94

WATER MANAGEMENT IN TAK'ALIK AB'AJ, RETALHULEU: THE EVIDENCE OF PREHISPANIC CANALS

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Water is one of the most important elements for any given society: its presence may be beneficial but it may as well be the cause of serious problems. Therefore, ancient man efficiently took advantage of this resource by building hydraulic projects with different functions, like for example directing water in the rainy season, or irrigating the growing fields, for household supply, or reservoirs for the dry season.

In Mesoamerica, evidence of different types of water management systems has been identified, which varied in their construction techniques according to the needs of each given place. Examples of such systems have been found and identified in sites like Izapa, where cobble canals used to drain rain waters out of the plazas and in turn direct them to a water hole or *aguada* (Lowe et al. 1982:77). At San Lorenzo Tenochtitlan, the Olmec people had ditch systems with one-piece carved stone features that joined together the lateral stones and the base, and which had, additionally, a cover stone or lid (slab; Coe et al. 1980:118). At Edzna, there was a system of canals connected to a circular ditch similar to a moat, which supplied and transported water to the site center (Matheny et al. 1983:68).

At Kaminaljuyu, irrigation canals were discovered in association with growing fields located south of Lake Miraflores, and these have evidenced hydraulic falls aimed at slowing down the speed of water, as well as a sluice system (Barrientos 1999; Valdés and Hatch 1996). Likewise, the Mound of La Culebra revealed a draining ditch built only with slabs placed one on top of the other to form the walls and the canal bed, with no evidence of stone covers (Ortega et al. 2001:37).

In Tak'alik Ab'aj, the hydraulic systems found served the following two functions:

- Fresh water supply to residential areas, presenting different methods for the control of this resource, such as for example not too pronounced slopes, elevations or hydraulic falls located at a certain distance to slow down the speed of water, ramifications and settling basins.

- The second function would be represented by drainages, for water evacuation; these were placed adjacent to plazas, terraces and structures, and featured steep drops, presenting construction variants such as the use of stones placed both vertically and horizontally, the use of wedges, and stones that served as beds.

The investigations conducted at the site since 1987 and to our days have reported a total amount of 25 canals distributed most of them within the area comprised by the Archaeological Park (22 blocks). They were found in association with buildings like Structure 7 (Schieber 2001; Marroquín 2002, 2003, 2004); Structure 12 (Balcárcel 1989); Structures 13 and 61 (Wolley 2000); Structure 67 (Schieber 1999, 2000 and 2002), and Structure Sub 3 (Schieber 1991); likewise, other ditches were identified, associated with the plazas of Terraces 2, 3 and 4 (Schieber 1998 and 2004; Marroquín 2002 and 2004; Jacobo 1998), as well as in some residential areas of the site (Figure 1).

