Karnak's Quaysides

Evolution of the Embankments from the Eighteenth Dynasty to the Graeco-Roman Period

Mansour Boraik, Luc Gabolde, Angus Graham

1. Introduction

The results presented by Luc Gabolde and Angus Graham at the symposium held at Mainz in March 2013[1] have in part already been published or are in print.[2] The authors proposed to the editors – who were very kind to accept it – a re-orientation of their contribution to the proceedings focused on the recent results gained through archaeology, history, geoarchaeology and geophysical survey on the evolution of the Nile embankments/quaysides at Karnak from the Eighteenth Dynasty onwards. This has led to the inclusion of the recent and fruitful research carried out by Mansour Boraik on the western and southern parts of the site.[3]

The idea that quaysides, embankments and river banks around the temples of Karnak were located differently than they are today can be traced back to

1 The communications were entitled as follows: A. Graham, *"The Origins of Karnak – Geoarchaeological and Geophysical Survey Results"*; L. Gabolde, *"The Origins of Karnak – Archaeological, Astronomical, Textual and Theological Sources"*.

2 Gabolde, *in press* and an overview which has been presented in Gabolde, 2014, p. 13–35; Bunbury et al., 2008; Graham, 2010a; Graham, 2010b; Graham/Bunbury, 2005.

3 Boraik, 2013a; Boraik, 2013b; Boraik, 2010b; Boraik et al., 2010.

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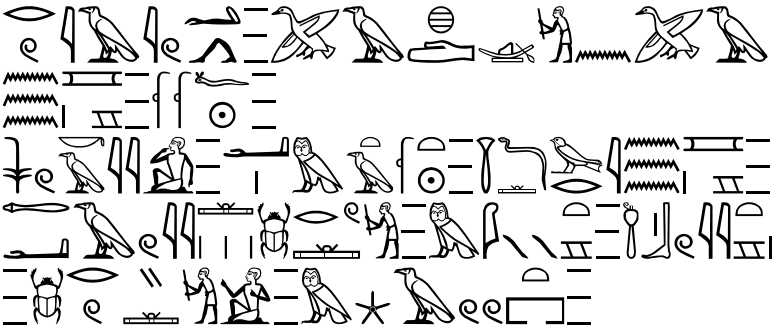
the work of Legrain and Pillet.[4] They investigated short sections of buried embankments and proposed some hypotheses on former positions of the river.

The evidence of important movements of the Nile during the New Kingdom until the Roman period can be ascertained by a number of different kinds of sources which are reviewed and analysed in this paper enabling us to propose some new hypotheses as to the historical evolution of the embankments in front of the temple.

2. The textual and iconographical sources

Textual sources reveal that the Egyptians had a wide empirical knowledge of the dynamics of their river as their wisdom literature attests.

The *Teaching of Ani*, most likely composed in the Nineteenth Dynasty,[5] mentions the unpredictable drainage of a channel:



"Last year's watercourse is gone; another river is here today; great lakes become dry places, sandbanks turn into depths".[6]

4 Legrain, 1906a; Legrain, 1906b; Pillet, 1924, p. 84–86. See also Cabrol, 2001, p. 427–430.

5 Quack, 1994, p. 61–62; Lichtheim, 1976, p. 135, suggested Eighteenth Dynasty.

6 *Teaching of Ani*, Lichtheim, 1976, p. 142; Quack, 1994, p. 110–111, 318–319.

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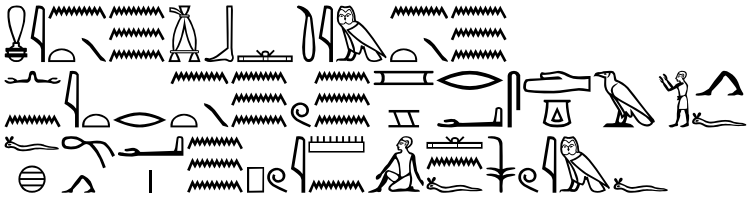
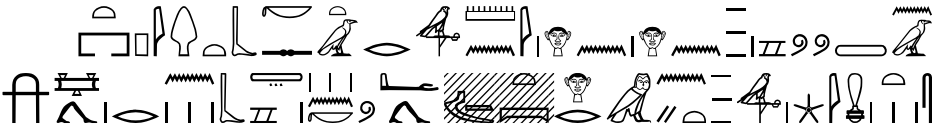
The *Teaching of Merikara*, known to us from late Eighteenth Dynasty papyri was most probably composed in the early Middle Kingdom.[7] It recalls the natural creation of new channels and the inevitability of the phenomenon:



"like a channel (is) being replaced by (another) channel, there is no river that suffers to be constrained: it (the river) is the releaser of the water-branch (lit. 'arm') it had hidden himself inside".[8]

Several literary texts make clear allusions to islands located off Karnak and Luxor while others mention an island of Amun connected to the god, although the locations of these islands are less precise.

A Ramesside hymn, P. Turin 54031, evokes the string of islands stretched between Karnak and Luxor:



"The islands (iww) (which are) in front of the façade of (the temple of) Amun, up to the ksbt bush of Opet (= Luxor), their (number) is like (that of) the stars in the sky, stretching for you the earth off-shore".[9]

The famous Ramesside *Tomb Robbery* record of P. Amherst III, 3 (≈ 1113 B.C.) describes an island (*mɜwt*) – the *"island of Amenope"* – in the Theban area, used

7 Quack, 1992, p. 114–136 favours an early Twelfth Dynasty date.

8 *Teaching of Merykara*, translation based on Quack, 1992, p. 74–75, 193–194; Gardiner, 1914, p. 33–34 translated: *"As the mud-flat (?) is replaced by a flood. There is no river that suffers itself to be concealed; but it loosens the dam (?) by (?) which it lay hid".*

9 P.Turin 54031, V, 20, I, 8; cf. Condon, 1978, p. 14, 22. The translation given here is L. Gabolde's.

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as a shelter by the robbers, where they stopped in order to divide quietly the booty of their theft.[10]

The ostracon O. Uppsala 608, dated to 115 B.C., deals with the collection of taxes on the territory of eastern Thebes *"Taxes on the harvest and (on the) extra (quantity payable) by the farmers for the Island of Amun named 'the southern district'",* while the late Ptolemaic O. Leipzig 2200 mentions oil mills and cultivations of oleaginous seeds in the Theban area located by reference to *"the Island of Aberhu",* to the *"sand (the silting up ?) of the canal (?) Hel-mu",* and the *"island of Amran".*[11]

The *"islands of Amun"* connected with the cultivation of oleaginous seeds mentioned in papyri originating from Gebelein are not precisely located.[12] Whatever their location was, within or outside the territory of Thebes, their name, often elaborated as *"the Island of Amun ..."* shows that these new lands were generally attributed to divine properties and especially to the estate of Amun, as Yoyotte has already noted.[13]

Nine different *"islands of Amun"* are mentioned on the recto of P. Amiens and P. Baldwin (BM EA 10061) dated to the late Ramesside period (≈ 1150-1070 B.C.).[14] Whilst all of the islands appear to be located in the Ninth or Tenth nome of Upper Egypt, Janssen's commentary on the text raises the important point that the terms *iw* and *mȝwt* are difficult to differentiate.[15] Furthermore, Gardiner[16] makes a very interesting point concerning the difficulty of deciding whether an expression such as *tȝ mȝwt* is part of the composite place name or whether it is simply a descriptive term. In the case of "the New land of Samĕ" (P. Wilbour (B 10, 5)), Gardiner[17] argues that there is no certainty that the "new

10 Peet, 1997, p. 49 (3,3), 61 (r° 1,6), 152 (10, 4–5): *"the Island (?) of Amenemope"* and p. 162 comment on *mȝwt*.

11 Kaplony-Heckel, 2010, p. 132, n° 55 and 142–143, n° 68.

12 Kaplony-Heckel, 2009, p. 577–579 notes that the designation *"islands of Amun"* does not make reference to deities of Gebelein but to Amun of Thebes.

13 Yoyotte, 2013.

14 Janssen, 2004, p. 4–5, 32; Gardiner, 1940, p. 95; Gardiner, 1941, p. 37–43.

15 Janssen, 2004, p. 19 n. 5, 33). See Graham, 2007, p. 299 for some initial comments on differentiation of the terms and also Eyre, 1994, p. 75–76; Schenkel, 1978, p. 60–65.

16 Gardiner, 1948, p. 29.

17 Ibid.

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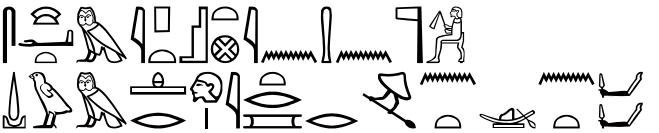
land" was actually new at the time of Ramesses V as it appears that this was an established local name. We can see today that toponyms on maps can also record a 'memory' of past geomorphology of the floodplain.[18]

The walls of the "Chapelle Rouge" of Hatshepsut (≈ 1450 B.C.) present descriptions of the embankments and of the procession roads used during the *Opet* and the *Valley festivals*.

