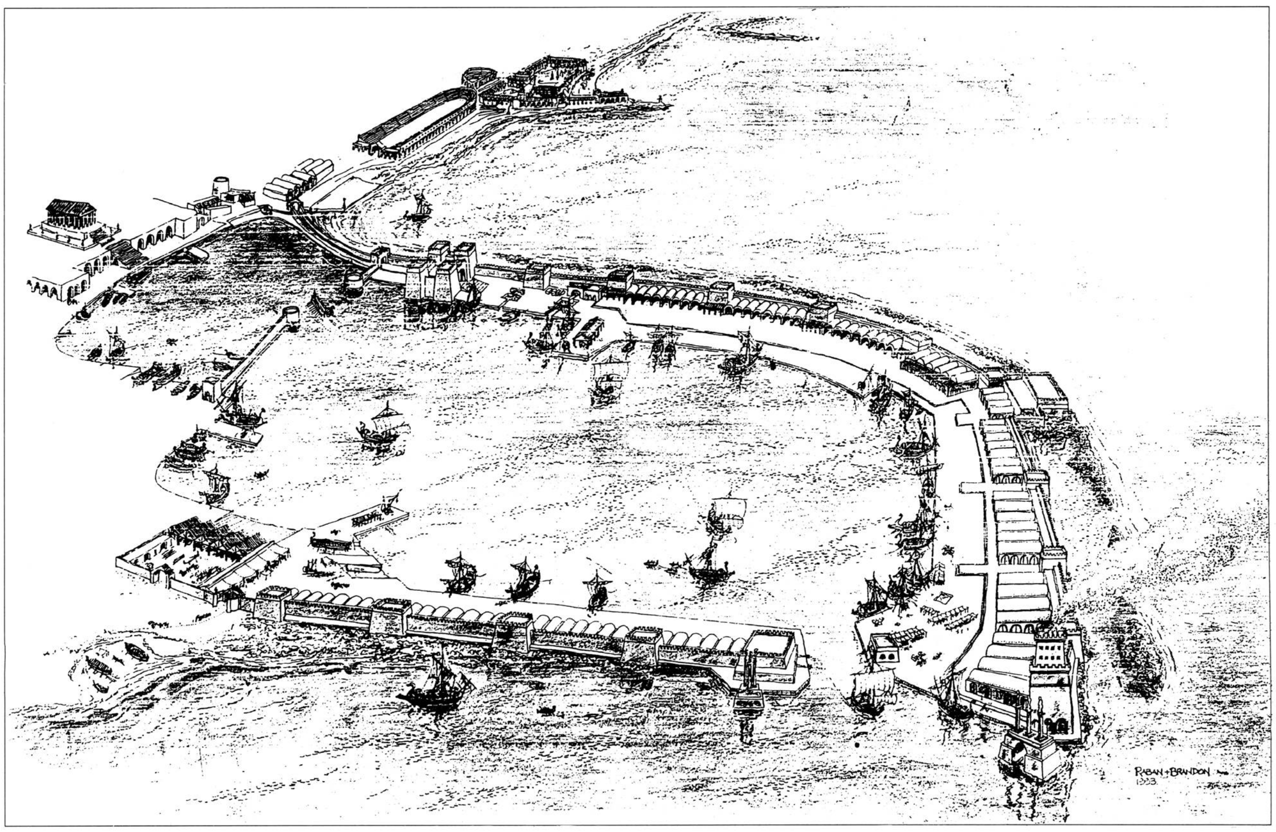


*Figure 5.103. Artistic rendering of Sebastos from the north (Raban 1996b, Fig.18)*


*Figure 5.104. Overview of the staircase at the end of the 1992 season, from the west (Photograph: A. Raban)*

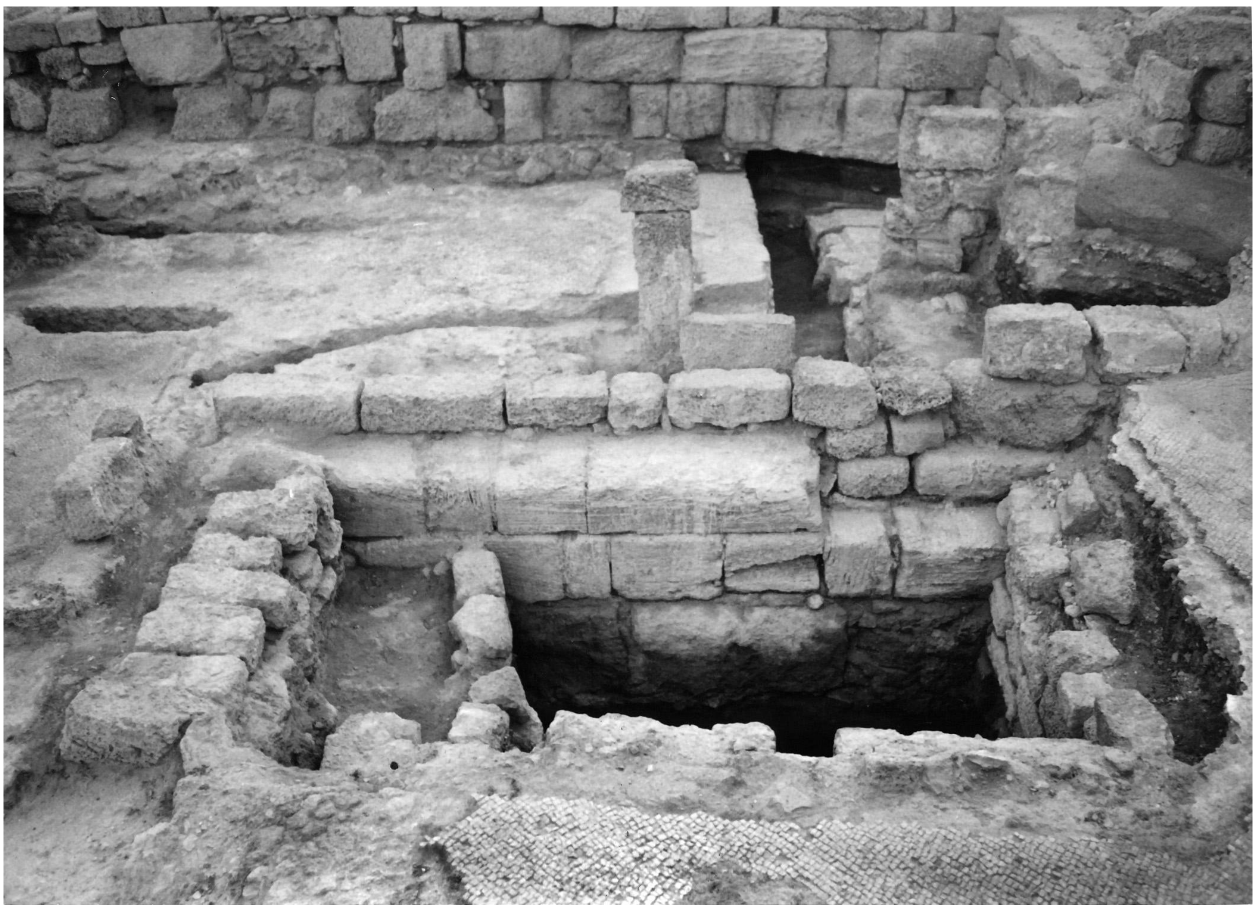


*Figure 4.105. The SE corner of the pier at Area I8, from the south. (Photograph: A. Raban)*

*Figure 5.106. The NW corner of the pier and the pavers over the quay (Photograph: A. Raban)*

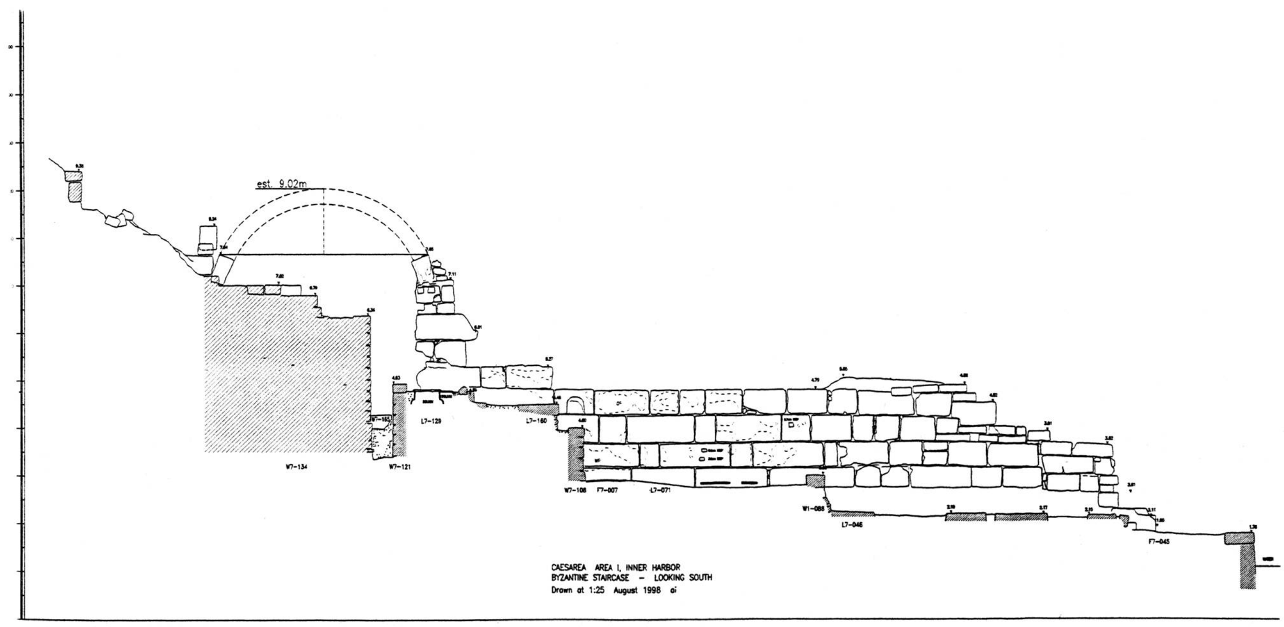



*Figure 5.107. E-W elevation of the northern side of the staircase (A. Raban, Caesarea Project)*

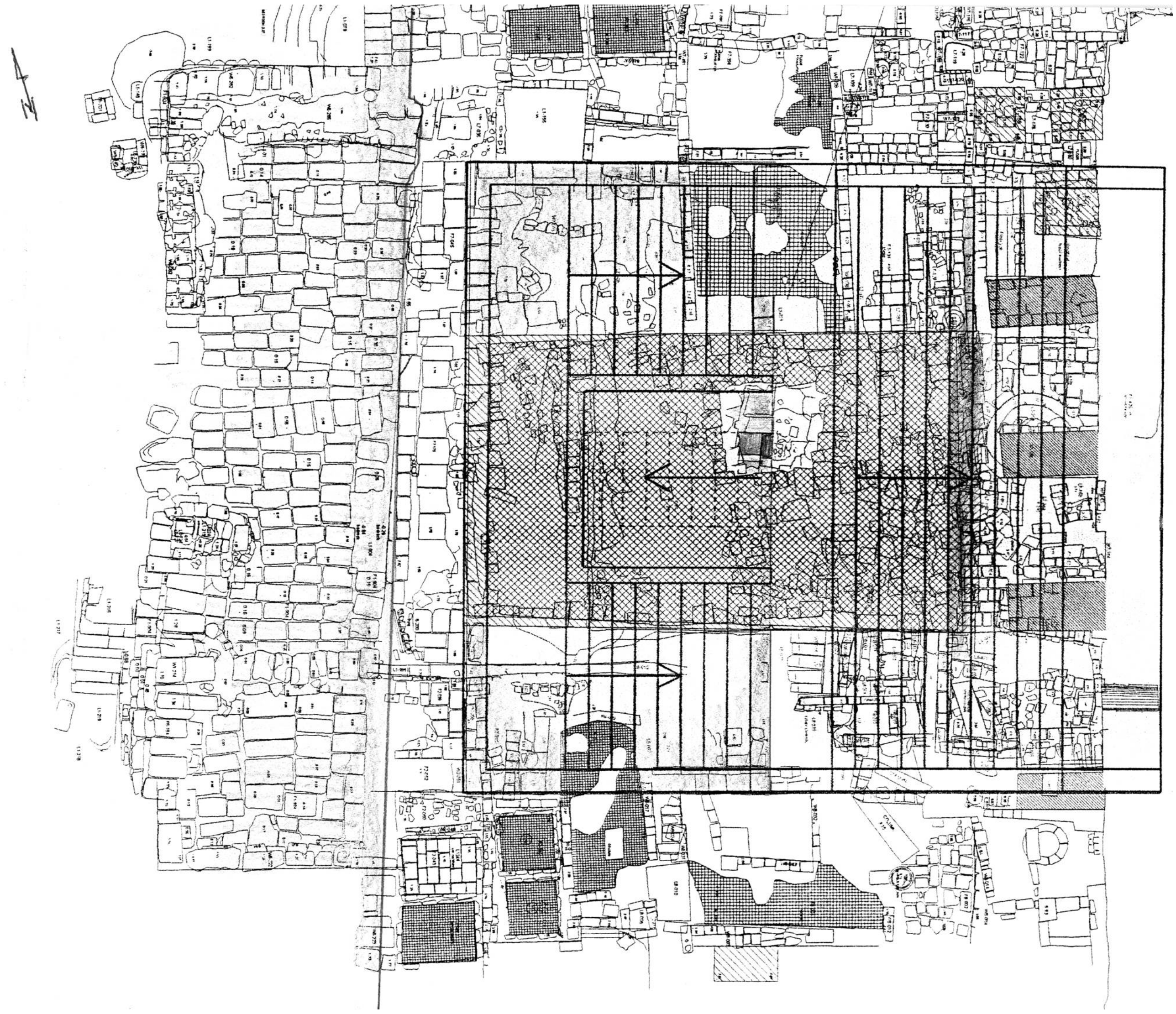


*Figure 5.108. Top plan of the staircase with hypothetical reconstruction of its Herodian phase (A. Raban, Caesarea Project)*

BP ± 60) and two courses of cut blocks, which confine its upper part (Fig. 5.105), were exposed on its southeastern corner, in Area I8. Further excavations in Area I7 revealed the northwestern corner of that pier, which was similarly constructed with additional paving slabs over the 2 m gap on top of the quay (Fig. 5.106).

In Area I8 the surface of the quay was leveled, in order to accommodate a tesselated floor in the mid sixth century CE (Fig. 5.104), but on the other side (Area I7) the leveling was even less and the remains of higher residual bulges of *pozzolana* concrete suggested a much higher original structure. In a trial probe made under the northeastern side of the Byzantine staircase (Fig. 5.104) three stairs and the northern ante of the eastern edge of the pier were exposed, with a 2 m estimated width. The discovery of the stairs at this location, leading up from east to west, may solve, at long last, the question as to why there was such a narrow space between the water's edge and the lower landing stage of such a magnificent staircase. Careful study of the retaining eastern wall of the Byzantine staircase indicates that it had an earlier phase of construction extending farther to the north and south, probably to the full width (20 m) of the Herodian pier. Remains of a half course of cut blocks east of this wall and a similar one, at the same elevation at the western facade of the temple platform, indicated the existence of a vault under the stairs and perpendicular to it (Fig. 5.107).

Based on this information and the existence of a spinal central east–west line across the staircase, as well as a pagan and a Christian shrine on the temple platform, a Herodian multiple-flight staircase can be suggested. Such a staircase was accessible directly from the eastern quay of Sebastos. As a result, those who disembarked at the harbour had to enter a vaulted passage at the back of the staircase, probably passed through a checkpoint and while turning westward, they ascended to a raised landing stage, from which they overviewed the inner basin. From there they turned eastward and ascended the temple platform

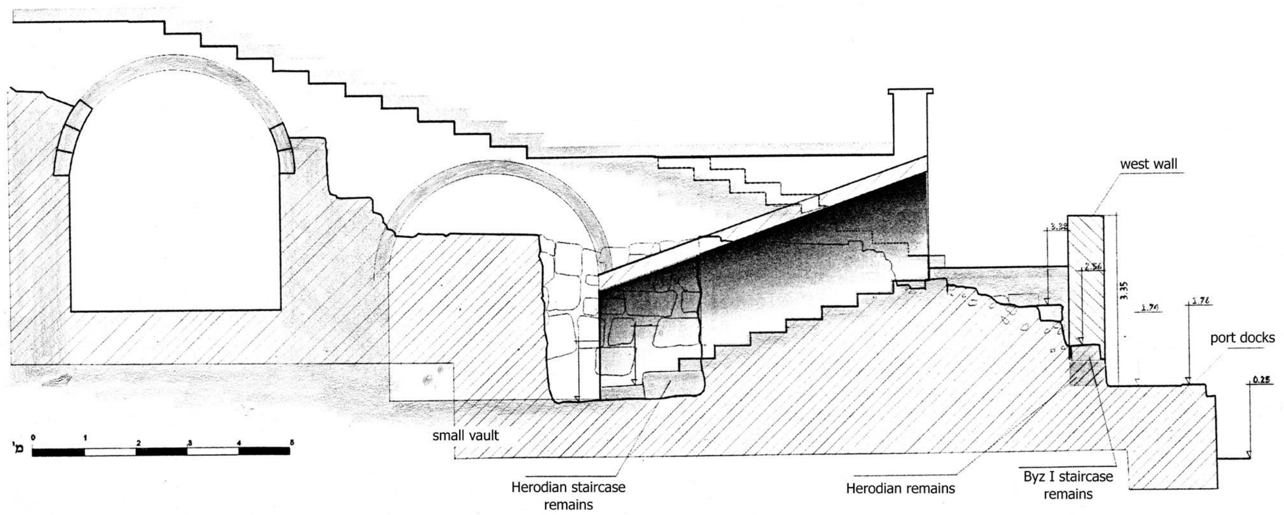



*Figure 5.109. Suggested reconstructed E-W section across the Herodian staircase (A. Raban, Caesarea Project)*

(Figs. 5.108, 5.109). Accordingly, Sebastos was vertically divided from Caesarea at the area along the southeastern part of the inner harbour basin. The series of elongated compartments 2 × 4 m) on both sides of the staircase were within the royal territory of Sebastos, but above them there was the elevated platform that accommodated the temple for Roma and divine Augustus, which was within the municipal boundaries of Caesarea.

**12. The Southern Bay**

An interesting and somewhat surprising complex was exposed during the excavations of the Israel Antiquities Authority, directed by Y. Porath, along the shore of the bay south of Sebastos. This is a stadium or hippodrome, undoubtedly the entertaining monument which Josephus referred to: *"…and south of the harbour and set back from the shore – an amphitheater, capable of accommodating a large crowd of people, conveniently located for the view over the sea"* (AJ 15: 341). Its original phase was constructed within 12 years (21–10 BCE) during which Herod's employees built Sebastos and the skeleton of Caesarea (Porath 1994; 1995; 1996a: 106–110; 1998: 40–41). The hippodrome had a series of raised arenas, alternated *spinae*, and was ultimately, during the later second century CE, converted into a true amphitheater for wild beast games (Porath 1996a: 113–114). In addition, there were at least five sequential *carcereai*, or starting gates for racing chariots that were unearthed by the CCE at the northwestern side of Area KK (Patrich *et al.* 1999: 72–73). Evidently, this complex was constructed at a newly created beach that was an eventual by-product of the building of the main mole of the artificial harbour of Sebastos.

The beach sediments consisted of wave-circulated crushed and "pebbled" *kurkar* chips that contained some well-eroded Hellenistic sherds. This characterized the coastline and the backshore throughout the area in the southern half of the south bay. These were re-deposited materials that were dumped into the sea when the coastal *kurkar* ridge was leveled and modified in order to accommodate the street pattern of Caesarea. The excavations exposed the foundations of the main retaining ashlar walls of the eastern tier of Herod's hippodrome that were installed into this newly created beach. Porath interpretation is that it was part of the already existing main mole of Sebastos, which protruded out into the open sea, northwest of the south bay. This mole apparently triggered an alteration of the coastal processes and additional deposition of wave-carried sediments, thus extending the built-up beach 50–60 m westward (Porath 1996a: 106–107; Figs 5.110, 5.111).

The interesting question derived from this data was whether Herod's engineers or his master builders anticipated that by building the moles of Sebastos they would gain additional land suitable for the pre-planned amphitheater. If so, their comprehension of coastal processes and their capability of calculating the outcome of manmade interventions were considerably advanced and more sophisticated even than that in our time.

Another possibility is that when Marcus Agrippa came to visit Herod's kingdom and to inspect the new building projects, Herod decided to host him in his new city still under construction, with its magnificent harbour, and to entertain him with games (AJ 16: 12–15). In order to achieve this, Herod hastily built an entertainment facility at the most suitable site with materials brought by sea, on barges. Later, this monument was finished and altered by his son Archelaus in order to fit into the master plan of the city (Porath 1996a: 110–112). If we accept the argument that, if the amphitheater was set, at least in its formative state by 15 BCE, the main moles of Sebastos were ready and functioning a couple of years earlier (c. 17–18 BCE) which means that Sebastos was built before Caesarea's infrastructure was achieved.

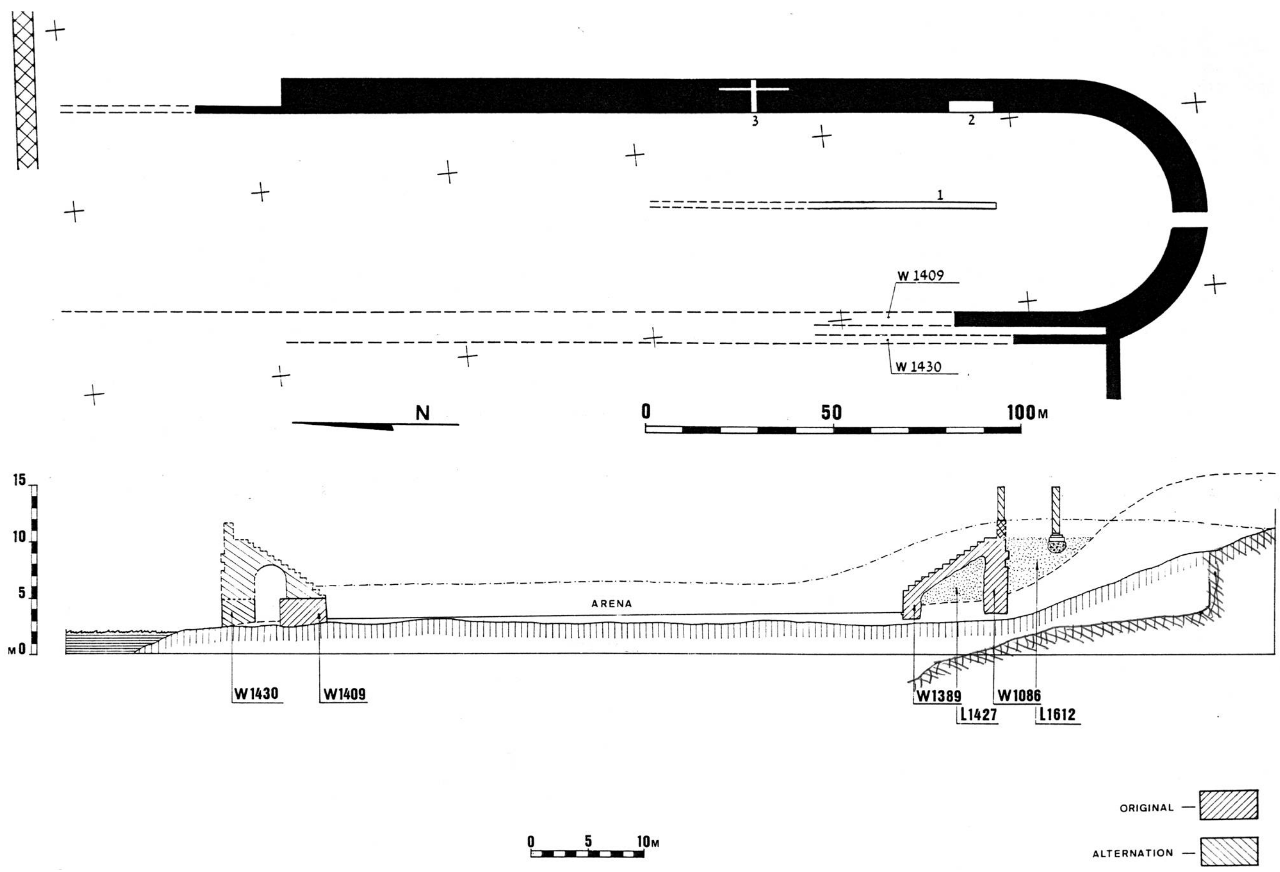



*Figure 5.111. Top plan and E-W section across the Herodian amphitheater of Caesarea (after Y. Porath 1995, Figs. 5, 6)*

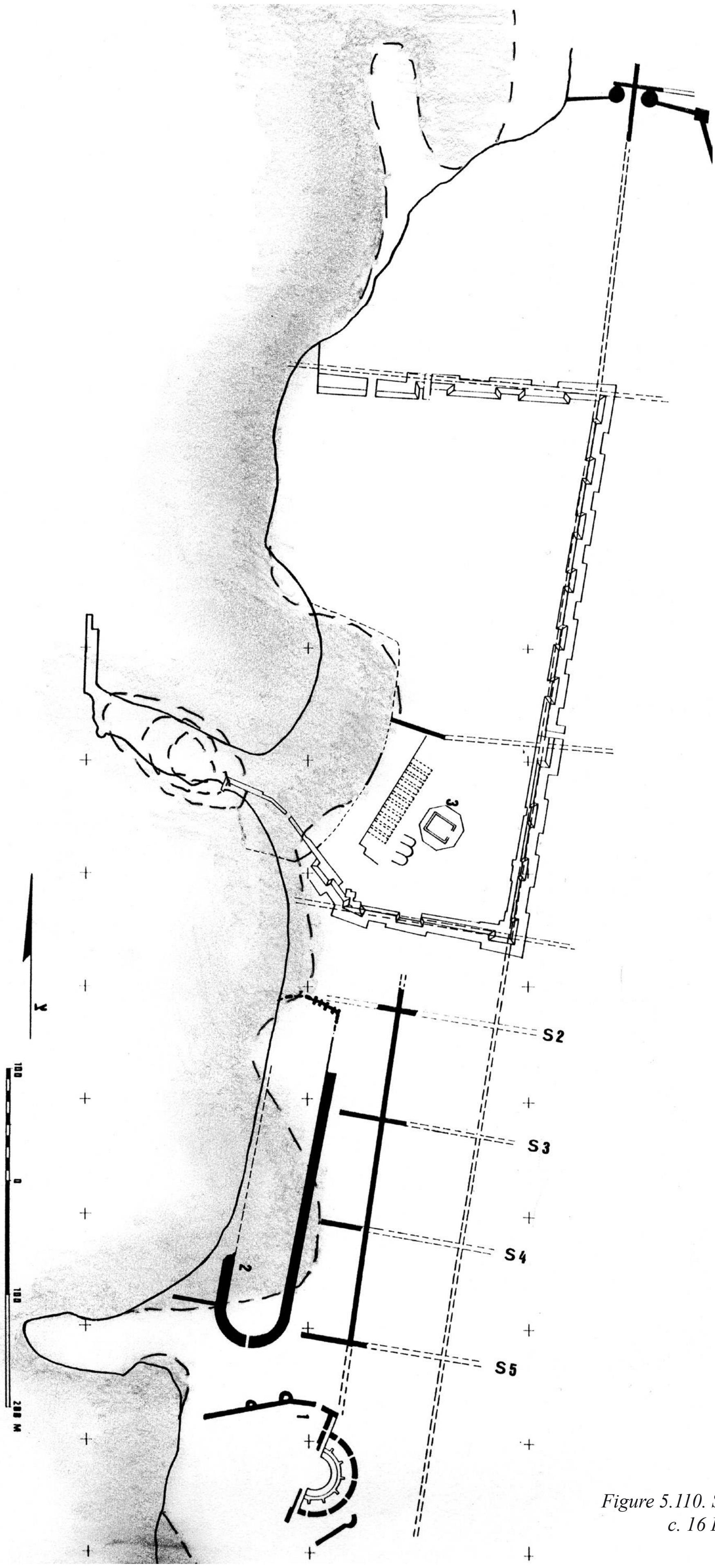



*Figure 5.110. Schematic to plan of Caesarea's coastline c. 16 BCE (after Porath 1995, Fig. 1b)*

# Chapter VI

# Imperial Harbours and Havens

## A. Introduction

There is no doubt that Herod's Sebastos was designed as an Imperial Harbour (e.g., Beebe 1983; Hohlfelder 1999:156; 2000: 248–249). Its size, capacity, water depth and operational concept as a year-round transit harbour did not agree with the more limited necessities of the provincial sea-borne trade of his kingdom. In fact, when surveying all other Mediterranean harbours of the period, including the main ones of the Roman Empire, Sebastos seems to have been larger and more sophisticated, if not the most advanced for its time. Although it was not as large as the double harbour of Alexandria or the triple one at Piraeus, Sebastos was the first full-scale commercial sea-port that was exclusively built as an artificial architectural complex installed in open waters, with no supporting topographical features (natural bay, off-shore reefs, peninsular headland, etc.). With its storage protected facilities, subsidiary breakwaters and collaboratory building techniques, Sebastos was the forerunner of imperial harbours, such as Ostia, Antium, Centumcellae, Leptis Magna and others, which were built later. As innovative and as unprecedented as the engineering feats used at Sebastos are, its "Master Builders" (Hohlfelder 1996) had previous theoretical and practical experiences, which guided them in carrying out this new pretentious construction endeavor.

A detailed comparative survey of the major harbours around the Mediterranean at the time when the works at Sebastos were commenced is presented in this chapter. Among those only three were large and properly enclosed harbours that existed in Herod's time in the eastern Mediterranean: Alexandria, Puteoli and Piraeus.

## B. The Harbours of Alexandria

The economic importance of Alexandria to the sea-borne trade of the Roman Empire was most probably the model for Herod when he envisioned Sebastos. The site of this natural haven and its role as the major sea-gate of Egypt was known in Europe centuries before the time of Alexander the Great (Homer, the Odyssey, IV 354–360). It had a uniquely well-sheltered double bay at the lee of the island of Pharos, and its adjacent line of reefs and islets (Savile 1941: 210–215; Taylor 1965: 160–162; Shaw 1972: 94). The historical documents do not specify the role of Deinokrates, Alexander's city's architect in the plan of the construction of the Heptastadion. The 1.3 km-long bridging rampart that connected the city to the island of Pharos and divided the two harbours was the main feature of the entire portual complex. This complex was already completed at the time of Ptolemy I Soter, towards the end of the fourth century BCE, so it is likely that it was planned earlier.

The basic concept of the portual complex was to use the eastern great harbour as the political and naval base, as was described by Strabo (17, I: 6, 7, 9, 10):

*"Pharos is an oblong isle, is very close to the mainland and forms with it a harbour with two mouths, for the shore of the mainland forms a bay, since it thrusts two promontories into the open sea, and between these the island is situated, which closes the bay, for it lies lengthwise parallel to the shore. Of the extremities of Pharos, the eastern one lies closer to the mainland and to the promontory opposite it that is called Lochias, and thus makes the harbour narrow at the mouth; and in addition to the narrowness of the intervening passage there are also rocks, some under the water, and others projecting out of it, which at all hours roughen the waves that strike them from the open sea. And likewise the extremity of the isle is a rock, which is washed all round by the sea and has upon it a tower that is admirably constructed of white marble with many stories and bears the same name as the island. This was an offering made by Sostratus of Cnidus, a friend of the kings, for the safety of mariners, as the inscription says: for since the coast was harbourless and low on either side, and also had reefs and shallows, those who were sailing from the open sea thither needed some lofty and conspicuous sign to enable them (C 792), to direct their course aright to the entrance of the harbour. And the western mouth is also easy to enter, although it does not require so much caution as the other. And it likewise forms a second harbour, that of Eunostus, "the harbour of happy return", as it is called, which lies in front of the closed harbour that was dug by the hand of man. For the harbour that affords the entrance on the side of the above-mentioned tower of Pharos is the Great Harbour, whereas these two lie continuous with that harbour in their innermost recess, being separated from it only by the embankment called the Heptastadium. The embankment forms a bridge extending from the mainland to the western portion of the island, and leaves open only two passages into the harbour of Eunostus, which is bridged over. However, this work formed not only a bridge to the*

*island but also an aqueduct, at least when Pharos was inhabited. But in this present time it has been laid waste by the deified Caesar (Julius Caesar) in his war against the Alexandrians, since it had sided with the kings. A few seamen, however, live near the tower. As for the Great Harbour, in addition to its being beautifully enclosed both by the embankment and by nature, it is not only so deep close to the shore that the largest ships can be moored at the steps, but also is cut up into several harbours. Now the earlier kings of the Egyptians, being content with what they had and not wanting foreign imports at all, and being prejudiced against all who sailed the seas, and particularly against the Greeks, set a guard over this region and ordered it to keep away any who should approach; and they gave them as a place of above the ship-houses, but was at that time a village; and they gave over the parts round about the village to herdsmen, who likewise were able to prevent the approach of outsiders. But when Alexander visited the place and saw the advantages of the site, he resolved to fortify the city on the harbour. Writers record, as a sign of the good fortune that has since attended the city, an incident which occurred at the time of tracing the lines of the foundation: When the architects were making the lines of the enclosure with chalk, the supply of chalk gave out; and the king arrived, his stewards furnished a part of the barley-meal which had been prepared for the workmen, and by means of this the streets also, to a larger number than before, were laid out. This occurrence, then, they are said to have interpreted as a good omen. The advantages of the city's site are various; for, first, the place is washed by two seas, (C 793) on the north the Aegyptian Sea, as it called, and on the south by Lake Mareia, also called Mareotis. This is filled by many canals from the Nile, both from above and on the sides, and through these canals the imports are much larger than those from the sea, so that the harbour on the lake was in fact richer than that on the sea; and here the exports from Alexandria also are larger than the imports; and anyone might judge, if he was at either Alexandria or Dicaearchia (now Puteoli) and saw the merchant vessels both at their arrival and at their departure, how much heavier or lighter sailed thither or there from. And in addition to the great value of things brought down from both directions, both into the harbour on the sea and into that of the lake, the salubrity of the air is also worthy of remark. And this likewise results from the fact that the land is washed by water on both sides and because of the timeliness of the Nile's risings; for the other cities that are situated on lakes have heavy and stifling air in the heats of summer, because the lakes then become marshy along their edges because of the evaporation caused by the sun's rays, and accordingly, when so much filth-laden moisture rises, the air inhaled is noisome and starts pestilential diseases, whereas at Alexandria, at the beginning of summer, the Nile, being full, fills the lake also, and leaves no marshy matter to corrupt the rising vapours. At that time, also, the Etesian winds blow from the north and from the vast sea, so that the Alexandrians pass their time most pleasantly in summer. In the Great Harbour at the entrance, on the right hand, are the island and the tower Pharos, and on the other hand are the reefs and also the promontory Lochias, with a royal palace upon it; and on sailing into the harbour one comes, on the left, to the inner royal palaces, which are continuous with those on Lochias and have groves and numerous lodges painted in various colours. Below these lies the harbour that was dug by the hand of man and is hidden from view, the private property of the kings, as also Antirhodos, an isle lying off the artificial harbour, which has both a royal palace and a small harbour. They so called it as being a rival of Rhodes. Above the artificial harbour lies the theater; then the Poseidium – an elbow, as it was, projecting from the Enporium, as it called, and containing the temple of Poseidon. To this elbow of land Antony added a mole projecting still farther, into the middle of the harbour, and on the extremity of it built a royal lodge which he called Timonium. This was his last act, when, forsaken by his friends, he sailed away to Alexandria after his misfortune at Actium, having chosen to live the life of Timon the rest of his days, which he intended to spend in solitude from all those friends. Then one comes to the Caesarium and the Emporion and the warehouses; and after these to the ship-sheds, which extend as far as the Heptastadium; so much for the Great Harbour and its surroundings. Next, after the Heptastadium one comes to the Harbour of Eunotus, and above this, to the artificial harbour that is called Cibotus; it too has ship-sheds. Farther in there is a navigable canal, which extends to Lake Mareotis"* (Fig. 6.1).