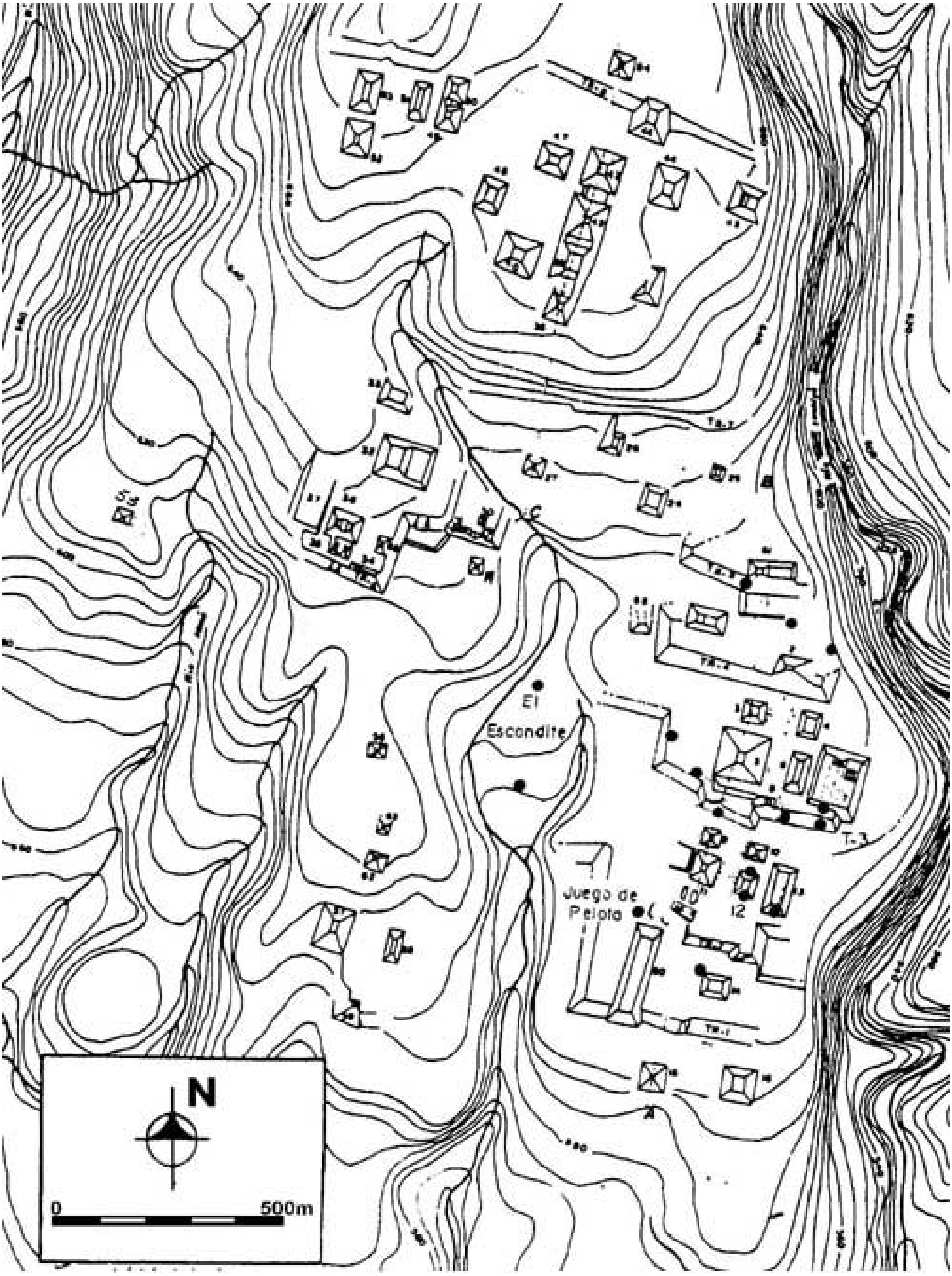

Figure 1. Map of the archaeological site of Abaj Takalik showing the location of water canals found at the site (*; taken from Johnson and Pope 1983).

CONSTRUCTION SYSTEM USED IN WATER SUPPLYING CANALS

To elaborate these ditches a cut was made in the bedrock *(taxcal)* with two different types of cuts found:

- One in the shape of a set square (because of the ground slope in this area) where one wall of the vertical cut substituted the function of a lateral stone (Figure 2a).

- The second type of cut features a “U” shape, placing and leaning lateral stones in a vertical position against the walls, on top of which there was a cover stone with a plaster or sealing of ground *taxcal* that protected the ditch; the bed on which water flowed was the plain *taxcal* (Figure 2b).

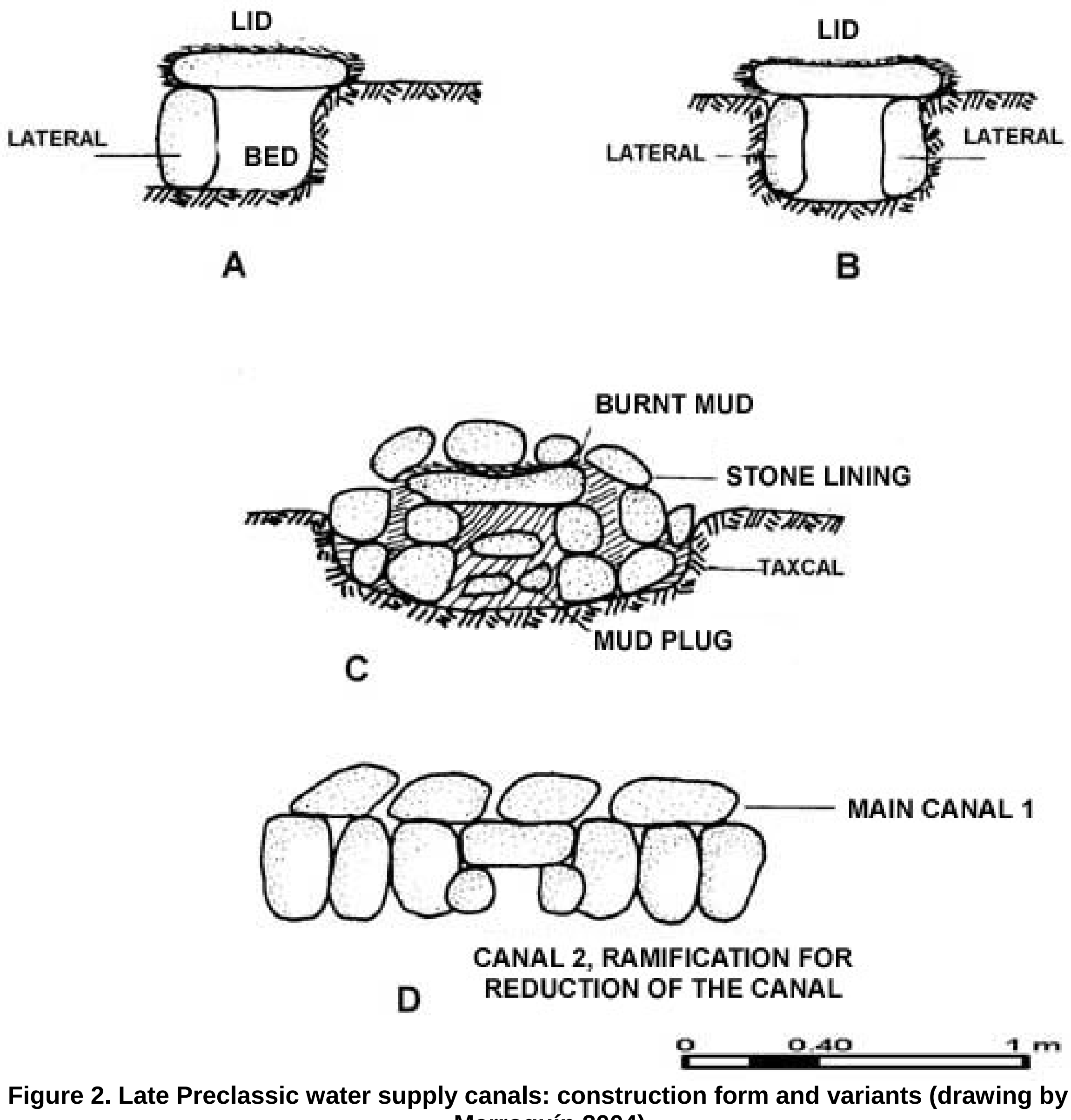

Figure 2. Late Preclassic water supply canals: construction form and variants (drawing by E. Marroquín 2004).