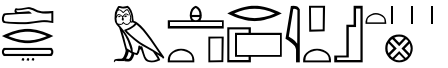
The portable bark of Amun is installed onboard the great riverine bark of Amun departing for Deir al-Bahari for the *beautiful Valley festival*, at the embankment, described as a *tp-itrw* (*"above the river"*; *"overhanging the river"*, an expression which may define both the position of a boat, like the *User-hat*, as that of a quay):



"Appearance in procession out of Karnak by the Majesty of the august god. Going in peace at the (place) above the river for the navigation of Deir al-Bahari".[19]

Cabrol argues that *tp-itrw* refers to the basin at the end of the canal, but that it does not have to have a "tribune / platform" associated with it.[20]

The landing place is also described in the scene of the arrival of the great riverine bark returning to Karnak from Luxor:



"Landing in peace at the tribune (?) of Karnak".[21]

However, the exact place of this tribune cannot be precisely determined from the texts and representations.[22]

18 Bunbury et al., 2008, p. 356; Graham, 2010a, p. 133; Jeffreys, 1985; Smith/Jeffreys, 1986.

19 Lacau/Chevrier, 1977, p. 170, § 227; Larché/Burgos, 2006, p. 98.

20 Cabrol, 2001, p. 631-634.

21 Lacau/Chevrier, 1977, p. 185, § 263; Larché/Burgos, 2006, p. 61.

22 Lacau/Chevrier, 1977, p. 186.

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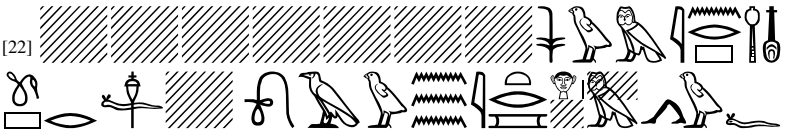
On the earthly way from Karnak to Luxor, the procession stops before the Mut temple in a bark station named

"the first station (named) 'the stairs / platform of Amun in front (?) of the house of the chest'".[23]

The remains of this chapel have been identified by Ricke in front of the temple of Mut and facing the *Kamutef-Heiligtum*.[24] Interestingly, a gate of Hatshepsut was found in the vicinity, inside the precinct of Mut[25] and it most probably opened directly on the processional road to Luxor.

A text of Montuemhat (≈ 660 B.C.) in his crypt at the Mut Temple seems to describe the building of an embankment in order to prevent the flood from threatening the temple of Khonsu: [26]

[22] 

"(... I ordered an embankment to be built for the god Khon)su (?) in beautiful light sandstone in order to repel from (him) the flood of the River when it comes".[27]

Dated between the reign of Ptolemy V Epiphanes (reign 204-181 B.C.) and that of Ptolemy IX Soter II (116-110 B.C., 109-107 B.C. and 88-81 B.C.),[28] the archive of Hermias' trial has revealed that, west of the dromos of Khonsu and of the forecourt of the Opet Temple, a north-south road existed named the *"royal*

23 Ibid., p. 161, § 207; 163, § 214; Larché/Burgos, 2006, p. 51–52.

24 Ricke, 1954, p. 42 and pl. 13d.

25 Fazzini, 2001, p. 61–74.

26 Leclant, 1961, p. 215 l.22, 219 and 227, n. bj.

27 The restitution « *[Khon]sou* » has been suggested by Wreszinski, 1910, pl. III, col. 393, [22], but, without a divine determinative, it remains questionable. One may also understand *"[... I decided to built an embankment, and I made] it in beautiful light sandstone ..."*

28 See Brugsch/Revillout, 1880; Pestman, 1993, p. 385–409.

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street". This street ran parallel to the eastern quay of a branch of the Nile, called the *"canal of the island of Amun"*. The quay thus faced an island called *"the island of Amun"* named *"Tamaut"*.[29]

A passage of the book of Nahum in the Old Testament (*Nahum* 3.8) deserves to be quoted here as it seems to provide us with a description of Thebes before 663 B.C., lying among branches of the Nile: *"Are you better than Thebes, situated on the Nile, with water around her? The river was her defense, the waters her wall"*. This passage led Egli to reconstruct canals around the city, with the main branch of the Nile flowing to the east but without any basis of geomorphological investigation (see figure 1).[30]

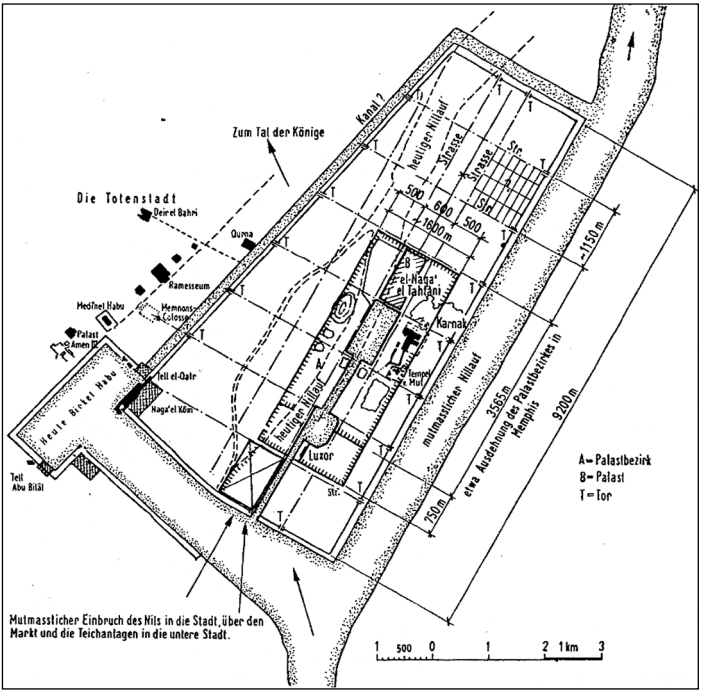

Figure 1. Reconstruction of the Nile by Egli, 1959 based on Nahum 3.8.

29 On *t3-mȝwt, "New land"*, see Yoyotte, 2013, p. 231–237; Bonneau, 1971, p. 70 n. 311, 115 and 193; Meeks, 1972, p. 56, n. 18; Gasse, 1988, p. 148 et n. 4; Eyre, 1994, p. 75–76; Graham, 2007, p. 299.

30 Egli, 1959, p. 40–43.

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Three iconographical sources appear to attest to canals and lakes associated with Karnak. Issues of perspective (i.e. images showing *primae facie* plan and elevations) of Egyptian pictorial evidence must be borne in mind at all times when interpreting images.[31]

The Theban tomb of Neferhotep (TT 49 dating to the late Eighteenth Dynasty) shows a widely known representation of the layout of the river Nile connected to a basin by a canal in front of Karnak[32] (see figure 2). The pylon at the end of the processional way linking the tribune has been argued to be the third pylon constructed by Amenhotep III.[33] However, the precise position and even the existence of the processional way, the tribune and the basin with its canal linked to the Nile all remain to be determined. One of the most informative features of the picture is the presence of an island surrounded by navigable channels in front of the entrance of the canal linking the river to the tribune of the dromos.

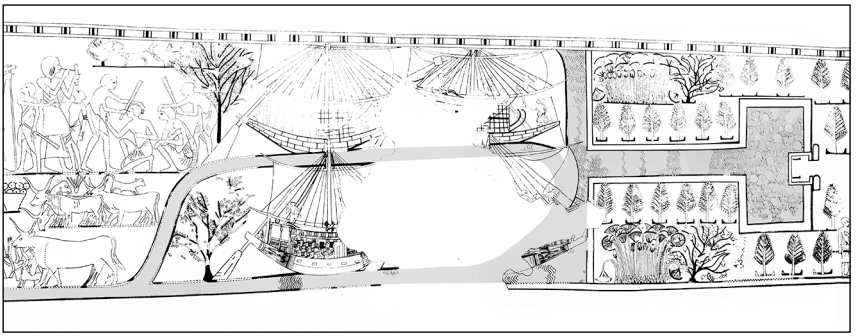

Figure 2. TT 49 (Neferhotep): basin and tribune of Karnak with an island in front of the canal (after Davies, waterways shaded in grey. NB not all the banks are extant in the image and are approximations).

The representation of Khâbekhenet's tomb, dated to the reign of Ramses II[34] (≈ 1250 B.C.), adds some information concerning the dromos in the area of the Mut temple and the environment of the *isheru* lake, though the specific point of

31 Schlüter, 2009, p. 143–161.

32 TT 49. Porter/Moss, 1960, p. 93, [15–16]; Davies, 1933, I p. 28–32 and pl. XLI–XLII and II, pl. III; Cabrol, 2001, p. 433–436 and Cabrol/Traunecker, 1993, p. 19–25.

33 Cabrol/Traunecker, 1993, p. 24 and n. 41; cf. Loeben, 1992.

34 TT 2 Khâbekhenet see Cabrol, 1995.

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view of the artist did not result in representing the Nile embankment itself (see figure 3).

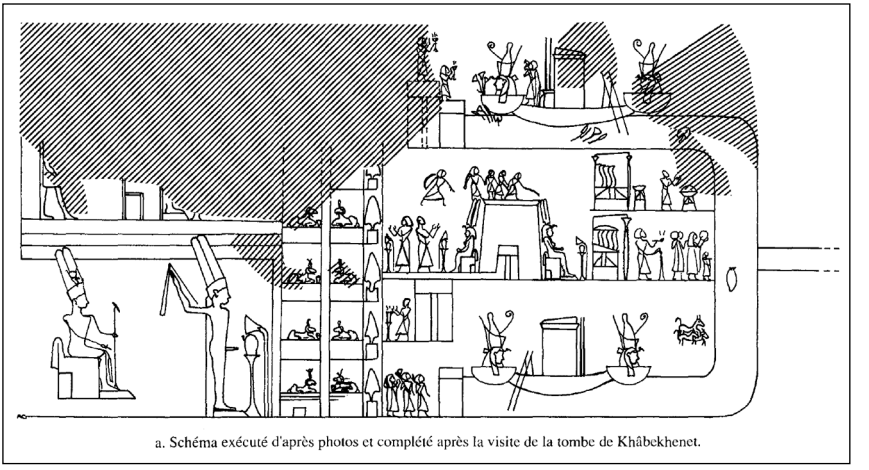

Figure 3. Representation of the tomb of Khâbekhenet after CABROL, *1995, pl. V a.*

A block formerly attributed to Piânkhy (but more likely belonging to the reign of Psamtek I) (≈ 660 B.C.) and discovered in the Mut Precinct[35] shows an interesting feature (see figure 4): a tree is represented between the prow of the riverine bark of Amun and the tribune. Benson and Gourlay suggested the tree represented "those growing on fertile soil beside the water".[36] In effect the block could represent an elevation view of a plan similar to that depicted in Neferhotep's tomb, with the trees set around the basin and canal. Alternatively, it could represent the presence of some kind of dry sandy bar between the tribune and the boat.