The lavish publications of the recent underwater and remote-sensing surveys of Alexandria enrich our knowledge about both the various components of the eastern harbour, its secondary basins, the moles within it (Goddio *et al.* 1998) and the eastern part of the Pharos (Empereur 1998). Studying these surveys, it becomes rather clear that Strabo's description is not of the original form of the harbour and includes structural components that were added to it during the three centuries that had passed from the time of its inauguration to his time (Goddio *et al.* 1998: 247–250). Based on these recent studies, some preliminary conclusions may suggest an alteration over time in the location of some of the inner basins and other components, such as that of Antirhodos isle and the Timonium peninsula (Fig. 6.2: G, E; vers. H, F and vers. Fig. 6.3). Similar changes are suggested by Goddio *et al*. (1998: 18–21; Fig. 6.3) in the location of the royal harbour. However, Strabo's description is still considered to be the most accurate and comprehensive one written by an eyewitness.

Of the recently supplied data, the more important for the aspects of building techniques is the discovery of a wooden component in the construction of the artificial isle (Antirhodos?). In this respect the exposure of a large fragment of a timber floor on the seabed underlying chunks of limy concrete is most significant for the study of the origins of the use of caissoned hydraulic concrete in harbour constructions. The $C^{14}$ date for these timbers, early third century BCE according to Goddio *et al.* 1998:

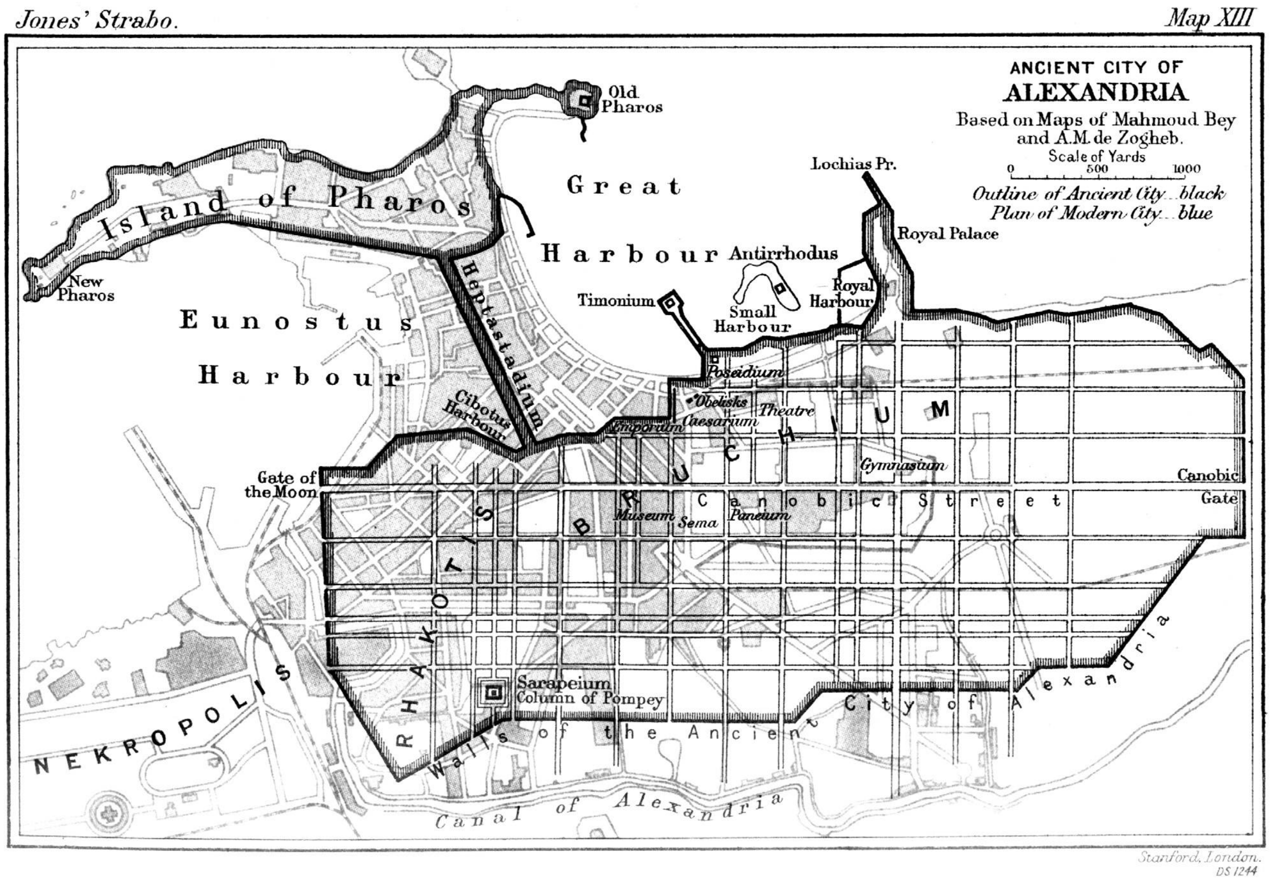



*Figure 6.1. Plan of Alexandria and its harbours (based on Strabo, vol.8 Map XIII)*

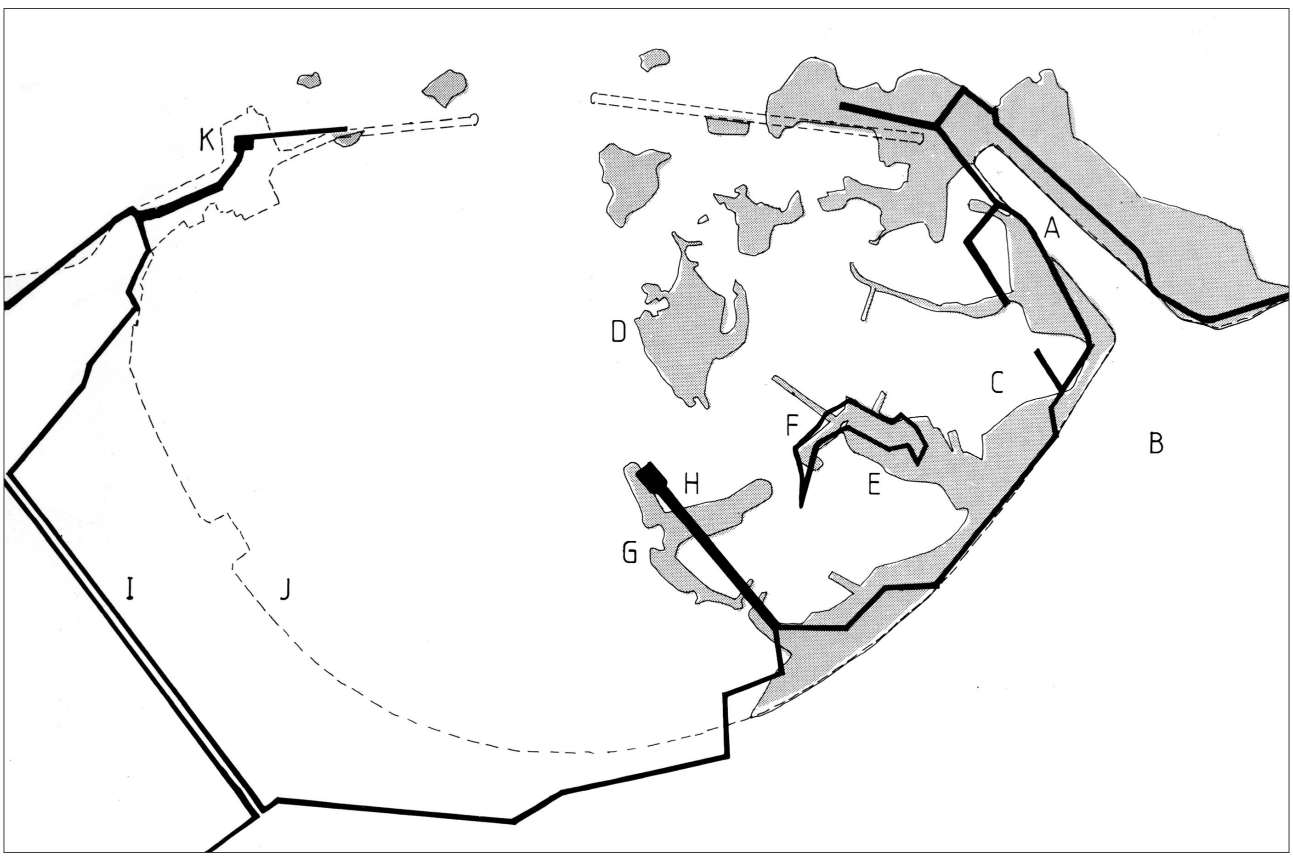



*Figure 6.2. Schematic plan of the Eastern Harbour of Alexandria (based on Pfrommer 1999, Fig. 21)*


*Figure 6.3. A suggested reconstruction of Alexandria and its Harbours (after Bernard and Golvin1995:60-61)*

32–35), makes it much earlier than the known Italian examples of what was considered as a genuine Roman, or maybe Etruscan, innovation (Blackman 1982: 197). A second wooden component was a vertical retainer for what seems to be a conglomerated compound of rubble and limy concrete comprising evenly spaced rectangular poles in a line, with vertically inserted planks in between (Goddio *et al.* 1998: 29–31). This feature resembles the components of the early Etruscan harbour at Cosa (Oleson 1987: 98–128) and the later Neronian one at Antium (Felici 1993). These timbers were identified as Elm trees (*Ulmus sp.*) and were undoubtedly imported either from Europe or Anatolia. Elm timbers were already imported to Egypt during the Pharaohnic periods for parts of royal chariots. The pinewood (*Pinus Silvestry*) used for the planking of the floor was imported as well, either from the Levantine coast, or from Cilicia (Gale *et al.* 2000: 351–352; Goddio *et al.* 1998: 35–37).

Aside from these rather restricted archaeological studies, the overall picture of Alexandria's harbours is still based, by and large, on ancient texts from the Roman period. These describe two major sections, divided by the *Heptastadion* (Fig. 6.3): the better protected eastern basin and the more exposed one in the west, the so-called *Eunostos* (the "Good Homecoming"). The entrance to the eastern great harbour was from the northeastern side through three navigation channels, divided by shallow reefs. Of these channels only one, either the central or the eastern, was wide enough for safe sailing (300 m wide; Goddio *et al.* 1998: 12–16). There are some remains of what might have been a seawall that extended westward from the tip of Cape Lochias (Fig. 6.3), connecting the reefs to the east of the main navigation channel and protecting the eastern part of the harbour basin from the northern gales.

Within it, along the southwestern side of the cape and following the original coastline to the south, the main basin was sub-divided into three inner harbours, all of which were designed for a defined function. The first inner basin to the north was the famous royal harbour, with the royal palace at its lee, on the stem of *Lochias* promontory (Figs. 6.2:A, 6.3). This basin (7 hectares) may have incorporated a confined, smaller one at its inner-most northern corner, as was suggested from the data retrieved during the recent survey (Goddio *et al.* 1998: 18–21). The moles and the jetties of these double basins may be built of rubble embedded in mortar and topped by limestone ashlar pavers (Goddio *et al.* 1998: 18–21). To its south, there was the second basin, twice as large as the royal one (15 hectares), probably used as a temporary naval post, hosting units of the royal or imperial fleet. It was suggested that the 72 galleys, referred to by Julius Caesar, might have moored there (Goddio *et al.* 1998: 26–27). At its southern side there was a natural peninsula that extended westward with an additional elongated "breakwater" and two ashlars constituting projected moles. One of these moles, the one protruding towards the southwest, was probably the feature identified above as the *Antirhodos*. It was constructed of a rubble rampart (25×90 m) with limestone pavers and esplanade (22×50 m) made of ashlar slabs (Goddio *et al.* 1998: 24; Fig. 6.2:F). The third basin, southeast of the main harbour, had two entrances on both sides of a T-shape artificial isle—most probably the actual *Anthirhodos* (Goddio *et al.* 1998: 28–52). On that isle, which seems to predate all other artificial features in the great eastern harbour, there was a royal palace and a large esplanade next to it. This complex and the well-protected basin to the east of it were, according to Strabo, the private property of the king of the Ptolemaic dynasty of Egypt.

The southern part of the main basin of the great harbour is presently land-locked and built over by the terrestrial structures of modern Alexandria, and thus not available for archaeological research. According to Strabo, this part was "*the biggest emporion in the inhabited world"* (XVII, 13.2.53). Farther west, along the southern shoreline and up to the stem of the *Heptastadion*, there were the warehouses and the Arsenals (*Neoria*), the shipyards, and maybe also shipsheds (Goddio and Yoyotte in Goddio *et al.* 1998: 252).

The *Heptastadion*, the largest and most prominent feature of the harbours of Alexandria, second in fame only to the 'Pharos Lighthouse', was almost a 1.5 km-long roadstead that connected the island of Pharos to the mainland. According to ancient texts it was a massive dam with two bridges on both its ends, which allowed the free flow of water between the two major harbour basins, and maybe also of light sailing vessels. These bridges were rather instrumental in allowing a proper flushing current to keep the eastern basin relatively silt-free (Fig. 6.3). This feature has for a long time been buried under quantities of wave-deposited sand and terrestrial buildings; thus it is not available for archaeological studies.

The western great harbour, the *Eusnostos*, is at the site of the present day commercial port of Alexandria, which continues its ancient role as its main sea gate to Europe and the rest of the Mediterranean. According to Strabo and other ancient writers, this harbour was connected by a navigation channel to Lake Mareotis and through it to the Nile Valley and the entire hinterland of Egypt. The subsidiary quays and embankments along the north shores of the lake (Empereur 1998: 214–218) attested to an adequate setting for a transit port. Modern structures are covering the entire ancient topography, including the actual course of the navigation channel. Yet, nineteenth century maps and illustrations still depict both the channel and the presently land-locked dugout basin of *Cibotos*, next to the stem of the *Heptastadion* to the west (Empereur 1998: 215; Fig. 6.3).

The artificial inner basin was referred to by Strabo as a *Neorion*, a function that was usually considered restricted, located within a confining protective wall. A basin with such a function would hardly be located at the outlet of the main navigation channel from Lake Mareotis, as was suggested by most scholars. Reconstructing the paleotopography of that part of the western harbour with its two inner basins, it seems to be the more logical place, unless one would discredit Strabo and correct his term identification of the shipsheds to warehouses.

Summarizing the data above, one may characterize the portual complex of Alexandria as it was in Herod's time, as a double-fold entity: The first, the western side, which served as the largest emporium of the Mediterranean, an outpost for exporting as much as 300,000 metric tonnes per annum of Nile Valley grains to Rome, and operating as a transit place, where cargoes were transshipped from river to sea-going vessels; and the second, the great eastern harbour, which served the various demands and necessities of the local rulers.

This overall situation of all three basins at the eastern side of the great eastern harbour of Alexandria was recently considered as obvious by a prominent harbours engineer who studied the data retrieved by Goddio's team (de Graauw 1998: 53–55). He phrased his view of the wooden components that were found there as follows: *"the inner sea walls that protect each of the three harbours are built with an embankment on their outer face with, usually, a quay made of blocks of mortar on the inner face of the work. The building of quays can be classified according to the materials used (Prada and de la Pena 1995) – 1. With wood: platforms of wood on piles or pillars in stone blocks. 2. Without mortar: blocks of dressed stones with final fill between the facings. 3. With mortar, without pozzolana; large blocks set dry in wooden shuttering. 4. With pozzolana mortar, large blocks set underwater in shuttering. The more ancient technique is that of dressed stone blocks (no.2). For work of certain width, two separated facings were made using blocks of stone and then filled with rubble from quarries. The resulting surface was then covered by flagstones. The weight of the blocks*

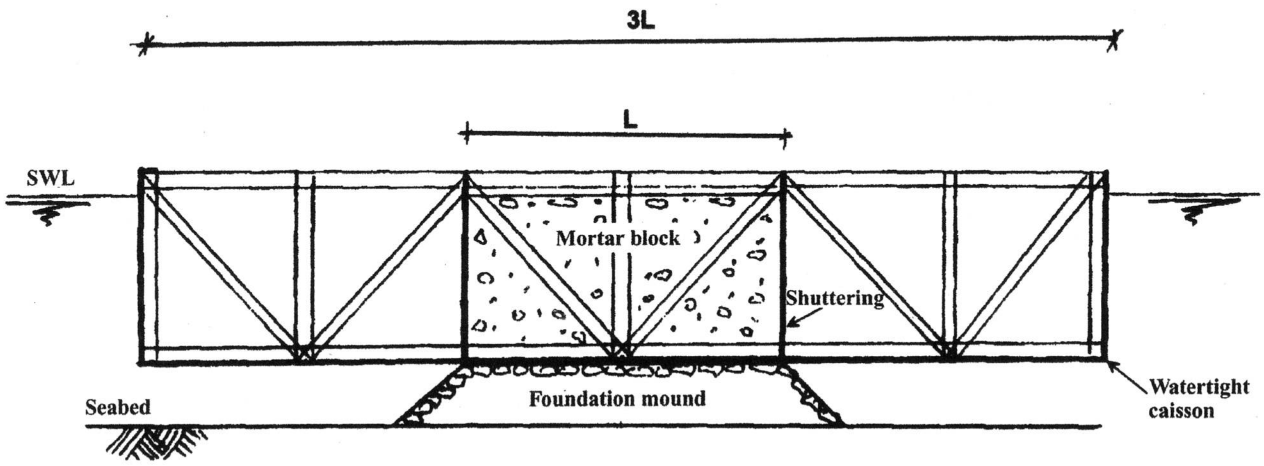



*Figure 6.4. A suggested reconstruction of the "Floating Caisson" at the Antirhodos (after de Graauw 1998, Fig.10)*

*never exceeded a tonne so they remained easily moveable by the means of leverage at the time. The blocks found at Tyre in the southern harbour weigh about 500 kg., blocs of 10 tonnes and more have been used in places exposed to the surge (Poidebard 1937). Lime mortar was made of slaked lime, sand and water. It dries in the air and can not harden underwater. From this fact the following outline has been suggested for the use of marine works. A wooden box shuttering is placed in the water where the quay is to be built. The shuttering is then filled with sand until it is above water level. The block of lime mortar is then poured out of the water onto this mass of sand and can thus dry in the air. In order for the whole structure to sink down to its final position, it needs no more than to release the sand from the shuttering by opening the doors constructed in it (Prada, de la Pena 1995). The introduction of pozzolana by the Romans was, as explained by Vitruvius about 30 AD, a revolution for hydraulics. This silicio-aluminium material had a volcanic origin, from near Puteoli, and combined with lime in water and allows mortar made with this mixture to harden underwater (Vitruvius, II. 6). But this was not available to the Alexandrians at the time the eastern harbour was built. The large concrete blocks for the quay discovered in the third harbour of Alexandria (typically 5-8m. wide, 10-15m. long, 1-3m. high) contain no pozzolana and the dating of the wood indicates a period at which pozzolana could not yet exist in Egypt (about 250 BCE). The presence of wood under the block shows that the shuttering certainly formed part of a floating caisson (a technique also used in Caesarea under Herod, and see e.g. Raban 1998b), a technique still used today (Fig. 6.4). We can therefore put forward the hypothesis that after having floated upright to where the quay was to be built, the caisson was ballasted until it reached the sea bottom where a surface foundation had been prepared in advance. In order for the mortar to dry in the air, the caisson had to float sufficiently and be water-tight. The caisson thus was like a barge capable of carrying a block of mortar. To do this the caisson had to be about 2.5 to 3 times wider than the block of mortar (which has a density of about 2.5) so that in this case the draught of the caisson with its block is about equal to the height of the block to be set aground. This explains the presence of beams and planks below the block, as well as the presence of vertical and inclined beams set in the mortar that gave the caisson its rigidity when it was afloat and set aground. This also explains the absence of vertical wooden sides as these must have been dismantled and recovered after the block of mortar was set on the bottom. The double row of piles discovered at the eastern end of the Island of Antirhodos is more ancient than the large blocks mentioned above (about 400 BCE). The presence of mortar at the bottom point of the piles of the south row shows that these rows of piles must have been built dry, that is to say that they were sunk below the level of the water after their construction. One could further propose the following hypothesis that this double row of piles was the remains of an ancient wooden quay. The southern row is made of piles with grooves into which planks were slid, thus forming a little curtain of timber shuttering in wood, capable of holding a hardcore composed of quarry rubbish. The northern row is made of simple piles that could have supported a decking in wood and be sunk in the bottom by as much as a metre (Fig. 6.5)."* (de Graauw 1998: 55–56).

Reading the above, one wanders on what basis de Graauw dates the first wooden components to 150 years earlier than the C14 dating indicates, and at least a century before the harbour was actually built. There are also some discrepancies in alleging that the row of *piles* are supporters of a wooden deck, when their grooved sides indicated that they were a water tight compartment into which lime mortar could be poured dry even if its base was well below water level, as was suggested by Vitruvius for non-pozzolana concrete (V. 12.5). This type of construction was observed at Les Laurons, on the eastern side of Fos bay in southern France, dated to the latter years of the first century BCE (Moerman 1993), generally contemporary with Sebastos. De Graauw's idea that dry mortar (better termed "hydraulic concrete") necessitated barges, or caissons three times broader than the block, is contradicted by the data from Caesarea suggesting otherwise (Brandon 1997a; Brandon *et al.* 1999). De Graauw ignores the option of filling some of the volume within the caissons when still on shore and

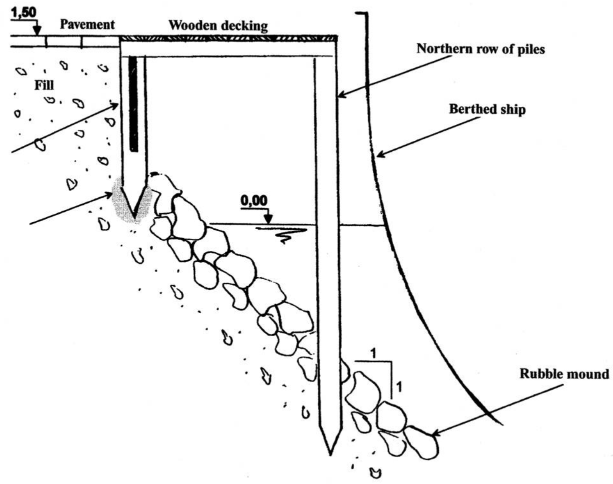



*Figure 6.5. A suggested section of the wooden quay in the Antirhodos (after de Graauw 1998, Fig. 11)*

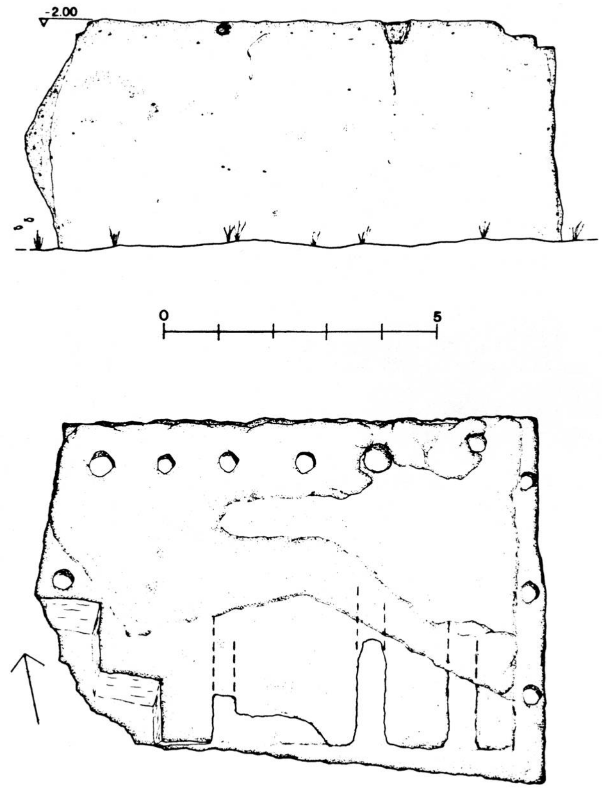



*Figure 6.6. Map of the Bay of Puteoli, depicting ancient coastlines (after Gunter 1903:Fig. 2)*

letting it harden before launching, as well as the attested fact that the caissons might have been constructed in a "shell-first" shipwright technique.

One of the shortcomings of Goddio's report is a lack of accurate elevations, either in the text or the plans. It should be noted that the harbours of Alexandria and Sebastos seem to have subsided at a similar rate of about six meters since antiquity. However, the lack of data makes it difficult to calculate the types of ships that could have berthed at the *Antirhodos* and whether there was ample draught there for the great "super tankers" of the Roman grain fleet. One may wander if these heavy carriers did not berth and were loaded at the *Eunostos*, on the other side of the *Heptastadion*. An important observation that might have derived from the new data from Alexandrian concerning the origins of building technologies that were used at Sebastos is that the idea of prefabricated wooden caissons did not come from Italy, as was suggested (Hohlfelder 1999; 2000), but might have come from some "master builders" recruited by Herod in Alexandria.

**C. The Harbour of Puteoli**

Puteoli, presently called in Italian Pozzouli, is located at the center of the northern coast of a bay bearing the same name, just west of the bay of Naples. The bay (5 nautical miles across) is well protected from all winds, except on the southern and southwestern sides. The bay is separated from that of Naples by Cape Pausilypon, or Palaepolis, and the near-shore island of Nisida that was connected to the mainland by a roadstead in the Roman period. The bay is on the lee of Cape Miseno (Misenum) on the west and is a rather mountainous promontory. The land around Puteoli comprises several volcanic craters, including some that became lakes, such as Aveno and Lucrino, that were connected to the bay by navigation channels in the Republican era. Yet, the on-going tectonic displacements in that area, known as "bradyseism" (Castagnoli 1977), not only diverted the ancient topography and caused all ancient coastal and portual structures to be well below the present sea level, but also caused a new "mountain" to pop up between the crater lakes and the bay – the "Monte Nuovo" (Fig. 6.6). Two thousands years ago the ancient coastline was about 100 m to the south in the bay and to the west at Cumae.

The first settlement, *Dikaerachia,* was a Greek colony of refugees from the island of Samos, dated to the late sixth century BCE. In 194 BCE it became a Roman colony named *Colonia Civium Romanum*. According to Strabo the city's name derived from the nearby odorous sulphuric fountains, as *Puteo* means stinky in Latin (Strabo V.4,6). He reported that in latter times the city became a great emporium due to the good manmade anchorages that were built properly, according to the special qualities of the local sand that, when mixed with lime in the correct proportions, created a solid and hard compound. Thus, by mixing the sand and the ash (*pozzolana*) with the lime the inhabitants could build jetties that protruded into the sea and created artificial coves in the straight coastline, so that the largest merchant ship could safely berth there.

Yet, because of Appian's description of the meeting between Antonius, Octavian and Pompeius that took place at the harbour of Puteoli on wooden platforms in the sea (V.71), some scholars suggested that the *pozzolana* moles were constructed only later (Ostrow 1979: 207). Few remains of the harbour are visible today, mostly segments of concrete blocks dislocated from the famous *pilae*, now on the seafloor next to the original course of the main jetty that was covered by a new pier during the nineteenth century. Luckily, the remains of the jetties were studied by de Fazio (1828) when he argued against the construction of the new pier. Three generations later a second survey was carried out, although at this time most of the *pilae* were partially covered and two of fifteen had totally disappeared (Dubois 1907: 254–257). According to de Fazio, the total length of the pier (=jetty) was 372 m and it comprised a row of 15 *pilae* of uneven sizes and spacing. The width of the pier was about 15 m and the length of the *pilae* 5–16 m. These *pilae* carried arches that supported the continuous promenade, the surface of which was about 5 m above the water level of the time, with a water depth of 18 m at the tip of the mole (Gunter 1903: 270). There was 1 m difference in the height of the arches above the water, depending on their length (de Fazio 1828: 107).

The pier ran from east-northeast to west-southwest in a somewhat curved line stemming at the southeastern side of the harbour and protecting it from the southern gales. The pier was segmented at water level, allowing about one third of the wave energy, at most, to pass through and to be refracted within the harbour basin. Yet, the rare southwesterly storms reached the pier in a diagonal, staggering manner that decreased the wave energy. It seems as if the ancient engineers constructed the pier so that it would better endure the impact of the surge, rather than inducing a flushing current to avoid siltation that was not a problem at the deep bay of Puteoli. The pier had also berthing facilities, attested to by at least six pairs of mooring stones that were installed on both sides of the *pilae*. When studied, the elevation of these mooring stones was 1.5–2.0 m below MSL with a calculated subsidence of at least 3–4 m since antiquity (Gunter 1903: 270–272).

The pier was constructed sometime during the Augustan era as one of many maritime facilities that were established around the bay in order to meet the excessive demands of the Empire for sea-borne importation of staples (Gianfrotta 1996:67). Hadrian and Antoninus Pius restored it in the second century CE as was documented on inscribed stone plates that were originally fixed to *pilae* and retrieved from the seabed (de Fazio 1828: 105; Dubois 1907: 261). Up to the water level, the *pilae* were cast within wooden shuttering that comprised of volcanic ash (*pulvis Puteolanum*), lime(?) and *tufa* rubble of various sizes. Higher, the construction included courses of fired bricks that were also used as facing for the visible sides of the pier.

Much can be learned about the construction methods of these *pilae* from other, better preserved piers, at nearby contemporary harbours of Misenum, Nisida and the external part of Portus Iulius. In Nisida, the furthest of the four surviving *pilae* and the best preserved one is 9.5 m high and extends up to 1.8 m below sea level. It has an irregular plan with sides measuring 7.7–15.2 m. A solid, impressive, tower was built of successive castings of *opus caementicium* and *tufa* fragments, which on the sides of the *pilae* formed a sort of *opus reticulatum*. The corners were rounded, the plan of successive castings of concrete could be seen, and in some sections there were holes that were used for wooden posts and beams of scaffolding. This double bulkhead scaffolding was watertight, so it remained dry during construction. The *tufa* blocks (in these *pilae* the term *opus reticulatum*, even if it gives an idea of the arrangement, is technically incorrect) could thus be placed in good order inside the scaffolding to achieve maximum cohesion (Gianfrotta 1996: 71). The *pilae* at Nisida have mooring stones with vertical pierced holes, similar to those in Puteoli, but only on the side facing the harbour basin.

The same type of construction was observed on the western side of the bay, at the two piers that define the entrance to the Roman naval base at Misenum (Gianfrotta 1996: 71-75; Beloch 1890:194–196; Fig. 6.7). The harbour there seems to have had two basins, with berthing facilities for merchantmen along the inner side of the piers, at what was probably an extension of the multi-basin complex of the bay of Puteoli in the Augustan era. The *pilae* there still retain the grooves and vertical holes for the scaffolding beams of the shuttering.

There is ample historical documentation to attest to the importance and scope of the harbour works at Puteoli and its adjacent harbours at the time of Augustus, as the main port of the in-sailing merchantmen from the east to Rome (Dubois 1907; Zevi 1993; Gianfrotta 1996: 65–67 with further bibliography). Illustrative and detailed information is depicted on ancient iconography, such as the wall painting from Stabeiae, the mosaic from Ravenna (Fig. 6.8) and, above all, the eight surviving souvenir glass bottles, such as those in Prague, Odemira, Populonia, the Pilkinston Museum, Cologne, Ostia, and Ampurias, all dated to the third and fourth centuries CE (Ostrow 1979). These bottles were decorated with an engraved depiction of the main architectural features of Puteoli of which the arched pier is a main figure in all of them. This feature is annotated by the term PILAE or PILAS as an indication of its function (Fig. 6.9). In most bottles the arched pier is depicted as a monumental structure based on several pilasters and decorated on top with arched gates carrying chariots, horses, and *hippocampi*, and columns carrying human statues. On the bottles from Ampurias and Populonia there is the term RIPA next to the harbour, indicating a waterfront with quays, within a gabled structure at the end of the pier. On the bottle from Odemira it appears above a portico next to the pier (Picard 1958: 26–51) and on the bottle from Prague (and others as well), there is the term INPVRI [VM] or INPV [RIVM]=Emporium, as a special complex not far from the pier.