One example of this system was identified in the ceremonial compound known as “El Escondite”, which revealed a water distribution center integrated by six ditches built at different times during the Late Preclassic period (300 BC – 250 AD; Figure 3). The first construction stage corresponds to the construction of Canal 3, adjacent to which Canal 2 was built; the use of both was discontinued by means of several artificial levelings that raised the ground on which a floor made of stone and *taxcal* was laid. In this new stage, a compound integrated by four walls was built, with a plain stela at the center (No. 56) and a plain altar (No. 29); Canal 1 is adjacent to it, presenting a known length of 60.30 m and a width of 0.80 m, with a 4.08 m drop. The itinerary of the ditch is not entirely straight but instead, it shows a zigzag shape and falls that suggest the intentionality to slow down the power of the water current.

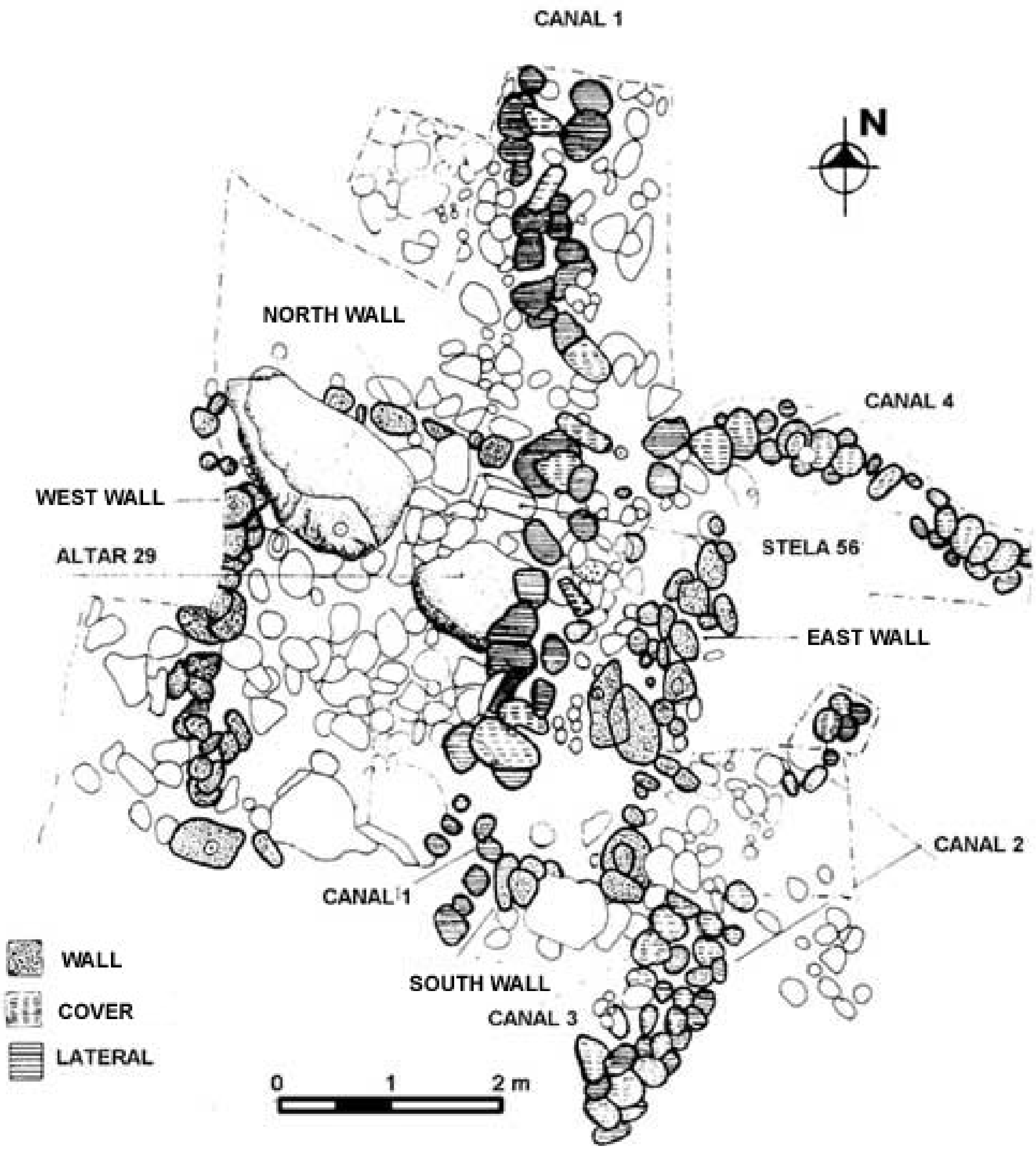

Figure 3. Ground plan showing the Ceremonial Center “El Escondite” and Canals 1, 2, 3, and 4 (taken from Schieber 2000).

There is a branching that starts on the east side of Canal 1 (Canal 4) with a southeast orientation; 24 m north of the compound two additional ramifications were documented, with an east and southeast orientation (Canal 5 and 6). It should be noted that inside this ditch and its ramifications there were traces of sediments approximately 6 cm to 8 cm thick, with fine layers of yellow sand, blue, ceramic fragments and small stones dragged by water.