35 PORTER/MOSS, 1972, p. 257–258 (8); BENSON/GOURLAY, 1899, pl. XXII 5; FOUCART, 1924, pl. IX b and p. 118–119 (who wrongly sees a representation of Heliopolis); LECLANT, 1965, p. 114–115 [32, B]. On the precise date of the blocks, see PERDU, 2010 and PERDU, 2011, where a more convincing attribution of the blocks to the reign of Psamtek I is proposed.

36 BENSON/GOURLAY, 1899, p. 258.

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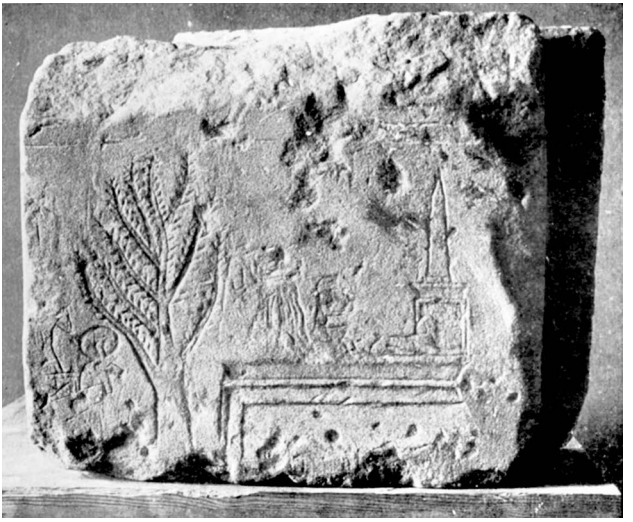

Figure 4. Block from the temple of Mut showing a tree between the bark of Amun and the tribune (after Benson/ Gourlay, *1899, pl. XXIIb).*

In summary we can see that a number of Ramesside texts attest to islands in the vicinity of Karnak. This is no surprise given the propensity of island formation in the Nile.[37] The pictorial evidence provides crucial information on the tribunes and basin as formal access to the temple complex, but the location of the basin remains unresolved.

3. The archaeological sources

Complementing the epigraphical and iconographical sources, excavations in several areas of Karnak have brought to light various features connected with embankments and dated to various periods.

37 Graham, 2010a.

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3.1 The excavations of the Nineteenth and Twentieth centuries

Extensive excavations were carried out on the western dromos of Karnak and its tribune (key plan see figure 23), under the supervision of Lauffray.[38] The extensive reports of this scholar are not always clear and often remain inconclusive, but the subsequent comments of A. Cabrol have greatly improved our understanding of these excavations.[39] The dromos seems to have been re-organized after the reign of Pinedjem I (≈ 1060 B.C.) of the Twenty-first Dynasty, whereas the tribune is apparently later than the reign of Sheshonq I (943-923 B.C.) of the Twenty-second Dynasty. A phase of restoration seems to have occurred between the Twenty-third and the Twenty-fifth Dynasties.

Mudbrick wall structures within the sandstone tribune must date to the Twentieth Dynasty as they covered – and thus postdated – layers which seem to date to the period between the end of the Eighteenth Dynasty and the Twentieth Dynasty, based on the blue painted ceramics they contained (layers d, d' and d'').[40] It is not clear if these mudbrick structures represent part of the construction of the tribune or relate to an earlier structure or embankment. Considering the notion that the basin and canal depicted in the tomb of Neferhotep were on the central axis of the temple, we cannot yet rule out the possibility that these mudbrick walls could have existed on the east bank of an island lying directly in front of the Amun-Re complex.

Between 72.40 m and 73.50 m a.s.l., few occupation levels were identified, some covered with lime, with abundant ashes, (undated) potsherds and chips of sandstone, but no trace of any architectural structure. It seems likely that this stratigraphy represents the dumps from workshops and a temporary occupation of craftsmen from the beginning to the end of the Eighteenth Dynasty. An older layer was identified below, around the levels 72.20–72.40 m a.s.l., consisting of ashes and incorporating conical bread moulds. In the absence of drawings and photos, it is alas not possible to evaluate their date. However, its composition – the ashes and the bread moulds – evoke a temple's bakery, and its low level, compared to similar levels of the central part of the temple[41] or from the forecourt

38 Lauffray, 1971; Lauffray et al., 1975, p. 43–76.

39 Cabrol, 2001, p. 117–136, 581–590.

40 Caution is, however, necessary in interpreting Lauffray's dating as the whole assemblage of finds from each stratigraphic level has not been fully published.

41 Lanoë, 2007, p. 374–375, sp. pl. V–VII.

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of Opet,[42] suggests that they could correspond to some kind of workshops from the Middle Kingdom or Second Intermediate Period. However, the possibility of a dump from a nearby bakery located at a higher level cannot be ruled out.

3.2 Tribune

In the 1890s, George Legrain excavated to a level ten courses of ashlars below the protruding pavement course of the tribune, a height of c. 71 m a.s.l.,[43] in order to record the Nile levels on the face of the tribune (see figure 5). The notion that the tribune functioned as a quay was pointedly refuted by Clarke[44] stating that these structures do not meet the criteria for being quays, as they do not accommodate the rise and fall of the Nile and the parapets around the platform make loading/unloading and embarkation/disembarkation very problematic.

Figure 5. Georges Legrain recording inscriptions on the western tribune (Image no. 40405_1 © CFEETK).

3.3 North Quayside Wall

Chevrier[45] found a wall linked to the north side of the platform extending northwards in line with the west face of the platform (key plan see figure 23).

42 Charloux, 2010, p. 202, fig. 7; Charloux, et al., 2012, p. 40–43.

43 Lauffray, 1971, p. 85.

44 Clarke, 1921, p. 70 n. 1.

45 Chevrier, 1947, p. 157-158.

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He believed this wall was used as a quay with a set of stairs as well as notches or loops at two different heights in the stone that allowed barks to be tied up (see see figure 6).[46] Of the five loops, three are cut in the fourth and fifth courses of the wall and two on the eighth and ninth courses of the wall (see see figure 6-7). The upper part of the loophole appears to have wear grooves where the ropes were tied through the hole (see figure 7 close-up).

An important aspect of these notches not previously raised is that the lower ones extend further north along the wall than the higher ones (see figure 6). Whilst not precisely at the same angle as the steps to the north, they are almost certainly designed so that the bow or stern was tied up to the mooring loop to enable (dis)embarkation amidships by way of the steps. The loops would allow vessels to moor at varying heights of the annual river cycle. The fact that there are mooring loops at the same height along the wall might suggest that they were designed to either accommodate vessels of varying lengths or they may have served to enable rafting up to occur. They could also have been used for spring lines. Fenders would have been used between the quay wall and the hull.

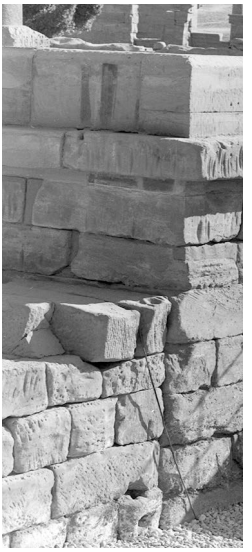

Figure 6 (left). North quay wall at Karnak showing the steps and two mooring loops (after Chevrier, *1947, pl. 48); Figure 7 (right). North-west corner of the western tribune with a mooring stone in the fifth course of the north wall (after 39685 ©CFEETK).*

46 Ibid., p. 158, pl. 48.

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The lower loops are at c. 71.45 m a.s.l. whilst the upper loops are at c. 72.85 m a.s.l.[47] This would allow mooring at water levels certainly lower than 69 m a.s.l., assuming the crew member used full stretch to pass the rope through the loop and with some freeboard. When the river was at its peak, a level marked by the many inscriptions on the facade of the tribune (see figure 8), the boat would have been able to tie up to a mooring post or stone mooring loop located on the top of the north wall, which is at c. 74.5 m a.s.l. The freeboard of the ship would have enabled the passengers and crew to step on and off the boat with relative ease onto the top of the wall when the inundation lay in the region of 73.5–74 m a.s.l. (see see figure 8). Below this they would have used the stairs. In year 6 of Taharqa's reign with the inundation reaching 74.4 m a.s.l. the passengers would have needed a gangplank to descend from the boat, but even this highest of all marked floods would have left the top of the wall largely dry except for the lapping over of wind and boat-generated waves. In brief, this quayside was very well designed to enable boats to tie up and passengers to embark and disembark via the staircase.

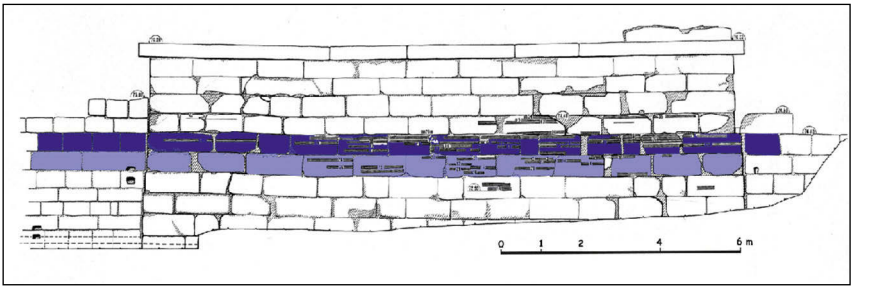

Figure 8. Facade of the western tribune at Karnak with inundation heights; the royal blue course of stones mark the flood heights between c. 73.5-74 m and the grey blue course of stones those between c. 73-73.5 m (after LAUFFRAY, *1971, fig. 6bis).*

3.4 The recent excavations of the SCA (2007-2014)

Over seven years, the Supreme Council of Antiquities surveyed and excavated the area in front of the First Pylon of Karnak Temple. The excavations extended both north and south of the tribune to expose an embankment/quay wall at least 6.5 m high, running roughly perpendicular to the axis of the Amun-Re temple

47 LAUFFRAY, 1971, fig. 6bis.

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(key plan see figure 23).[48] The wall was built of roughly cut blocks of sandstone. The soundings have uncovered over 500 m of its length from north to south.