Another complex that was adjacent to the Ripa, or even a part of the *ripa puteolana*, is the *macellum*. This rectangular complex of shops was still above the water level during the eighteenth and early nineteenth centuries and was partly excavated then. It had shops all around, opening both into

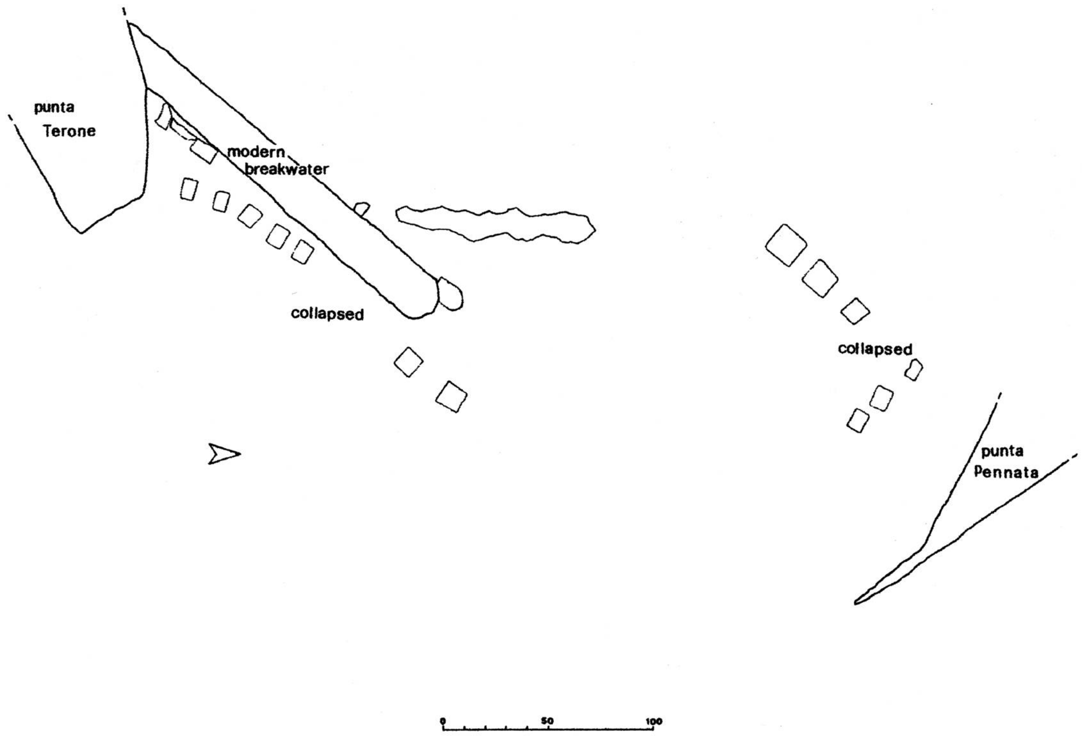



*Figure 6.7. Misenum, general plan of the harbour entrance (after Gianfrotta 1996, Fig.10)*

*Figure 6.8. Mosaic from Ravenna depicting merchantmen entering harbour with arched mole (Photograph: C. Brandon)*

*Figure 6.9. Incised glass bottles depicting the waterfront of Puteoli: from Ampurias (1, 3); Populonia (2); Odemira (4,6); Prague (5); and Rome(7) (after Picard 1958, Pls. IV-VI)*

the paved square and outside to the surrounding streets. There was a colonnaded portico in front of the shops and a colonnaded rotunda in the center of the square. The floors were raised by as much as 2 m within the two centuries of the structure's life span from its initial phase, at the time of Augustus, to the time of Septimius Severus.

An interesting complex in the harbour of Puteoli is that of the Enclosed Basins, located to the east of the arched pier, between its stem and the cape. It is almost 400 m long and extends about 100 m into the sea and had a double line of pilasters that defined its waterfront. The external line comprised rectangular pilasters (8×6 m) 4 m apart and the inner comprised trapezoid pilasters in a staggered placement between the external ones. Their narrow, outward facing, side is 3.5 m and the backside is 8 m wide. The pilasters carried an arched wall and were based on the seafloor 2.1–8.5 m deep; today, however, not one reaches the water level. The site is exposed more to the south and southwestern storms, and the double line seems to fit the special demands of such an inferior location. The complex was subdivided by four walls that were perpendicular to the shoreline and a segmented one, parallel to it. The western wall was shy by about 40 m of the line of pilaster, leaving access to the first rectangular basin, which was about 150 m across. The openings of the next two walls were only 20 m wide and there were two similar entrances that led to the inner rectangle basin from the central one. The two innermost basins are considerably smaller and may be used as *piscinae* resembling the "*old piscinae*" mentioned on an inscription that was found in a nearby church. The excluded location of the larger basins away from the commercial harbour and the emporium, may actually have been used as *neoria* for naval units (Dubois 1907: 261–265).

The Bay of Puteoli was doubtlessly the main sea gate for the metropolis of Rome, at least from the second Punic war in the mid-second century BCE, and remained so throughout the second or even the third centuries CE. Although there is no solid evidence for dating the earliest *pilae* at any of its four harbours, it is quite secure to assume that the concept, as well as the introduction of the *pozollana* hydraulic concrete, was in vogue prior to the Augustan era. This standard of building piers and moles was certainly used in Misenum, Puteoli and Nisida, following Marcus Agrippa's project of establishing Portus Iulius in 37 CE, by digging navigation channel that connected Lake Averno and Lake Lucrino to the bay (Gianfrotta 1996:66). In 23 BCE Agrippa was heir-apparent to the imperial throne of Rome and was considered a close friend of Herod, "second only to Augustus himself" (AJ 15: 361; Roller 1998: 41–53; Hohlfelder 2000). He was rather instrumental in, and willing and capable of sending Herod teams of well-trained "master builders" and harbour engineers from the Puteoli area. Agrippa could also ensure that the empty grain carriers sailing from Rome back to Alexandria would replace the mandatory ballast of *sabbura* (sand) with *pulvis puteolanus* (*pozzolana* cement). This cargo was unloaded at the building site of Sebastos, where the carriers were probably reloaded with a profitable cargo of olive oil (Gianfrotta 1996: 75–76; Hohlfelder 2000: 251–253). Laboratory analyses of volcanic ash components that were retrieved from *pozzolana* matrix at Sebastos showed that it was of the same chemical composition as samples collected at the Bay of Puteoli, or the Phlaegrean coast (Oleson and Branton 1992: 60; Felici 1998).

There was another specific constructive element that might have been borrowed from the Puteolian experience, namely the concept of deepwater *pilae,* or vertical towers installed on a seabed under more than 3–4 m of water (Brandon 1996: 29). Such were the *pilae* at Misenum and Nisida, as well as the twin towers west of the harbour channel at Sebastos (Area K) and the "evenly-spaced" towers along its main mole (AJ 15: 336; Raban 2002-2003).

These towers were connected by a 'spinal wall' built in a technique that might have been a forerunner of the commercial harbour of Cosa, Etruria, where five *pilae* were connected by a wall that was set in shuttering (McCann 1987: 66–75; Felici and Balderi 1997: 13–16). However,

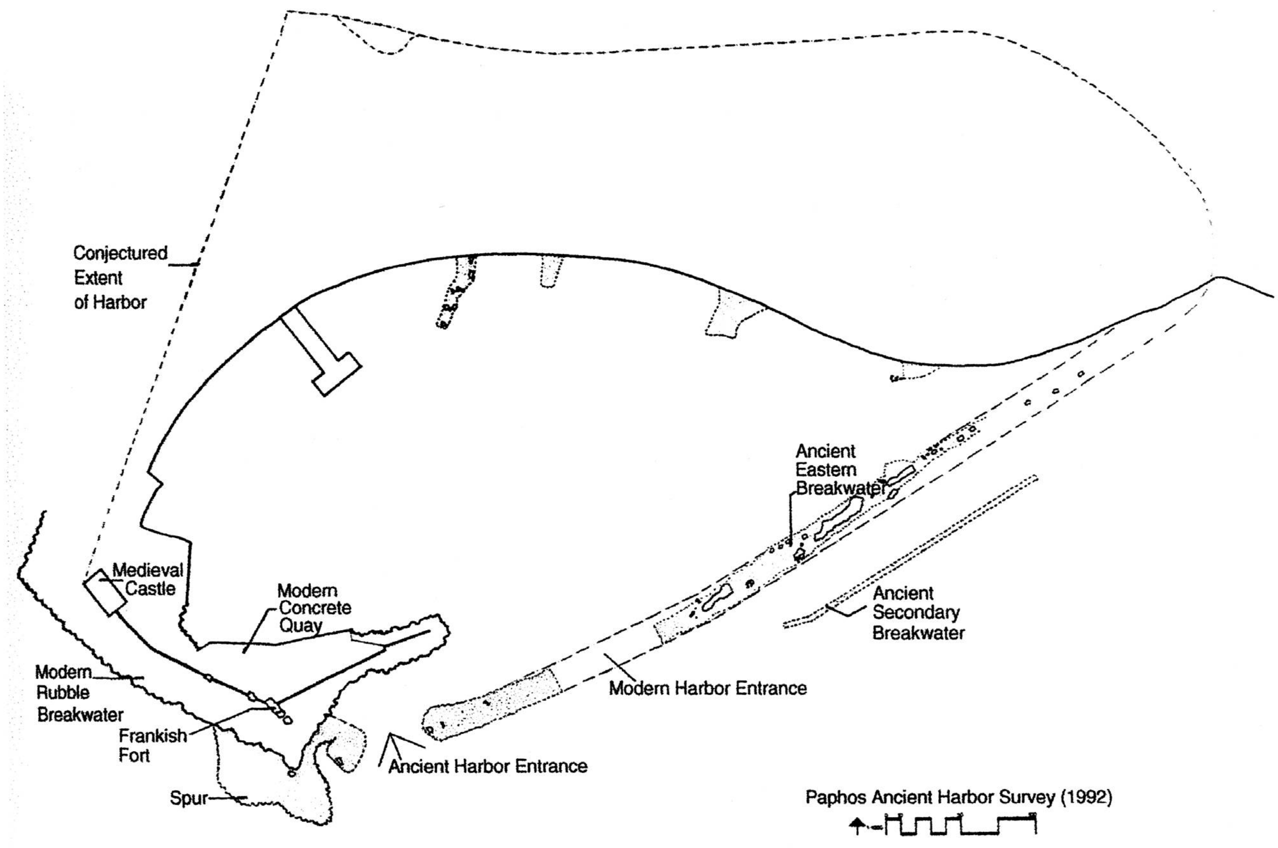



*Figure 6.10. Extant of the closed basin of Paphos harbour. (after Hohlfelder 1996:97, Fig. 9)*

the sherds retrieved from the concrete in the lower part of some of the *pilae* (McCann 1987: 324–325) indicate a possible dating of the Cosa additional structures to the early first century CE. The innovative technique of replacing the *pulvis puteolanus*, or other volcanic components by grog or sherds seems to be not earlier than late first century CE, or even later.

**D. The Harbour of Paphos**

The harbour of Paphos, on the western coast of Cyprus, was probably the most important port on the island during the early part of the Roman era, but it was never an imperial one, by size and by its scope.

Hohlfelder (1996: 97–101) assumed that the "master builders" of Sebastos were actually assignees of Marcus Agrippa. Accordingly, after finishing their assignment in Sebastos in 15 BCE, he dispatched them to Paphos in order to rebuild the harbour, which was supposedly destroyed by an earthquake that affected Cyprus that year. There are, however, no historical references to such an alleged destruction, nor any evidence for rebuilding the harbour at such an occasion (Hohlfelder 1996: 97–101).

The harbour of Paphos is located at the lee of a natural headland, the only one large enough for a shelter for a considerable number of vessels along the western coast of Cyprus. The earliest breakwaters that protected that basin were built not before the early years of the third century BCE, probably by Ptolemy I (Daszewski 1987: 174–175; Hauben 1987b: 224). In any case, by the Augustan era Strabo (14.6.3.) referred to the harbour of Nea Paphos as a "limen", that is, a full scale all-season haven (Leonard 1995a). According to later surveyors, the two moles carried spinal walls on top, as a continuation of the perimeter city walls and a main component in any Hellenistic *limen kleistos*. The eastern mole (600 m long; 6–10 m wide) was constructed of ashlars, at least on its external sides, and it had a broader spur that might have carried a tower at its western tip.

The remains of the western mole are presently fully covered by modern structures, so most of the data originate from a late nineteenth century report (Hogarth as quoted by Leonard and Hohlfelder 1993: 370–371) and an underwater survey that was carried out in 1965 (Daszewski 1981). The western mole was probably over 270 m long, running east-southeast from the southeastern side of the headland with an additional spur (50 m long) extending southward about 40 m short of its eastern tip. These two features (10–15 m wide) were built with large ashlars similar to the eastern mole (Daszewski 1981; Fig. 6.10).

Topographic surveys and various trial excavations within the present day harbour area revealed ample data, allowing reconstruction of the coastline of the Hellenistic and Roman periods as being 150 m further inland than the present day waterfront. An interesting feature that is considered as a "subsidiary breakwater" (200 m long; 5 m wide) is

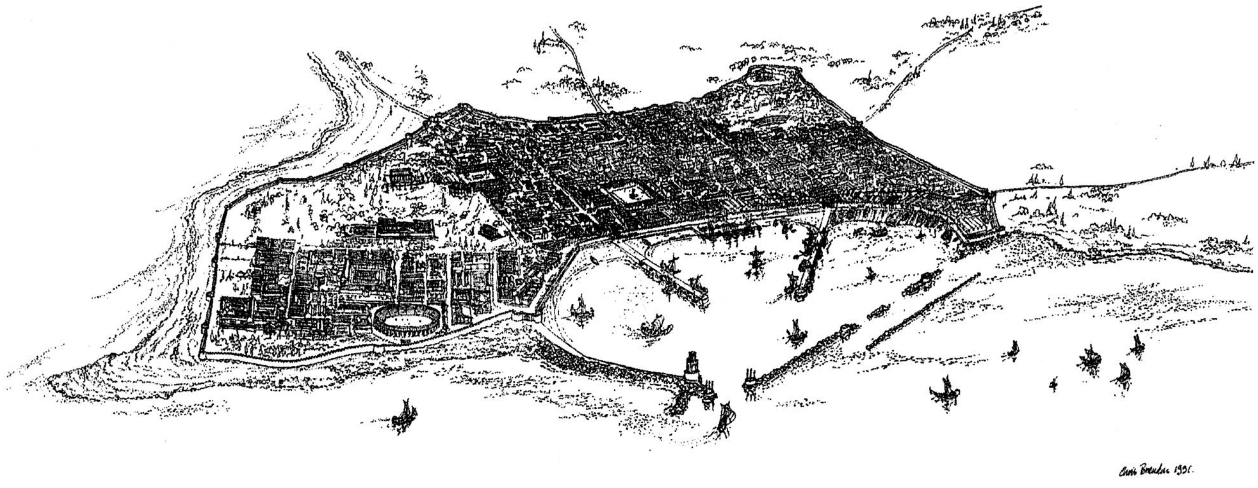


*Figure 6.11. An artist's rendering of the Roman harbour of Paphos (after Hohlfelder 1996:100, Fig. 12)*

presently under more than 4 m of water. It ran parallel for 30 m off the eastern mole, eastward from its central point. It is comprised of rather large blocks lying jumbled upon each other, but generally with their long axes perpendicular to the line of the wall (Leonard and Hohlfelder 1993: 375). This feature, with only one parallel at Sebastos, was an alleged part of the Augustan period attempt to solve the problem of siltation within the harbour basin. It was a defensive measure from the incoming surge toward two outflow, flushing channels that were cut through that part of the eastern mole (Hohlfelder 1996: 97–101; Fig. 6.11).

The proposed reconstruction of the harbour drawn by Brandon on behalf of Hohlfelder's team showed one basin that is subdivided by jetties into three sections. This hypothetical division is based on the reference of an ancient text known as "*Stadiasmus*", or "*Periplus Maris Magni*", that described the harbour of Nea Paphos with three basins suitable for all winds (Leonard 1995a). Daszewski (1981:334) suggested that the western basin was a naval base, with military facilities; the central one accommodated merchants and passengers; and the eastern basin was for fishing boats and shipyards. Other scholars suggested a different division, including inner basins to the north and to the east of the main one, and also referred to possible shipyards, either within the harbour or nearby (Nicolaou 1966: 564). Unfortunately, so far there is no archaeological evidence to verify either the drawn reconstruction or the existence of shipyards. Hohlfeder's claim (1999:160) that the timbers for the "single-mission barges" used in Sebastos came from Cyprus, probably via Paphos, has not been established. As mentioned in chapter 5, the only maritime endeavor of Herod outside his kingdom was in sponsoring the shipyards at Rhodes, and *Pinus brutia* was not an exclusively Cypriot pine but could also be found in Anatolia and Greece. Thus, there is very little in common between the Harbours of Caesarea and Nea Paphos, except for the fact that both suffered repetitive destructions caused by earthquakes. Even the so-called "subsidiary breakwater" that was constructed for different functions than that of Sebastos can hardly be called "lesson applied" (Hohlfelder 1996: 101).

### E. The Harbours of Ostia

#### 1. The Portus

By the middle of the first century BCE Rome was growing rapidly towards becoming the largest urban centre in the entire Mediterranean sphere. As such, its ever-growing demands for staple commodities had to be supplied by imports from outside the Italian peninsula. Puteoli served as its main sea gate, but the distance to Rome by land routes, as good as the Via Consularis Campania and Via Appia were, was a technical and logistic nuisance. These routes, as was any land transportation in Antiquity, were cumbersome especially when dealing with mass quantities of grain, olive oil, wine, conserved fish products and other goods that were packed in amphorae.

The Tyrrhenian coast of Latium has no natural haven and the only access to Rome from the sea was through the outlet of the Tiber river, which was limited to rather shallow draught vessels and feasible only when the sea was calm. In the fourth century BCE Ostia was established on the southern bank of the Tiber, close to its outlet (which is the meaning of its name). The earlier, yet unknown, settlement that made its living from the nearby *salinae* was at first a military outpost for Rome protecting it from any seaborne invasion or other dangers (Meiggs 1973: 13).

In the third century BCE a *Quaestor* was in charge of raising money for building naval vessels for the Roman fleet (Livy XXII.11.6; XXIII.38.8). Towards the end of that century Ostia served as a port of call for shipments of grains from Etruria, Sardinia and Sicily. As shares for Rome's army as distributed by its navy grew, such a role became more apparent especially after the Punic wars, when Ostia became the port city of Rome (Meiggs 1973: 10–29; Calza and Nash 1959: 8–9; Livy XXII.37.1-6; XXV.20.3).

During the later Republican era Ostia became a transit station where sea-borne goods were unloaded and stored before being carried up the river to Rome. Storage facilities and an extended row of quays and *horreae* dated to the second century BCE were exposed in the excavations along almost half a kilometer of the river banks (Livy XI.51.4–6; XXXV.10.12; Meiggs 1973: 30–32). Ostia reached its peak towards the second half of the second century CE, following the building projects of Trajan and Hadrian, including the new harbours at the other side (north) of the *isola sacra*.

The city of Ostia and its commercial role in the economy of Rome lost ground with the growing entity of Portus around the hexagonal Trajan harbour. This happened even more rapidly early in the fourth century CE, after Constantinus I gave Portus the status of polis, granting it all the privileges of the port city of Rome. By the sixth century CE Procopius described the road from Rome to Ostia, the Via Ostenianza, as unused and covered with grass, and the Tiber empty of barges (Calza and Nash 1959: 12–13).

## 2. The Claudian Harbour

The idea to build a true, all-season, deepwater harbour that would serve the rapidly growing demands of the people of Rome had already been proposed by Julius Caesar. This rather costly and technically complicated project was actually carried out only by Claudius in 42 CE. The selected site was a few kilometers north of the Tiber's outlet, where there was a small sandy bay, a place where the river meandered not far inland, which could easily be connected by navigation channel. These were probably the reasons why the chosen site was north and down the long-shore current of the Tiber's outlet and thus vulnerable to siltation by its deposit (Blackman 1982: 187). At least two channels that connected the new harbour basin with the Tiber were completed by 46 CE, as mentioned in a dedication inscription found near the Claudian basin. Nero, in 64 CE inaugurated the harbour, although it was probably functioning already during the latter years of the reign of Claudius himself (Suetonius V.20).

The basin, encompassed by two long moles, was almost a rectangle with rounded corners at its sea-side. With the natural coastline running south-southwest–north-northeast at that time, the two moles were lined up perpendicular to it. Yet, as in Sebastos, the southern mole turned towards northeast, encompassing the basin on its entire weather side, with the entrance facing north–northwest, being over 200 m wide (Testaguzza 1964:179). The southwestern mole stemmed from a large sandy outcrop, probably artificially accumulated from the dredged harbour basin. The idea that there was a wide gap between the eastern end of the left mole and the shoreline to the south (Lugli and Filibeck 1935: Fig. 4.3) as a means for enhancing a flushing current through the harbour basin was not substantiated. Yet, the quantity of silted-up depositions within that part of the basin might have been caused by such a gap, facing the source of the long-shore-carried silt (Fig. 6.12). Further to the east, along the southern side of the basin, there were quays with two storey *horrea* at their back, and the *darsena*, an elongated rectangular shipyard that were connected to the Claudian channel that ran between the Tiber and the sea (Testaguzza 1964: 178). The maximum water area within that basin was about 90 hectares, according to Testaguzza's calculations, or 60–80 as calculated by others (de Graauw 1998: 55).

The left mole was 758 m long, running from the northwestern tip of the sand spill northeastwards, turning in near its tip. At its stem the mole is actually a 75 m long terrestrial seawall. Further on it comprised an internal core of 6 m wide blocks of concrete that included chunks of tuff and external structure, built of large cut stones (4–5 m). These were placed parallel to each other with a fill of poured concrete between them, as well as chunks of tuff and bricks that were embedded in lime and pozzolanic matrix. It was proposed that the inner core was part of the original Claudian structure, while the external one was a later amendment (Testaguzza 1970: 71). For its entire length the left mole was based on a spilled rampart (2.5 m high), which was made of large rubble blocks that were retained on its both sides by a mixture of volcanic concrete and aggregates.

The mole consisted of two parts: the first one was 333 m long of which the first 172 m continued the line and type of construction of the terrestrial sea wall, with a vertical, ashlar-built vertical pier along its inner side. Further on, this part of the mole was a continuation of the only pier, with a base course of headers and above it alternating courses of headers and stretchers fastened by metal clamps both horizontally and vertically (Fig. 6.13). There was a 21 m gap between the northeastern tip of this part and the stem of the next part, most probably in order to allow a flushing current through the harbour basin. Yet, when it became apparent that it enhanced siltation, this gap was blocked by a *pozzolana* filled vessel (7.5×22 m; Testaguzza 1970:72).

The second part was 425 m long, built of shuttered blocks of hydraulic concrete that comprised chunks of *tufa,* embedded in lime and *pozzolana*. Its first section was an elongated mound, called "Monte Arena", most probably the true location of the well-documented lighthouse (see below) that was based on Caligula's Obelisk carrying vessel (Testaguzza 1970:105–120). This section was 95 m

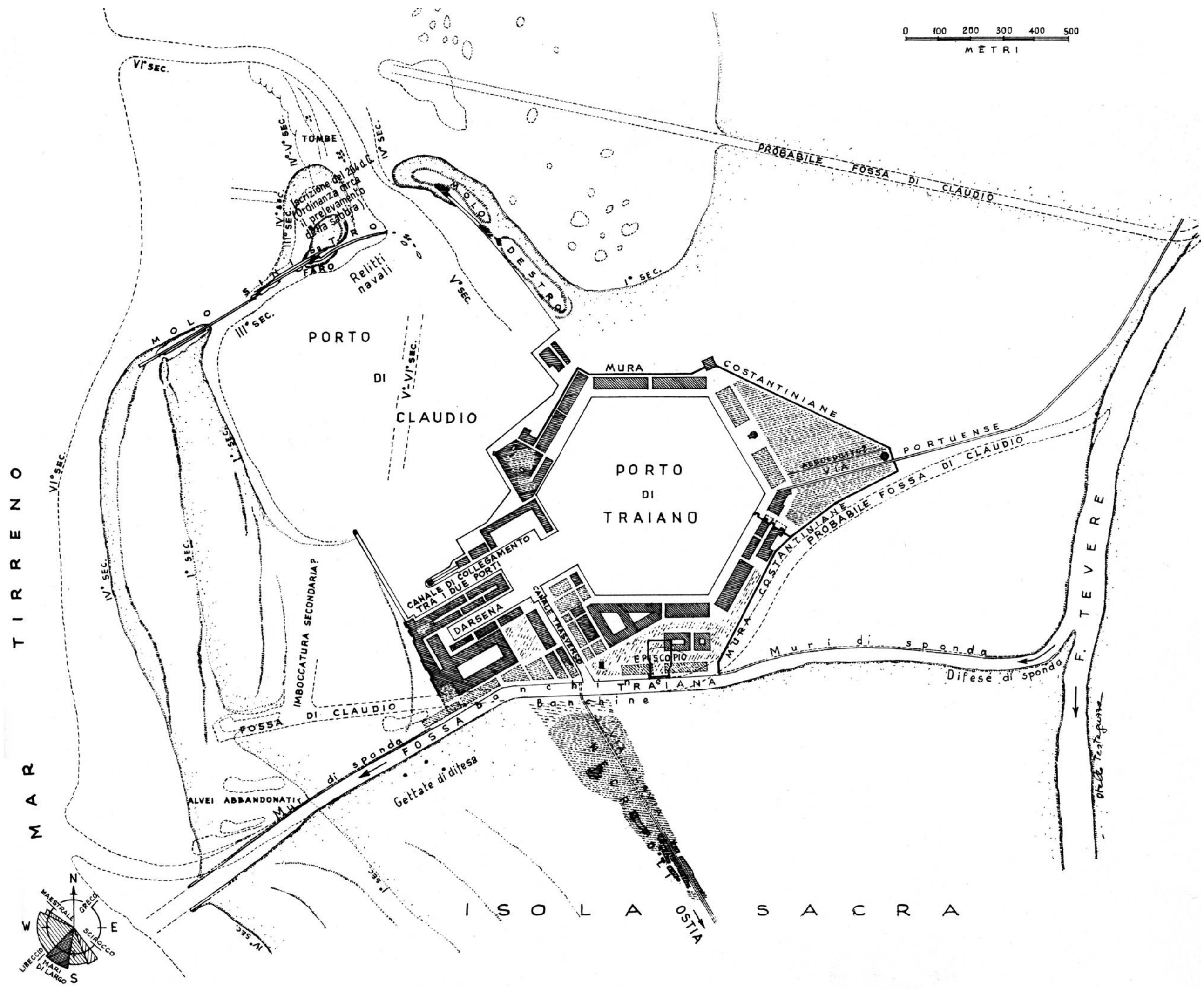



*Figure 6.12. Ostia: a reconstructed topography at Portus area. (after Testaguzza 1970:390)*

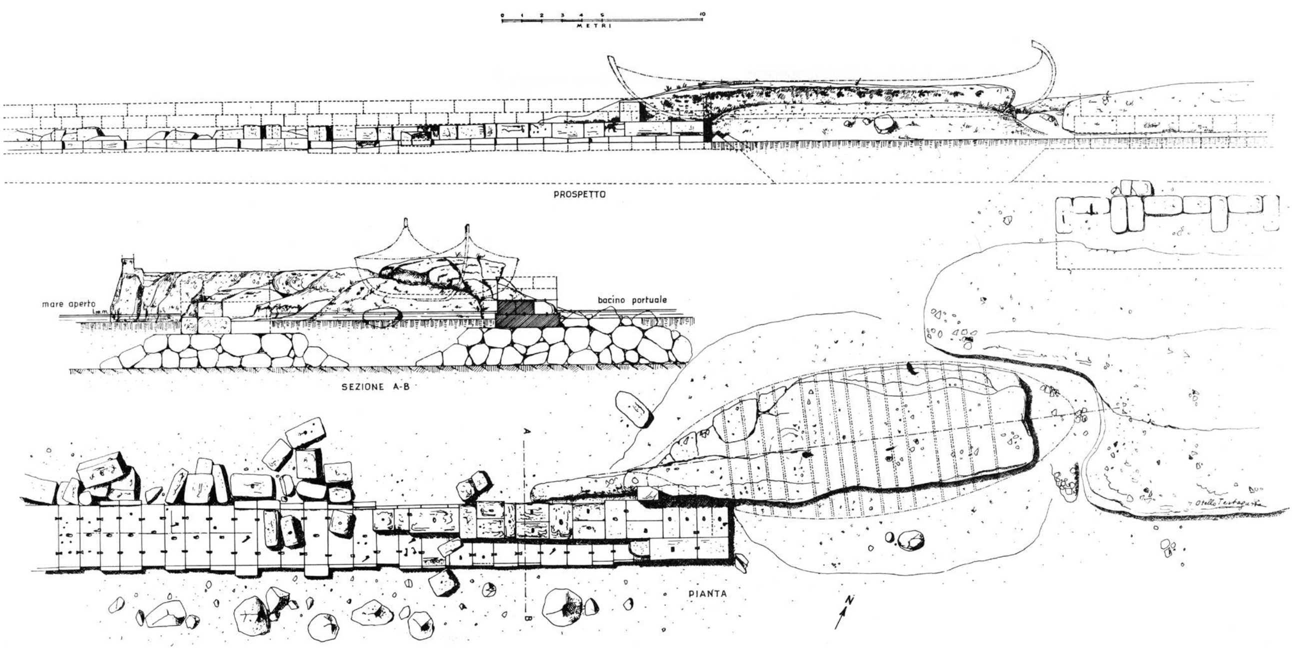



*Figure 6.13. The Claudian harbour: plan and section of the left-hand mole at the connection between its first and second parts (after Testaguzza 1970:91).*

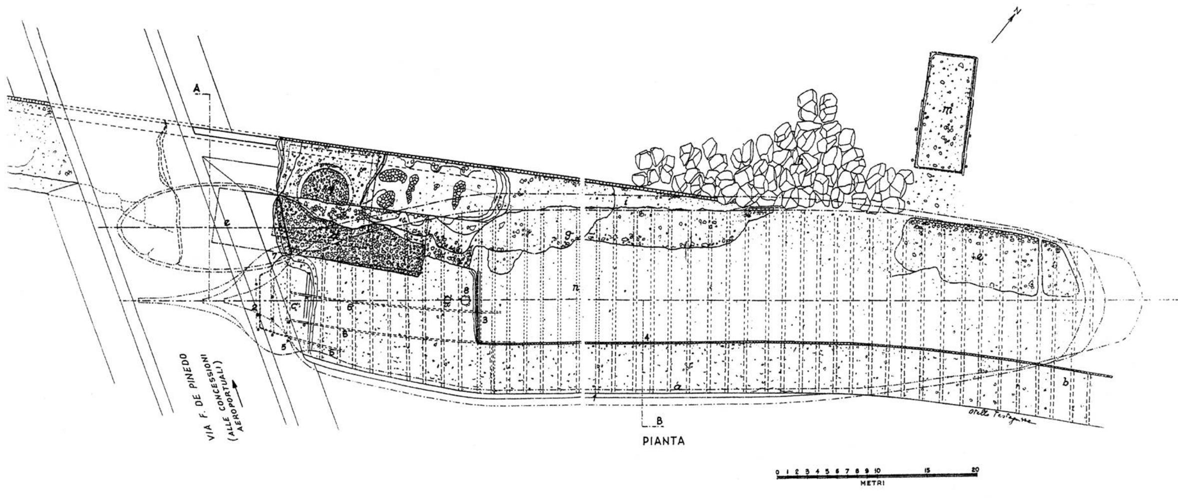



*Figure 6.14. The Claudian harbour: plan of the part of the left-hand mole with Caligula's ship (after Testaguzza 1970:116-117)*

long and 21m broad and fitted the calculated size of that royal ship well. Further on the mole ran on a curved line towards the east (5.5 m wide) and comprised shuttered elongated blocks of hydraulic concrete that were laid in phasing courses and retained by courses of tuff bricks.

Following the unloading of the Obelisk at Puteoli, the mooring ship was probably reloaded with *pozzolana* matrix to its capacity and sailed (or was towed) to the building site, two miles north of the Tiber's outlet. The designated spot was 500 m off shore and over 7 m deep on a sandy seafloor furnished by a retaining cushion of a large amount of rubble, settled in the negative shape of the ship's hull. There it was moored and allowed to sink by letting the sea enter it and by loading an additional burden of building materials onto it. Once it was lying in place, the hull was further kept in place at both its sides by additional rubble, while the starboard side of the prow was retained by wooden formed concrete (26 × 8 m), as a foundation for the lighthouse to be built there (Fig. 6.14). Series of hollows, negatives of cross-beams, in the surviving mass of hydraulic concrete that comprised much of Monte Arena attested to additional scaffolding and shuttering to retain the settled ship's hull (Testaguzza 1970: 108). However, this could also be the remnant of data on the additional reinforcement that was installed already in Alexandria for the loading of the Obelisk, in order to make the ship seaworthy for such an overburdened and lengthy sea voyage. Wooden samples from both the ship's hull and the surrounding shuttering were subjected to C14 analyses and they indicated a construction date in the first half of the first century CE.

Samples from the hydraulic concrete that were analyzed showed that the fill of Caligula's vessel comprised an admixture in the proportions recommended by Vitruvius, but in all others the amount of lime and sand varied and were usually greater than the recommended ratio (Scrinari 1963: 534–535).

The right mole was not studied thoroughly, except for some test probes along the inner face of its western half. Topographically its remains were covered by an elongated mound of sand and silt, known as "Monte Giulio" (100–150 × 600 m). Close to the western tip of the mole, the test probes exposed a service quay built of vertically molded hydraulic concrete that comprised chunks of *tufa* embedded in a mixture of lime and *pozzolana* of similar composition as at the left mole. On top of the quay there were remnants of buildings, some dated to the Claudian era and some to the end of the first century CE (Testaguzza 1970: 77–78).

The structures at the southern (inner) side of the tip of the mole were functioning, most probably, as a base for piloting services and for the harbour's officials who were in charge of checking the in-coming vessels, their cargo and bill of lading. The imposing structure at the tip of the northern mole at Sebastos probably had a similar function (Area D, see Chapter 4, above).

The southeastern side of the basin was at the original coastline, which was furnished with broad unloading quays at three levels and sizable horrea behind. The quays were constructed of shuttered hydraulic concrete, with horizontally pierced mooring stones incorporated in their vertical face. Several columns that were installed in the quay's pavement resemble those at the Trajan harbour and might belong to that later phase. A navigation channel was dug eastward and inland from the southernmost corner of the basin towards the Tiber, connecting the harbour's main basin to the *Darsena*. That basin (45 × 240 m) was dug also on land and had an entrance channel only 9 m wide at its eastern side. This elongated rectangular basin was confined by walls of hydraulic concrete, in which slipways and descending staircases were incorporated. The waterfront along its southern side had vertically pierced mooring stones protruding from the quay at 4 m intervals.