Ditch 1 passes in front of a residence located 5 m southwest of the compound, called “Casa El Escondite”, and 10 m to the south there were remains of an additional residence denominated “Casa Grande El Chorro”, where water was stored in a settling basin into which the canal flowed. Here, two deposits of offerings were found consisting of clay vessels (dishes and bowls) placed in some kind of niche or cavity worked on the natural soil (Schieber 1997, 1998 and 2000).

One variant in the construction form of this type of ditches was to place the lateral stones in a horizontal position (a double row), possibly for a greater stability. This was covered with burnt mud, on top of which a pavement that covered the entire canal was laid (Figure 2c). This variant occurs in the sector known as the brook of El Chorro, 74 m south of the compound “El Escondite” where a pavement was discovered, fully covering a ditch that probably supplied this habitational sector (Schieber 2003).

This ditch presents a ramification to the east (Canal 2), with evidence of use of a method of control of the water flow, using one lateral wall of Canal 1 as the covering of Canal 2, thus reducing its flow (Figure 2d). This method for water control may be corroborated by the dimensions present in the flow of the major ditches, which are larger (0.25 m wide and 0.30 m tall), with ramifications that drop to a half.

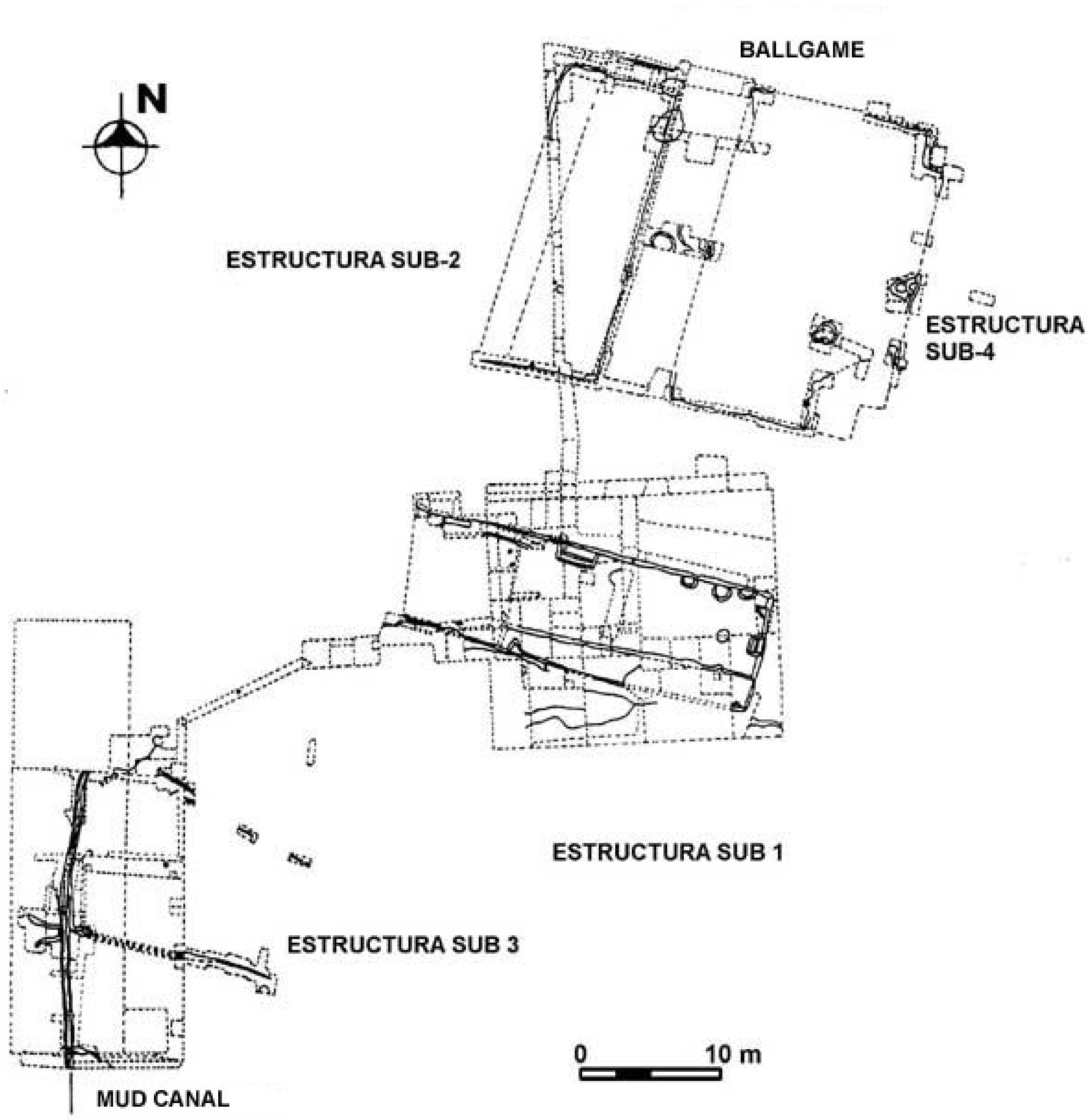

Figure 4. Ground plan of the Ballgame showing the localization of the mud canal (taken from Schieber: 1994).