3.5 Quays north of the Tribune

The extension of excavations north of the tribune (key plan see figure 23) have revealed a second flight of steps integrated into the wall coming down from north to south and facing the steps earlier exposed by Chevrier. Both flights are 1 m wide and 20 steps were revealed in both descending 4.5 m.[49] Augering carried out by Matthieu Ghilardi (CNRS/CFEETK) suggested a platform might exist between the two sets of steps at ~ 69.2 m a.s.l.[50] If a platform does exist, given the freeboard of the large ceremonial boats the king and priests could embark and disembark with ease at levels between the highest inundation down to ~ 68.7 m a.s.l. A stepped gangplank could have assisted (dis)embarkation if the low Nile were even lower.

Different extensions of the embankment were added after the Kushite Dynasty with the reuse of blocks inscribed with the name of a divine votaress Amenirdis from the Twenty-fifth Dynasty being used in the construction. It remained in use until the end of the dynastic period when the Ptolemaic baths were constructed on top of the wall (see below).

3.6 Baths built after Ptolemy VIII and the Roman thermae

Excavations have revealed that the area to the west of the embankment was widely used during the Ptolemaic-Roman period (key plan see figure 23). Different phases of occupation were uncovered, including houses, workshops, and baths.[51] The occupation levels to the west of the embankment continued to a depth of only 1 m next to the wall and were superimposed on different layers of Nile silt. Occupation also extended north-south along the western facade of the First Pylon. It seems most likely that the Ptolemaic buildings were burnt in a large fire at the beginning of the Roman period. On the top level many

48 Boraik, 2010b; Boraik et al., 2013.

49 Boraik, 2010b, p. 72.

50 Augerings HA7 and HA8 were terminated as they hit upon sandstone fragments at 69.22 m and 69.37 m a.m.s.l. respectively (Boraik/Ghilardi, 2011, p. 3213, fig. 8). The 0.15 m difference in height could also suggest that rubble may have been encountered rather than a platform.

51 Boraik, 2010b, p. 73–75; Boraik, *et al.* 2013.

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houses were found with their wooden roof beams burned and almost everything in situ, including pottery, grinding stones, terracotta figurines, oil lamps, tools of daily life, and coins. Among the important discoveries from the Ptolemaic-Roman period – houses, workshops, and industrial activity buildings – three bath complexes were unearthed. Two of them date to the Ptolemaic period and one to the Roman period. The three baths are located to the north of the tribune of Karnak Temple.

3.7 The Ptolemaic Public Bath

The Ptolemaic public bath was found 75 m to the north of the tribune ~ 1.50 m below the modern surface (see figure 9 and key plan see figure 23). Under topsoil at an elevation of approximately 77.20 m a.s.l., a very rich layer of pottery sherds and ceramic debris was encountered, probably the backfill from older excavations. It covered traces of masonry consisting of foundations of fired brick and reused blocks of the dynastic period. It is thought that they belong to a Roman or medieval domestic area. At a lower elevation, 76.64 m a.s.l., in the eastern part of the sounding, a large mudbrick wall was unearthed. It was apparently oriented north-south and associated with other brick masonry visible in the eastern and western baulks. Against one of these mudbrick construction blocks and at a level near the foundation at an elevation of 75.46 m a.s.l., a hoard of 316 coins was discovered. This enabled these mudbrick structures to be dated to the second half of the second century B.C. (Ptolemy VIII Evergetes II ≈ 145 to 117 B.C.). These features most likely sealed the destruction level of the bath.[52] The construction of this massive feature undoubtedly caused the systematic levelling and razing of the older bath, which was only preserved to a maximum height of approximately 0.70 m. The bath itself had been built directly over the uppermost course of the embankment.

The building of the Ptolemaic baths on top of and to the west of the quayside wall points to a westward migration of the river. Furthermore, the lowest point of the furnace serving the baths is measured at 72.46 m a.s.l.[53] Assuming it was constructed to stay dry all year round it provides a proxy for the flood levels of the Ptolemaic period suggesting that the highest floods of the time were somewhat lower than those recorded on the Western tribune during the Third Intermediate Period. This concurs with the large-scale interpretations of two

52 Boraik, 2010b, p. 73; Boraik/Faucher, 2010.

53 Boraik et al., 2013, p. 49 n. 11

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studies, but contradicts Seidlmayer's conclusions.[54] The strontium isotope ratios from a single sediment core taken in the Manzala Lagoon as a proxy for Nile discharge suggest a fall in flood height during the Late Period.[55] Furthermore, a recent meta-analysis of radiocarbon and Optically Stimulated Luminescence (OSL) dated Holocene fluvial units in the Nile catchment suggests that a large scale hydroclimatic shift in the Nile catchment occurred in c.450 B.C. The study argues that after 450 B.C. water levels did not exceed those recorded before 500 B.C.[56]

Figure 9. The bath built after Ptolemy VIII.

The bath was built on a rectangular area, measuring 13 m by 18 m. The building is characterized by circular rooms (*tholoi*).

The floor of the southern room consists of two concentric decorative zones. The inner circle is 2.42 m in diameter and comprises mosaic components of small multi-coloured pebbles (white, red, black, and brown) set in red mortar. It is separated from the bath seats by a second zone which has a white band made of mosaic pieces of white stone flakes. The mosaic floor of the northern *tholos* is made of white stone flakes also set in red mortar and decorated with figures of dolphins and tilapia fish in sequence and a rosette in the centre (see figure 9). Three figures are made of small, coloured pebbles and outlined with lead strips

54 Seidlmayer, 2001, p. 72.

55 Stanley et al., 2003, fig. 2.

56 Macklin et al., 2015.

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that emphasize their shape. From this we can see that the bathing establishment at Karnak stands out for the luxury of its mosaics and wall paintings.

The bath was probably built between the end of the third century and the first decades of the second century B.C. and was therefore only in use for a very short period. It is to date, the southernmost thermal installation known in Egypt and apparently among the oldest archaeologically attested ones.[57]

3.8 The Great Roman Bath

As the excavation extended northwards from the private Ptolemaic bath at the nearby site called El-Hassasna (key plan see figure 23), a Roman bath came to light. These Roman *thermae* are made of fired brick with a floor of large sandstone blocks. It covers some 3000 m^2 with many well-preserved architectural features, such as the bathing pools. Most superstructure walls stand less than a metre high but some wall elements in the substructure are three metres tall. The *thermae* were remodelled and redecorated over what appears to be a long period of use. The Roman bath complex is partially built over late Ptolemaic buildings with the Ptolemaic settlement extending to the north. The *thermae* were probably built during the third century A.D. and were subsequently used for a long period of time.

3.9 Geophysics across North quayside wall

Three short Ground Penetrating Radar (GPR) profiles (G030, G031 and G032 respectively located c. 184 m, 190 m and 205 m northwards from the centre of the tribune) were carried out in February 2013 using a GSSI 200 Mhz antenna in the northern part of the excavated area of the Roman baths (see below). They were conducted in order to see to see if it was possible to identify the continuation of the quayside wall below the excavations (key plan see figure 23).

All of the profiles demonstrated considerable 'ringing' in the data, most probably caused by increased salt content in the soil derived from ground water to the west of Karnak.[58] In spite of this, a number of possible features were noted in the data. These include strong reflections in G030 approximately 14–16 m along the profile to a depth of 2.5–3.0 m, marking the possible location of the top of the quayside wall in the northern area of the MSA excavations of the Roman baths. This feature also appears to be represented in profile G031 as a

57 Bouchaud/Redon, in press.

58 Conyers, 2004, p. 50; Doolittle/Collins, p. 2004, 99.

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faint reflection in the data some 18-20 m along the profile, and in profile G032 some 2–4 m along the profile, starting at a depth of 1.5–2.0 m below the surface of the ground. This work suggests the wall extends over 200 m northwards of the tribune.

An Electrical Resistivity Tomography (ERT) profile (P 14, see figure 23) across the line of embankment wall between the Ptolemaic and Roman baths excavations was carried out in February 2012 with the probes at 4 m spacing providing a vertical resolution of c. 2 m in the resistivity readings. The profile crosses the quayside wall at c. 68 m along the profile length and higher resistance readings are found down to about 12–13 m below the surface or 66–65 m a.s.l. This is a little lower than the level of the platform suggested by Ghilardi's augering between the facing staircases.

3.10 Ramps

Two of the three lateral ramps to the south of the tribune (key plan see figure 23) were investigated during Lauffray's research.[59] The central one was recognized as the work of Taharqa (690–664 B.C.) though the titulary of the king had been chiselled out by Psamtek. Lauffray thought that the ramp of Taharqa was older than the ramp located to the north,[60] but the recent research shows it was the contrary and that Taharqa's building post-dated the ramps which surround it. It is indeed now clear that, to the east, Taharqa's ramp had been inserted in the pre-existing sloping pavement while to the west it was founded on it. The Twenty-fifth Dynasty ramp therefore sloped down less steeply than its predecessors and thus ended originally more to the west, probably at the western limit of the surrounding quays, but this western end is now destroyed.

The recent SCA excavations in this area have found traces of an ancient waterway in the section of the excavation opposite the ramp of Taharqa. This waterway has an east-west orientation, but its base lies above the lower end of the ramp. It indicates that the Nile had shifted westward after the Twenty-fifth Dynasty (see figure 10). Different fragments of inscribed blocks and statues were uncovered and many bronze nails were found in the Nile sediments. The depiction already mentioned of the Karnak tribune with an obelisk, a sphinx, and a kneeling royal statue is engraved on a block found in the Mut Temple (now in the Cairo Museum) and is dated to the reign of Psamtek I (see

59 Lauffray, 1971, p. 101–106; Traunecker, 1972.

60 Lauffray, 1971, p, 103–104.

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figure 4).[61] The presence of a tree between the bark of Amun (i.e., the Nile river) and the tribune may suggest that the course of the Nile was moving westward at that time. However it is not the only possible interpretation of this tree which may also result of an artistic perspective of the background.