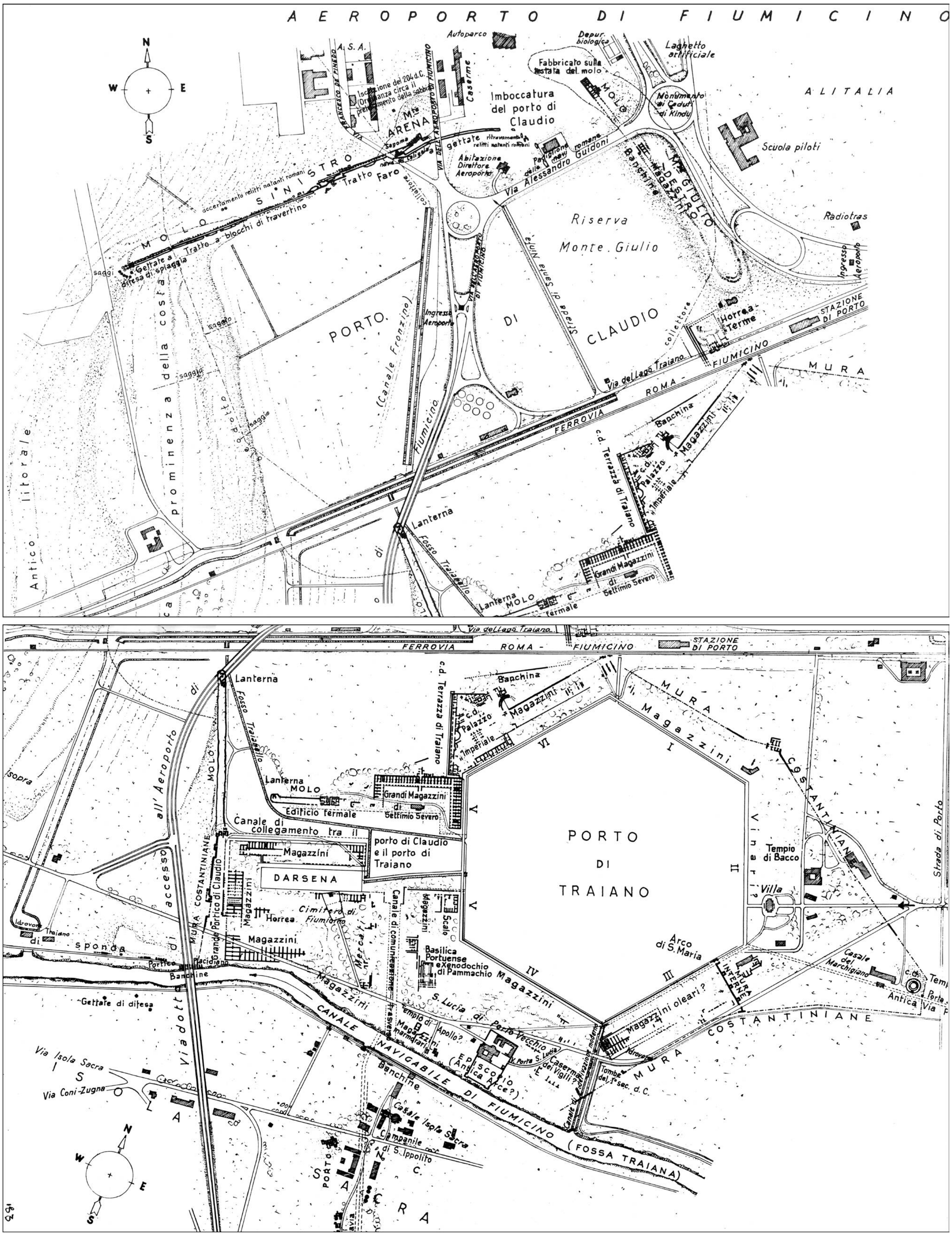



*Figure 6.15. Portus: plan of the Trajan harbour and its surrounding (after Testaguzza 1970:153)*

The surrounding quays (6 m wide) had a wall enclosing the complex and dividing it from the nearby storage facilities built later. The *Darsena* functioned most probably as the anchorage basin for lighters and other service boats (*lenunculi*). Its close proximity to the channel that connected the main commercial harbour to the Tiber, on the riverine way to Rome, might substantiate this hypothesis (Lulgi and Filibeck 1935: 74–76).

The lighthouse was of great importance for the type of rather low lying and featureless coastline, north of the Tiber's outlet. According to the archaeological data, it was located not on an artificial island at the centre of the harbour channel, as suggested by the historic texts and artistic depictions of the period (Dio Cassio, LX 11.5; Suetonius, V.20.3), but half way along the line of the northern mole. Various ancient depictions on coins, mosaics, frescoes and reliefs showed it comprised two to four superimposed units, of which the only surviving remains is a cylindrical block of cast concrete, probably the core of a spiral staircase (Testaguzza 1970: 107). If the archaeologically based location is correct, then a similar location of Sebastos' *Drusion* could be half way along the main mole, on a massive (80 × 40 m) "Artificial Island".

As the main sea gate to the staple demands of Rome and due to the seasonal limitations of the sea-borne long distance trade in the Mediterranean, the new Claudian harbour had to contain an excessive volume of storage facilities, warehouses and *horrea*. The regular pace of three days' hauling of loaded riverine barges from the port to Rome required wharves, warehouses and *horrea* not only around the harbour and at nearby Ostia, but actually along the river banks of the Tiber (Rickman 1988: 259). Of these, there was at least one complex that was comprised of a double row of large rectangular chambers, with a colonnaded portico in front of the line facing the harbour that has been securely dated to the time of Claudius (Testaguzza 1970: 211; Fig. 6.15).

In conclusion, the Claudian harbour, which was built more than half a century after Sebastos and was the imperial port for the metropolis of Rome, was technically inferior to its forerunner, although it followed some of its conceptual layout. Like Sebastos, the Claudian harbour was an artificial, free-standing moles complex. In both, there was an extensive use of combined structures made of wood-formed blocks of hydraulic concrete and ashlar blocks of cut stones. Yet, while at Sebastos the builders used evenly preplanned blocks of standard size, wooden forms and "artificial islands" made of clusters of "single mission" barges, the finds from Ostia suggest a less organized and rather haphazard selection of reused ship and boat hulls as eventual shutters, with an uneven and variable composition of hydraulic concrete. One would consider the earlier port as a project built with a plan, ample time for planning and execution and a wealth of financial resources, and the latter one as an inferior product of urgent necessity and economic constraints executed in haste. Such a conclusion contradicts the historical background and the comparative scale of imperial resources versus those of a petty king of the humble Judea. Historically, Sebastos was completed within five to six years, while the port initiated by Claudius was built in no less than 20 years (43–63 CE), which also contradicts the data concerning the comparative quality of their execution. The two harbours shared a similar role of transit function, but while Sebastos was serving a mixture of "cabotage" and a long-range sea-borne trade, with hardly a hinterland market of imported goods, the new "Portus" was functioning almost entirely for better transshipment of imports from overseas to the riverine access to its "hinterland" market at Rome. Accordingly, while Sebastos' moles were designed to accommodate the bulk of storage space close to the berthing quays, the more adequate location for the warehouses at Portus was next to the inner navigation channel, where cargoes were transshipped from sea-going to riverine vessels.

Yet, the two major shortcomings of Claudian Portus were its overwhelming vulnerability to rapid siltation and its oversized basin. These caused enough turbulence within it during severe storms to cause the loss of over two hundred merchantmen in a single event (Tacitus 15.42). In this context and in the light of the suggested silt-preventing measures that were allegedly incorporated within the layout of the moles, one may wonder whether the ancient artistic depictions that portrayed the right mole of Claudian Portus as a vaulted structure of a Puteolian *pilae* type is not more accurate than the common comprehension of the sketchy archaeological data (Blackman 1982: 81, Fig. 1B).

One may also bear in mind that there are certain limits to the comparative study of these two harbours. On the one hand the short-lived main basin of Sebastos was actually a single phase complex, which eventually went down under the waves, while, on the other hand, the external "Claudian Portus" was a land-locked port that went through many modifications during two-three centuries, with an almost complete overhaul when Trajan's inner harbour was built.

### F. The Trajan Harbour

As mentioned above, the harbour built by Claudius and Nero did not function well enough to replace the harbours of the Bay of Puteoli. However, it took another half a century before a major step was taken to resolve the problem.

The new inner harbour basin was dug on land to the east of the main existing one and the *Darsena*, in the area where the navigation channel towards the Tiber passed. This location was far enough from the open sea and well protected from both the potential impact of the storms and wave deposited silt. The basin could easily be connected to the former one and to the channel on the riverine route to Rome. The idea to build on land a full scale and deep basin for the largest merchantmen was influenced by the success of the harbours at Carthage and the Lechaion of Corinth, both of which were in full operation when Trajan became the emperor.

It is rather strange that such a large and successful project was hardly mentioned in historical documents, except for one remark mentioning "additional, safer harbour" (Schol. Juven. XII.25). Another, probable reference to the new channel, the Fossa Augusta (= Fossa Trajana?) was made by Plinius the Younger (Frags. VII.14). There are, however, two fragmented inscriptions – one found at the bottom of Fossa Trajana and a part of a dedication for Trajan's new hexagonal port (Testaguzza 1970: 38); and the other in St. Paul Cathedral at Rome, which bears the name of Trajan and the term "Fossa" (Meiggs 1973: 488). There is also a commemorative coin that was issued around 112 CE (either the fifth, or the sixth Consulate of Trajan) and depicted the hexagonal harbour surrounded by double storey warehouses with porticos, temples, column-mounted statues and the title: PORTUS TRAIANI.

The Trajan basin survived almost intact and was studied when drained in 1923 for cleaning and some restorations (Calza 1925). It comprised an even hexagonal basin with 358 m long loins that were defined by vertical wells (6 m high and 3 m wide). These were constructed of wooden shuttered concrete, an admixture of chunks of *tufa*, lime and volcanic ash (pozzolana). The shuttering scaffolds comprised vertical planks that were fixed by iron nails to horizontal cross timbers and to poles that were inserted deep into the ground (Calza 1925: 55). In the first phase, the surrounding quays were of a single level and topped by large paving slabs. The vertical face of the quays was coated with bricks with mooring stones protruding at even intervals of 14–15 m, furnished with an horizontal pierced hole and located next to the quay's upper edge. The estimated water depth in the basin is 4–5m, probably fluctuating somewhat with the changing seasonal tides of the Tiber.

The distance between the mooring (over 100 m all over) may represent the maximum beam of the moored merchantmen, berthed either stern-to, or prow-to the quay The maximum size of the merchantmen was 10 × 50 m with maximum burden of 500 metric tonnes (Testaguzza 1970: 163). At the back of the quays there were stemmed columns that are understood to be either bollards (Lugli and Filibeck 1935: 70), or navigation aids for guiding merchantmen towards particular wharves of specific goods (Testaguzza 1970: 163). During the reign of Septimius Severus, an additional higher quay was built, probably to accommodate high waters during the seasonal tide of the Tiber (Lugli and Filibeck 1935: 68–70).

The main new navigation channel (still functioning today) was the Fossa Traiana, 50 m wide and almost 1700 m, long that connected the Tiber to the open sea, passing 300 m south of the new inner basin (Fig. 6.15). This artificial course was defined by retaining walls formed by shuttered hydraulic concrete that were faced with *opus reticulatum* brick work and bore wharves on top, probably used as berthing posts for the naval units of the imperial military fleet (Lugli and Filibeck 1935: 73; Testaguzza 1970: 79–81). Mooring bits and bollards along both banks facilitated the on-going procession of towed barges up the channel to the Tiber and to Rome. There were two cross channels that connected the new harbour to the Fossa Traiana: the western broader one stemmed from an intermediate trapezoid basin that was between the western flank of the hexagon (No. V) and the *Darsena*. The first was 25 m wide, built and retained in similar manner as the Fossa, and furnished with quays and warehouses on its both sides. The second was a much narrower stem from the southernmost corner of the hexagon, where a modern drainage device dug into it in 1923.

There was a continuous wall that encircled the hexagonal basin 6 m away from the water edge, and separated the quays from the storage area. Five gates (1.8 m wide) were at every loin, probably too narrow for crates to pass through, and accommodated only manual shifting of goods. This may have facilitated a better administrative control and enforcement of customs and other dues. The original 3 m high wall was extended and almost doubled in the Severian era. The warehouses spread around the new harbour, between it and the external one, around the *Darsena* and between it and the *Fossa*. These were built throughout different periods with large scale renovations and additional *horrea* that were installed by Septimius Severus. The warehouses were two-storey high with a double row of chambers, like the Claudian ones and unlike the "corridor", or the "courthouse" types of Ostia.

There is still an ongoing debate among scholars whether there were specific unloading and storage zones for different goods, as there were in Rome. However, there are enough surviving features that suggest that the grain stores were of thicker walls with suspended raised floors that secured proper ventilation and warded off dampness from that sensitive bulk staples. There were remains of a long warehouse that presumably was a *horrea olearia* (for olive oil) along the southeastern flank of the hexagon (No. III). It was evident that a temple for Bacchus existed at the back of the eastern flank (No. II), possibly indicating that imported wine was stored this area (Testaguzza 1970: 186).

It seems as if the last phase of any significant construction occurred at the time of Septimius Severus, around 200 CE. A century later, early in the fourth century CE, Constantine I encircled the harbours and their adjacent urban area by a city wall and established the complex as *civitas*, called "Portus" changing the status of Ostia as the port city of Rome. The harbours operated, although in a diminished scale, until their final demise, in the sixth century CE.

Summing up the Portus, the maritime infrastructures of Ostia and Rome, and the developed layout of portual system, one should bear in mind that it went far beyond the described structures above. Storages and wharves were also in Ostia, along the banks of the Tiber all the way up-stream to the embankments and the warehouses of Rome (Castagnoli 1980: 35–42; Colini 1980: 43–50; Mocchagiani-Carpano 1982; Rickman 1988). Additional

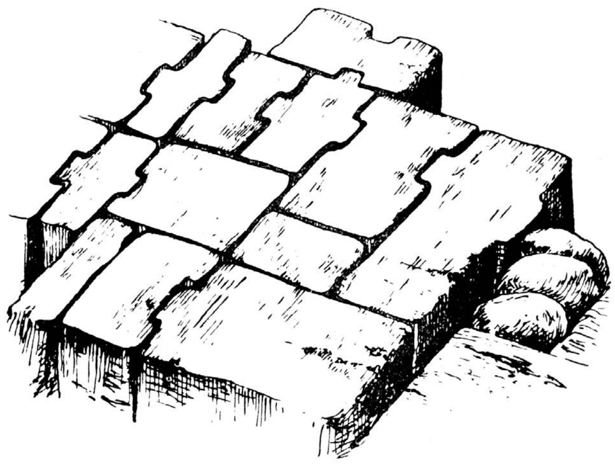


*Figure 6.16. Leptis Magna: an early (Neronian?) paved quay outside the port to NW, below Neptune's temple (after Bartoccini 1958, Fig.13)*

"subsidiary" harbours played an important role in this framework: the Neronian harbour at Antium which was an imminent complement to the Claudian port (Felici 1993), the older harbours at Astura and Tarracina further down the coast, the Etrurian harbours of Cosa and Graviscae and the Trajan harbour at Centumcellae (Blackman 1988: 259–260).

No detailed information of a similar combined network comprising paved roads, sailing routes and regional cabotage is known from the Levant. However, the conceptual settings of Sebastos, including the positioning of its warehouses on the seaward quays, indicates that this was its major role as well. But, aside from the obvious difference in size and scope of maritime activities, Sebastos, Alexandria, Leptis Magna, Empurias and other "provincial" harbours were mainly exporting centers, while Portus was almost exclusively an importing one. Sebastos as an exporting harbour operated to a certain extent as a transit post that enabled merchantmen to sail properly loaded with profitable cargo. Portus, however, hosted incoming marine vessels that quite frequently had to sail off with a dead weight of sand, or other disposable ballast. It did not even have the marginal, but rather important type, of "returning ballast" that was offered at the Bay of Puteoli, namely the volcanic components so important for hydraulic concrete—the *pozzolana*.

**G. The Harbour of Leptis Magna**

This port is located on the North African coast of the Mediterranean, on the easternmost side of Tripolitania and almost due south of Sicily, between the Bay of Gabbes to the west and the Great Sirta, to the east.

In the late eighth century BCE there was a Punic station there, probably due to the favorable topographical feature of the headland and the adjacent in-shore reefs on the northwest side of the Lebda's estuary – a rather rare natural and adequate haven in that area. The topography of the hinterland is moderate with the mountains at the northern edge of the Sahara desert at a distance from the shore, sloping down gradually towards it. This topography and the ample precipitation during the winter enabled certain agricultural land use from early times, with olive trees and winter grains as the main crops. There are indications that the site was the final stop for Trans-Saharan caravans that used the high plateaus, which were relatively wet, on the way to the sub-Saharan region of Lake Chad, which was a source of gold, ivory and wild animals.

The early references of the Roman period to the harbour are of a flourishing well-built city, built on an orthogonal Hippodamic plan with a *Cardo* and *Decumani* and public monuments that were displayed in the former Punic city, during the Augustian period. Although its hinterland was still affected by clashes between neighboring cities and tribal upheavals, the fact that Leptis Magna had no city walls may attest to its political and economic strength (Haynes 1960: 71). The city grew up and expanded during the first two centuries CE, with a final burst of new public monuments built during the reign of its native ruler, Septimius Severus. Later, the city was reduced, fortified and eventually abandoned following the Islamic conquest.

In its Severian phase, the harbour was the last true full-scale imperial harbour built in the Mediterranean during the Roman era. Some scholars consider it as flaunting exhibition of an emperor who wanted to glorify his birthplace, rather than an economic necessity, or needed for other practical considerations, for that matter. Whatever the reasons for its construction were, it is the best-preserved monument of its kind and was never covered by later structures, nor robbed or overwhelmed by earthquakes, or other upheavals.

Only little is known about the early harbours of the Punic and Augustian cities. There is almost no doubt that both were located along the eastern sheltered side of the headland, either at or just outside the estuary of the Lebda, where there are still remains of wharves, quays and warehouses dated to the time of Nero. Another quay was probably also positioned along the north facing shoreline to the east of the estuary (Bartoccini 1958: 18). These are mostly covered by the later Severian structures and the suggested reconstruction of the harbour that was accomplished by the time of Nero is rather comprehensive.

On its northwestern side, the basin was protected by a 80 m long vertical ashlar-built seawall, with an adjacent quay along its inner side, as attested to by staircases and vertically pierced mooring stones. At the eastern tip of this mole there was a massive rectangular structure, either a navigation mark, or a lighthouse (Bartoccini 1958: 35). Further to the west, along the exposed north shore and below the old Forum, there were additional quays built of complementary scarves of ashlars (Fig. 6. 16). Along the western side of the basin to the south of the seawall, there was a 220 m long broad quay with an unpaved surface. This quay was later rebuilt on a higher level, but the

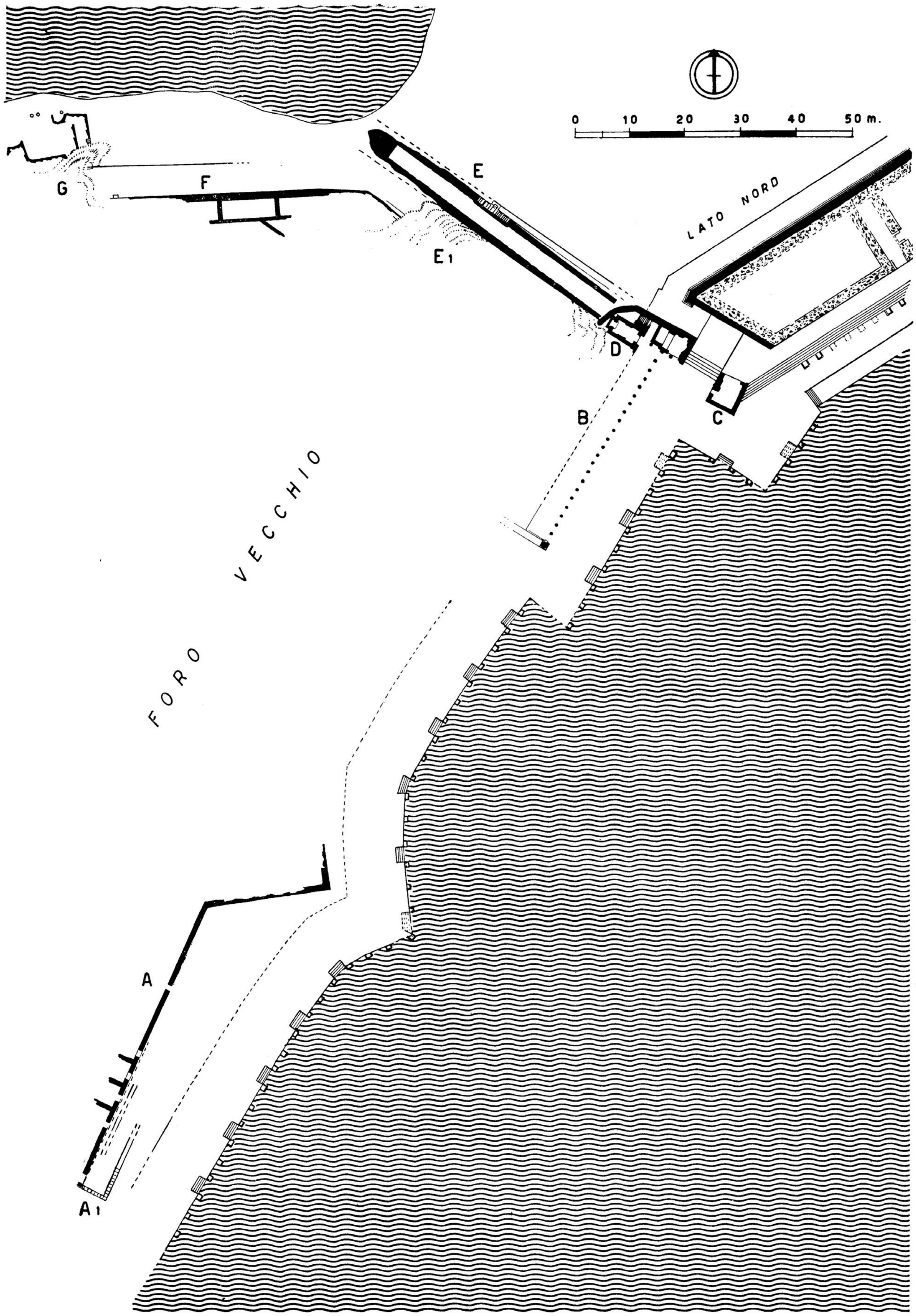



*Figure 6.17. Leptis Magna: the western flank of the Neronian harbour (after Bartoccini 1958, Pl. VI)*

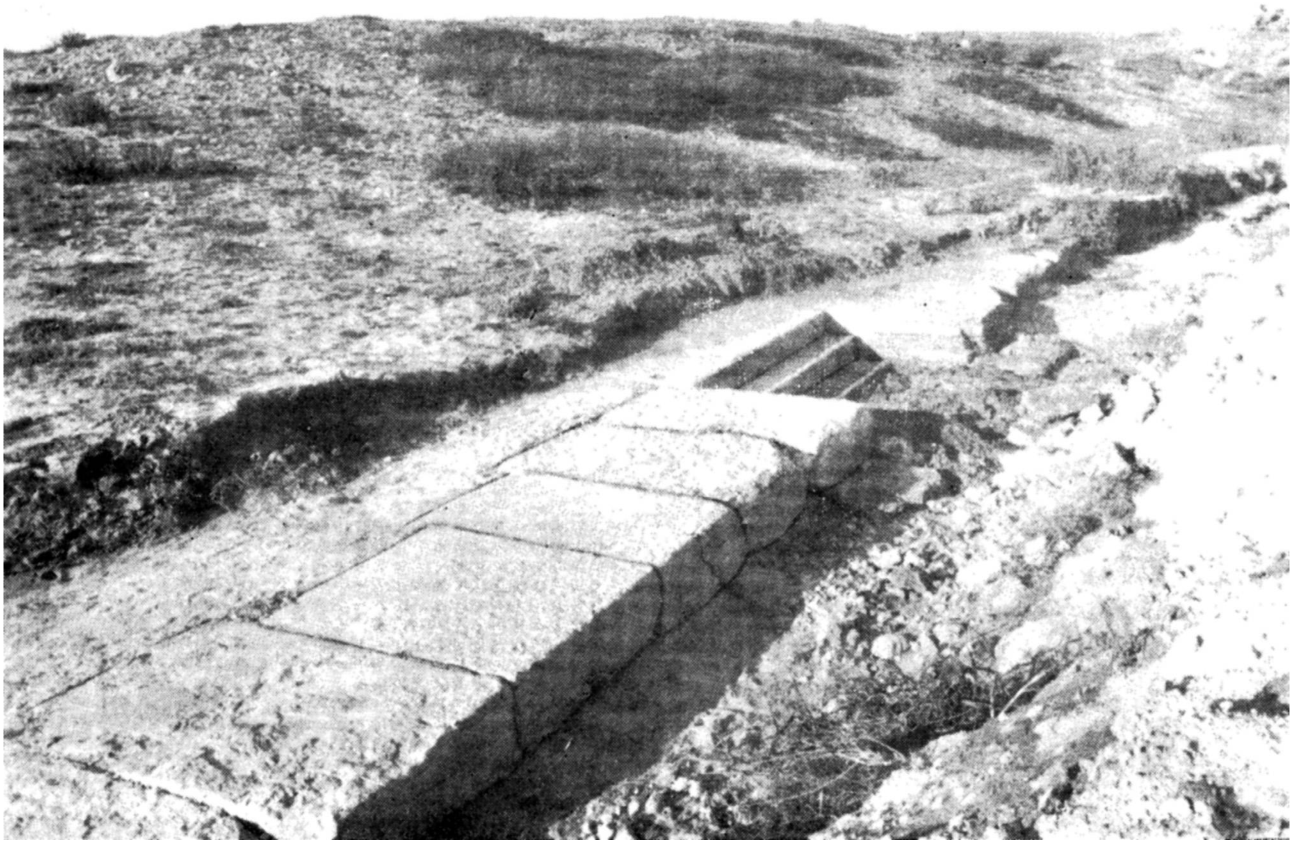


*Figure 6.18. Leptis Magna: the Neronian harbour (after Bartoccini 1958, Pl.IV-2)*

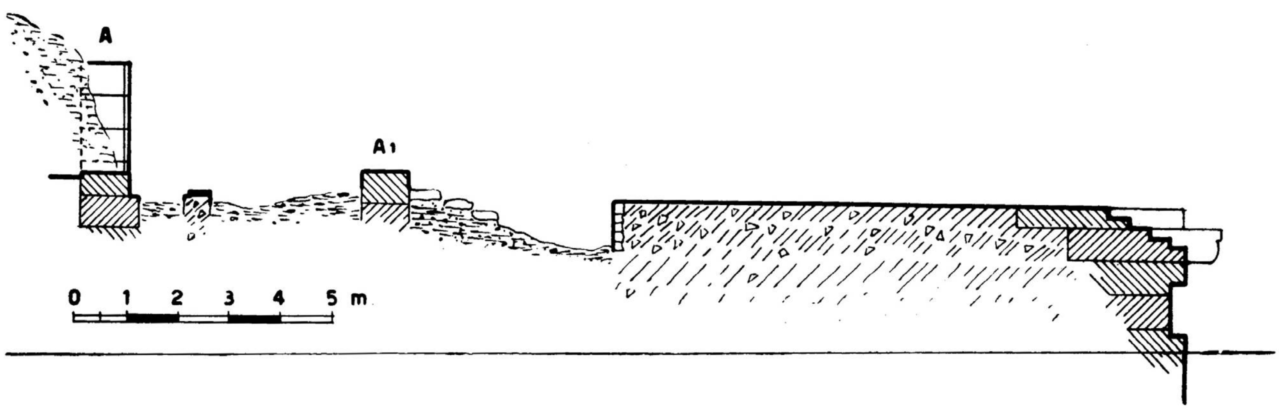



*Figure 6.19. Leptis Magna: Section across the quay at the western flank (after Bartoccini 1958, Fig.1)*

colonnaded portico of Doric order with a series of storage chambers at its back was related to the earlier phase and stylistically resembled the structures at the Old Forum (Bartoccini 1958: 38). Another, somewhat offset structure at the southern part of the original quay may also have functioned as *horrea* (Fig. 6.17). The outlet of the river Lebda divided the eastern quays from the western wing of the harbour and the excavation there yielded no indications as to whether it was bridged over and if so, how. The river was blocked by Nero's time two kilometers upstream and its sudden floods were diverted eastward, down the long-shore current of the harbour basin. There were riverine wharves along both banks of the lower course and to the east of the outlet (Fig. 6.18).

### H. The Severian Harbour

During the reign of the Severian dynasty, Leptis Magna was refurbished with large-scale new public monuments, and its harbour was expanded to its final layout, as was exposed in the excavations. The extended basin was formed by artificial closure of the gaps between the near-shore reefs with broad moles, wharves and storage facilities.

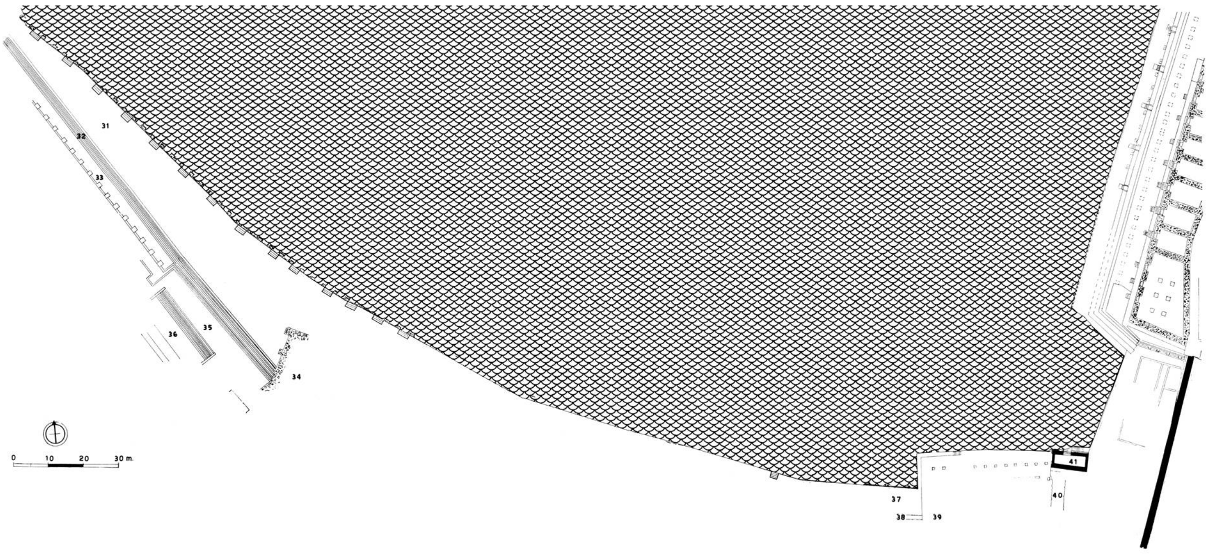


*Figure 6.20. Leptis Magna: the southern flank of the harbour (after Bartoccini 1958, Pl. XLII)*

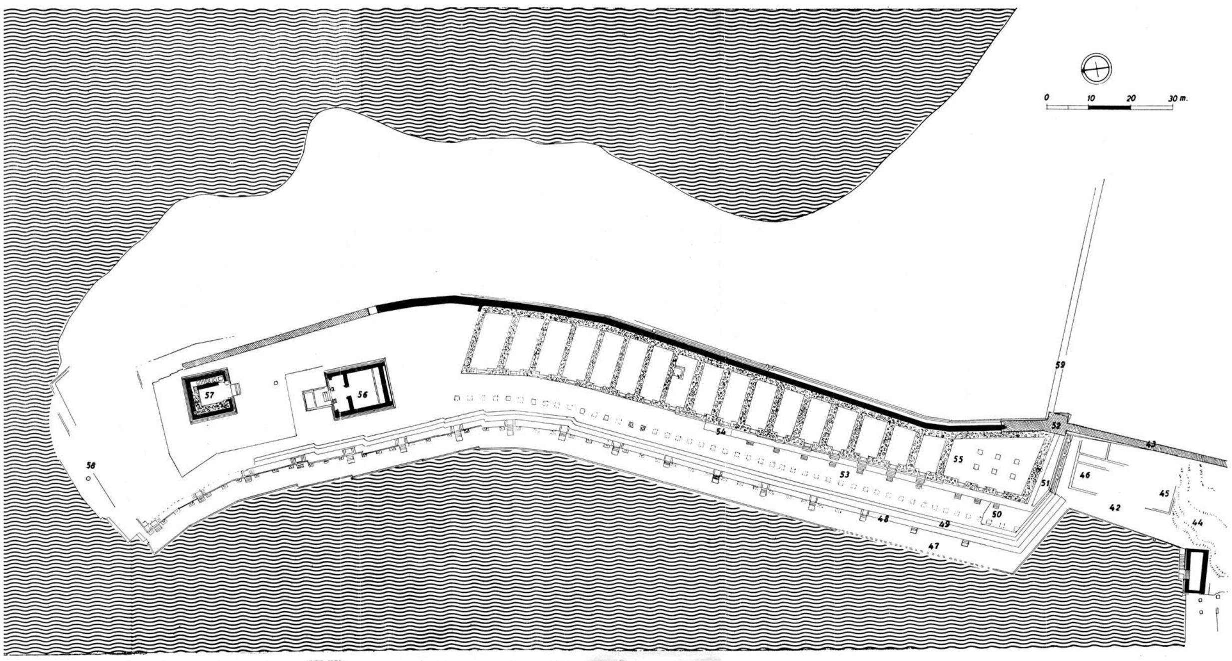


*Figure 6.21. Leptis Magna: the eastern quay and the connected from the south (after Bartoccini 1958, Pl. LIII)*

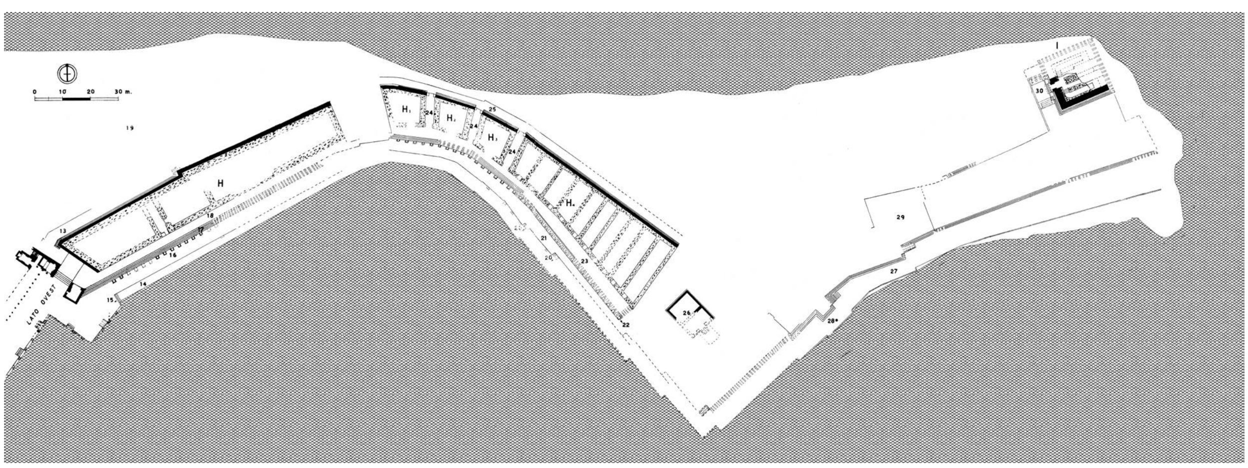


*Figure 6.22. Leptis Magna: The northern quay of the Severian harbour (after Bartoccini 1958, Pl. XVIII)*

The old harbour was also renovated, furnished with new broader moles and an extended one to the northeast, and a large lighthouse was built at its tip (Pollak 1999).