CONSTRUCTION SYSTEM USED IN DRAINAGE DITCHES

Two variants are identified in this type of ditches: ditches carved in mud, and stone-built canals. The canals carved in mud built during the Middle Preclassic period found the succession of two mud canals associated to Structure Sub 3 south of the Ballgame, which were carved in the foundation and had a known extension of 23 m, curve divergent walls and a flat bottom 0.50 m wide, a depth of 0.20 m, and a 1.10 m drop (Figures 4 and 5; Schieber 1991 and 1994).

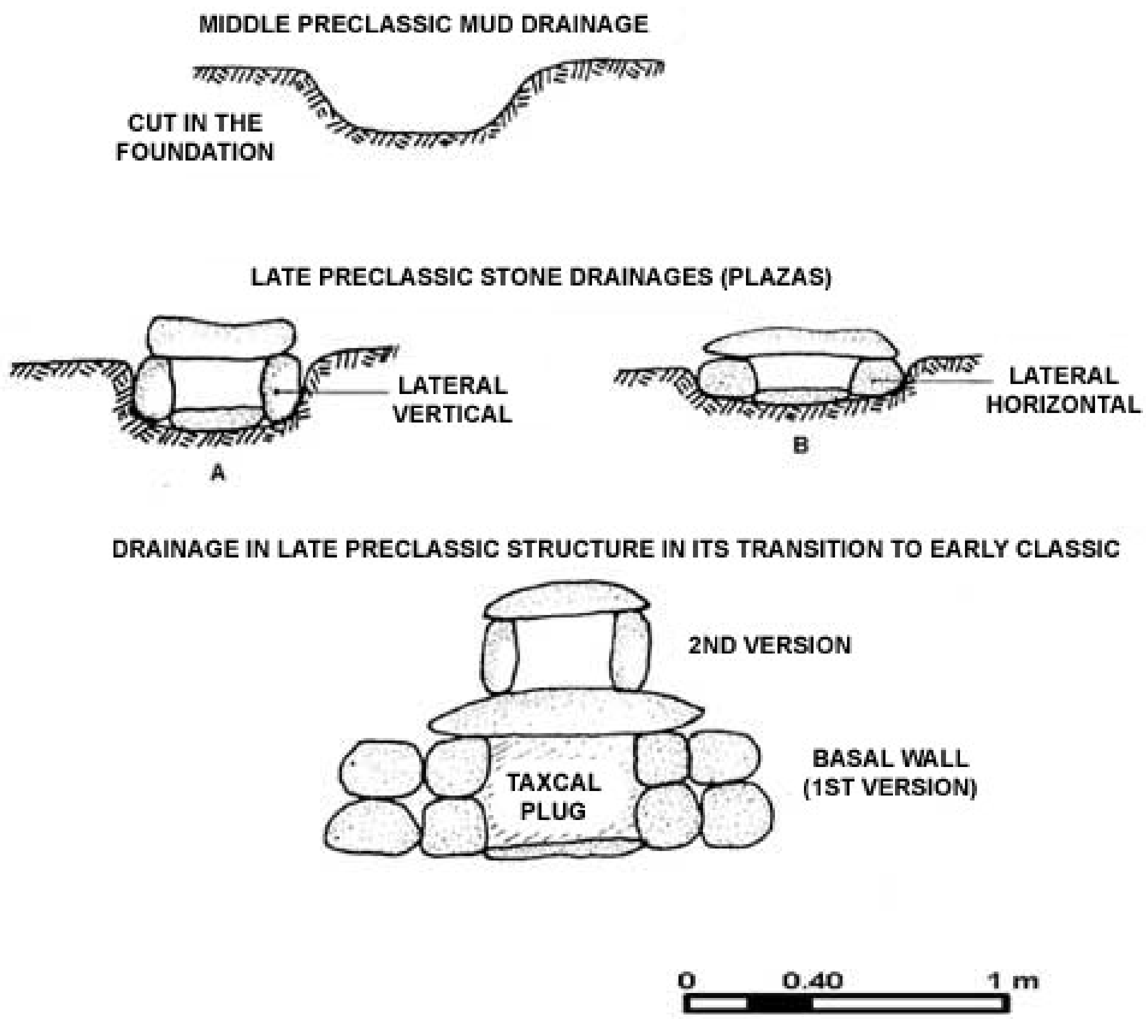

Figure 5. Mud-carved drainages (Middle Preclassic period) and stone-built drainages (from the Late Preclassic and the beginning of the Early Classic periods; drawing by E. Marroquín 2004).

The ditches built with cobblestones in the Late Preclassic period show a construction system similar to that of the supply canals, with the difference that the drainage canals used a flat stone placed on the ground to function as canal bed, to prevent the erosion of the soil. In this period, the use of lateral stones, both horizontal and vertical, continues, consequently varying the width and height of the clear span of the canal (Figure 5).

One such example was found in Structure 12 (Balcárcel 1989 and 1995), with the identification of the presence of two drainages of the Late Preclassic/Early Classic transition (250-600 AD), located in the north and south façades and on the central axis of the structure. They both correspond to the first ditches, which show evidence of reuse of *mano* fragments, grinding stones, and fragments of monuments as a part of the construction material.

Interestingly, the south canal had two evacuation sluiceways that were used during the different construction stages of this structure. The first was placed at the base of the wall and was sealed with a *taxcal* block and then with a new wall that was placed adjacent to it during the Late Preclassic period. However, this ditch was not cancelled, as an additional sluiceway was built at a higher level inside the new wall, where the water sluice was reduced by varying the width and height of the clear span of the canal (Figure 5).