Mooring loops were found in the north and south walls of the main ramp for embarkation and disembarkation of the boats.[62] Two scenarios for mooring are possible, either perpendicular to the ramp or Mediterranean fashion tying up alongside the north or south wall bow first at the ramp. This latter seems more likely as the length of the boat would not be restricted. The slope over the upper 9 m of the ramp is slightly steeper than the 'central' ramp, which was measured at 7.5 cm/m. It then steepens to 25.5 cm/m.[63]

It should also be noted that the northern wall of the ramp has a fragment of a hymn and title of ritual that priests had to recite during a ceremony in which they filled theomorphic vases of the Theban triad with water.[64] The ramps may have also been used in a procession of a sacred vase of Amun to access the waters during a festival to mark the end of one year and the beginning of the new one.[65]

Figure 10. The ramps.

3.11 Ground Penetrating Radar (GPR) survey of the ramps

A Ground Penetrating Radar (GPR) area survey (20 x 20 m) was conducted using a GSSI 200 Mhz antenna at the bottom of the ramps in February 2013 in order to determine whether they extended further west below the excavated ground

61 Benson/Gourlay, 1899, p. 258, 378 and pl. XXII (5); Perdu, 2010; Perdu, 2011.

62 Boraik, 2010b, p. 70, 72.

63 Lauffray, 1971, p. 101, fig. 17.

64 Ibid., p. 101.

65 Traunecker, 1972, p. 234–235.

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level. The survey was carried out using traverses spaced at 0.5 m intervals. The GPR data was processed in Reflex2DQuick and GPR Slice software. All profiles were processed to remove background noise, and a regain function was applied to strengthen the deeper responses to the radar signal. All data was then sliced and resampled to produce a series of timeslices through the site (key plan see figure 23).[66]

The GPR survey in area AG006[67] at the bottom of the exposed ramp adjacent to the tribune indicates several linear anomalies running from west to east on the line of the ramp (see figure 11). A single high amplitude linear anomaly [AG006_1] measuring 14 m in length seems to indicate a continuation of the exposed ramp revetment/foundations. Several linear and rectilinear anomalies to the north of this [AG006_2], [AG006_3] mark a parallel wall and possible structural elements [AG006_4] on the north side of the ramp. A fainter anomaly [AG006_5] marks a possible continuation of the exposed southern edge of Taharka's ramp, with other linear anomalies [AG006_6], [AG006_7] and [AG006_8] marking a possible earlier ramp revetment or small structures or platforms associated with the ramp. The results seem to indicate a continuation of the ramp under the alluvium to the west of the exposed structure, and possibly different phases of ramp. These anomalies seem to run up to c.7 m below the current ground level, i.e. 62 m a.s.l. The extension of the ramp may well have facilitated the loading and unloading of the barque of Amun-Re for the Theban festival processions. How far the ramp extended and to what height above sea level it descended is unknown.

66 The survey was carried out by Dominic Barker (Southampton University) and Sarah Jones (Museum of London Archaeology) and the data was processed by Kristian Strutt (Southampton University) as part of the collaboration between the Supreme Council of Antiquities research led by Mansour Boraik and the Theban Harbours and Waterscapes Survey led by Angus Graham. Graham et al., 2013, p. 50–51; Graham/Strutt, 2013, p. 7.

67 Graham/Strutt, 2013, p. 6–7.

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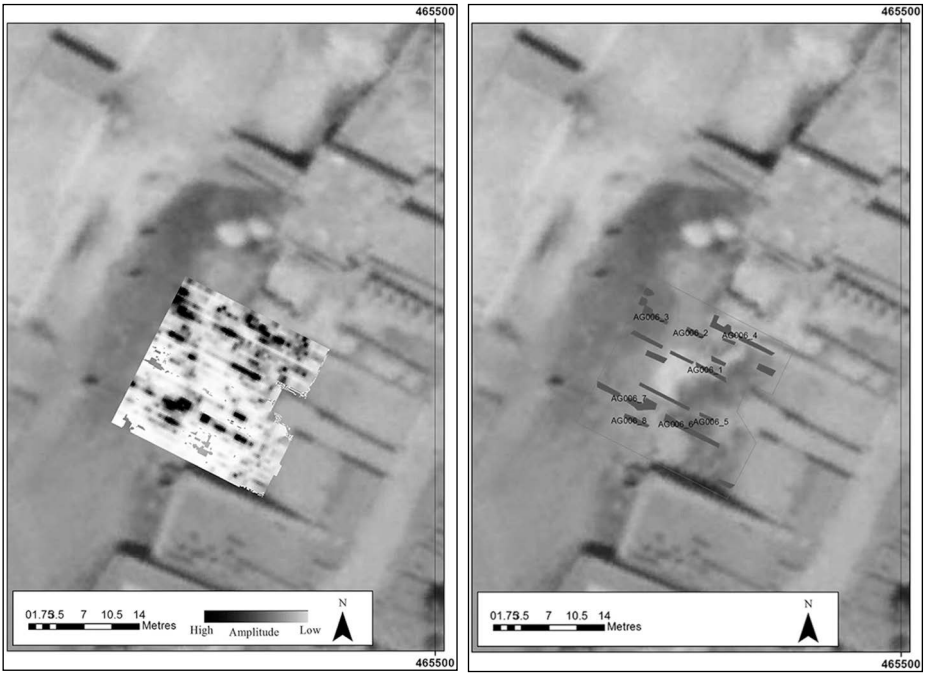

Figure 11. Structures revealed by Ground Penetrating Radar (GPR) in front of the ramps (K. D. Strutt).

3.12 The quay to the south of the tribune and its date

The excavations south of the ramps have revealed the quayside (*key plan* see figure 23) for a distance of around 110 m[68] (see figure 12). Though several phases of building can be identified, the main masonry work seems to date to the Kushito-Saite period (722-525 B.C.), based upon the parallels of the kind of masonry and the chisel marks on the ashlar blocks recorded at North Karnak.[69]

The two upper courses of the wall were constructed after the reigns of Akoris/Psamouthis, 393-380 B.C., with a sandstone lintel bearing their names being reused in the upper part of the wall.[70] Furthermore the stones in the two upper courses of the wall bear evidence of iron chisel marks suggesting a Ptolemaic-Roman date of construction. The uppermost course is characterised by headers

68 Boraik, 2010b, p. 67–69.

69 Gabolde/Rondot, 1993, p. 258–260.

70 Boraik, 2010b, p. 67.

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and the second course by stretchers, whereas the wall built before this addition is composed of headers and stretchers within each course. The height of the wall prior to these two additional courses was measured at 74.40 m a.s.l., which is precisely the same height as the highest flood recorded on the face of the tribune dating to year 6 of Taharka's reign.[71] This is circumstantial evidence suggesting that this may not be a coincidence, but that the exceptional flood was used as a level for the height of the wall (see figure 13).

Two staircases leading from south to north were exposed during the excavations. Again mooring loops were revealed cut into the stone blocks of the wall positioned roughly parallel to the slope of the steps inset into the wall enabling boats to moor at the quay at a range of water levels throughout the annual cycle of the Nile.

Figure 12. The quay south of the tribune.

71 Legrain, 1896; von Beckerath, 1966; Broekman, 2002; Gozzoli, 2009.

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Figure 13. The sondage on west facing side of the wall. The arrow head at the base of the second course indicates the height of the inundation (74.40 m) during year 6 of Taharka's reign. Note the second course is made up of stretchers and the upper course is a series of headers. (photo: A. Graham, February 2007).

3.13 The southern extension: the double-curved quay

Further south, an extension of the embankment in the shape of a double curved quay was discovered during the work undertaken next to Neferhotep's temple (key plan see figure 23).[72] As mentioned before textual sources may indicate that this wall was built by Montuemhet, Fourth prophet of Amun under the reign of Taharqa. To the west of the Ram Avenue in front of the Khonsu Temple, an extension of this embankment wall was discovered. This extension was built with small squared off blocks of sandstone and curved south toward the Avenue (see figure 14). This indicates that the Karnak complex was then on land partly protruding to the west and had been framed by this huge embankment intended to protect it from the flood erosion.

72 Neferhotep's temple has been dated to Ptolemy IV through a nearby naos, which however was not in situ. Barguet, 1962, p. 10–11; Porter/Moss, 1972, p. 224–225; Goyon/Traunecker, 1982, p. 300 and n. 3; Thiers, 1997, p. 264. For the reliefs of Ptolemy IV, see Lepsius, 1849, Bl. 15, b-c.

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Figure 14. The double curved wall under Neferhotep's temple (view towards the south-west).

3.14 The quay of the island west of Nectanebo's dromos (Saïte ?)

Another part of a wall going under Nectanebo's sphinx-lined avenue was found (see figure 15 and key plan see figure 23). This embankment can be roughly dated to the Kushito-Saïte Period, based on the shape and workmanship of the blocks.[73] Interestingly, the slope of the masonry clearly shows that it represents the embankment on the eastern side of an Island.

Figure 15. The quay of the island west of Nectanebo's dromos (view towards the south).

3.15 Stratigraphical observations related to Nectanebo's dromos

The excavations have revealed the complete absence of older layers under Nectanebo's dromos. The excavators only encountered Nile mud from Nile

73 Gabolde/Rondot, 1993, p. 258–260.

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silting.[74] The first conclusion to draw from this observation is that the road to Luxor in Hatshepsut's time was certainly not yet there, and most probably lay 100 m to the east. The second conclusion is that Nectanebo's dromos apparently occupied for its greatest part an abandoned channel of the Nile, a great opportunity which provided the king with a long strip of free land (2 km long) perfectly suitable for a new road.

3.16 The channel traces on Nectanebo's dromos

The filling up of the depression on which the monumental 2 km long dromos of Nectanebo I (380-362 B.C.) was installed, straight from the Mut temple complex to Luxor temple, was obviously not stabilised over its total length and, in some places, the pavement sunk down tens of centimetres. This resulted in the appearance of some sort of incidental ramps, subsequently incised by deep wheel marks (see figure 16).