The western flank was refurbished with a new quay that followed the line of the old one, but on a higher level. The waterfront of the new quay was dissected by 16 flights of stairs, leading down to the water with protruding mooring stones on either side of each staircase (Bartoccini 1958: 27–38; Fig. 6.19). The southern flank extended for about 360 m at the landward waterfront and comprised three sections. 1. The western 140 m contained a quay similar in construction and design to the western flank. There were two levels of quays, with the lower one widening to as much as 26 m at its southeastern end, connected to the higher one at its back by a staircase almost 80 m wide. On the upper platform there was an elongated structure, probably a warehouse, of which only the bases of the columns of its portico survived. There was also a structure that was identified as a temple to Jupiter Dolchinos. 2. The second section was 170 m long and comprised quays on three levels. It was only partly surveyed due to its poor state of preservation as most of it was washed away by river floods, following the destruction of the upstream dam in late antiquity. 3. The third section was actually an eastward continuation of the uppermost quay that was 20 m offset northward into the harbour basin and 3.9 m above the water level. A line of a portico's column bases survived along its waterfront, except for its eastern end where there were the extensive remains of a large, ashlar-built fresh water tank for the outward-bound vessels (Bartoccini 1958: 93–98; Fig. 6.20).

The eastern flank is connected to the southern one by a 31m long and narrower quay, which was furnished with mooring stones and a staircase that descends to the water tank. Maybe this was the berthing post for ships loading fresh water on board, before sailing away. It seems that this quay (3 m above sea level; 18 m wide) was already installed during the Neronian phase (Bartoccini 1958: 117). Further to the north, the quay protruded westward, into the harbour basin and continued for about 250 m in a curved line. It was comprised of quays in three ascending platforms: the lower was at the waterfront (5 m wide and 2.36 m above water level) was 120 m long on a straight line and then—in a staggered course with four recesses—up to its northern tip. The intermediate platform level comprised ascending broad stairs to its almost entire length, dissected by 17 shorter and narrower staircases, located at even intervals of 11 m. Between each flight of stairs there were three vertically pierced mooring stones. The upper platform was rather broad and extensive, descending from 5.05 m to 3.15 m above the water level and carrying all the superstructures. Among these there was a 140 m elongated complex of warehouses that was retained on its back by the eastern seawall and had a roofed portico along its facade (Fig. 6.21). North of the warehouse was a small north-facing temple of Doric *distylos in antis* style with an altar at its front built on a well-paved platform. At the tip of the mole there was a massive rectangular building, maybe the administration outpost for customs dues and security. Remains of mooring places and multi-level wharves next to it may suggest that the place was rather busy as a temporary berthing for the inspection and towing of inward-bound vessels, as well as being the operational base for the harbour's service boats, lighters and towing boats.

Between the temple and the large rectangular building there was a round well, which still has flowing, fresh water. At the very tip of the mole there was a lower part (2 m high) of a large column, similar to the one on the eastern tip of the northern mole, on the other side of the harbour's channel. These columns could well have been navigation aids rather than posts for a cross iron chain used for closing the harbour's entrance, as was suggested by the excavators (Bartoccini 1958: 127).

The northern flank consisted of an uneven mole that encompassed the northern near-shore reefs as an eastward extension of the western quay and additional protection for the harbour's basin. It was apparently composed of three sections:

1. The first section was triangular in form, tipping eastward for about 100 m and consisted of quays in three ascending levels. The lower one was lower than the quay of the western flank and was reached from that direction by descending flight of stairs. The intermediate level descended towards its western stem and contained a single vertically pierced mooring stone, 30 m east of that end. At the back of this level there was a 90 m broad staircase that connected it to the upper level with a colonnaded portico along its edge. Most of the broad area of the upper level was occupied by an extensive and irregularly shaped warehouse with a covered portico along its facade and a descending paved landing stage at its back towards the open sea.

2. The second section is also a roughly triangular, tapering towards the first section. It was connected to the upper section by a continuous flight of stairs, with part of the colonnade in front of the warehouse complex installed on it. Its inner face was oriented to the southeast and turned inward at a broad angle with staggered waterline (Fig. 6.22). There were two additional elevated quays with the intermediate level following the same staggered course and furnished with evenly spaced staircases and protruding mooring stones. This complex consisted of four blocks separated by corridors that led to the quay. At the back of the warehouses, at a lower elevation, there was an external quay and next to their eastern end there were the remains of a rectangular double-chambered building that resembled a small temple.

3. The third section had an inner waterfront at right angles to the former one and, have been excessively exposed to the elements, its original superstructures are in a bad state of preservation. Yet, it seems that the same three platforms continued along most of its length, with some elongated rectangular structures on the upper platform.

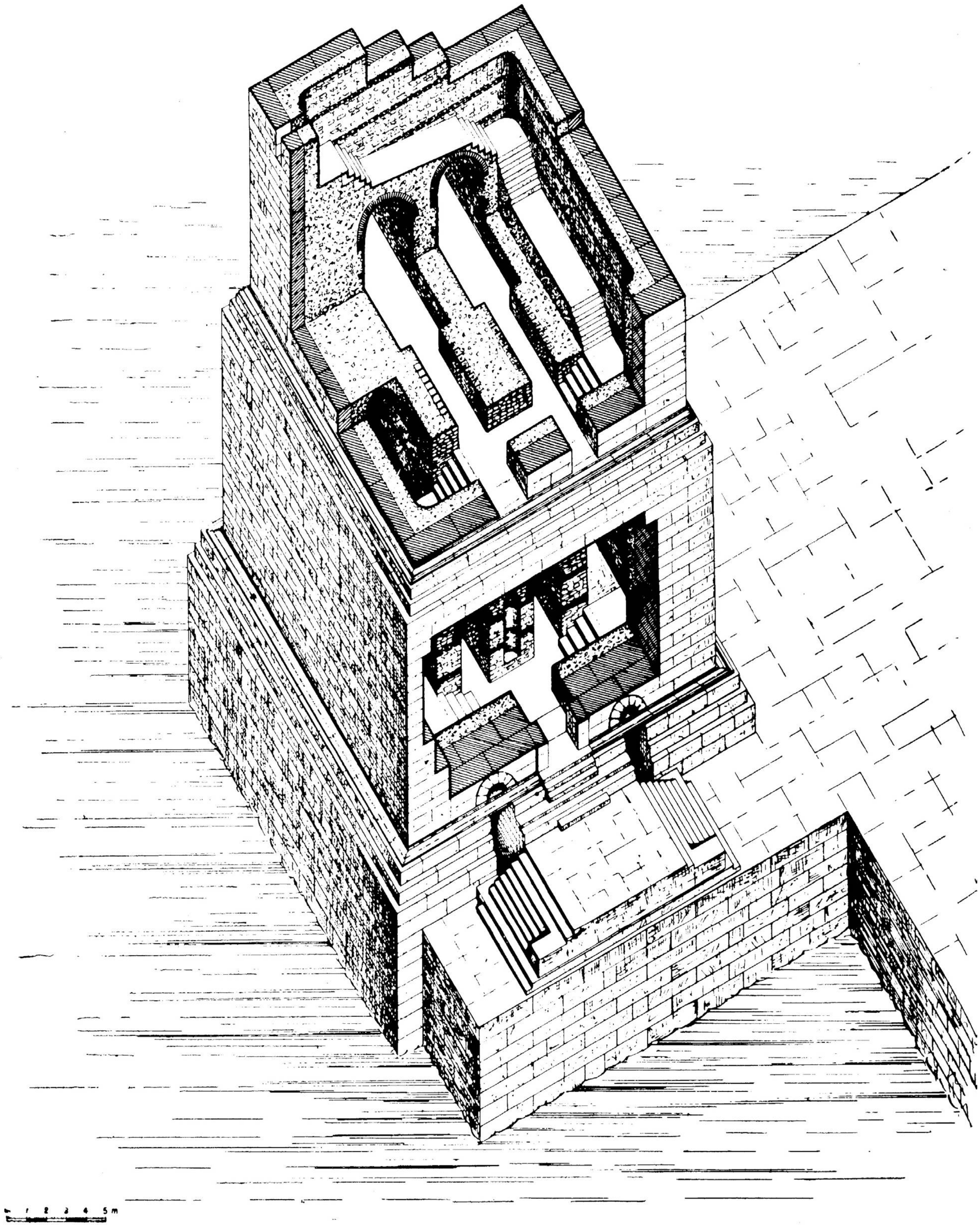


*Figure 6.23. Leptis Magna: isometric reconstructing views of the lighthouse (after Bartoccini 1958, Pl. XXVIII-XXIX)*

At the external, northern side of the eastern tip of the mole there was an elevated rectangular platform supporting a lighthouse of considerable size. The lighthouse was based on a rectangular podium (21.2 × 21.2 m) constructed of iron-clamped ashlars built in *opus quadratum* style, of which some blocks are still above the waves. The podium supported a rectangular unit, 11.35 m above the present MSL containing a core of aggregate-rich concrete, with a facing of *opus quadratum*. The tapered second unit of the lighthouse survived to about half of its original height, almost 20 m above the present MSL. The missing upper units may be reconstructed according to the depiction on

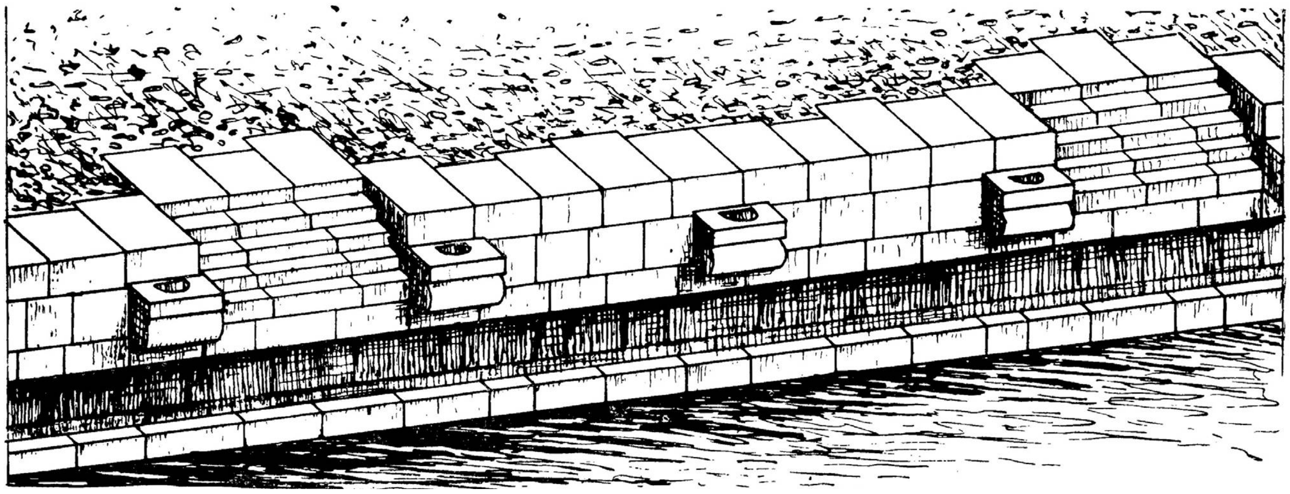


*Figure 6.24. Leptis Magna: The façade of the quay at the western flank (after Bartoccini 1958, Fig. 2)*

the triumph arch of Septimius Severus at Leptis Magna (Bartoccini 1958: Pl. XXXVII.1). Within the internal conglomerate matrix, double ascending vaulted passages that led to the top with twin high vaulted windows facing east and west at each superimposing unit were found (Fig. 6.23).

The combined thickness of the walls (the external *opus quadratum* and the internal rubble and concrete core) with a regular interim of three courses of thin bricks was 3.3 m, a typical component in almost all other structures in the Severian harbour (Bartoccini 1958: 59–65). It seems that the models for the lighthouse were those of Portus and Alexandria, which, too, lacked topographic features high enough to be used as navigation aids for ships arriving from the open sea and searching for their destined haven.

The building techniques that were used in both phases of the harbour's construction were studied by the excavators, although the actual component was not analyzed in modern labs. The seawall of the Neronian phase was based on a poured foundation that was laid, as it was elsewhere, on the harbour floor directly on the sandstone bedrock, consisting of rubble embedded in lime mortar. This formed a conglomerate that was used for the external and internal facing walls with packed earth as a fill. Cut blocks were quarried from the local travertine rocks and used in the *opus quadratum* order clamped horizontally and vertically. The excavators considered these as wooden pegs that were laid in the "dove-tail" grooves, settled in mortar (Bartoccini 1958: 27–29), although elsewhere such technique was exercised with iron clamps fastened by molten lead. The absence of those at the harbour of Leptis Magna may be due to eventual extensive exploitation of the lead by the locals, as was the case in Caesarea and in almost every other Mediterranean site of the classical era. This assumption was also presented specifically in the excavators' plans where the grooved channels for pouring the molten lead are clearly depicted (Bartoccini 1958: 124; Fig. 6.23).

The quays and the wharves were built in the same terrestrial method as the seawalls, with additional molded cross walls connecting the ashlars' facings of both the front and the back sides. In all the studied instances it became obvious that the higher ones were installed first and may have served for berthing before the lower ones were added. This was attested to by both the incorporated mooring stones in the faces of the higher and the intermediate platforms and their vertical walls fashioned by articulated *opus quadratum* all the way down to the base, including the courses that were covered eventually below the lower quays (Bartoccini 1958: 114–115).

The mooring stones were incorporated in the facades of the various quays at uneven elevations and intervals. The elevation of the lower mooring stones was 1.8 m above the water, but the more common elevation was 2.5 m. Most mooring stones were vertically pierced, although some of those of the Neronian phase had horizontal holes. Thus, it is impossible to deduce the size of the berthing ships, or whether there were specialized wharves for certain types of cargoes (Fig. 6.24). Along the first section of the north mole and at the tip of the eastern one there were diagonally pierced holes at the edge of the quays for mooring the harbour's service boats.

To sum up, the Severian harbour at Leptis Magna is the best available example of a Roman imperial port. As such, it represents a rather comprehensive complex, with a surprisingly high measure of utilitarian components for what was considered as a "show off" project of real questionable economic justification. Much like Herod's Sebastos, the earlier harbour can be considered as an example of "Roman Imperial Style" (and technological innovations), but could also be described as a "white elephant". The later harbour at Leptis Magna was a well planned transit port, as can be deduced from the display of its storage facilities on the moles, as close as possible to the berthing of the merchantmen and away from the urban center. Unlike Sebastos and Portus, the harbour of Leptis

Magna was built exclusively of cheap local materials, with no decorative marbles and statues, and without using *pozzolana*, or other hydraulic concrete, whose absence provides ample indication that this project was well calculated and economically viable.

One may reevaluate the importance of central transit ports as the hubs for cabotage seaborne trade and their prime role in the economy of the Roman Empire at its heyday (Nieto and Raurich 1997: 146–159; Rickman 1988). The last and most intriguing observation concerning the harbour of Leptis Magna is the absence of any ample protection against marine elements. As reconstructed by its excavators, there were no breakwaters or true seawalls to protect the warehouses on the moles from the sea spray and the wash of the breakers. It is true that the site is partly protected by the natural topography, but not against the northwestern devastating winter storms, locally known as Ghara.

**I. Other Harbours of the Roman Era**

**1. General Survey**

As emphasized above, the harbours of the Roman sphere should be studied not individually but as clusters that were operating with a considerable rate of symbiosis and mutual dependence. Perhaps the more obvious systems of this model were the combined framework of riverine and maritime trade posts in Egypt with the harbours in Alexandria's bays, lake Mareotis and the Nile channels as one exporting unit. Similar were the harbours of Latium, Etruria and Campania with the riverine posts at Ostia and Rome and the double harbour of Portus, as a large scale importing unit. Other collaborating harbours were at the western Mediterranean basin, such as the exporting (mostly) complex at and adjacent to the lower course and the lagoonar outlets of the Rhone, serving Arelate (Arles), as the major one (Leveau 1999) with Narbo (Gayraud 1981), Tarraco and Ampurias (Nieto and Raurich 1997) for their provinces. Of these harbours only several were partially studied, but none thoroughly enough to serve as a significant comparison to Sebastos. A better study of regional portual framework was that of Corinthia, which comprised the main dug-out series of basins of the Lechaion, on the western side of the isthmus and the smaller harbour of Kenchreai on the Saronic Gulf, on the other side of the isthmus. The latter is the only ancient harbour in Greece that was hitherto excavated and properly published.

**2. The Harbour of Kenchreai**

Of this multi-phased harbour the more relevant and probably better-preserved features are those of its heyday, during the Early Imperial era (Scranton *et al.* 1978). It is a relatively small harbour with a protected basin of no more than 3 hectares, and a total length of berthing and beaching of about 450 m. It was probably built to its full-scale form sometime after 44 BCE, when Corinth was re-founded by Caesar Augustus, but reached its mature phase during the second century CE. The basic layout of the harbour resembles many other Greek harbours from, at least, the Archaic era, namely, adding a closure to a natural bay with twin moles based on rubble-spilled rampart on both sides that reduced the width of the opening towards the sea (e.g., Samos, Cnidus, Mythilene, Epidaurus and others; Lehmann-Hartleben 1923: 53; Blackman 1982: 196).

Yet, unlike its predecessors, the moles at Kenchreai were broad enough to accommodate warehouses, as was the standard in transit harbours built after that of Sebastos. Like most other Aegean harbours, the steep topography of the seabed nullified any serious siltation in the small bay of Kenchreai, and there was no?? need to take preventive measures. The site of the harbour within the larger, but rather well protected Saronic Gulf, reduced the demands for elaborate breakwaters and made storage on the moles feasible.

In addition to the archaeological data, there is complementary information that enables us to reconstruct the harbour (Fig. 6.25). This includes the verbal description of Pausanias (II 2. 3), depictions on some Corinthian coins from first–second centuries CE (Lehmann-Hartleben 1923: 238, 259; Hohlfelder 1970; 1975: 223) and the depicted of portual waterfront on unique panels of *opus scilate* vitrages that were retrieved from the inundated floor of the temple of Isis, at the stem of Kenchreai's southern mole (Ibrahim *et al.* 1976).

The archaeological research detected the presently submerged north mole, a 100 m long broad spill (25–30m) with some remains of rectangular pavers, but no superstructures. Northeast of this mole and off the protected basin along the shoreline, there was a 40 m long and 10 m wide floor paved with flagstones descending towards the water, which might have predated the construction of the mole (Scranton *et al.* 1978: 143–147). Beyond that floor and inland from the stem of the mole there was a complex (50 × 70 m) protected by seawall and identified as a sacred area devoted to Aphrodite (Scranton *et al.* 1978: 79). In a series of probes carried out at the present shore, half way along the back of the bay, an ashlar-paved quay in "headers" formation was found with rectangular structures behind—probably stores and shops— and an elongated *stoa* on their seaside. The southwestern part is the best preserved and was more thoroughly studied; it includes the breakwater, the broad mole at its stem and the adjacent structures on its landside (Fig. 6.26). Most of this area was occupied by a series of warehouses that consisted of at least five successive blocks, with 6–7 triple chambers in each. The facade of the *horreae* followed the coastline and its back widened northwestward. The chambers had doors on both their sides, as in Portus, indicating that most goods were either destined for or brought via land routes, probably across the isthmus by the Diolchos. In a later phase, small temples for Isis and Asclepios replaced some of the warehouses — perhaps an indication of the Levantine orientation of the harbour (Strabo VIII. 6. 20).

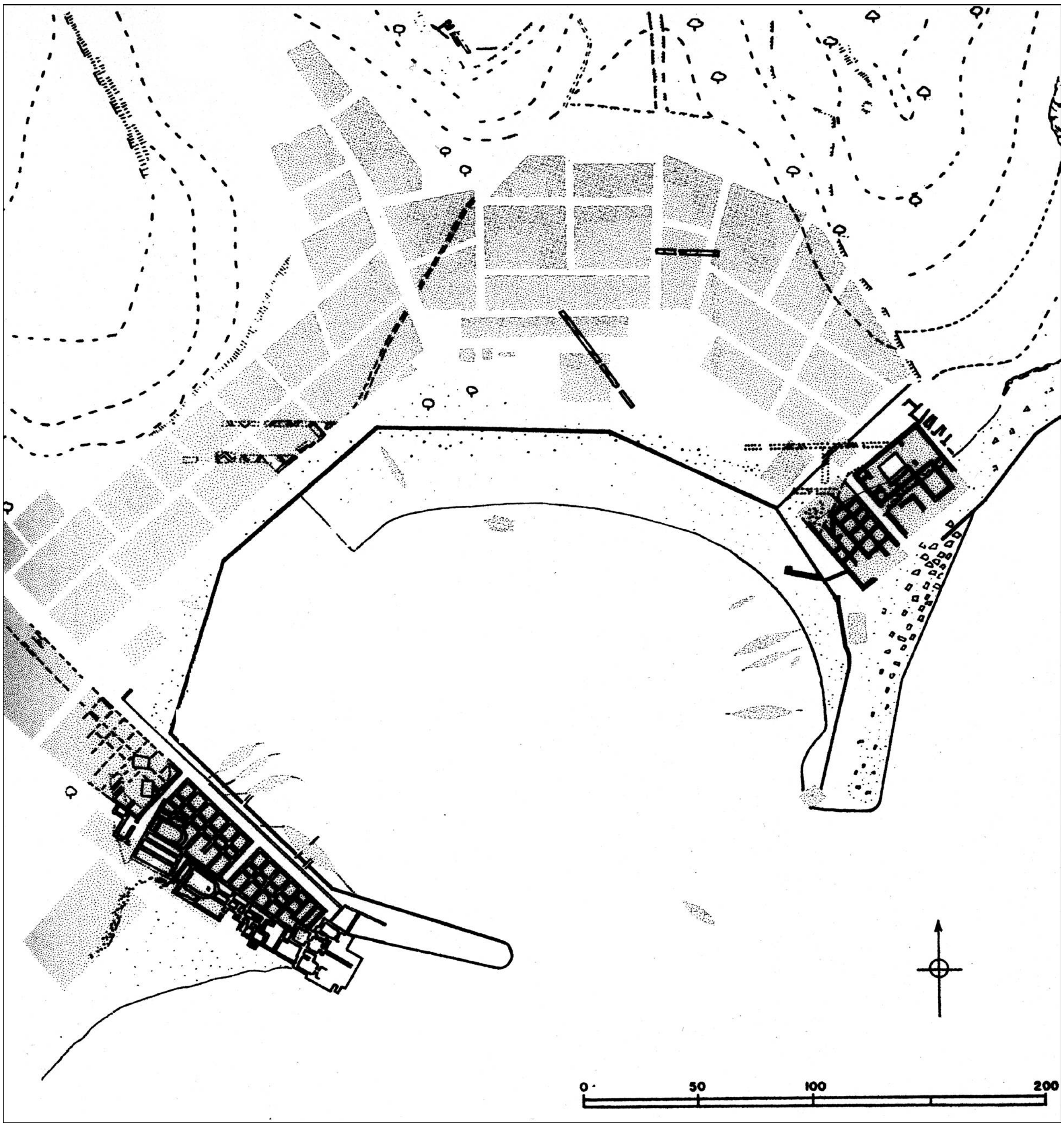



*Figure 6.25. Kenchreai: reconstruction of the harbour at its Roman phase (after Scranton, Shaw and Ibrahim 1978, Fig.5).*

The eastern tip of the southern breakwater is presently 4 m below water and its spill slopes steeply to 18 m in depth.

The building techniques that was used in the harbour included dry ashlar quays and pavements laid either directly on bedrock, or on a massive spills of rubble. The use of mortar is almost exclusively in the later, terrestrial building and there were no indications of hydraulic concrete being used during any building phase. Given Pausanias's descriptions and the detection of some oversized blocks at the tip of the northwestern breakwater, it is possible to say that large statues of deities (Poseidon and Isis?) were probably situated at both sides and used as navigation aids for the in-coming sailing vessels. The excessive water depth of the harbour basin, especially at its southeastern part, made possible the berthing of the largest merchantmen and was the reason for locating the warehouses on this more exposed side.

**3. The Harbours at Antium, Astura, Centumcellae and Cosa**

These harbours of the central coast of the Tyrrhenian Sea may be considered as auxiliary ports, serving mostly the Metropolis of Rome (Rickman 1988: 259). Two of these were thoroughly studied: Cosa, by an American team, led by A.-M. McCann (1987) and Antium (Anzio), by E. Felici (1993; 1999). Of the other two, much is still visible and their layout is rather clearly restorable (Lehmann-

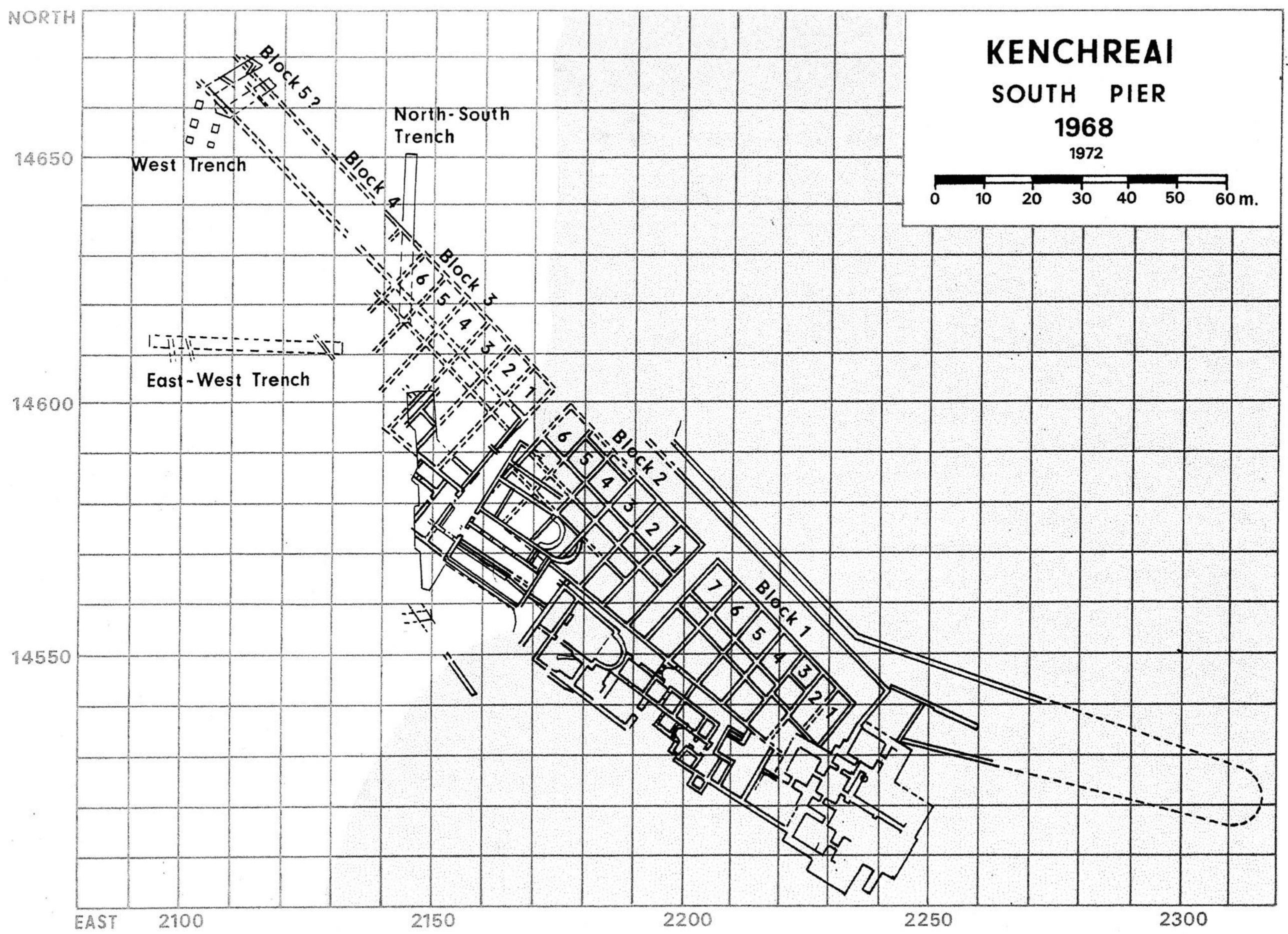



*Figure 6.26. Kenchreai: top-plan of the southern mole area (after Scranton, Shaw and Ibrahim 1978, Fig. 23)*

Hartleben 1923: 192–195; Piccarreta 1977; Felici 1993: 89–92). The use of *pozzolana* blocks, considered by Vitruvius as "second style", in the breakwaters is a common feature of all these harbours (Felici 1993: 95). Another common aspect of three of these ports was an element newly introduced during Nero's time, namely, the setting off of headlands, as free standing features similar to the concept of Sebastos. Yet, unlike Sebastos the basins of these harbours were confined by narrow moles, or rather breakwaters, with no structures on top, similar to the left side mole of the Claudian Harbour at Portus.

The harbour of Antium was built by Nero for his newly inaugurated colony (Suetonius VI.9) and was studied, almost single handed, by E. Felici, who verified the earlier eighteenth century suggested reconstruction of its plan (Felici 2002: 117; Fig. 6.27). The importance of this study is its meticulous analysis of the building technique of the shuttered blocks of *pozzolana* concrete and the minute details of the shuttering and the settings of the inscribed crossbeams (Felici 2002: 111–115).

The moles at Antium, like others in Italy, were comprised of aggregated *pozzolana* with intermediate courses of bricks with the inserted stones laid in rather even courses, similar to the moles at Astura and those as far west as Cadiz (Fig. 6.28). The main mole ran for about one kilometer, from its stem at the headland towards the southeast, enclosing a basin of a presently elongated triangular shape. Originally it was of a more trapezoid form and the presently landlocked and developed area was part of it, enclosing an area of about 80 hectares (Felici 2002: 119). The concrete mole was probably no more than 8 m wide with a seawall along and on top of its external half. Yet, clearly visible remains of shuttered substructures within the southern part of the basin may belong to internal piers or jetties, probably based on *pilae*. No remains of the mooring berths and warehouses of this harbour, or of those at Astura and Centumcellae, have been noted, probably because they are at present covered by an extensively built-up area and, it will not be possible to search for these features. Of the harbour of Astura even less is known, except for the similarity in construction techniques of the moles to those at Antium (Felici 1993: 89–92) and that its eastern facing harbour channel consisted of detached free-standing segments, similar to the one suggested for Centumcellae, which is now completely overbuilt (Castagnoli 1963; Quilici 1993).