The construction of drainage canals in the Late Classic period presents larger dimensions and several modifications in the construction in different sectors of the ditch. For example, at the beginning of the ditch the lateral stones are spike-shaped, with a size that varies from 0.50 m to 0.60 m placed in a vertical position and buried 0.20 m to 0.30 m in the ground for greater solidness; the covers were large stones 1 m long, 0.80 m wide, and 0.30 m thick, while one stone 0.10 m to 0.20 m thick was laid on the ground to function as canal bed (Figure 6).

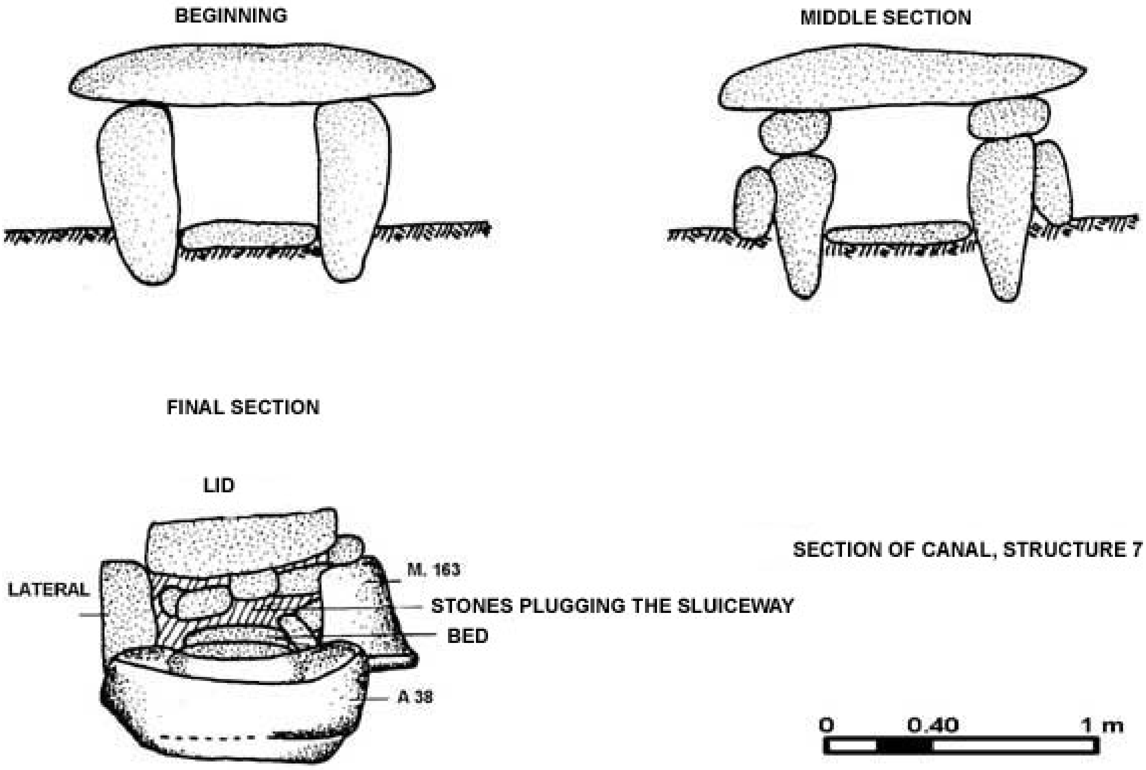

Figure 6. Late Classic drainages built with stones (drawing by E. Marroquín 2004).

In the middle section and as a consequence of the drop, we observed the use of a double lateral row and of small stones used like wedges, on which the cover stones were places. This modification grants the ditch a greater stability as it descends, and in the final portion, the ditch introduces itself in the basal wall of the structure using small laterals. One example of this type of canal occurs in the south façade of Structure 7 (Schieber 2001; Marroquín 2002-2004), with a total length of 13 m and a width of 1 m, which runs from north to south with a drop of 3.50 m to the south, probably draining the water accumulated on the surface of the structure's platform (Figure 7). During this period we have also observed the reuse of fragmented monuments jointly with grinding stone fragments, earrings, grinders and carved stones.