Figure 16. The raising of the pavement on Nectanebo's dromos.

3.17 The processional road to Luxor Temple

In the precinct of Mut the discovery in 2000 by team of Richard Fazzini (Brooklyn Museum) of a gate of Hatshepsut opening to the west in the north-

74 Boraik, 2010a, p. 51 and personal observations.

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west sector of the precinct (key plan see figure 23)[75] is of some interest to our discussion as it is likely to have opened on the processional road to Luxor, as has already been mentioned.

3.18 The processional road and tribune of Montu Temple

An extant tribune was built, certainly by the Twenty-sixth Dynasty, at the northern end of the Montu dromos (key plan see figure 23).[76] However, augering approximately midway between the tribune and the Montu enclosure has revealed that this area of North Karnak was still part of the Nile channel, certainly during the Middle Kingdom, and perhaps until the early New Kingdom. The ceramic fragments in the lower fining upwards sequences of Auger Site 2 (AS02, see figure 23) had been dated from the Middle Kingdom to the Second Intermediate Period with one sherd dated to the early New Kingdom.[77] However, a re-examination of the fragments in these lowest levels reveals that they are too rolled to be certain about their date. The fabrics are known from the Middle Kingdom to New Kingdom and probably later leaving the dating of the channel less precise.[78] It is not clear where the tribune (if there was one) of Amenhotep III was constructed. It remains a possibility that it was in the location of the extant tribune, but it could have been closer to the Temple of Montu.

3.19 The gate of Ptolemy XII Neos Dionysos

A gate of Ptolemy XII Neos Dionysos (≈ 81–59 and 56–52 B.C.) was discovered at the west end of the east-west dromos running westward from Mut temple, close to its intersection with what was the Chevrier/Legrain drain (see see figure 22 and key plan see figure 23).[79]

The continuous pavement of the road from Mut temple to that west end clearly shows that the previous island had then been joined to the right bank and

75 Fazzini, 2001, p. 61–74.

76 Pillet, 1924; Varille, 1943, p. 1 and pl. III [2–3]; Cabrol, 2001, p. 571–579.

77 Graham/Bunbury 2004; Graham/Bunbury 2005; Bunbury et al., 2008; Graham, 2010a, p. 134.

78 The ceramic fragments were re-examined by Marie Millet (Le Louvre) and Aurélia Masson (British Museum) in 2009 using the fabric collection from their 2001–2007 excavations at Karnak as a reference.

79 Boraik, 2010a, 46, Boraik, Thiers, 2015, 51-62.

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that the new eastern embankment of the river had been shifted westward a little further towards the place where the gate was discovered.

4. The geoarchaeological data

4.1 Auger (AS16) in front of the tribune

In the 1890s Legrain excavated to a level 10 courses below the protruding course of the tribune (see see figure 5), reaching a height of c. 71 m a.s.l.,[80] in order to record the Nile levels on the face of the tribune. Chevrier's[81] excavations in the 1940s had reached the slightly greater depth of c. 70.50 m a.s.l.

Figure 17. Chevrier's 1940s excavation in front of the western tribune. The two mooring rope loops in course four and five are visible. The pump is located at c.70.50 m, five masonry courses below the stone loops (Photo no. 6112 ©CFEETK).

80 Lauffray, 1971, p. 85.

81 Chevrier, 1947, pl. 48.

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A hand auger (AS16),[82] carried out 1.54 m from the face of the tribune starting at 72.40 m a.s.l., reached a depth of 3.79 m down to 68.61 m a.s.l. when an obstruction terminated the work. Throughout the augering were found chronologically heterogenous ceramic fragments ranging from the Middle Kingdom to the Roman Period. All of the material was angular in terms of its wear pattern and not rounded by water transport. The only rounded sherds were cores from large coarse-ware vessels. The first 1.90 m was clearly Twentieth century backfill from excavations. Sample 09 with its bimodal light yellowish brown (2.5Y 6/4) desert sand and very dark greyish brown (10YR 3/2) mud would appear to mark the contact between the backfill and the unexcavated sediment at about 70.25 m a.s.l., which accords well with the excavations of Lauffray and Chevrier. Below this we have evidence of well-sorted silty sand/sandy silt water-lain deposits and well-sorted muddy sand; the ceramic fragments point to a *terminus post quem* date of the Roman Period.

4.2 Auger (AS39) behind the embankment

Auger Site 39 was undertaken at the base of a SCA/MSA excavation conducted under the direction of Boraik on the south side of the tribune, immediately behind the embankment wall.[83] The height at the top of the auger was 70.85 m a.s.l., terminating at 67.0 m a.s.l. due to pressure of the groundwater. AS39 aimed to investigate the process and chronology of the construction of the embankment wall.

The excavated sections revealed a Late Roman Period cut made behind the wall, which may have been an attempt to get to a foundation deposit at the corner of the tribune and the embankment wall. Such practices have been observed in several locations in the temple of Karnak. Unfortunately this hole may have destroyed any foundation trench that might have been present to the east of the embankment.

Primae facie it would seem that we have a sandbar or levee at the location of the tribune during the Middle Kingdom (see table 1). This finding has potentially considerable implications for understanding the position of the tribune and its possible date. However, with only a single auger on the east side of the embankment wall and a clear gap in the auger data between this location

82 AS16 was carried out in February 2004 by Morag Hunter (University of Cambridge) and Angus Graham (University College London) as part of the Karnak Land- and Waterscapes Survey directed by Angus Graham and Judith Bunbury (University of Cambridge). The ceramic fragments were studied by Sally-Ann Ashton (Fitzwilliam Museum, University of Cambridge).

83 Graham et al., 2012, p. 41.

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and the fifth pylon to the east and the court of the Opet Temple to the south it is difficult to clearly understand what this represents. Could it be a bar off the west side of the early island of Karnak? Could it represent the continuation of the bar deposits identified in the Opet Temple court augering? The ERT profile (P 3 see see figure 23) between the Khonsu temple and the 10th pylon court and hand auger along the profile revealed that a backwater or slough lay between the two areas during the First Intermediate Period.[84]

It also raises the question of when the tribune could have been constructed. The sandbar at the level it was would have been submerged for much of the annual cycle during the Middle Kingdom to early New Kingdom period.

Height m a.m.s.l.	Sedimentary description / interpretation		Chronological information
70.85	Backfill into the excavation		
70.50	Muddy, moderately sorted fine (sometimes very fine) sand with clasts of sandstone and concretions, sherds, quartz, and limestone. Small numbers of granite, dolerite, diorite, bone, flint, and shell fragments also occur		70.50 New Kingdom The ceramic fragments were mainly typical of the New Kingdom and not earlier than Thutmose I
			68.86 Middle Kingdom – New Kingdom
69.50	Muddy medium and fine sands with an even greater variety of clast types.		
68.30 67.00	A unit of less muddy, fine to very-fine sands that may represent levee or sandbar deposits		68.30 Middle Kingdom – early New Kingdom From identified fabrics, the bulk of the material is from the Middle Kingdom – early New Kingdom prior to the reign of Thutmose I. Fragments were less frequent and medium to medium-high rolled

Table 1: Sedimentary description/interpretation and chronology of Auger Site 39.

84 Graham, 2010b.

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4.3 Was the quayside part of a harbour basin?

The tribune and quayside wall exposed by Chevrier have previously been reconstructed as part of a harbour basin connected to the Nile by a canal.[85] Such a reconstruction has been influenced by the scene in the tomb of Neferhotep (TT49, see see figure 2). However, following two hand augers carried out in front of the wall – one to the south (AS31) and one to the north of the tribune (AS34)[86] – it can definitively be stated that the quayside wall was not part of a semi-enclosed basin but that it had been in direct contact with the Nile. If it had been in a semi-enclosed basin, one would have expected to find very fine sediment (silt and clay-sized particles) in the augers.

In AS31 fine sand was recorded throughout the auger cores. The sediments in the first 1.95 m (samples 01-17) down to 69.22 m a.s.l. are mostly fine sandy silt with some silt deposits. They are all well-sorted and deposited by the river. Below this a water-lain package of sands with medium sand at the base fining upwards to fine sand (samples 18-21) was recorded. These fining-upwards sands are typical of sandbar formations in the Nile. This lateral bar appears to have formed during the construction process. In samples 18–21 >20 % of the total core weight is fragments of sandstone, believed to be debris from dressing the stone blocks. An increased percentage of sandstone fragments at 70.05 m a.s.l. (sample 08) may represent a further dressing of the wall suggesting the wall was constructed over a number of years.

This interpretation is supported by the auger north of the tribune. The deposits encountered were all fining-upwards sand and silt packages with abundant yellow sandstone. The deposits in AS34 are generally finer than those recorded in AS31. This is consistent with the water being a little slower to the north of the tribune and can be understood by the curvature of the revetment wall. The tribune is the furthest westerly point of revetment wall and hence the water would have been slacker to the north of it.

85 For example Aufrère et al., 1997, p. 82–83, 86–87.

86 AS31 and AS34 were carried out as part of the collaboration of the SCA research excavations led by Mansour Boraik and the Karnak Land- and Waterscapes Survey led by A. Graham and J. Bunbury. AS31 was conducted at the base of the SCA sondage against the wall in the 'Madrasa site' excavations by Angus Graham, Romain Mensan (Cfeetk), Shima Montasser Abu El Haggag (SCA) and Rosemary LeBohec (Cfeetk) in February 2007. AS34 was carried out by Angus Graham, Judith Bunbury and Salah El-Masekh (SCA) in February 2008. Aurélia Masson and Marie Millet studied the ceramic fragments from both AS31 and AS34.