The harbour at Cosa was more extensively studied than the others. Nevertheless, this was not an imperial harbour and even not a real auxiliary port, although it was occasionally used as a base for naval units, as in the case of Ahenobarbus, who had a small fleet there during the civil wars of 49 BCE

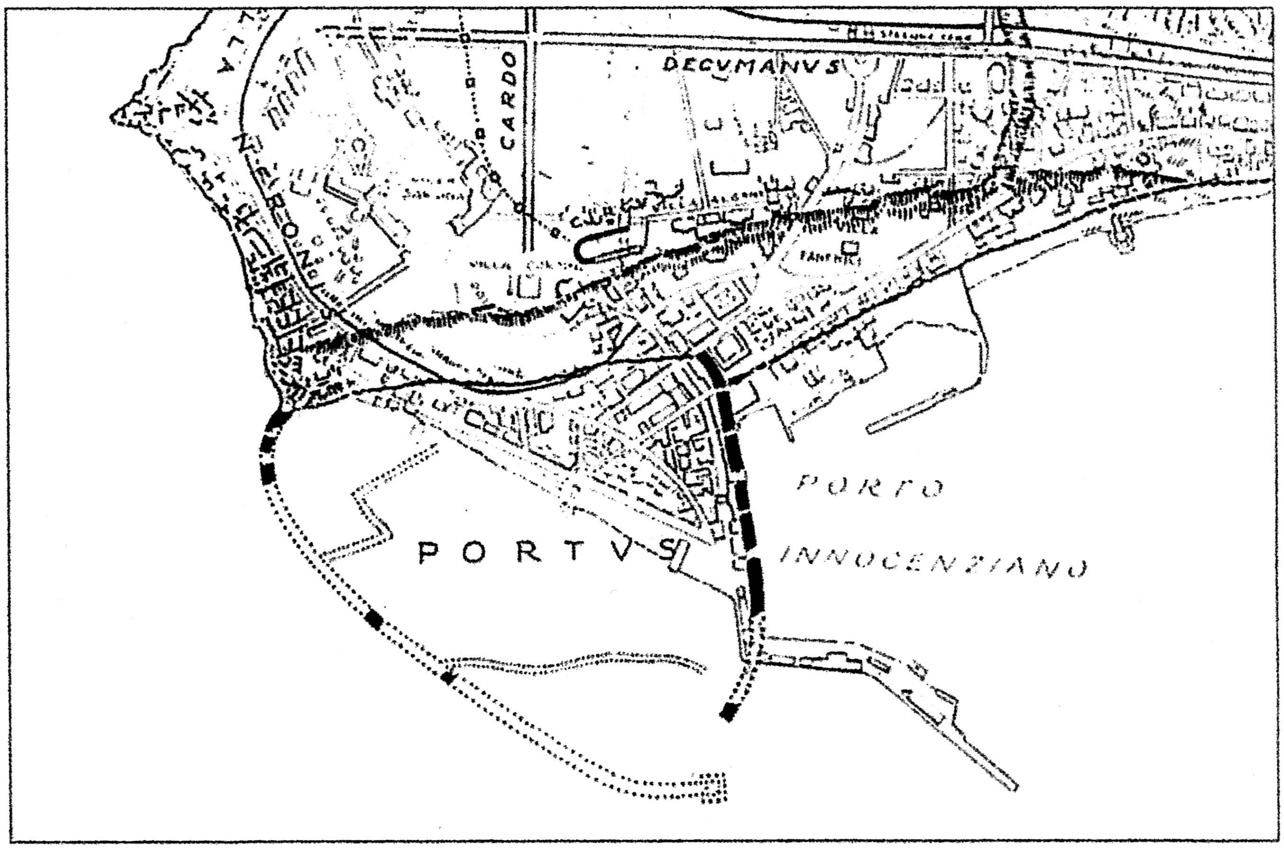



*Figure 6.27. Antium: reconstructed lines of the harbour of Nero (after Felici 1997, Fig. 20)*

*Figure 6.28. Cadiz, Spain – the Roman seawall SE of the old city (Photograph: A. Raban)*

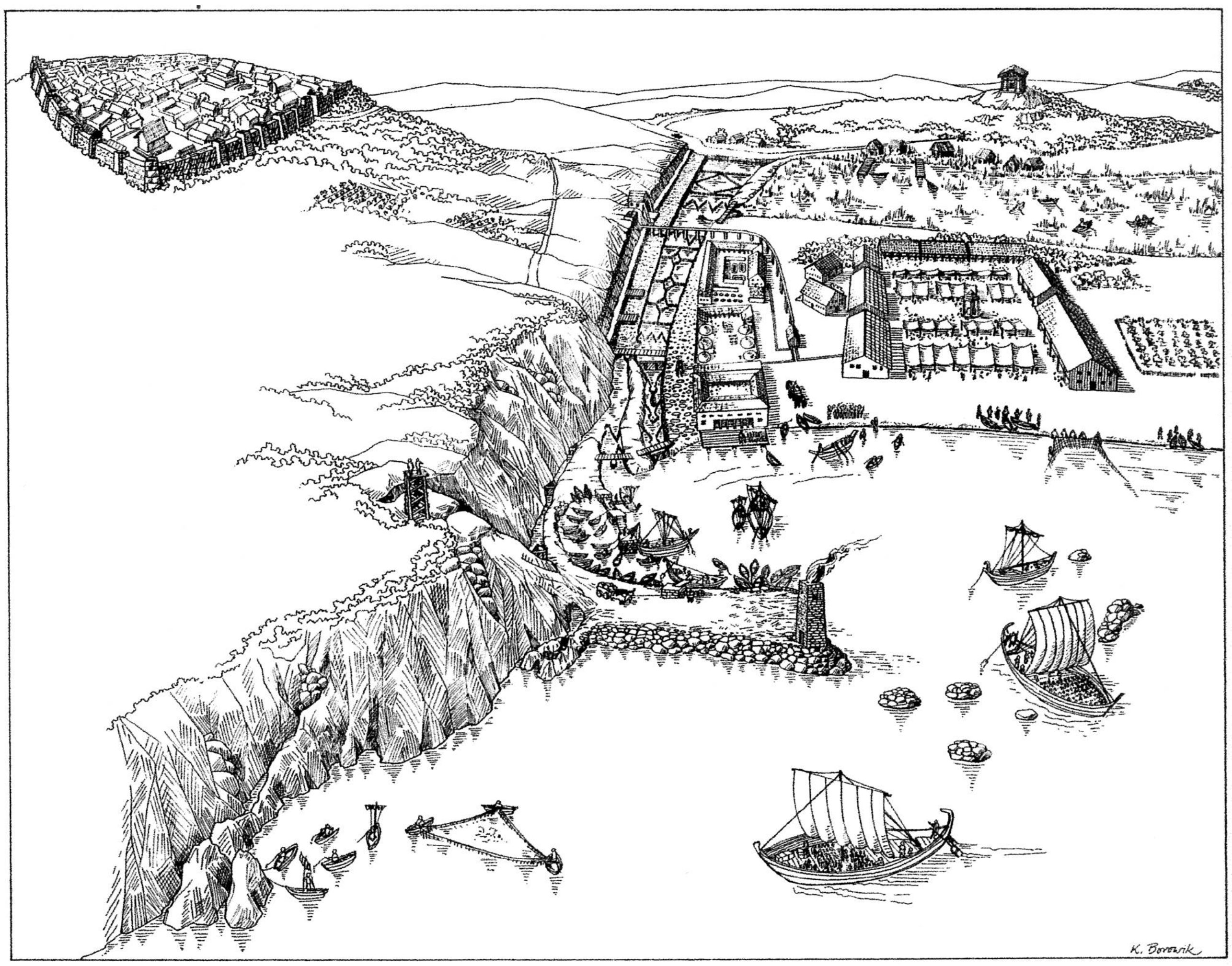



*Figure 6.29. Cosa: a suggested reconstruction of the harbour (after McCann 1987, Fig. VII-20)*

(Cicero 9.6.2). Cosa is important due to the fact that, so far, it is the earliest Roman harbour where *pozzolana* concrete was extensively used, although it was located at quite a distance from the *tufa* and other volcanic resources. It also had along its inner and external areas detached structures that can be considered as "Proto *pilae*", which were formed in shuttered woodwork in a technique resembling Vitruvius' first style (Brandon 1996: 30–31). The existence of a lighthouse on the tip of the southern mole (McCann 1987: 140) is questionable, due to the steep topography at Cosa's surroundings (Fig. 6.29).

**4. Other Provincial Harbours in the Mediterranean**

Of the several hundreds of artificially improved havens that served the various urban centers that flourish during the *Pax Romanum*, only a few have been archaeologically studied. In most cases the remains are presently either well buried under later and modern structures, silted-up in prograding estuaries, robbed of most of their building materials or have subsided below the waves due to changing land/sea relations. Among those harbours that were partially studied there are several in which molded moles and seawalls, constructed in wooden shuttered hydraulic concrete, were the more prominent surviving features. Such is the remaining seawall at Ampurias (Nieto and Raurich 1997) and the almost 1.6 km long one at Thapsus in North Africa (Yorke 1977: 23–24), both of which were probably built according to Vitruvius's second style. Other shorter moles of the same style, and still underwater, were studied at Aegina, in the Saronic Gulf (Knoblauch 1972), and at the Pamphilian city of Side, where ashlar courses were laid on top of the concrete walls from sea level upwards (Knoblauch 1977: 29–32; Schlager 1971: 150–160; Blackman 1996: 44; Fig. 6.30).

The other studied ancient harbours containing a Roman phase in their final form had a mainly conceptual lay-out and were built using construction methods that originated in their earlier phase, in Phoenician or Greek engineering endeavors. Among them are the harbours of Marseille, ancient Massalia (Hesnard 1994) in the west; Phaselis, in Pamphilia (Schaefer *et al.*1981); Apollonia and Carthage in North Africa (Flemming 1972: 90–124; Hurst and

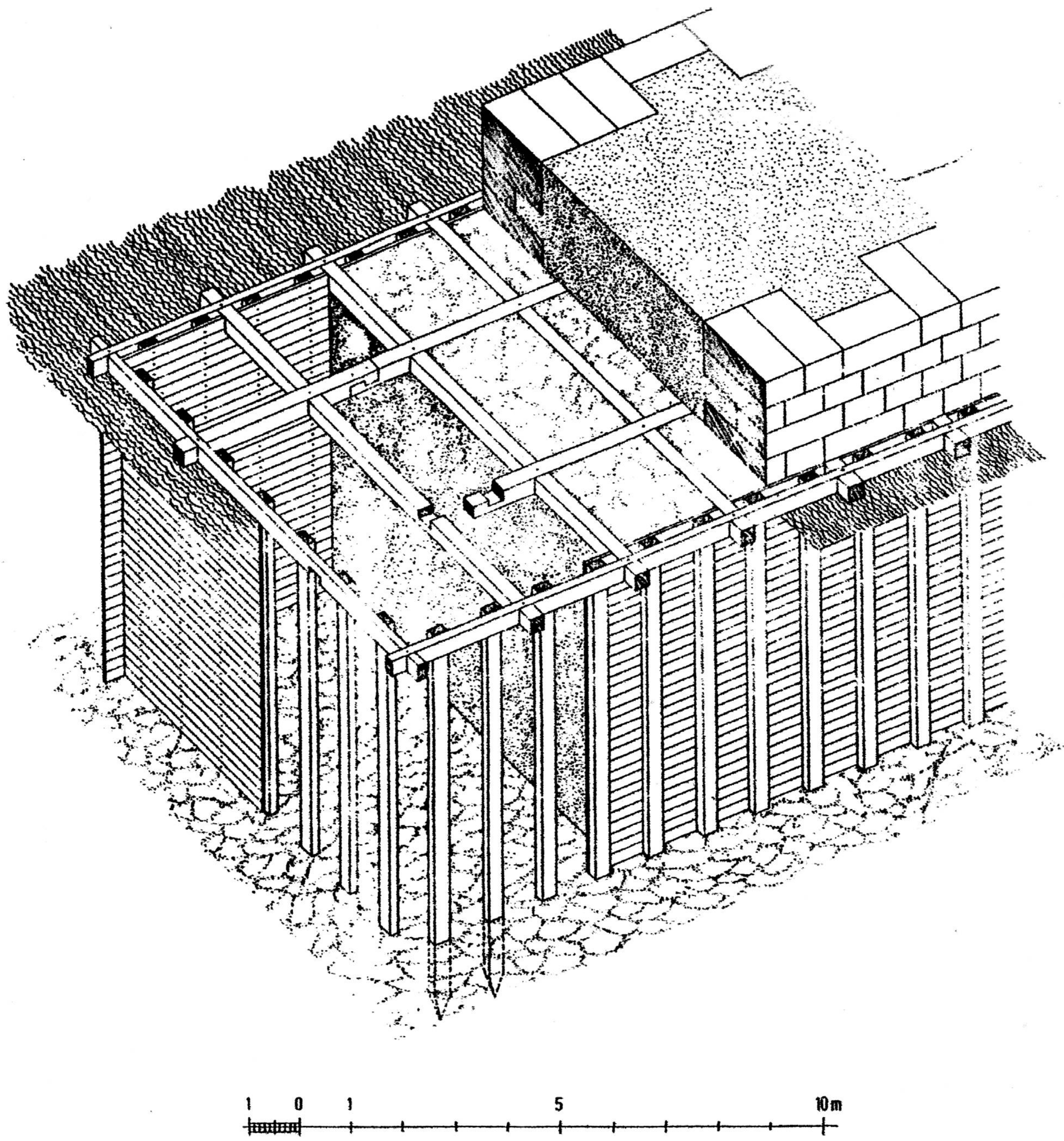



*Figure 6.30. Side: Reconstruction of the wooden shutterings at the north mole, based on the impressions in the molded concrete (after Schläger 1971, Fig. 7)*

Stager 1978; Yorke 1977) and Sidon, Arwad and Akko in the Levant (H. Frost 1969; 1972; 1973; Poidebard and Lauffray 1951; Raban 1985a: 32–44; 1995a: 158–163).

### 5. Military Harbours and Naval Bases

The question as to the difference in settings and operations of the Roman Imperial military harbours versus their Classical and Hellenistic predecessors is still an open topic. While ramming was the ultimate naval tactic, at least from the Archaic period throughout the Classical and the Hellenistic periods, it likely changed during the Punic wars and afterwards. The naval battle at Actium might well have been the last decisive one in which the oversized Levantine "Multiremes" played a significant role. This observation is important and relevant to the configuration and setting of the Roman naval harbours that were built later. Once ramming vessels were replaced by galleys carrying soldiers, using curvus wooden bridges as the most decisive close-range military device, the basic notion of light, easy to maneuver naval craft was changed. The former vessels, which had to be properly stored in dry and shady *nauoikos* until they were to be utilized for actual engagement, were replaced by much cheaper and more

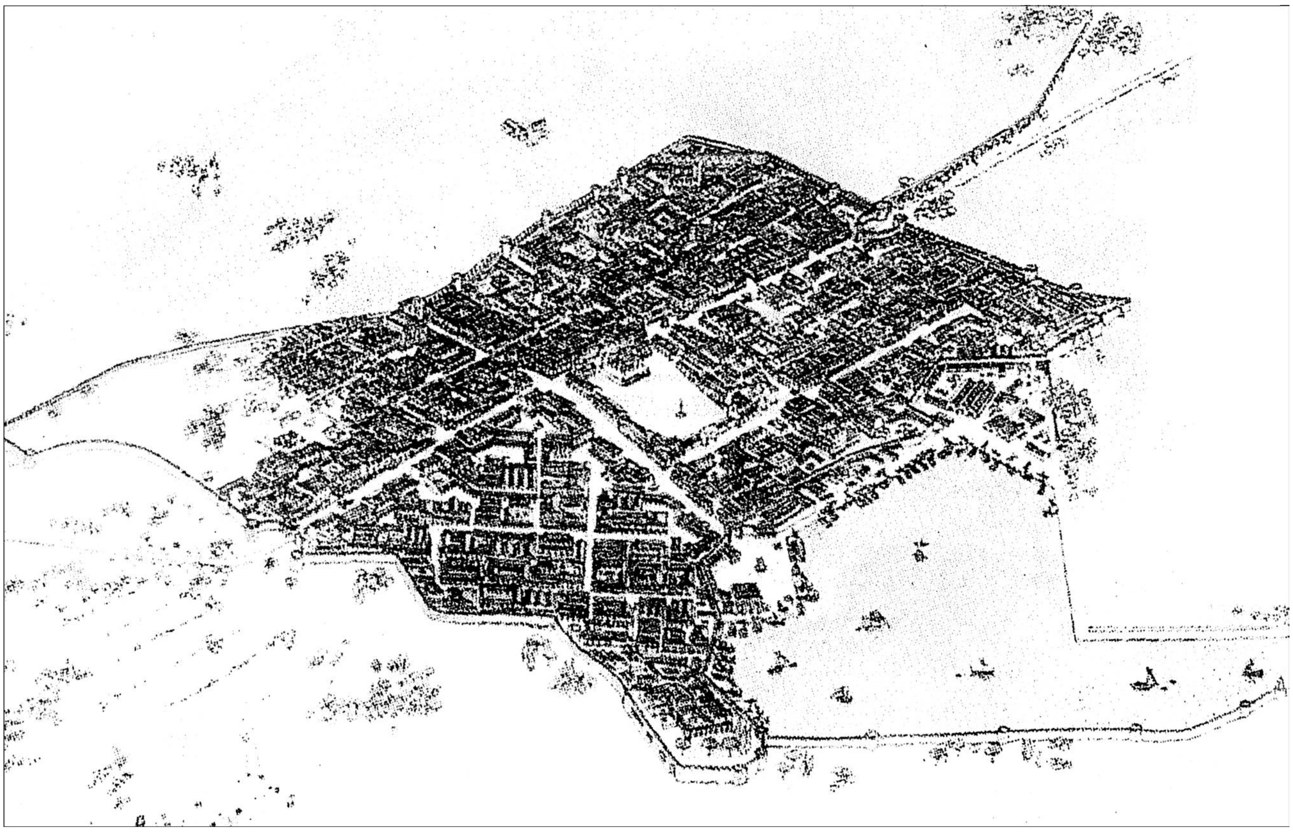


*Figure 6.31. Forum Iuli: An artist's rendering of the Roman harbour as drawn by C. Brandon*

convenient types of vessel. Taking this into consideration, it is no wonder that no Roman shipsheds of classis bases were found. But as Blackman has shown, Roman naval bases were known from historical records and there might be some accessible archaeological remains (Blackman 1982: 206). Rome under Augustus had two main naval bases in Italy: one in Ravenna, a lagoonar harbour at the delta of the Po River, for its Adriatic fleet; and the other at Misenum, on the southwestern corner of the bay of Puteoli for the Tyrrhenian fleet. While of the first there is no archaeological evidence, the second one in Misenum had a typical "Puteolian" layout, not much different from its neighboring commercial harbours. Further to the west there was a naval base within the commercial harbour of Forum Iulii, now Frejus, in southeastern France (Ferier 1963; Fig. 6.31).

In the eastern Mediterranean the Roman naval units used their specially built harbour at Pompeiopolis (Viransheir) in eastern Cilicia, the renovated Hellenistic harbour at Seleucia—the port of Antiochia and the royal haven in the eastern harbour of Alexandria (Starr 1993). Not much can be said about the physical aspects of the one in Alexandria, whereas the other two were only surveyed. Their surveyed remains suggested a similar oval basin confined by a basal concrete wall that was topped by ashlar-built narrow quays, comprised of well cut stone slabs that were neatly fastened by iron clamps embedded in molten lead filled dove-tail grooves.

At Seleucia the basin is presently almost completely landlocked (Erol and Pirazzoli 1992), except for the impressive rock cut tunnel that was executed by Vespasian and Titus, who used Jewish prisoners of war to prevent the outflow of the mountainous ravine from silting up the harbour basin. The southern confining concrete wall can still be seen in the fields and the seaward tips of both moles protruding into the sea. These are of rather massive construction (20 m wide) and consist of cut blocks of local limestone, weighing almost half a tonne each. The possible shipsheds along the landside of the basin are, if extant at all, buried under the alluvial deposits.

The military harbour at Pompeiopolis was much smaller, but of an oval plan type of construction (A.A. Boyce 1958). Most of it is presently silted-up by wave-carried sand, but many of its features are still unaffected and available for further research. The preliminary surveys may be expanded and include proper scaled excavations in the future (Vann 1997: 316–321).

A similar unstudied oval portual complex is landlocked at the ancient site of Elea, the seaport of Pergamon, north of Izmir. It was previously considered as the naval base of the Hellenistic dynasty (Blackman 1982:189), but the well-integrated and almost completely exposed mole is quite clearly of the Roman era. It was likely a naval base for imperial military units, beside the similarly landlocked commercial harbour. Its oval layout of the basin, the narrow and most probably closable harbour channel, the narrow ashlar paved toppings of the mole are all similar to those at Pompeiopolis and Seleucia and substantiate the above conclusion. Whether the naval units were stationed in shipsheds, or just beached at the landside area of the oval basin, the moles seemed to bear on their top a screen wall to protect the restricted military zone and temporary berthing facilities for loading supplies and embarking marine soldiers. The factors that dictated the size and shape of the basins of these naval stations were the maneuverability of the vessels, being self-propelled under oars, and their maximum size and draft.

### J. The Harbour of Sebastos in Mediterranean Context

Within the context of the harbours of the period discussed above, it becomes clear that Sebastos was not a unique harbor of its kind, nor the largest and the most important one for maritime activity, as Josephus suggested. One may learn that much of the innovative building technologies that were introduced in its construction were imported, almost as-is, from Italy and from Phoenicia. Yet, there were aspects in the layout, the building techniques and the operational concept that were not known in any other contemporary harbour, or in those built during the following centuries.

It was suggested by some scholars that Sebastos was built with imperial assistance in money, technology, Italian "master builders" and building materials (Beebe 1983; Hohlfelder 1996; 1999: 154–159; 2000; Roller 1998: 41–53, 89). It is likely that Herod had to have Augustus's consent for the naming of his new harbour and its adjacent city after him, as acknowledged by Josephus (BJ I: 414). However, there are no written references to any actual financial assistance for the project, either from Augustus or from Marcus Agrippa, Herod's personal friend. Even if there was some kind of imperial involvement in enhancing that most ambitious and expensive endeavor, one cannot conclude that it was planned and executed by "master builders" from outside the Levant just because "Judea had no master builders familiar with the unique challenge" (Hohlfelder 1999: 156). Herod did not have to look for expertise in harbour construction among his Jewish people when within his domain there were many Syro-Phoenician as well as Hellenized master builders with a long tradition of constructing and maintaining harbours along the Levantine coast.

With the existence of the early Hellenistic shuttered concrete moles at Alexandria, it is not necessarily obvious that the "artificial islands" at Sebastos were a concept imported from Puteoli. Yet, it is true that the *pilae* concept in the construction of the spinal wall of the main mole and the subsidiary breakwater at Sebastos was most likely derived from Italian predecessors, especially when taking into consideration the laboratory analyses that established that their hydraulic concrete contained true *pulvis puteolanus*. The softwood timbers that were used for constructing the "single mission" barges for the "artificial islands" (Areas K, G) were of species of conifer typical to not only to northern Italy but also to Cyprus and Anatolia. The double walled bottomless caisson (Area G) that somewhat resembles the shuttering at Side and maybe also at Laurons (Ximenes and Moarman 1988), might be a variation of one of Vitruvius' types while others (Area K) were more of the Alexandrian type, but built of European timbers. Additional building materials that were imported from further away were the rounded cobbles used for installing a more substantial and current-resistant cushion on sandy seafloor as an extended base for the moles. Such a preventive measure, which was almost a "must" for the endurance of structures laid on top of non-consolidated sediments in a high energy environment, was used at every Phoenician harbour that has been studied (Tyre, Akko and Athlit; Raban 1988; 1995a:154–163; Haggi 2006; Haggi and Artzy 2007). Josephus acknowledged that Sebastos was built not with local available materials, "*but it was brought to completion with materials imported from afar at enormous expense*" (JA 15: 332). It is possible that the bulk of these materials was shipped as ballast, or at no cost at all by the "Alexandrian Grain Fleet" on their leg back from Italy; this could be how the *pulvis puteolanus* was brought to Sebastos. The cobbles originated from the north coast of Syria, in the vicinity of Seleucia (Votruba 2004), as was demonstrated by petrographic analysis. Thus, one may suggest that these too were imported as mere ballast in ships that exported either olive oil, wine, or salt to Herod's neighboring Roman province to the north.

In chapter 3 it was shown that Sebastos was potentially a subsidiary, or even replacement for Alexandria. Yet, within this comparative context it is worth noting that Sebastos was the first harbour that was designed to match the demands of a purely maritime transit port, with all its berthing and storage facilities on its "sea side". This was a new and unprecedented concept at the time and was replicated, much later, at Leptis Magna, if not anywhere else.

Herod's economy thrived on the export of olive oil from the Judean hills and the Galilee, salt and asphalt from the Dead Sea, the aromatic plants from his estates near Jericho and the exotic goods from Arabia Felix that reached his kingdom by means of the Nabatean caravans. It is not impossible that some of these commodities reached Sebastos by sea from other smaller havens to the south (e.g., Rafah, Anthedon, Ashkelon, Azotos, Yamnia, Yaffo, and Apollonia) as a Cabotage.

In order to facilitate this unique layout in such a hostile environment as the weather-exposed free-standing moles, it was necessary to protect these main features by what Josephus called `*prokumia*`, or `*prokumatia*`—"*Hapax Legomenon*" in ancient Greek texts, and an unparalleled feature in any known ancient harbour. In reality this was an actual true breakwater that was operated as a device designed to break the energy of the in-coming waves some distance off the main mole. By doing so it prevented the eventual nuisance of piled-up waters and considerable spillage of seawater over the spinal wall, on top of the warehouses and the quay itself. A second effect, but of no less importance, of such a segmented low-laid fore wall was the minimizing, or even nullifying, of the phenomenon of an under-trenching and scouring current at the foundations of the main mole, where it faced the weather. Whether the reason that this innovation was not replicated elsewhere was due to its redundancy, or simply because it failed, is hard to tell. The fact is that the idea of such a *prokumia* is still *in functio*, for the same purposes, in some super modern harbours around the world.

The flushing channels that were fashioned along and across the southern side of Sebastos were no novelty, as similar ones were found in earlier Phoenician harbours, such as Sidon and Akko. However, their setting at Sebastos showed an intimate knowledge of the local coastal processes, especially the menace of siltation (of which even Josephus was aware). When compared with other harbours of the Roman era, the greatest ingenuity in the construction of Sebastos was probably the constructive use of the wave-carried and surf-deposited sediments. Instead of being deposited within the harbour basin, the load released by the breakers was accumulated in the infrastructures of the mole itself. It was so simple, so easy, so obvious; why was it not thought of it before or after? Truly, it is being replicated in many modern harbours, but the sand is shifted by heavy machinery of a kind that was not available in antiquity. It was so simple and obvious that some of our colleagues and most of civil engineers would not accept it as an archaeological truth (i.e., Hohlfelder 1996).

# Chapter VII

# The Demise of Sebastos and Flourishing Caesarea

The magnificent as the feat of maritime engineering at Sebastos was, it disappeared below the waves long ago. Even its exact location was not properly recognized until the mid-twentieth century. Questions associated with the debate were: When did Sebastos go out of use, at what pace, why and how did its demise affect Caesarea's commercial activities?

Based on the archaeological data collected thus far, we will make an attempt to answer these questions. But first, we wish to present the indirect evidence concerning maritime activities in Caesarea following the Herodian period, as referred to in historical records, or deduced from numismatic data and ancient inscriptions. There is no doubt that Caesarea flourished for an extended period following Herod's death, and most probably very much so after it was promoted by the Roman Emperor Vespasian to the status of Colonia Prima. The original role of Sebastos as a royal, and later as a state, harbour was to serve mainly for transit trade that did not pass through the city itself. The city lost ground when it became the sea gate of the *monicipium*, serving, as a rule, the local needs of Caesarea and its immediate hinterland. Augustan Rome flourished without an ample harbour, and a modern example, the late nineteenth and early twentieth centuries CE 'Palestine', managed to retain its sea-borne export of "Jaffa" oranges with no proper harbour. In a similar manner Caesarea's economy, following the Herodian period, did not retain both the maintained integrity and the full-scale coherence of Sebastos harbour.

### A. The External Evidence

There is hardly any direct reference to the harbour of Caesarea in Roman and Byzantine sources, or for that matter, to naval units stationed there, even temporarily. During the Great Jewish Revolt and the earlier "Varru's Conflict" the military reinforcements shipped from Syria arrived at the harbour of Ptolemais (Akko) and not Caesarea (AJ 17: 287). In the much later Talmudic tract (Gittin I.1,43b) we are told that Rabbi Ya'akov bar Rabbi Zivdi said: "It happened that someone brought a bill of divorce from the port of Caesarea" (Lamina deKisrin). The case came before Rabbi Abbahu [the famous head of the Rabbinic school of Caesarea during the second half of the third century CE] who said: "*Yes, one is obliged to attest – 'it was written in my presence'* [as was the Rabbinic law for bills of divorce brought from abroad)] *but is not the harbour of Caesarea to be considered as Caesarea itself?*" Rabbi Abin said: "*The reason in this case that it was a departing ship, already under sail* [within the harbour]*.*" This text is quoted by Levine (1975b: 17) as a proof for the coherence of the main basin of Sebastos and Caesarea in the third century CE.

A much later reference was written by Procopius Gazzeus (the Bishop of Gaza) early in the sixth century CE, in his panegyric eulogy to the Byzantine emperor Anastasius I: "*The harbour of the city named after Caesar had disintegrated through age and lay open to every threat of the sea. Its structure no longer measured up to the category of a harbour, but of its former condition it kept the name alone. You did not ignore her as she asked for help, continually bewailing the merchant vessels that after escaping the open sea, often wrecked in the harbour, all their precious..???.. drowning before their own eyes and they are helpless; and with your exceptional generosity amended her condition, so now she receives safely all her needs*" (Migne 1865, col. 2817, translated by J.P. Oleson, in Oleson *et al*. 1984: 294, n. 20).

The Greek inscription found at Caesarea on a marble pedestal is the only one that refers to a kind of port, or maritime activity (Burrell 1993). It was written by a certain Varius Seleukos, the Kurator of the ships of Colonia Caesarea, in honor of his patron – Titus Flavius Maximus, the Philosopher. The inscription was later replaced by a Latin one, in honor of the Roman Caesar Probos (276–282 CE), so it should be dated to the first century CE, but only after 71 CE when Caesarea was promoted to the status of Colonia. The title "curator of the ships of the city" is unknown either from Caesarea or other Roman cities, and it may be understood as the "Harbour Master" (Burrell 1993: 291–292). For comparason's sake, in Ostia there were guilds of sea-going ships, riverine vessels and even Carthaginian ships considered as shipping agents who secured docking facilities (Meiggs 1973: 277, 288). We might deduce here from the appearance of the title 'curator of the ships of the city', that there was an operating harbour serving the city of Caesarea sometime between late first to late third centuries CE.

Somewhat more ambiguous and controversial is a bronze coin bearing the term: 'Portus Augusti', issued in Caesarea during the reign of Trajan Dacius (243/4 CE). Kadman (1957: 67), the author of the Corpus of Caesarea's coins, suggested that this coin with its unique title was issued by the people of Caesarea expecting a royal visit of the Caesar. They hoped to receive an ample grant from him in order to restore the dilapidated harbour. Unfortunately for them, the visit never took place. Kadman published this argument years before there was any archaeological evidence for the ill state of Sebastos at that relatively early period. Later, with the accumulation of archaeological data, Hohlfelder (1988: 59, n.20; 1992; 1998; 2000) argued that the use of titular coins as a means of lobbying and propaganda was too rare to be a valid argument. A more thorough numismatic study of maritime symbols on coins minted in Caesarea pointed out their relative rarity, but concluded that: "…*despite the scarcity of documents, especially with respect to the second century, literary and numismatic sources, either directly or indirectly attest fairly clearly to the continuing activity of the Port of Caesarea during the Roman period, up to the end of the fourth century*" (Ringel 1988: 72). A coin, which was not published, which can also attest to maritime activity in Caesarea in a later period is a mixed copper-lead token, of which a few specimens were collected in Caesarea and bear the Greek title 'LIMENOS' (harbour) under a Maltese cross (Fig. 4.73). This was possibly used for entering the harbour sometime during the Byzantine era, probably following its renovation by Anastasius I.

These limited external documents show that there was an active harbour serving Caesarea during most of or even the entire period, at least up to the Islamic conquest in 640 CE, even if it had lost its earlier grandeur.

**B. The Archaeological Evidence**

Following are detailed descriptions of the archaeological data collected during 30 years of field research in Caesarea presented in chronological order whenever possible.

**1. The Offsetting of the Caissons at Areas K and G**

At present the caisson-formed concrete blocks at Area K are tilted and partially decomposed. Two neighboring blocks (K-3 and K-5; Fig. 4.11) were studied more thoroughly, including their under floors (Raban *et al.* 1999a; Brandon *et al*. 1999; Raban 2004). Both caissons were tilted towards north–northeast with their chine-beams half detached, as an eventual result of the tilting. This offsetting enhanced a gap between the two blocks through which the surge swept, scouring under the up-tilted chine-beam and the wooden floor of K-3. The surge re-deposited rather coarse sediments in these trenches, including eroded sherds and some coins, both dated to the first–second centuries CE (Fig. 7.1). The backfilled scouring trenches were easily defined by the texture of the laminated coarse sediments and the edge that cut off the original cushion of well-rounded large pebbles serving as a stabilizing base for the caissons. The tiltage possibly occurred as a sudden upheaval, and the shock segmented the coherent petrified mass of hydraulic concrete, displacing huge chunks and shifting them toward the opposite direction of the tilt.

The excavations carried out in the southern part of Area K yielded comparable data, but the state of preservation of the individual forms there was much less cohesive (Raban *et al*. 1999a:159–166). The important finds in this area were the metal remnants at a wreckage site of a merchantman that foundered there after the caissons marked as K-8 and K-9 had subsided below the waves and were badly segmented by the upheaval. The metal objects, which infiltrated down through time and settled on the more consolidated substratum of large pebbles below the sandy seafloor, included pieces of the lead sheathing of the bottom part of the ship's hull (some were coiled when torn off the foundering bilge; Fig. 7.2), and ship nails and segmented bolts that may help us reconstruct the overall size of this ill-fated vessel (Fig. 7.3). Found also were six lead ingots, three of which were still in mint condition, with all their markings legible (Fig. 7.4). The ingots were of different weights but seemed to have been smelted at the same foundry and even in the same cast. Their crowning title was: 'IMP.DOMT.CAESARIS.AUG. GER', namely 'Imperator Domitianus Caesaris Augustus Germanicus'. These ingots should be dated between 83 CE, when the Senate gave Domitian the title Germanicus, and 96 CE following his death. Two of the ingots were better preserved than others (Fig. 7.5) suggesting that they were rather new when loaded on the vessels, and that the wreckage occurred within only a few years after that (Raban 1999a). Hohlfelder felt that this particular wreck may predate the construction of the artificial island in Area K, which was of a later phase of Sebastos, probably during the time of Hadrian (Hohlfelder 1996: 88–91); however, we feel that the location of at least some of the ingots and other metal objects indicate that their deposition post-dated the decomposition of the caisson blocks of hydraulic concrete (Reinhardt and Raban 2008).

Remains of timbers from another wreck, of a later date, were exposed in the post-displacement phase at the gap between blocks K-3 and K-5. Two timber samples were subjected to C14 examination at the Archaeometric Laboratory of the Weizmann Institute and the calibrated dates were late third and mid-fourth centuries CE (Segal and Carmi 1999).