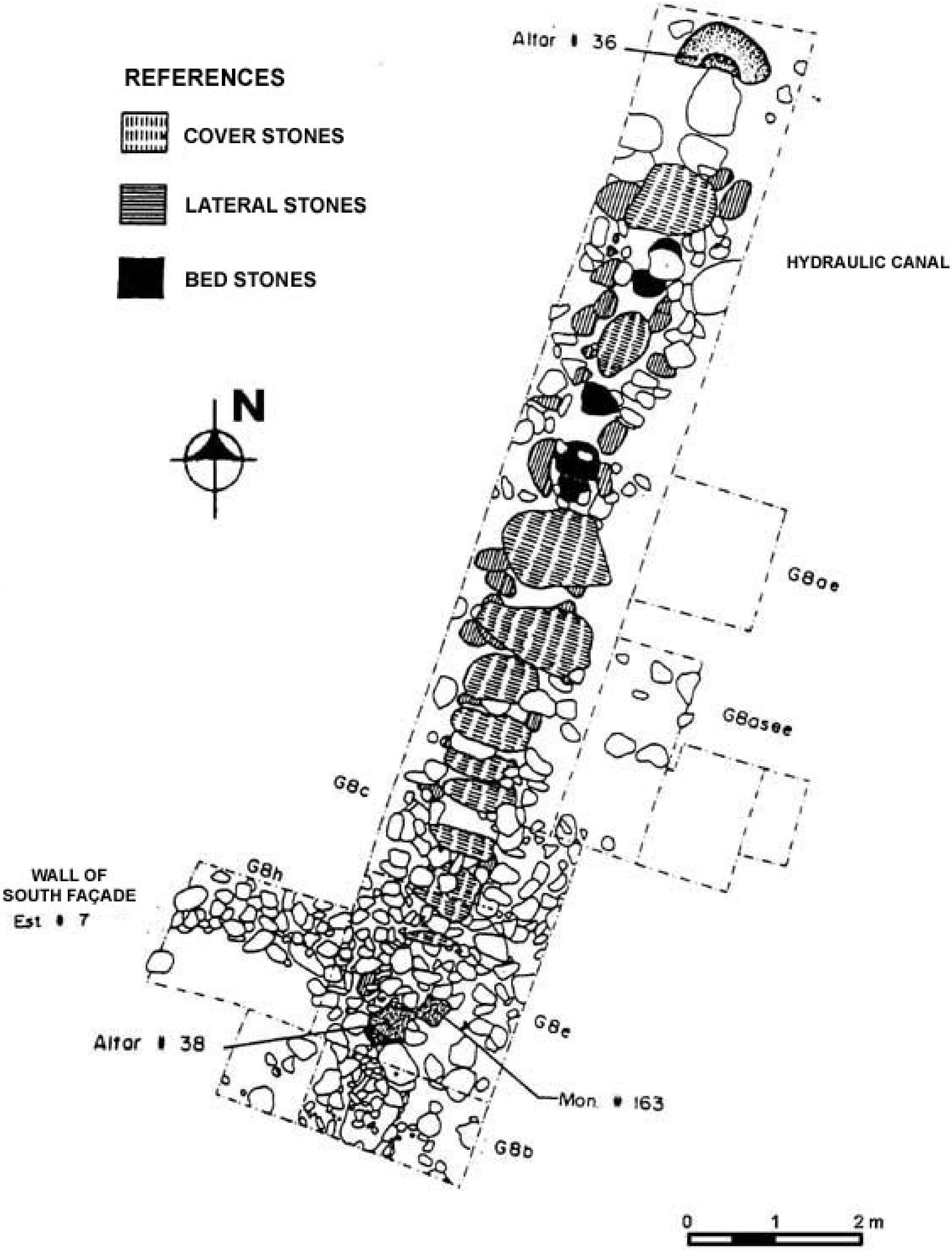

Figure 7. Ground plan of the drain ditch located in the south façade of Structure 7 (drawing by E. Marroquín 2003).

In this ditch, four monuments located in different sectors were identified:

- At the beginning of the canal there was one fragment of a censer altar with supports (No. 36); the outer side is surrounded by a fillet and on top of this there is a design of a glyph which probably repeated itself, as suggested by an additional glyph apparently similar present in the opposite end of the fragment (Figure 8).

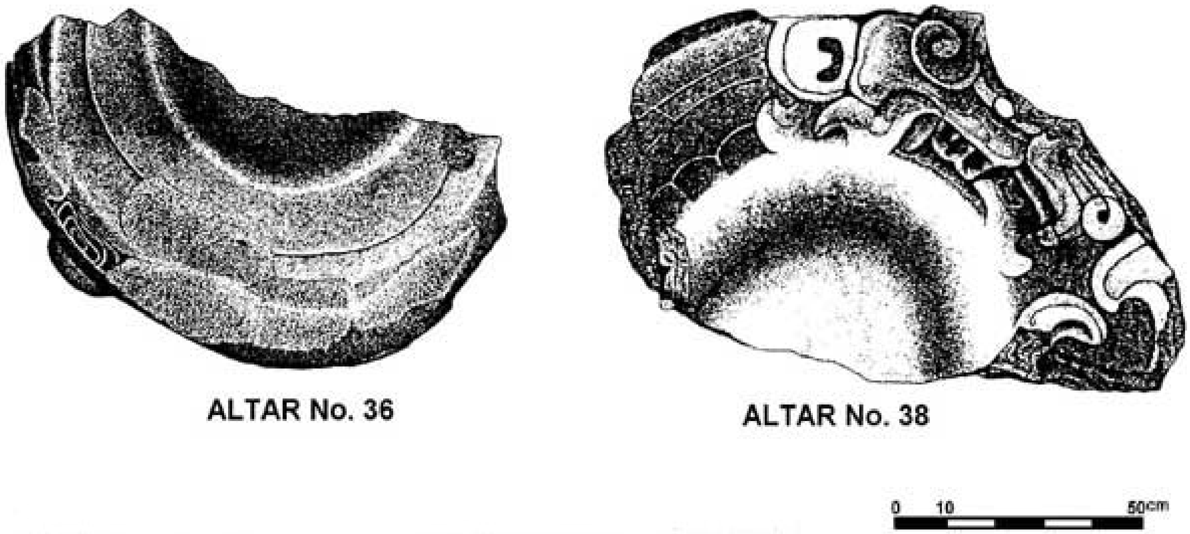

Figure 8. Censer altars No. 36 and No. 38 (drawings by O. Lopez 2003).

- In the middle section of the canal one fragment of a stela was found (No. 71), which was used as a lid; in its upper portion, this fragment presents Early Maya iconographic features carved in high-relief (Figure 9).