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Dating the quay is more problematic. The study of the ceramic fragments in AS31 and AS34 has not led to definitive evidence of the date of construction of the wall. In AS31 there are in fact only 128 sherds > 4 mm in size in the whole core, which is a relatively low mean number of fragments per metre of depth. The sherds are heavily abraded, which is consistent with the coarse sediment matrix. Most of the material is dated to Middle Kingdom to Roman Period (MKRom), the abraded nature making tighter dating not possible. However, there is also material from the end of the Third Intermediate Period to Ptolemaic Period. There is no material specifically from the Middle Kingdom, New Kingdom, early Third Intermediate Period (Twenty-first – Twenty-second Dynasties), Roman or Late Roman Periods. The material dating from the end of the Third Intermediate Period (Twenty-fifth Dynasty) to the Ptolemaic Period suggests a terminus post quem for the construction of the wall. A late Third Intermediate Period/early Late Period date of construction (Twenty-fifth – Twenty-sixth Dynasty) would be contemporary with some of the later flood records on the western tribune.[87] An earlier construction date could not be ruled out as early Third Intermediate Period material may be present in the abraded MKRom corpus.

This conclusion is supported by the two deep water wells that were dug in 2009 with the support of the American Research Center in Egypt.[88] Remains of acacia wood were found at a depth of 17 m (z = 56 m a.s.l.). In the framework of a convention signed with the Institut Français d'Archéologie Orientale du Caire, ^{14}C testing was conducted, which indicated that these samples date to the New Kingdom (≈ 1494-1402 B.C. that encompasses the reign of Thutmose III). It is suggested that the river bed in the time of this king lay between 54.82 m and 58.82 m a.s.l.[89] Furthermore, it has been argued that this wood is from the remains of a wrecked boat, which sank down to the river bed. However, it needs to be stated that the dating of the wood does not date the time the boat sank as the boat may have had a considerable working life or the timber may have been reused in another younger vessel. Thus this finding does not conclusively prove that the river was in this location during the reign of Thutmose III.

87 Broekman, 2002; Legrain, 1896; von Beckerath, 1966.

88 Boraik et al., 2010; Boraik/Ghilardi, 2011; Boraik et al., 2012.

89 Gabolde, in press.

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4.4 Conclusions on the western layout in the late New Kingdom, Kushite and Saite ages

To sum up, the recent excavations in front of Karnak show that, in the Late Period, the embankments did not form part of a basin, as it was probably the case earlier, following the depiction of the New Kingdom tomb of Neferhotep (TT49, ≈ 1300 B.C.). The Eighteenth Dynasty basin may well have been located in front of the Second Pylon in what is now the First Court. It seems possible that an area of low lying (marshy?) ground in this area was augmented and reshaped by the Egyptians to construct a basin and that a channel was dug to the Nile. This area of Karnak may have been the in-filled backwater observed in the augering and ERT profile (P3, see see figure 23) between the Khonsu temple and the court of the Tenth pylon[90] and also a previous auger (AS11) shows evidence of this backwater environment just west of the court of the ninth pylon.[91] Further geoarchaeological investigation is required in this area to clarify this hypothesis.

Returning to the massive wall running south and north of the extant western tribune, we suggest that the wall had two principal functions. Firstly, it was used as a quay to enable boarding and disembarkation of boats via the four staircases exposed thus far. The stairs are too narrow to safely load and unload the bark shrine of Amun on to his boat. However, the lateral ramps immediately south of the tribune provide a wide enough space to be able to load and unload the bark shrine for Amun-Re's journeys during the Opet Festival and Beautiful Festival of the Valley. This massive wall may well have also been constructed as a defensive measure in order to protect the temple complex against the erosive action of the river in flood. It would not have served to prevent water entering the temple precinct as water would still enter the temple by a rise in the groundwater level subject to the height of the inundation. It may have been constructed in response to an observed westward migration of the river and built as a barrier to prevent the river eroding the site of Karnak.

The extent of this massive wall reveals it to be a large-scale project. The aesthetic function of such a huge well-constructed wall should also been borne in mind. When the river was low it would have provided an impressive framing of the western extent of the site. Did it also serve as a clear boundary between the sacred space of Karnak and rest of the world?

The sandstone chippings found in the augers attest to more than one phase of construction and dressing of the stones in the wall. The findings of AS39 and the

90 Graham, 2010b.

91 Graham 2010a, p. 135–136, fig. 11.

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recent excavations raise the possibility that the first phase of construction of this embankment began during the late New Kingdom. However, until the level of the base of the wall is known and further augering is carried out this proposition remains inconclusive. We propose that a subsequent phase of the wall was built by Taharqa in the Twenty-fifth Dynasty to the level of his year 6 inundation with his work on the area clearly attested by the central ramp. A further vertical extension of two further courses took place in the Ptolemaic Period.

5. Conclusion

The variety of data presented in this paper reveal numerous features in many geographical areas and belonging to different periods. We attempt here to sort them by date in order to propose a provisional and hypothetical view of the evolution of the temple's embankments, the relationship to the migration of the Nile, and the existence of channels and islands at the following epochs:

5.1 Hatshepsut-Thutmose III

A tribune was apparently located to the west of the "festival court" as can be postulated after the indications of the "Chapelle rouge".[92] The Nile or a canal must have flowed more or less parallel to the west walls of the court of the seventh and eighth pylons as was first suggested by Legrain[93] and more recently supported by the augering programme of Graham and Bunbury.[94] It is very likely that remains of the old eastern branch of the Nile had transformed into a backwater marshland to the north and the east. To the south, a slough lay between the main body of Karnak and a western bar upon which the Opet and Khonsu temples were subsequently founded.[95] The procession road to Luxor was following the axis of the seventh and eighth pylons, the dromos of Mut and then another dromos to Luxor located slightly west of the Hatshepsut door found at Mut temple.

The northern extent of the bar on the west side of Karnak depicted in figure 18 is conjectural. Furthermore, the extent of the backwater on the east side of Karnak is not yet fully determined. Further investigations are necessary to clarify both these features of the Karnak landscape during the mid Eighteenth Dynasty.

92 Lacau/Chevrier, 1977, p. 170, § 227; 185, § 263.

93 Legrain, 1906a, p. 112; Legrain, 1906b, p. 141.

94 Bunbury et al., 2008; Graham, 2010a; Graham, 2010b.

95 Graham, 2010b.

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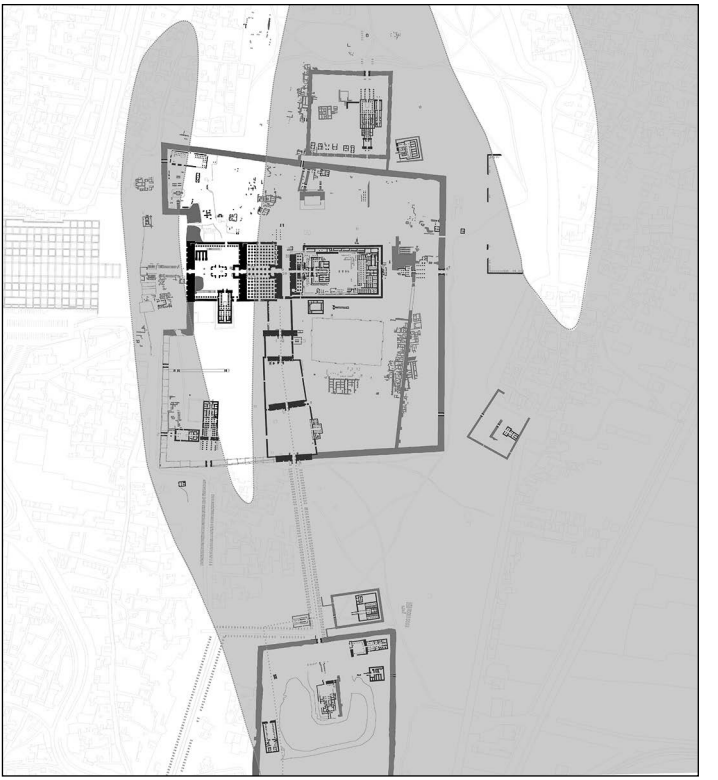

Figure 18. Hatshepsut-Thutmose III. Based on the cartographic fund of the architectural and topographical unit of the USR 3172 of the CNRS at Karnak (© CFEETK).

5.2 Tutankhamun to Ramses III

There is a scenario which presents the possibility of matching the representation of the Nile in Neferhotep's tomb with the geomorphological data: the former backwater of the Nile may have been transformed into a rectangular basin. Consequently a canal connecting the basin to the Nile might have been dug through the old bar. The location of the tribune slightly west of the second pylon and the location and dimensions of the basin as well as the position and geometry of the island to the west are hypothetical reconstructions.

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Figure 19. Tutankhamun. Based on the cartographic fund of the architectural and topographical unit of the USR 3172 of the CNRS at Karnak (© CFEETK).

5.3 Twenty-fifth to Twenty-sixth Dynasties

With the Twenty-fifth to Twenty-sixth Dynasties, the data available are more abundant as numerous traces of the embankments, tribunes, protective walls and quays have from place to place survived. The western tribune is still there, the quays north and south of it are preserved to a great extent, the double curved wall (possibly of Montuemhat) protecting Khonsu and Opet temples still shows remains of its lower courses. Last but not least, remains of the eastern quay of the island which lay west of Karnak are still preserved near Nectanebo's dromos. To the north, a stone masonry tribune was built, possibly by order of a king Psamtek, on the axis and along the dromos of the temple of Montu. The location

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and area of the basin fronting the tribune at North Karnak are conjectural and require further work to clarify this.