The 1998 probe along the southern half of the eastern tower (KE) yielded undisturbed sediments (8.2–9.1 m below the MSL) composed of a mixture of coarse sand, shells, well-eroded and non-diagnostic sherds and marine-encrusted rubble. This was an indication of redistributed flux during a long period of time up to the sub-modern era. At the lower elevation, the southern sheer recedes inward, but with no remains of any base forms, except sand-eroded aggregated concrete. This was retained by a backfill, scouring trench, which was comprised of coarse gray sand, shingles and boulder-like chunks of concrete

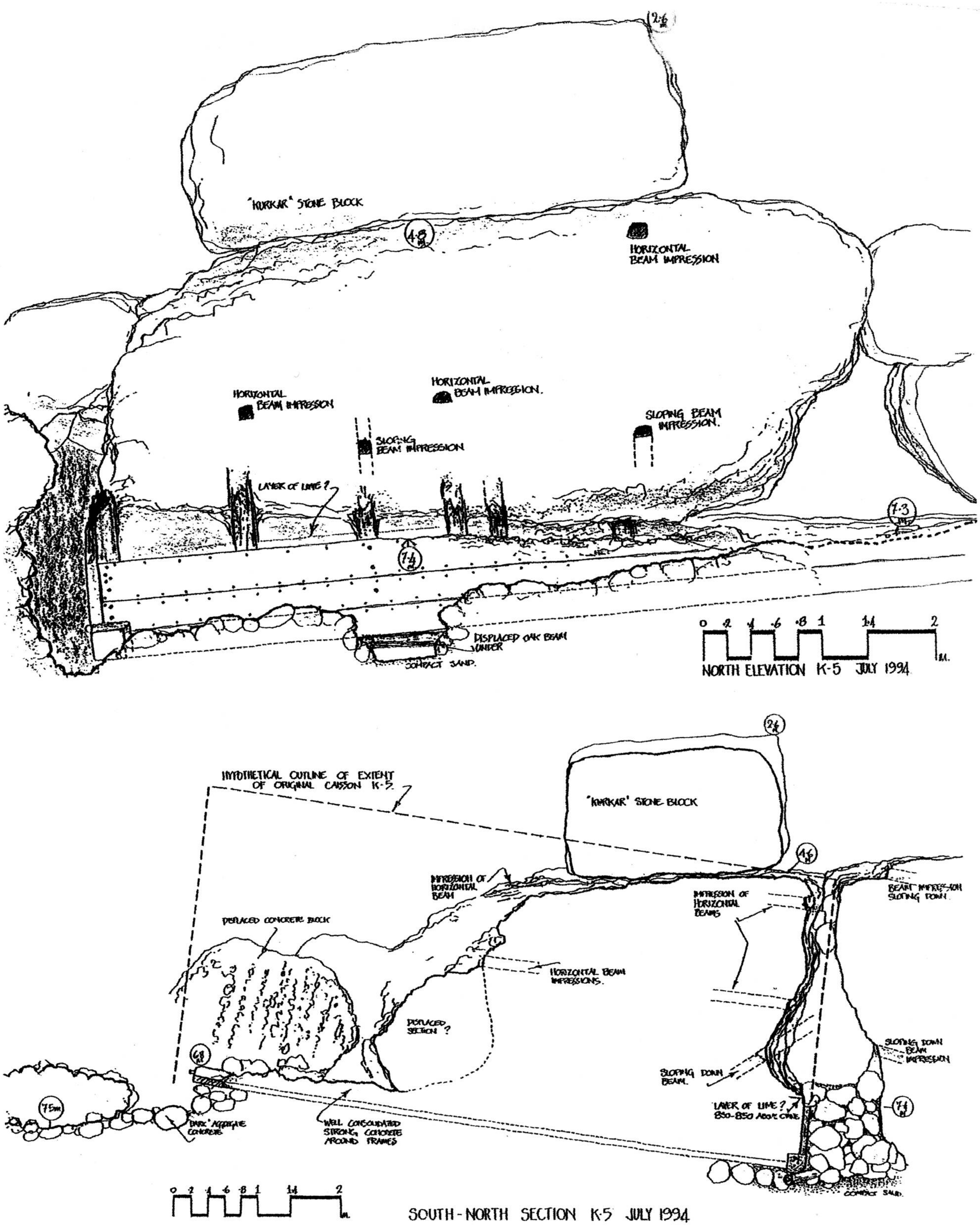



*Figure 7.1. Sketch of N elevation and S-N section of block K5 (Drawings: C. Brandon)*

compacted together. Under this, there was a large segment of concrete block (11.7×2.1×1.1 m) buried under the base of the tower to a depth of 10.4 m. below MSL that was a series of well-sorted, single-deposition alternated laminas of finer and coarser white sand, at the bottom of which there were some angular, non-eroded sherds, dated to the first and early second centuries CE. On the top of these depositions, large number of metal objects were found including net weights, a complete lead box, many pieces of lead sheathing, bronze ship nails, various spikes, and a "pocket" of 29 well-preserved coins. Most of the coins were minted in imperial mints between 161 CE (Marcus

*Figure 7.2. Coiled fragments of lead sheathing from K8 (Photograph: Z. Friedman)*

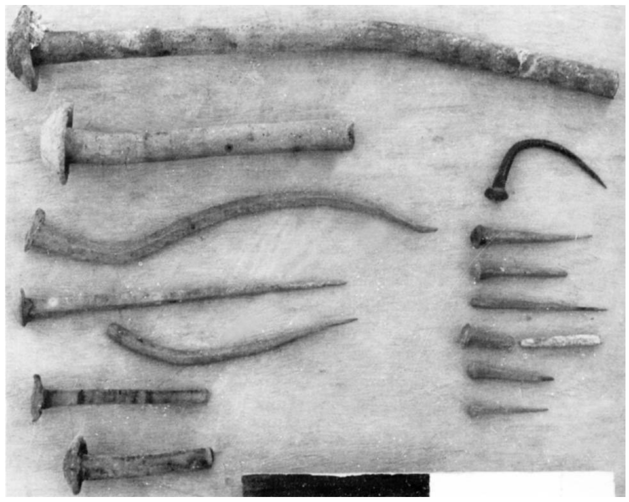


*Figure 7.3. Ship nails and bolts from K8 (Photograph: Z. Friedman*

Aurelius) and 244 CE (Gordian III); the later ones were less eroded and in almost mint condition. Six coins were of earlier issues from provincial mints, such as Beyritus (Antoninus Pios), two of Trajan, two Flavian with second century CE countermarks and one second century BCE Seleucid. It is quite probable that these metal objects are the remains of a wrecked vessel that foundered there sometime after 244 CE, obviously later than the upheaval that caused the eastern tower to tumble down. The tumbling of the tower was evident its western sheer was exposed to a depth of 11.3 m. It consisted of two different types of concrete: one of a light gray matrix in which dark

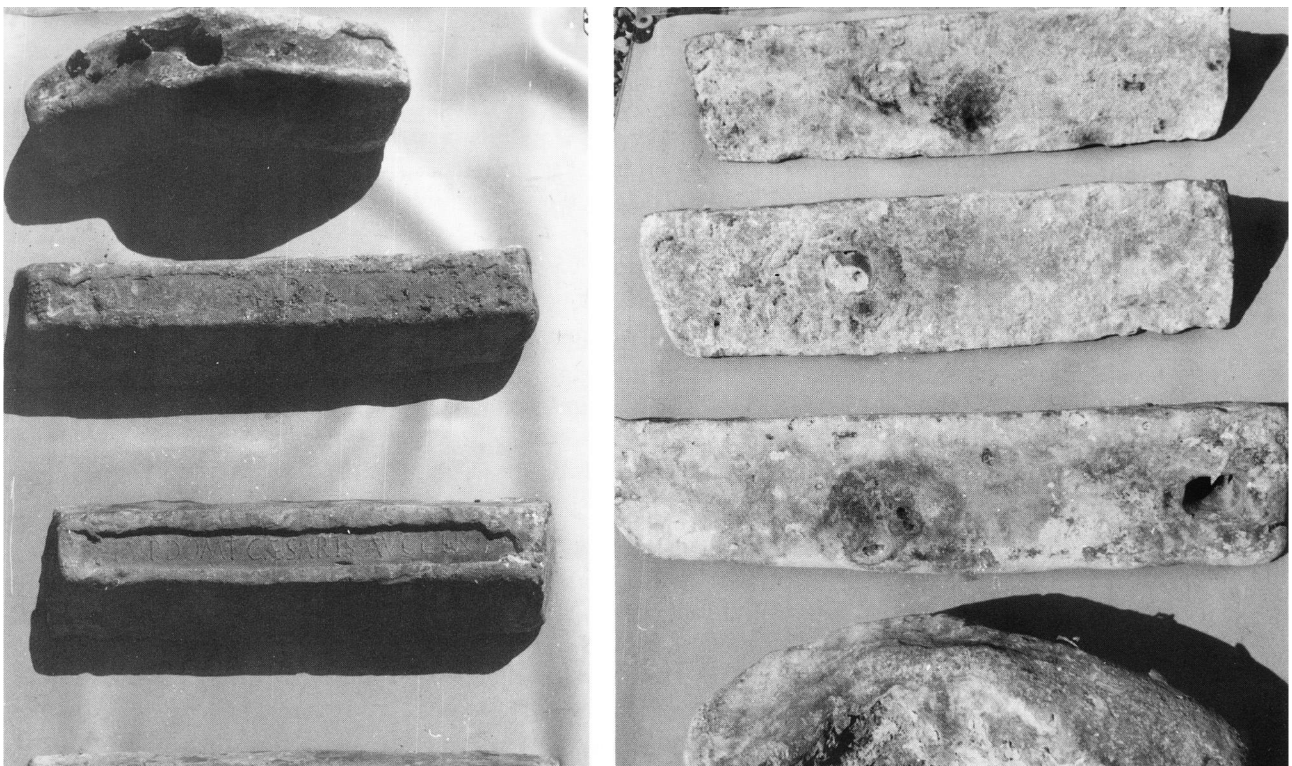


*Figure 7.4. Four of the lead ingots found at K8 (Photograph: Z. Friedman)*


*Figure 7.5. Drawings of two better preserved ingots from K8 (Drawing: Z. Friedman)*

pyroclastic aggregates were embedded and the second of a darkish gray matrix of volcanic *tufa*, with whitish lime like aggregates. If we assume that the two types of concrete represented are of two successive depositions of building materials within a shuttered confinement, the contact line should have been horizontal and not vertical.

Investigation of Area G focused on the southeastern corner of the wood formed block, probing below its base, found tilted slightly towards north-northeast, much like the caissons at Area K. A well stratified single deposition's lamina was exposed, consisting of alternating finer and coarser sand within a rather extensive and well defined

*Figure 7.6. Aerial photograph showing a boat sailing across the sunken main mole of Sebastos (Photograph: B. Kurtzinger)*

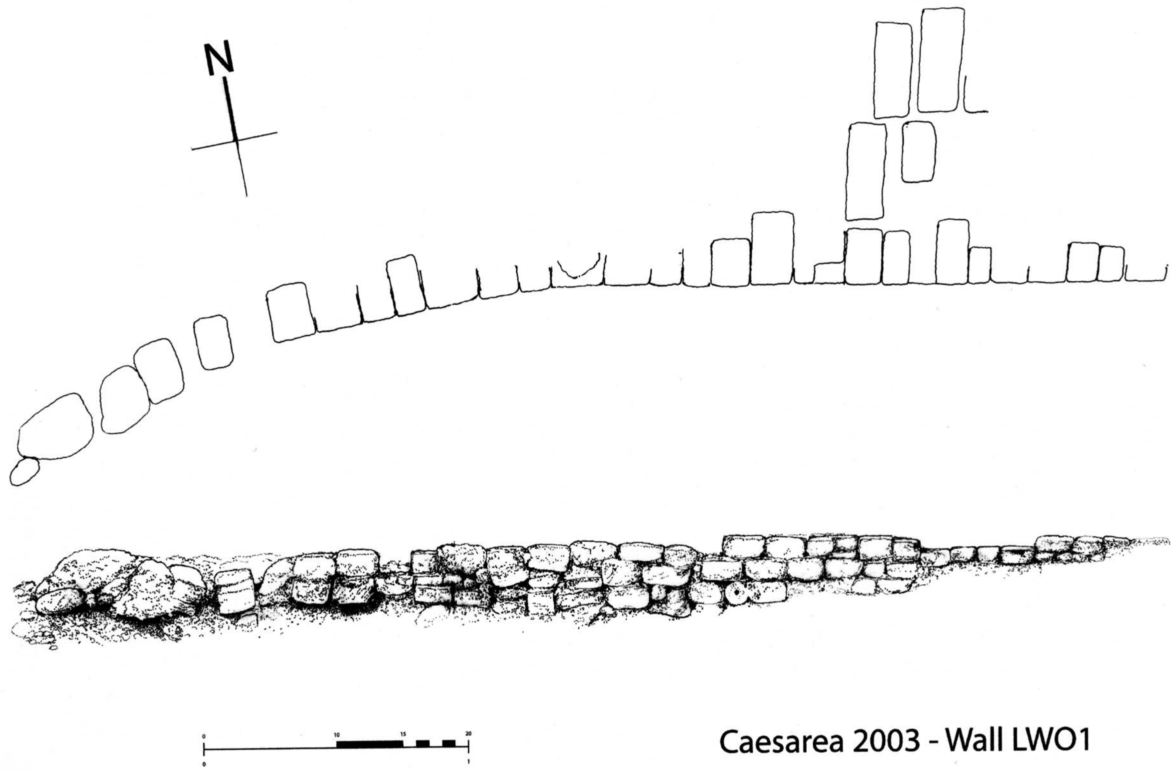



*Figure 7.7. Top plan and southern elevation of the quay at LW (Drawing: C. Brandon and A. Raban)*

backfilled scouring trench, in which a score of well eroded first–early second centuries CE sherds were embedded (Fig. 7.6). This evidence corresponds with that from Area K, but also indicates that the surmised late-first century upheaval extended over a rather large area, perhaps all over the western half of Sebastos, and caused such structural damage that it should be considered as a tectonic one.

**2. Wreckage Sites on Top of the Main Southern Mole**

At the end of CAHEP's excavations, there were 23 identified wreckage sites located on top of the debris of the presently submerged main moles of Sebastos (Raban 1992b: 113–115). Probably most of the ill-fated vessels had foundered while trying to reach the coast by sailing over what was already a hidden menace. The wreckages should therefore be dated to a phase when most, if not all, of these complexes had sunk below sea level – a setting that resembles Procopius Gazzeus' description. Since then more wreckage sites have been located, most of which are marked by piled ballast stones, usually of black basalt rubble that cannot be clearly dated. In Area N-1 however, scattered, carefully shaped concaved sided ashlars of basalt, predating the renovated course of the eastern quay of the inner harbour basin where these cut stones were incorporated in a secondary use, was noted. This structure is stratigraphically dated to the early third century CE, somewhat earlier than the earliest dated heaps of broken amphorae on top of the main mole (Raban 1992b: Fig.5).

**3. The Submerged Quay in Area LW.**

A structure that formerly had not been noticed was exposed and studied only in 2003. Its upper course could hardly be distinguished from the surrounding encrusted rubble and building materials that comprised the shallow sea floor at the northeast side of the intermediate harbour basin, about 50 m west of the southern end of Area L-1 (Raban 1989: 151–154). The excavated trench followed the southern face of a low wall, of probably no more than two or three courses high, from its westernmost surviving end, for over 20 m eastward. The wall was built of medium size ashlars, most of which were reused from former terrestrial structures, as can be learnt from the extensive remains of smooth plaster not necessarily being on the face of the wall, as might be expected. These ashlars were of uneven size and were laid in uneven courses with some incorporated column shafts in secondary use. The wall ran more or less on an east–west line, but curved towards the west–southwest. Its uppermost edge was at 0.6 m below MLS, which was approximately the surface elevation of broad rectangular pavers that reached it on its north side (Fig. 7.7).

This was undoubtedly a quay with the *horrea* of Area LL at its lee (Holum *et al.* 2008) facing the intermediate basin. The base of the wall was placed over a thin layer (0.3–0.4 m) of muddy sand, at 1.9 m below MLS with coherent *kurkar* bedrock at 2.2–2.3 m depth. The face of the wall, down to half of its lowest course (1.75 m below

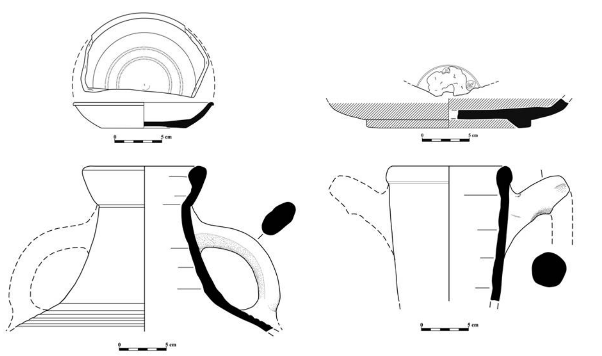


Figure 7.8. Pottery from Locus 02 at LW1 (Drawing: S. Ad)

MSL), was coated by marine fauna typical to shallow and oxygen rich seawater within areas of confined wave energy. This seemed to have been the elevation of the seafloor at the time the quay was in use. Apparently its paved surface was above water level, which means at least 1 m higher than at present. Hence, the water depth at the base of the quay would have been less than 1 m. Such shallow berthing could not be enough for any type of seagoing vessel and could serve only shallow bottom harbour lighters. The datable finds from the muddy sand at the base of that structure included sherds originating from elongated hole mouth jars, types associated with the Herodian period, Eastern Sigillata and Early Roman cooking pots, the latest of which is dated to the end of the first or early second century CE. The relatively fine grain sedimentary deposits indicated a minimum wave energy in a confined environment, most probably within the still rather coherent moles of Sebastos. The materials deposited against the face of the quay wall post-dated its functioning phase and contained large quantities of ceramics, broken glass vessels and some metal objects. Also found were numerous sherds of imported trade amphorae which originated in Portugal, Spain, France, North Africa, and the Black Sea; all of types that are dated to the second half of the third early fourth centuries CE (Fig. 7.8). The angular non-eroded sherds with no marine encrustation indicated that they were deposited in a backwater or lagoonar environment. The location of this quay left the Herodian jetty and quay of Area L-1 well landlocked, as was proposed on the basis of local stratigraphic evidence (Raban 1992b: 115–119).

It appears that as early as the second century CE, a new quay, replacing a former Herodian one, was constructed 50 m into the original intermediate basin. A century later it probably went out of use and subsided. While debating the "neo-tectonics" in Caesarea, it is doubtless that the quay in Area LW subsided alongside the bedrock on which it was laid, and the alternative causes of the submergence, such as fluidation, compaction, or scouring (Galili and Sharvit 1998: 156–158; Morhange 2000), are unlikely.

**4. The Inner Harbour Basin and Its Quays.**

As a topographic 'terminal' for deposited sediments, the water depth in the inner basin was very sensitive to any deficiency in the flushing system of Sebastos, and more so to excessive wave energy. It seems that the ample water depth was successfully retained throughout most of the first century CE, due to properly functioning flushing channels, a relatively confined navigation channel into the basin (Raban 1999: 155–156; 2004), and, most probably, a repetitive project of dredging the basin when needed. This is evident from the typical thin layer of fine mud coated by extensive colonies of *ostreae* that characterized the basal deposition above the quarried bedrock in the inner basin (Toueg 1996). Sometime, during the second century CE, however, it became necessary to take some constructive measures in order to maintain ample berthing at proper water depth when the silt-up process of the inner harbour basin was accelerated (Raban 1996b: 644–652).

At this stage, a structure was built adjacent to the eastern quay of the inner basin, in front of the royal staircase ascending to the Temple Platform. This raised platform (Area I-1; 8×22 m; Raban 1989: 132–137) was one of the more enigmatic structures exposed in Caesarea, in terms both of its alleged function and the way it was constructed. Its original part was built either late in the first century CE, or more likely during the first half of the second century CE, as can be deduced from the datable sherds that were retrieved from the thin layer of beach sand on which its base blocks were placed. In this initial phase the structure comprised of loosely laid superimposed rectangular cut blocks of an even size (1.2×0.7×0.6 m). At present the top of the upper layer is just above the MSL and almost 0.5 m below the fresh water table at the site; but there are three lines, or narrow courses of similar blocks, running across the face of the platform on east–west direction, divided it into three segments (Figs. 7.9, 7.10). The complete absence of any remains of marine fauna or other type of encrustation indicates that the platform's original surface was at a higher elevation and it was lowered in a later phase – maybe when it served as the floor of a fresh water pool. The platform abutts the vertical face of the eastern quay, centered in accordance with the 20 m broad staircase that led up to the Temple Platform and the temple itself, as if designed to serve as a pilgrimage landing stage. Following the construction, three external elements were added to the platform. The first was a 1.2 m broad staircase incorporated off the center of the western face of the platform and descending southward down to bedrock at the base of the inner basin (2.2 m below MSL). The second was part of the western facade to the north that was retained by a steep *'glacis'* and comprised small rubble embedded in dark gray concrete, with upright wooden poles within it. A sample of one of these poles was dated by $C^{14}$ to c. 1890 B.P. The third was a quarter of a circle staircase located at the northeastern corner of the meeting point between the north face of the platform and the quay and descending, like the one in the west, down to bedrock (2.1 m below MSL). The stairs continue eastward, under a later addition

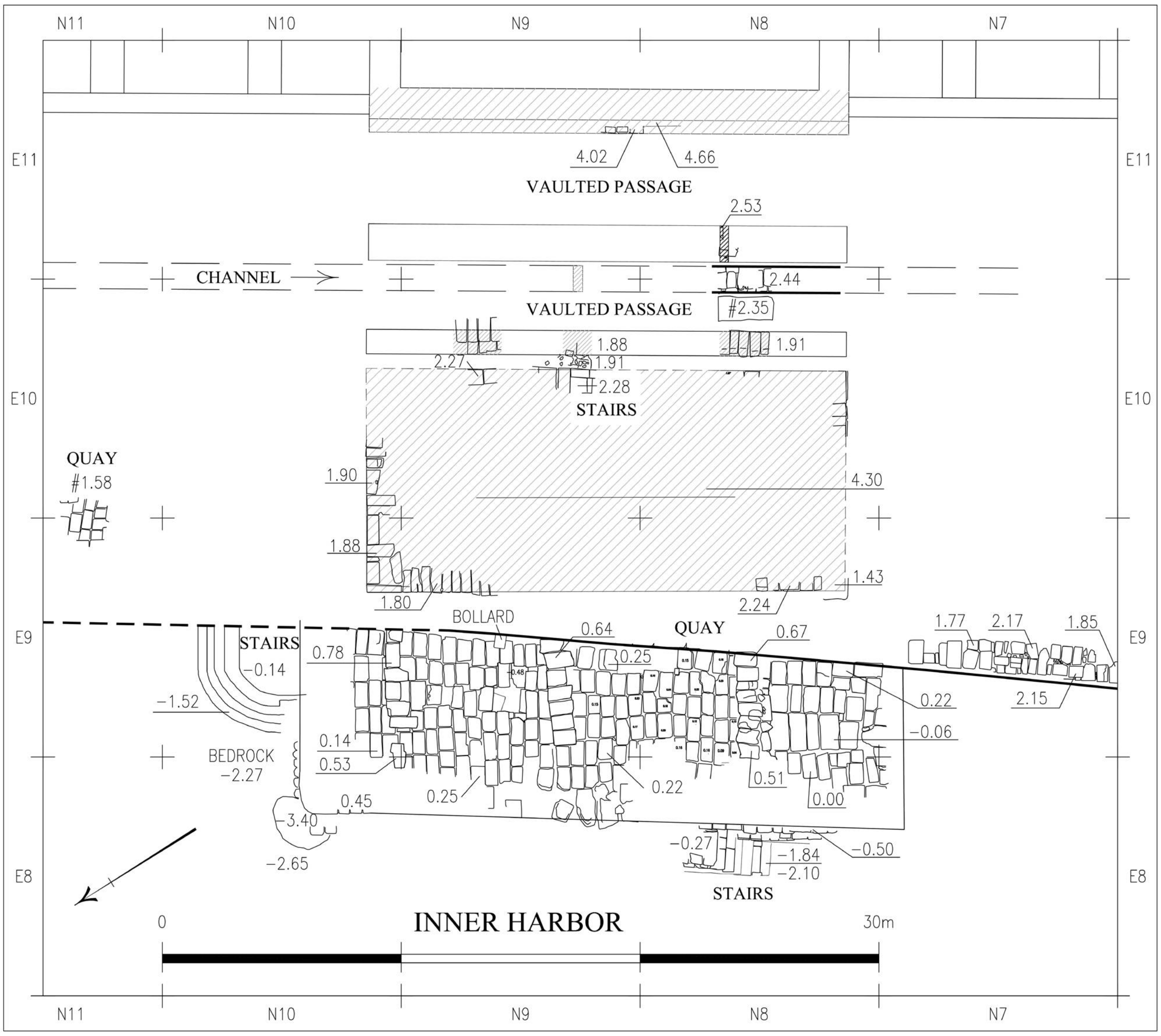



*Figure 7.9. A top plan of Area I-1 (Drawing: A. Yamim)*

of the original eastern quay, where the constructed stairs were replaced by rock-cut ones and followed the general line of the quay to the north (Fig. 7.11). The ashlars from which the stairs were constructed were coated with a bright gray plaster that was smeared manually according to the human finger imprints. The plaster coating extends over all the rock-cut stairs on one side, and over the lower part (below MSL) of the northern facade of the platform, down to its base. The plaster is rigidified in places by marine encrustation; but at others it is mud-soft and partly dissolved in the fresh ground water. Volcanic ash was traced in the plaster's matrix (mixed with lime), so it might be considered as a *pozzolana* type of hydraulic plaster, chemically accommodated to be hardened in seawater but dissolve in fresh water.

It is most likely that the platform was built and plastered in a manner fit for a maritime function of some sort. It might have addressed the increasing problem of siltation within the inner basin, with diminished water depth at the foot of the eastern quay. This protruding platform could provide an ample berthing depth at least at the more important section of access to the imperial shrine.

But there are still open questions as to why there was an additional staircase protruding towards the designated berthing edge, and actually hampering it, or how, for that matter, the platform was manually plastered at an elevation of 2 m below sea level and even below the fresh water table. Our rather limited probes were carried out in what is presently an area well off the water line, in a land-locked location, and still we had to pump as much as 1.5 cubic meter of water per minute in order to maintain the trench above the in-flowing ground water. Thus, building that platform out of the water demanded the construction of a somewhat larger and broader cofferdam and constant pumping, or emptying, of the inflow of water from the porous and permeable *kurkar* bedrock at a pace of at least 4–5 cubic meters per minute. This was technically feasible with the use of a series of Archimedes

*Figure 7.10. A view of the platform at Area I-1 from above (Photograph: Z. Friedman)*

*Figure 7.11. A northern elevation of the circular staircase at I-1 (Photograh: A. Raban)*

*Figure 7.12. The western edge of the platform, or the "Reflecting Pool", from the north (Photograph: A. Raban)*

Screws. Yet the question still remains: Why carry it out in this manner? This question is further augmented by the enigmatic two sets of staircases that lead into (well under the water) the basin's floor. One might argue that the sea level receded at that time by more than 2 m, either due to alleged eustatic fluctuation (unknown from any other site), or a local tectonic uplift that eventually rebounded back to its exact previous elevation. Such radical spatial distribution changes in land/sea relations is known from other locations around the Mediterranean, but they have no parallels along the Levantine coast, including among other structures in Caesarea, except, maybe, the quay at Area LW. Such an alteration would have left both the quay and the platform dry to their bases and it is contradicted by the extensive marine faunal encrustation on both faces and by the fact that the coating plaster of the platform is clearly of a marine nature.

The later history of this platform is also intriguing and rather complicated. To judge from the fill north and west of it, there was a body of seawater that was deliberately filled with dumped material. It was comprised of broken pottery vessels (mainly jars and amphorae), building stones and decomposed plaster and cement, embedded in fine mud and coated by marine fauna, mostly *ostreae* shells. This deposited mixture is indicative of an ample flow of seawater, but with no energy for re-circulating sandy particles and eroding the sherds. At about the same phase, or slightly earlier, the edges of the platform were confined by an elevated wall that reached the level of the eastern quay (1.5 m above MSL). This wall survived in the southern and northern sides and consisted of roughly square ashlars (0.4×0.8×0.8 m) arranged as headers along the northern half of the western edge, with the upper course containing 'dove-tail' grooves for inserted lead fastened iron clamps (Fig. 7.12). Within this wall there were several thin depositions of wave-carried sand including quantities of shells and well eroded sherds, evidence of transgressing stormy runovers (or repetitive tsunami deposits?). These layers were separated by at least two artificial aggregated 'floors', consisting of small pieces of rubble, pebbles and limy matrix. The uppermost deposition 'floor' was comprised of sand with coarser particles, typical for an exposed beach (Fig. 7.13). It was covered in the northern side by a mid-sixth century CE terrestrial structure with a mosaic floor bearing a Greek inscription that praised the Lord for "enrooting the Orthodoxes" (Lehmann and Holum 2001). It seems that at an earlier phase, probably as part of the overall renovation project of Anastasius I, the confined platform served as a "Reflection Pool". If it was intended that the reflected image would be the then newly built octagonal church at the center of the Temple Platform to the east, then one had to be on high ground west of the pool to see the reflection, and there are no indications of

*Figure 7.13. The late beach deposits in the "Reflecting Pool" from the north (Photograph: M. Little)*

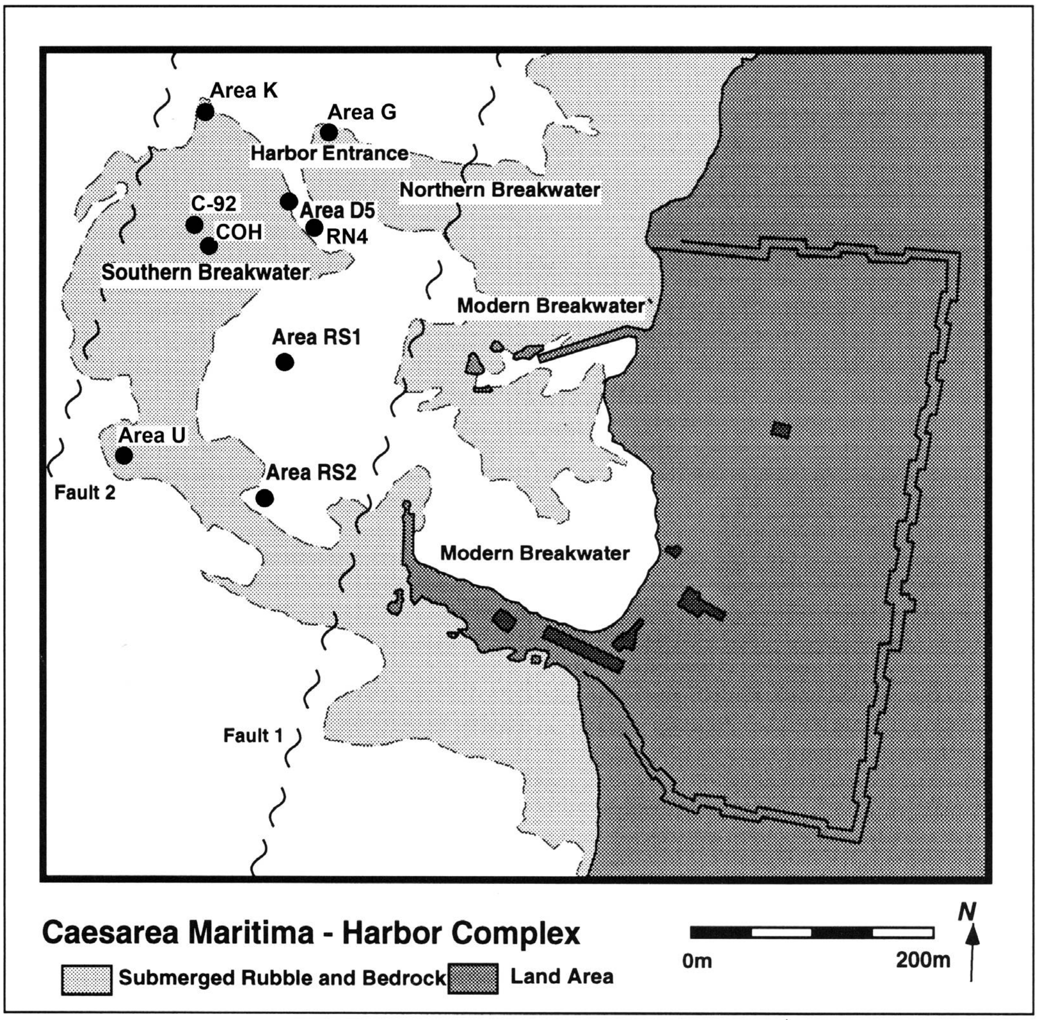



*Figure 7.14. sketch plan of Sebastos' area with demarcations of stratigraphic probes carried by CCE (Compiled: E. Reinhardt)*

such topography. On the contrary, the area west of the pool was a low-lying sandy beach with an inundated garden to the north (Raban *et al*. 1993: 18–21; Raban 1996c: 658).

An indicative piece of evidence for the demise of the inner basin is the deliberate fill of its flushing channel that ran along the back of the eastern quay. This fill, which caused the cessation of the channel's use, was cleared and found to comprise fine mud with a relatively high content of lime, quantities of *ostreae* mollusks, un-eroded sherds and several coins. Careful study of the pottery and the coins show that the latest datable item is a coin of the reign of the Roman Emperor Septimius Severus (193–211 CE). Hence, the filling, which no doubt was dredged from the bottom of the inner basin, took place no later than the early third century CE (Raban 1996c: 640).

It seems that at about the same period the southern seawall of the inner basin was breached either by the elements, or deliberately by the people of Caesarea. This allowed free flow of the surge from the south bay through the southeastern part of the inner basin and from there westward towards the intermediate basin and to the already fully, or at least partly, submerged external basin. This is attested to by the type of high-energy depositions of coarse particles and well worn sherds along that course. One might argue that this occurred contemporaneously with other dramatic and radical changes at the waterfront of Caesarea, such as the abandonment of the hippodrome at the south bay (Porath 1996a: 114–115; Patrich 2001: 92) and the additional subsidence of the main mole of Sebastos (Raban 1992b: 113–119; Hohlfelder 1992: 75–78). The excessive deposition of coarse sediments at the southeastern part of the inner basin was coupled by a similar deposition by the surge that entered from the west, enhancing a sand bar at the southwestern part of the basin and partially silting it up, or even the entire northern half of the inner harbour (Raban 1996c: 652–653). The then confined hollow at the central part of the southern half became a kind of stagnant backwater that turned brackish and became a dumping site for the urban sewer from late third through mid-fifth centuries CE is attested to by the meticulous research conducted in probe I-14 (Raban 1996c: 654–656; Yule and Barham 1999; Tomber 1999: 296–304; Williamson 1999).