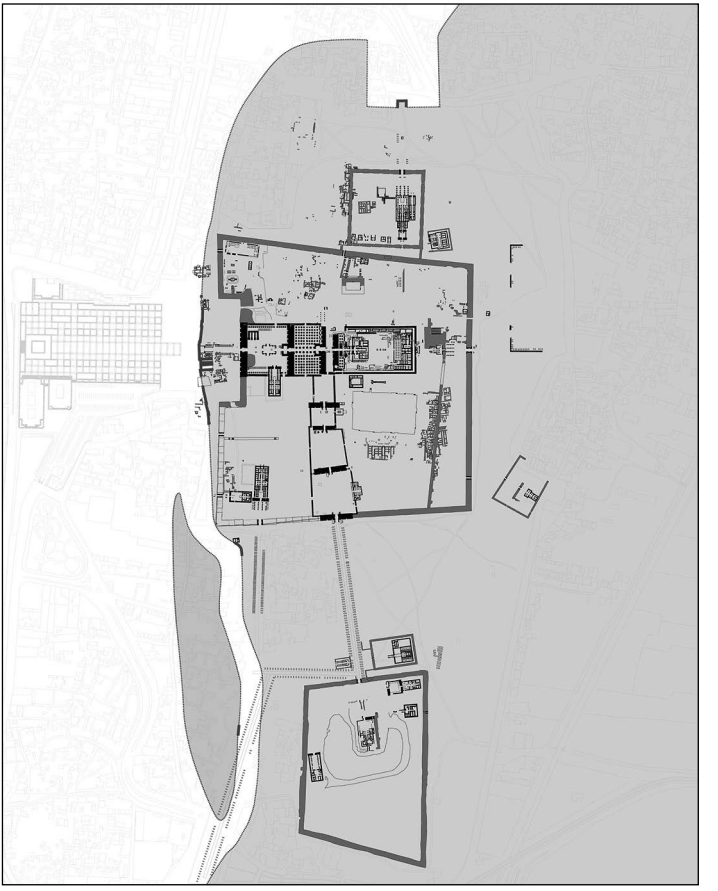

Figure 20. Twenty-fifth to Twenty-sixth Dynasties. Based on the cartographic fund of the architectural and topographical unit of the USR 3172 of the CNRS at Karnak (© CFEETK).

5.4 Nectanebo and early Ptolemies

The Saite channel appears to have been progressively filled up, providing new land and giving the opportunity to trace a monumental dromos straight to Luxor temple. At the same time, the westward Nile migration created a new channel (the "canal of Amun"), and a new island (dedicated to Amun and named *Tamaut*)

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as recorded in the archive of Hermias's trial. Again the location and geometry of the island to the west of Karnak remain conjectural.

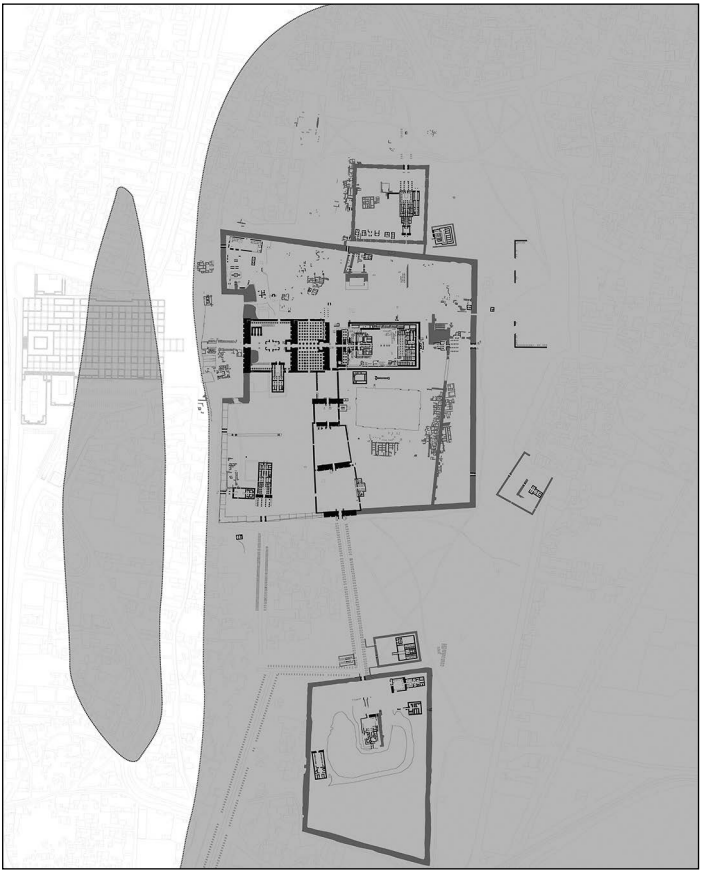

Figure 21. Nectanebo and early Ptolemies. Based on the cartographic fund of the architectural and topographical unit of the USR 3172 of the CNRS at Karnak (© CFEETK).

5.5 End of Ptolemaic and Roman ages

The canal of the Ptolemaic Period silted up and under Ptolemy VIII at the earliest, the old quay was partly dismantled and the baths were built over it and dumping over the wall took place in order fill up the former channel. The river bank had already migrated westwards. The position of the river bank and the island are conjectural.

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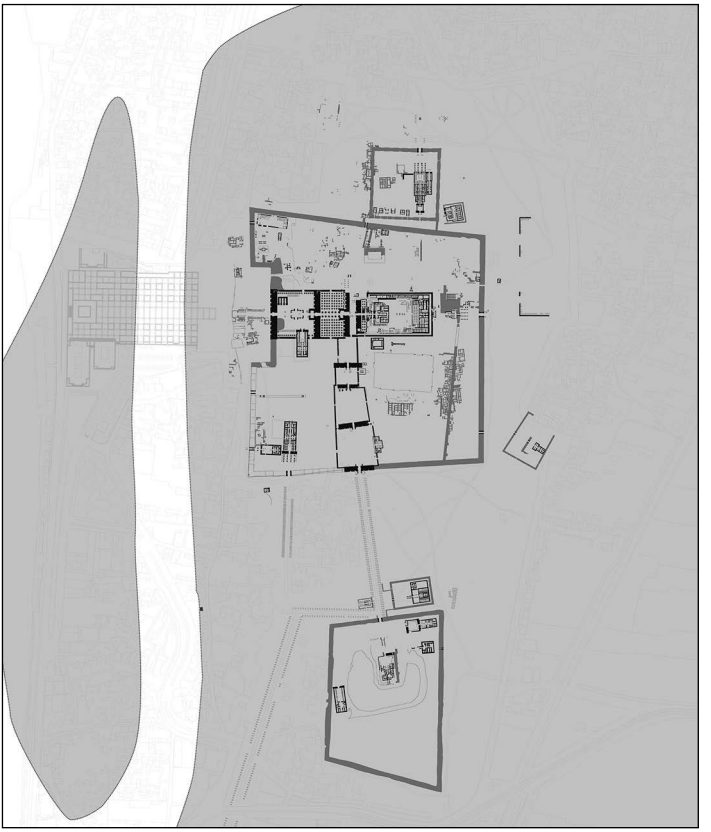

Figure 22. End of Ptolemaic and Roman ages. The gate of Ptolemy XII, which suggests the position of the embankment to the west end of Mut dromos, is indicated by a small black dot. Based on the cartographic fund of the architectural and topographical unit of the USR 3172 of the CNRS at Karnak (© CFEETK).

The five views of the evolution of the embankments of the temple of Karnak presented above are based upon current archaeological, geoarchaeological and textual interpretation, but remain conjectural. Further geoarchaeological survey is required to clarify the views presented.

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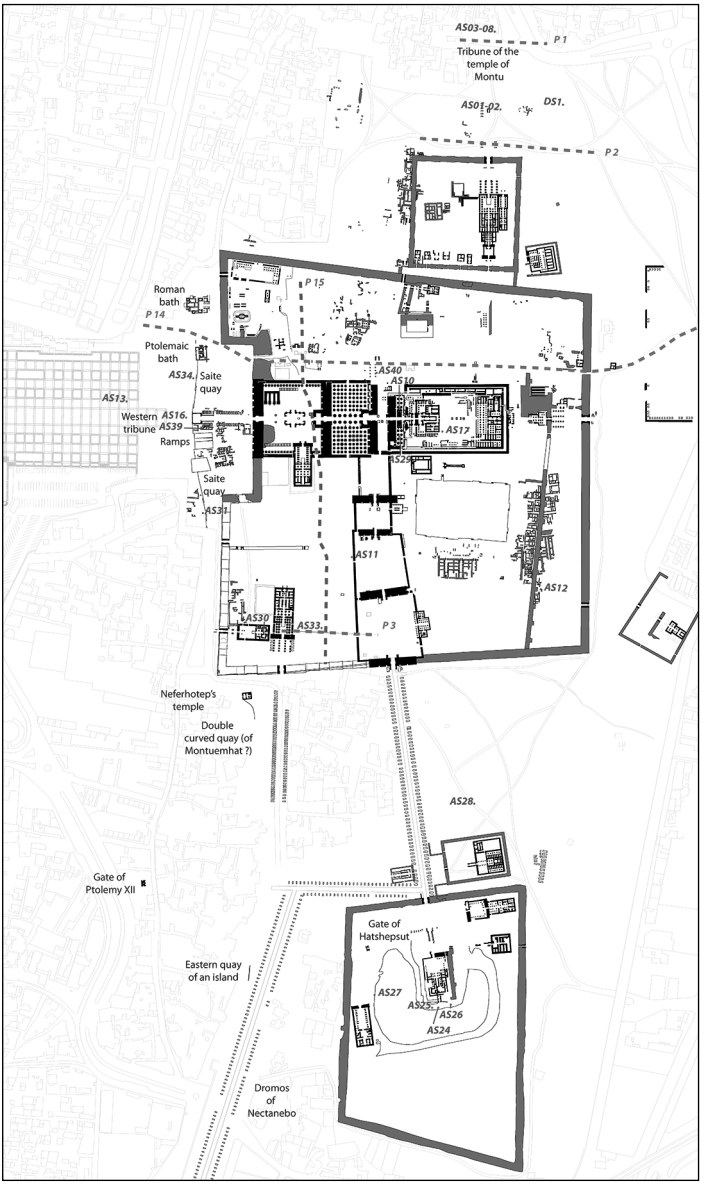

Figure 23. Key-plan of the temples of Karnak with indication of the archaeological units and of the augering sites. Based on the cartographic fund of the architectural and topographical unit of the USR 3172 of the CNRS at Karnak (© CFEETK).

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