**5. Probes within the Intermediate Harbour Basin.**

A dozen controlled, stratigraphic probes were dug at the sea floor within the intermediate harbour basin (Fig. 7.14). Some were next to the presently submerged medieval seawall (Areas TN, TW, TS), others at the northeastern part of the basin (Area SW1-6) and a few more at the center of the western part of the basin (Area QN). The stratigraphical sequence in all the probes of Area SW resembled that of Areas TN-2 and LW.

Following is a typical sequence (Area TN-2), counting the layers from top to bottom with absolute elevations below the MSL (Raban 1997; 2004; Reinhardt and Raban 1999: Fig.2):

***a. Layer 1 (1.76–2.3 m).*** Contemporary wave-disturbed deposits, with repeatedly shifted sand and re-circulated artifacts, covering a well encrusted spill of rubble and cut building stones, mixed with extensively eroded sherds.

***b. Layer 2 (1.9–2.5 m).*** A spill of medium size ashlars, several composite three-hole stone anchors and pottery dated to the tenth–thirteenth centuries CE (Raban 2000). The submerged north–south seawall seems to belong to this phase.

***c. Layer 3 (2.3–3.5 m).*** A deliberately deposit (1 m) of terrestrial building materials mixed with angular non eroded sherds dated to the second half of the sixth–early seventh century CE. At the base of that layer there were some timbers, three of which were C14 dated to the early seventh century. Two of these were of pine and one of *cedrus libani*. Three hoards of bronze coins (several hundred all together) were found and dated from the time of Anastasius I (the earliest) to the early years of Heraclius' reign (c. 620 CE). However, most of the coins were from mid-sixth century CE and on, and two gold coins were of the reign of Constants II (658, 660 CE), well after the Islamic conquest of Caesarea. Most of the sherds were encrusted with marine fauna such as *vermetides* and *ostreae,* indicating that there was an ample flow of relatively clear and oxygen rich seawater, as at present, but with a much more constrained wave energy.

***d. Layer 4 (2.5–3.7 m).*** A thick compact layer of mud in which non-eroded angular sherds of fourth–fifth century CE were embedded as well as compacted laminas of partly decomposed wooden planks and other organic remains. These were C14 dated to the second half of the fifth century CE (Raban 2004). The overall characteristics of this layer suggest an environment of semi-lagoonar backwater, probably almost detached from the open sea by a sand bar to the west.

***e. Layer 5.*** A segmented layer (0.3–0.4 m) of fine sand in dissolved calcium-rich solution and some eroded sherds of the third–-fourth century CE.

***f. Layer 6 (3.6 m).*** The basal deposition, directly over the bedrock represents an entirely different environment. It comprises solely coarse well rounded and lime coated rubble and boulders of basalt, gabro and dolomite rocks, all of alien provenance. There were marine encrusted sherds, mostly of jars and amphorae, dated from fourth century BCE to early second century CE. This is a typical deposition for a high-energy environment, much like the present one and should represent two separate chronological phases. The earlier is pre-Sebastos followed by its initial demise. The later represents a situation when the main moles could not protect the harbour basin from the flushing of the surge. It carried dynamic energy as far in as the northeastern side of the intermediate basin, clearing its bottom of the fine grain depositions from the time when the harbour was still intact.

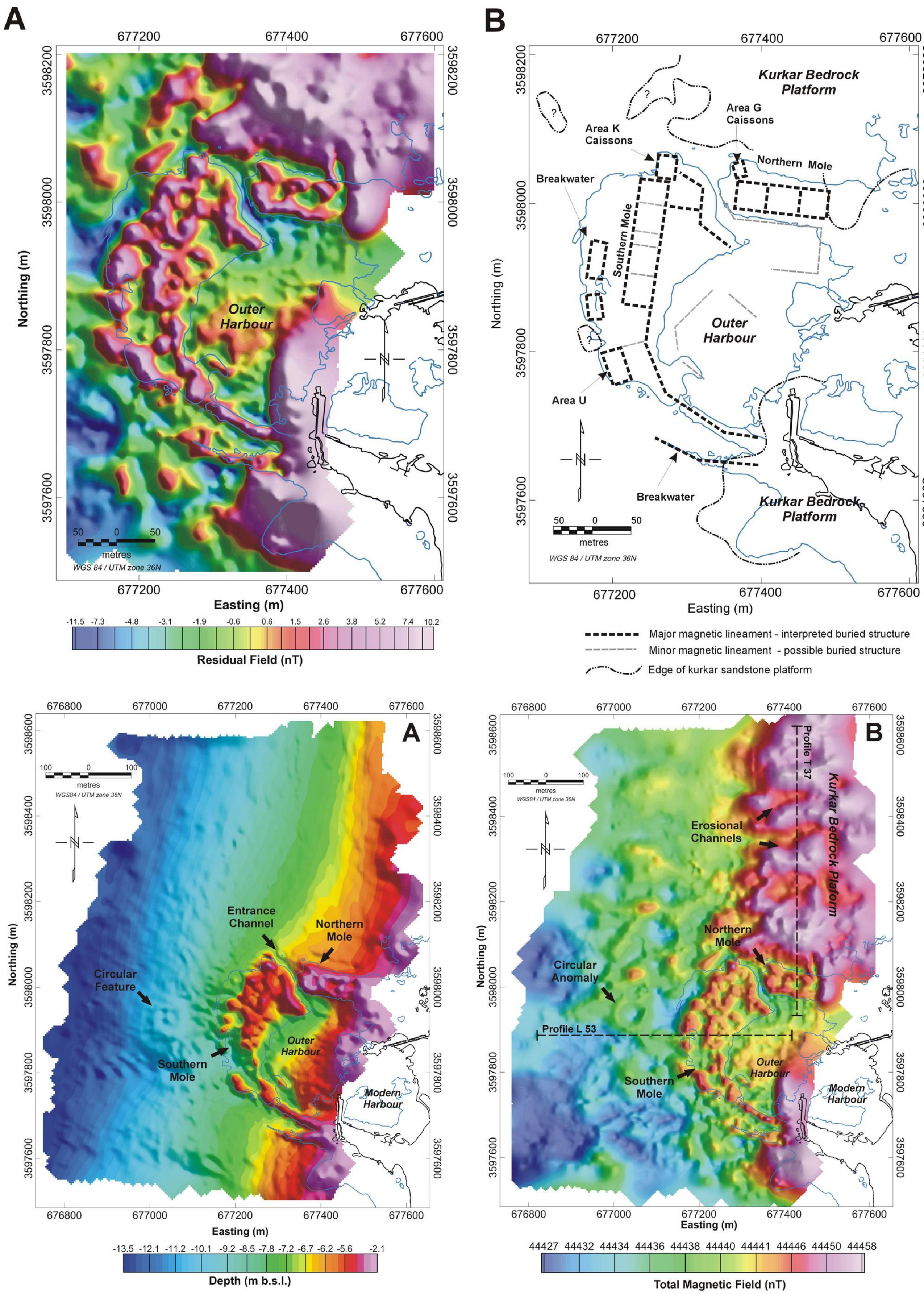



*Figure 7.15. Digitized map with demarcations of the probed magnetic "Hot Spots"(Compiled: J. Boyce)*

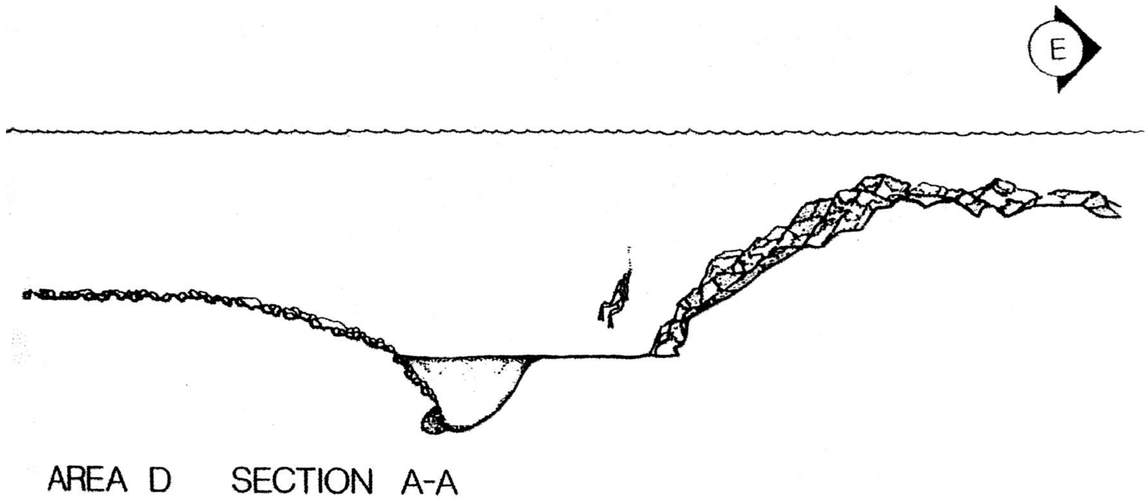



*Figure 7.16. Section A-A' across CAHEP's Area D1 (Raban 1989, Fig. III.20)*

**6. Probes Outside Sebastos at Magnetic "Hot Spots" in the Open Sea**

Following the magnetic survey conducted in 2001 (Raban 2002-2003: 12–14; Boyce *et al.* 2004) a series of probes were made outside the confinement of Sebastos, at locations that were designated as magnetic "hot spots". Seven of these sites (W1–W7; Fig. 7.15) were located several hundred meters west and northwest of the main mole of Sebastos, on a typical sandy sea floor (10.5–11.7 m below MSL). A concentration of ballast stones were found at all sites, usually consisting of either volcanic or ingenious rocks. These were under 0.5 m of shifted sand and within a context of mostly commercial jar sherds of the Byzantine era and amphorae dated to the sixth–early seventh century CE.

It seems that these sites represent off-shore anchorages, in which merchantmen riding at sea were loading and unloading their cargo to freighting boats. These should be associated with the period that followed the subsidence of Anastasius' renovated harbour (see below). The jettisoned ballast may indicate that the volume of exported goods exceeded by far the imported ones. In probe W2, 0.5 m below that level, there was an articulated platform comprised of *kurkar*, lime stone and some ashlar slabs, the larger of which were over 0.7 m long. This well leveled 'platform' could hardly be jettisoned ballast, and is more likely a sunken cargo of building stones, still in articulated order when loaded in the ship's hold. The extensive coating of *vermetides* over the slabs indicates long exposure in a shallow backwater, protected from the abrasive affect of the shifting sands. This formation overlaid a consolidated deposition of coarse sediments, mostly pebbles, shells and shingle devoid of datable artifacts and typical of a near-shore, high-energy environment. Considering it as a deposition of a historical era, its present location is enigmatic and may suggest an extreme catastrophic upheaval (tsunami?).

At probe W3, about 0.5 m below the sandy sea floor, there was a concentrated spill of rubble and some large slabs of metamorphic schist, with a large quantity of pottery, mostly angular sherds of early Roman jars and amphorae, a complete Cypriot carinated bowl and broken parts of a cooking pot (Fig. 4.66). This was maybe a jettison, or wreckage site of late first or early second century CE.

Probes W6 and W7 yielded similar results, with the additional surprise of a well-defined, cohesive and compact layer (0.5 m thick) which comprised mainly still articulated glycymeris bivalve shells, with some small pebbles and well eroded of first BCE through late first century CE sherds. In both probes, but at different elevations (one meter apart), this layer was topped by more than half a meter of fine sand with no artifacts and the 'regular' Byzantine (sixth–seventh century CE) ballast stones and broken amphorae above it. In W7 (13.4 m below MLS) a stamped handle of a Rhodian wine amphora, dated to the early years of the second century BCE was found 0.3 m below the shell layer.

These depositions, extending over an area larger than 60 m, were entirely alien to the types of sediment that were settled at such a depth and distance from the shore (ca. 1 km). The rate of energy demanded for such deposits, exceeded, by far, the strongest storm, so we assumed that the coarse components of this layer were dragged from the shore to their present location by a retreating tsunami wave dated between second century BCE and mid-first century CE. Was it the upheaval detected at areas K, G, L and the inner basin? It is rather tempting to use it as proof, but we still lack any historical documentation for this particular catastrophe (Amiran *et al.* 1994; Reinhardt and Raban 1999).

**7. Probes within the Main Basin of Sebastos.**

In Area D1 a stratigraphic probe was carried out in the seabed. Since there was ample shoring facilities as needed for a controlled section in fairly loose sand, the probe had to be extended to the entire breadth of the channel (10 m in diameter; Fig. 4.66). The sandy bottom was then (in 1982) almost 3 m thick and its top was at 7.6 m below MLS (Raban 1989: 113–119). Below the sand there were spills of rubble and several very large ashlars, sloping down from the western tip of the northern mole, both eastward and westward and as far east as the northern tip of the western mole. The better-preserved stratigraphic sequence was at the northeastern side of the probe, protected by the covering spill, the bottom of which was at -8.7 m (Fig. 7.16). There was a layer of unsorted sand mixed with coarser particles, eroded shells and segmented laminas of fine grey clay. A score of artifacts were extracted from it and published as a 'Closed Deposit 1'(Oleson *et al.* 1994a: 87–90). Below it there was a sterile deposition of coarse sand that overlay a rather thick layer of compacted dark grey mud (9.3–10.5 m below MLS), containing a vast quantity of artifacts, many of which are still intact, which were designated as 'Closed Deposit 2' (Oleson *et al.* 1994a: 91–105). The analysis of these deposits suggested that 'Closed Deposit 2' was accumulated when Sebastos was operating properly and its moles still coherent between the time of Herod and the second half of the first century CE. The 'Closed Deposit 1'' represented an operational phase that followed some traumatic hiatus, but predates the phase during which the rapidly decomposed moles tumbled across the entrance channel (Oleson *et al.* 1994a: 161; Oleson 1996: 368).

Hohlfelder (1993) probed that area again, using a metal cylindrical caisson. He reached much more ambiguous data and entirely disturbed stratigraphy and claimed that it was improperly executed, probably at a site that was dug before and misread (Oleson 1996: 376; Reinhardt and Raban 2008). Another dozen probes were carried out in the mid-1990s by Reinhardt using a similar cylindrical caisson, but in carefully selected and non disturbed sites (probes D11–12, RN1–4, RW1–3). All these probes yielded sedimentological, paleontological and archaeological data that agreed with Oleson's original analysis (Oleson *et al*. 1994a: 161; Oleson 1996: 368). The only discrepancy was between the statistical analysis of the ceramic corpus and the sedimentological data. The first suggested a renovation at Sebastos during the apex of Caesarea's economy in the mid-third–early fourth century CE (Levine 1975a: 174–176; Oleson 1996: 376), while the second demonstrated excessive depositions of wave- carried material from everywhere within all three basins of the harbour that would not permit a full scale functioning of the harbour. Other probes were carried out in the rubble spill that stretches eastward from the northeastern side of the main mole into the northern part of the main basin (Area R).

Probe R1 was made at the rather steep eastern edge of the dog-leg shaped projected rubble spill (Raban 1989: 173–174). The top of the spill was 5.4 m below MSL and it sloped down to 8.5 m below MLS, to the sandy bottom of the inner part of the harbour channel 10 m further. The spill was composed of two layers: the upper one (5.4–7.3 m below MLS) was composed of small to medium size flattened pieces of rubble (0.3–0.5 m in diameter) with some badly eroded potsherds of late Byzantine date. The lower layer (7.3–9.2 m below MSL) contained much larger and more angular chunks of rubble, up to 1 m in length, with no artifacts within their context.

*Figure 7.17. A composite anchor on the seafloor in Area R3 (Photograph: A. Raban).*

Below the rubble there was coarse sand (0.5 m thick) mixed with small stones, quantities of shells and scores of broken amphorae dated to the second–fourth century CE. Within this context were also lead weights of fishing nets, lead depth plumbs, pieces of lead sheathing and ballast stones of volcanic rocks. Deeper, down to the bottom of the probe (10.5 m below MLS), the same type of ill-sorted and shell-rich sand devoid of any manmade artifacts was found. The section of the loose sediments below the base of the spill showed no signs of re-deposition under the trenched channel. It is quite obvious that at least the upper layer represented the seafloor inside the harbour basin at a period when it was exposed to high wave energy, before the premeditated spill was laid. This chrono-statigraphy enabled us to attribute that spill to the historically attested renovation of the harbour by Anastasius I. Moreover, the fact that the base of the spill in that probe resembled that of Area D1 substantiated that assumption.

Additional probes that were carried out at the rubble covered area further to the east yielded similar data, including what seemed to be a wreckage site, dated by a small hoard of coins to mid-third century CE. In that context there were also sets of brailing lead rings spread *in situ* on the seafloor. Other interesting remains in the same context were quantities of copper ship nails and bolts as well as an almost complete wood and lead composite anchor, maybe a century earlier in date (Fig. 7.17; Raban 1998b: 251–253; Raban *et al*. 1990: 245–247).

## 8. Relevant Data from the Excavations along the Southern Bay

This rather large area, which extends almost 100 m eastward from the waterline and about 0.5 km from the southern edge of the Temple Platform to the theater, is the more extensively excavated part of the ancient city of Caesarea. Its investigation began with the JECM excavations in the mid-1970s to the early 1980s, followed by CCE through the 1990s and complemented by the large scale project of IAA between 1992 and 1998.

Although most of these excavations have not yet been fully published, a score of preliminary and intermediate reports provide an overall picture of the results (Bull *et al.* 1986; Blakely 1987; Blakely 1988; Porath 1995, 1996a; Burell 1996; Porath, Patrich and Raban 1998; Lehmann 1999; Patrich *et al.* 1999; Patrich 2001). Of these not many are directly relevant to the maritime history of the city following the Herodian era. However, four issues are of concern to us for their maritime context.

1. The coastline of the south bay went through three phases of change, all of which were most probably an eventual outcome of human activities and rebounding coastal processes. First, an additional deposition of built-up coastline, enhanced by the construction of Sebastos, offered ample space for installing the western amphitheater, or the Hippodrome of Herod, as early as 16 BCE (Porath 1995). Probably then, as early as the beginning of the second century CE, the subsiding moles of Sebastos, and maybe also the increased gradient of the sea floor in the southern bay, was caused by tectonic displacement of its western side. The resulting excessive accumulation of its surf zone endangered the coherence of the hippodrome to such an extent that it motivated its replacement by the then newly built eastern one. The original structurewas then reduced, on by a third in its southern section and used as a temporary amphitheater during the late second–early third centuries CE. Finally, sometime after the mid-third century CE, the entire sport arena was deserted, due to the sea repetitively flooding over and washing away large parts of it (Patrich 2001: 92).

2. The so-called Mithraeum *horrea* near the shore and north of the hippodrome seems to have functioned during the late first century CE and again from late third century CE, and probably until late in the Byzantine era (Patrich 1996: 150–153). Its location and the fact that all four elongated vaults faced the shoreline suggest that the sea-borne goods were stored there. These were brought by lighters from, or to, ships riding at anchor in the open sea of the south bay, which was a less hazardous anchorage than the partly submerged Sebastos. Such a replacement arrangement may explain the relative absence of second to fourth century CE finds on Sebastos' seafloor (Oleson *et al*. 1994: 161).

3. Among the richer assemblages of potsherds excavated in the vaults in Area CC are those found in vaults No. 19 and 54. They consisted of local bag-shaped jars (Riley 1975: type 1b), imported amphorae from around the Mediterranean, with greater quantities from the Aegean (Peacock and Williams 1986: type 47), as well as household wares and oil lamps of the first half of the fourth century CE (Patrich 2001: 96, n.109). The IAA excavations at the next *insulea* to the south, revealed a similar assemblage of the second–third centuries CE, in which the number of amphorae from the western Mediterranean is rather high, probably being the remains of food and wine containers for the locally stationed garrisons of the Roman army (Burrell 1996: 243–245). In that respect there is a clear discrepancy between the statistics from Sebastos and its proposed historical significance (Oleson 1996) and from the land excavations next to the South Bay. One may wander how much can be deduced from statistical analysis of potsherds that were retrieved and recorded in a very non-comprehensive manner from random depositions, from a large site of which only a small part was excavated (Blakely 1988).

4. Several structures that seem to have had a maritime function were detected, recorded and partly excavated along the shoreline south and north of Sebastos (Raban 1989: 230–235). Most of these were not properly dated, but three seem to be of Post-Herodian and Pre-Byzantine periods. a. The first was an ashlar-built platform in a preserved area, 9.8×3.6 m, at the southeastern inner part of a small cove west of the Roman theater. It consisted of at least three rows of headers of even size (0.6×0.6×1.2 m), each laid on a north–south orientation with their narrow side towards the water. The platform was partly eroded at its edges, so it is impossible to reconstruct its original plan and architectural context. At present it slopes down southward and its southern course is partly inundated. The technology used in the headers' construction, the standard size of the ashlars, the fact that the western reach of the southern wall of the Byzantine Fortezza and the immediate context of the Roman "Praetorium" (Burrell 1996) are all circumstantial, but rather convincing arguments for dating it to the Roman period, most likely no later than the late second century CE (Raban 1989: 235). b. The second was a similarly constructed quay at the lee of the eastern edge of a broad V-shaped platform of abrasive shelf. This is currently used as the anchorage of Kibbutz Sdot-Yam, across a small sandy bay 200 m southwest of the Byzantine city wall. This structure has yielded potsherds of the third through fifth centuries CE (Fig. 7.18). c. The third structure was in a similar context, 40 m to the south and also at the lee of the V-shaped abrasive platform. There were two adjacent, rather large and shallow, rectangular basins (6×8 m and 10×12 m), partly cut into the bedrock and partly built of thick walls that were composed of *pozzolana* concrete with small rubble aggregates (Raban 1989: 78). In recent years these basins were studied by A. Engart of Kibbutz Sdot-Yam, who found a series of clay and lead feeding pipes that reached the basins from southwest and an additional broad floor coated by *pozzolana* cement, just below water level. The entire complex resembles some fish processing industrial facility, maybe *garrum*. Its present elevation suggests a somewhat lower sea level when it was functional, or some subsidence of the entire area. The use of true *pozzolana,* lead pipes and dry ashlar construction are typical to the Roman period and are not known in later contexts at Caesarea.

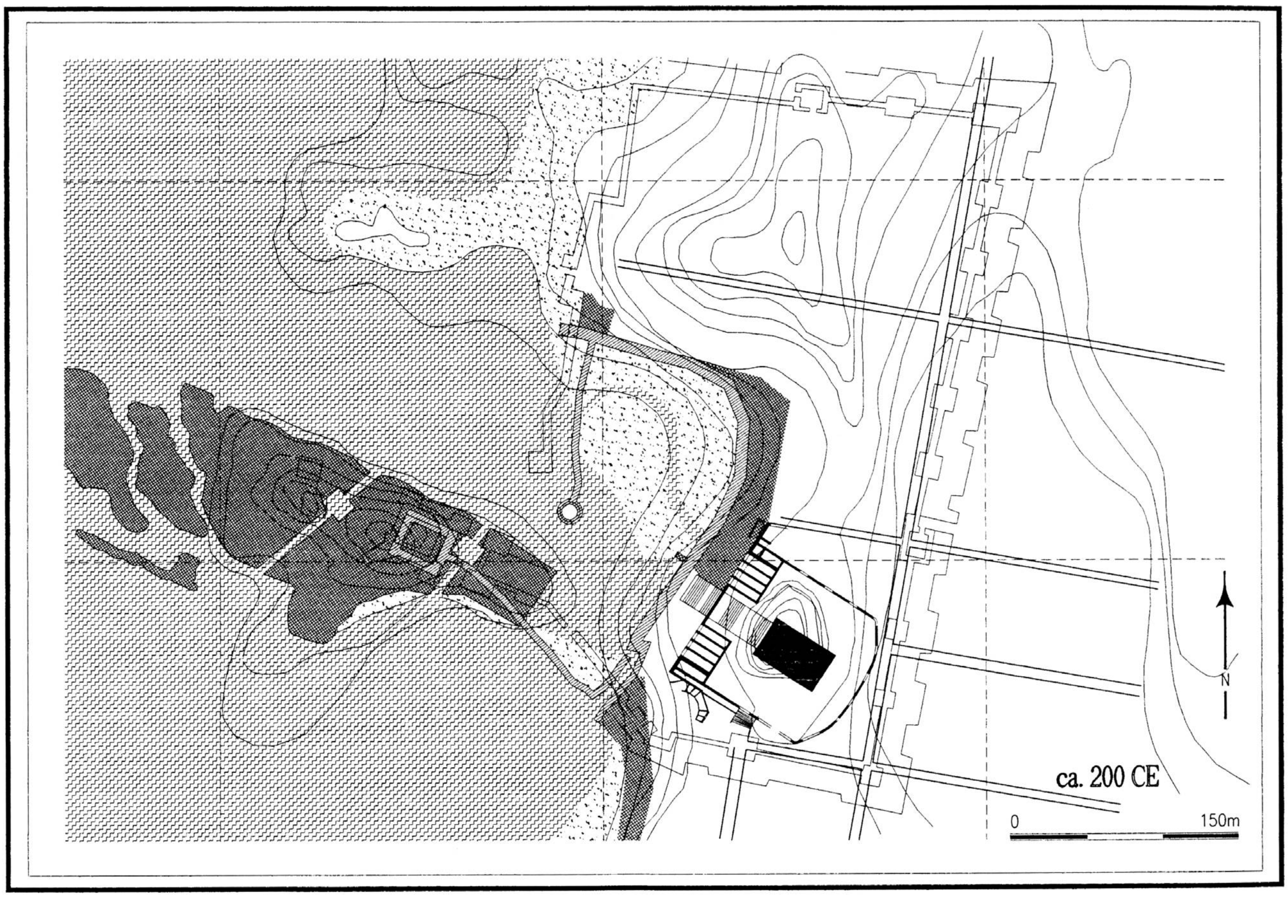



*Figure 7.18. Schematic reconstruction plan of the eastern part of Sebastos around 200CE (Compiled: A. Iamim)*

These three structures were most probably instrumental for the local fishing activity that was undoubtedly important for the economy of Caesarea. The quay next to the earlier Promontory Palace may have served also as a landing stage for the officials who resided at the *Praetorium*, enabling direct access through a private, or even "regal" anchorage. However, the later use of that promontory as a fish market and an elaborated *piscine* was possibly the actual reason for its construction. Since dating the transition from *Praetorium* to *piscina* is still debated (Oleson 1989: 160–167; Flinder 1976; Levine and Netzer 1986: 176–182; Netzer 1996; Burrell 1996), the two options should remain open.

### C. Summary

From the data presented above the following conclusions can be drawn concerning maritime activity in Caesarea and the role of Sebastos within it:

1. The scope of sea-borne trade that passed via Sebastos was reduced considerably when it became a municipal harbour and lost its royal status or stately role, at ca. 70 CE. This is evident from both the limited or even non existent maintenance in the following period and the reduced quantities of artifacts dated to the time after that change (Oleson *et al.* 1994: 161).

2. The rate of sea-borne imports to the growing city of Caesarea increased rapidly, following its elevation to the status of *colonia* and the actual capital of Judaea/Syria Palaestina, where the Roman governors and the financial procurators of the province sat (Blakely 1996: 334; Patrich 2001: 77). The increase in economic activities is well attested to by the archaeological finds. They reached their peak during the third and fourth centuries CE, when Caesarea was the true economic, cultural and political metropolis of the region (Oleson 1996: 376; Patrich 2001: 78).

3. The data from Sebastos, in particular those from its eastern half (Areas F, LW), match only the latter part of that thriving period. There are no indications of any attempt to renew or to mend the deteriorating and subsiding main moles of the main basin. On the contrary, the wreckage sites on top of the moles are good evidence of their being, at least partly, in a submerged state.

4. The detailed data from the inner harbour clearly illustrate a rapid process of sediment accumulation from the late first century CE. These suggest that the flushing system went out of use ca. 200 CE, and from then on most of the inner harbour basin was well detached from the sea (Raban 1996c: 644–656; Figs. 7.18, 7.19).

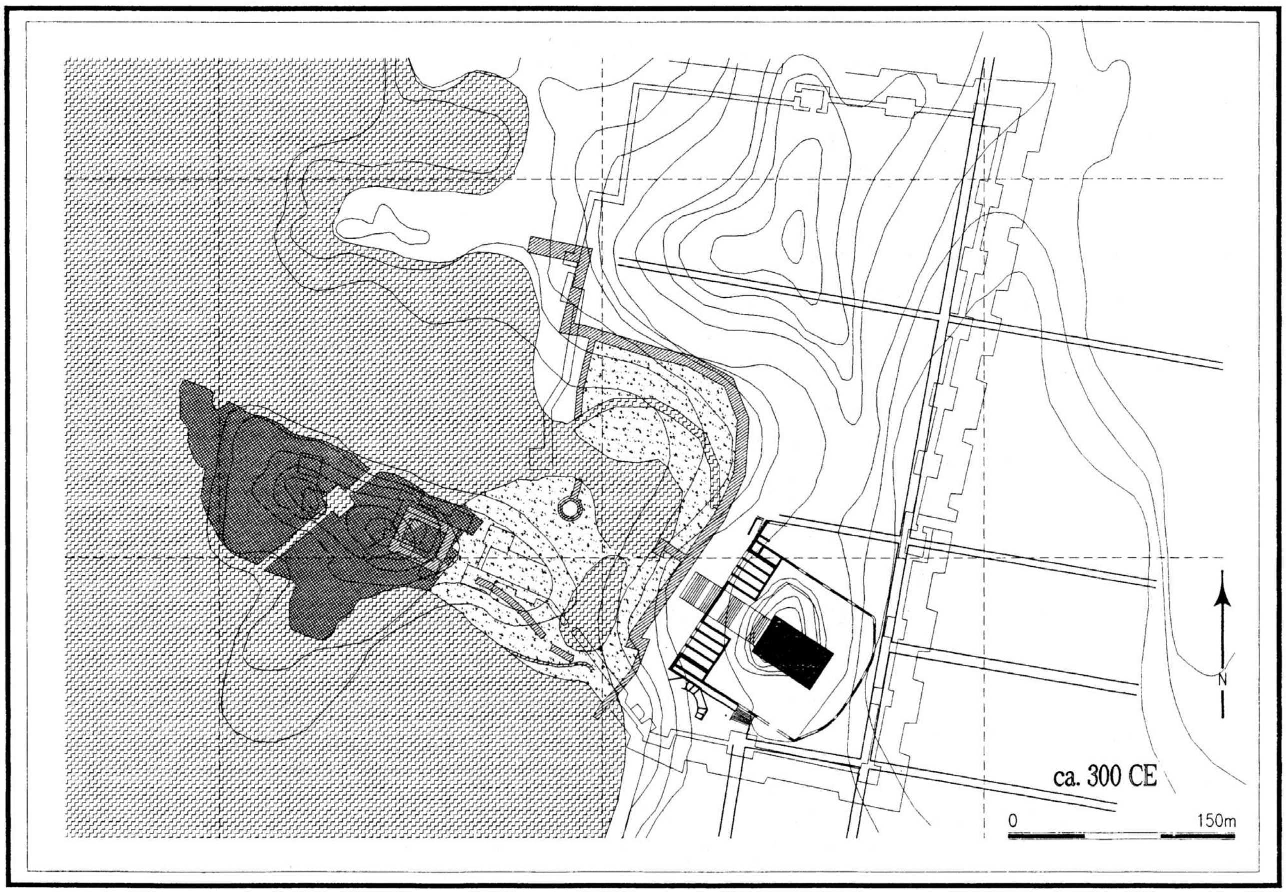



*Figure 7.19. Schematic reconstructed plan of the eastern part of Sebastos around 300CE (Compiled: A. Iamim)*

5. The data from and around the inner harbour entrance channel and the tips of both main moles (Areas G, K, D, R) indicate that the structural components of Sebastos already lost their coherence and tilted and were somewhat displaced toward the end of the first century CE. Tilting occurred again during the second and maybe also in the third and fourth centuries CE. This destructive process was a combined result of repetitive tectonic upheavals, which enhanced compaction, fluidation and excessive scouring at the substructures of the main moles.

6. The breached moles allowed for the deposit of quantities of wave-carried sediments, not only within the inner basin but also at the northeastern part of the intermediate section. These were silted-up and the ashlar-built quay and the jetty at Area L were actually covered, probably in the earlier half of the second century CE (Raban 1992b: 115–119).

7. The people of Caesarea continued in their efforts to maintain berthing facilities within Sebastos that would be properly protected from the in–coming surge and off the already silted-up sections. These were recorded at the back of the inner basin, in front of the staircase to the temple (Areas I-1 and LW). While the first may be dated to the early part of the second century CE, probably following the affects of the first natural upheaval, the second may be dated a couple of generations later, maybe after another upheaval which caused the eastern tower in Area K to capsize.

8. The fact that the quay in Area LW went out of use within a century, and the quay in Area I-1 probably at about the same time, indicates continuous upheavals and excessive number of uncontrolled siltations, which seemed to coincide with the accretion of the western hippodrome's arena (Porath 1995: 24–26; Patrich 2001: 92). The present elevation of the surface of the quay at Area LW is about 1 m lower than when it went out of use. This indicates that similar upheavals continued to affect the land/sea relations at Caesarea in later periods as well.

9. Despite the upheavals, as the archeologically and geomorphological evidence shows, Caesarea continued to flourish and its sea-borne trade continued. This can be learned not only from historical and other textual references, but also from the archaeological data concerning the construction of various *horrea* complexes during the late second through early fourth centuries CE (Porath 1996: 113–116; Patrich *et al*. 1996: 153; 2001: 93). The numbers of commercial containers dated to this period, recorded during the excavations, both on land and under the water, and their wide spatial distribution also attest to this flourishing international state (Blakely 1996; Oleson 1996: 363–367).

10. It becomes clear that a year-round, large-scale harbour of the imperial style was not necessarily relevant to the economic and commercial thriving of a port city. This can well be attested to in the case of port cities in the Levant,

such as Gaza, Ashkelon, Jaffa, Apollonia, Akko and Beirut. Thus, historians should not look for connections between the documentation of a thriving sea-borne trade and a year-round harbour operating properly. Such a harbour would be a luxury, and an expensive "white elephant" for a single city, even as largely a populated one as Caesarea was throughout the Roman and Byzantine eras, to maintain.

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