- Monument 163 was recorded in the mouth of the canal, as a part of it, serving the function of lateral stone. This pedestal sculpture represents a character in a seated position with his legs folded and mutilated upper limbs and head. Among the most outstanding characteristics of this monument are its feet, showing five toe-fingers, with the male genital organs depicted as well. This type of monuments corresponds to the Late Preclassic period (400 BC – 250 AD), and have spread across the Pacific boca costa region and the Guatemalan Altiplano (Figure 9).

- A censer altar was placed at the end of the ditch (No. 38), featuring a design that occupies the space between the concavity and the outer rim that probably surrounded the entire piece. Here, we observe one portion of a snake's body that ends in a head with the "U" symbol, possibly a representation of *God K* or *Chac*, as found in celestial two-headed serpents. The reutilization of the central concavity that originally sheltered the ceremonial fire receives the water of this ditch, which flows on three large stones placed there to reduce the impact of water. The sculptural style of these altars is early Maya, developed in the Late Preclassic period in the southern Maya area (Figure 8; Schieber 2004).

Inside the ditch we found a very solid mud mortar that included ceramics and stones of different sizes. At a distance of 0.50 m north of the mouth of the ditch, we found, under the last lid, stones horizontally placed in the mortar to plug that opening (Figure 6).

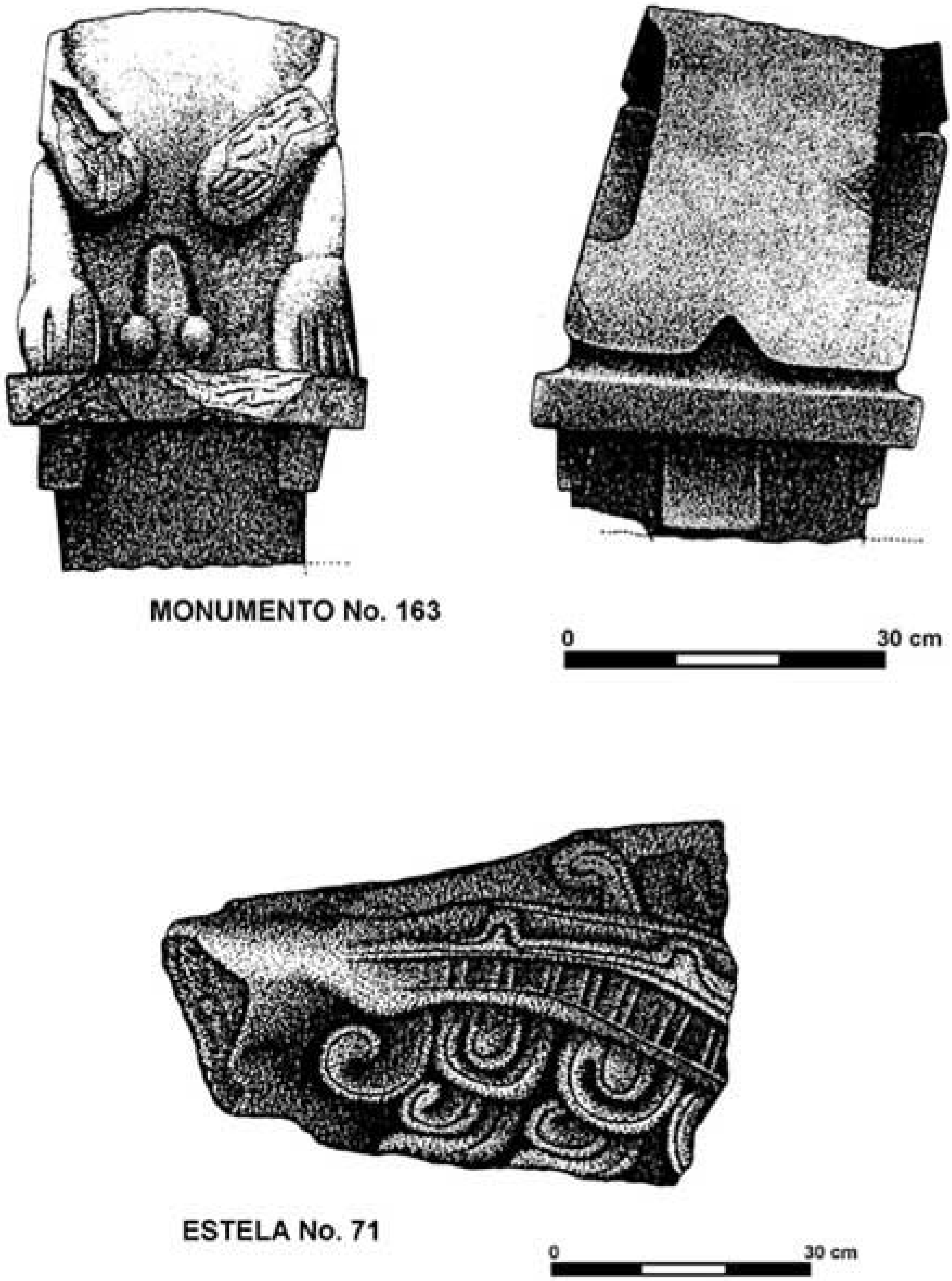

Figure 9. Front and rear view of Monument 163 and plan view of a fragment of Stela 71 (drawing by O. Lopez 2003).

FINAL COMMENT

Based on the investigations conducted and the analysis of archaeological materials associated with the ditches, it was possible to reconstruct the evolution of the hydraulic system through the different occupational stages of the site. This study has determined that the first canals date to the Middle Preclassic period, and were exclusively carved in mud. However, it is probable that this technique was not too effective, as in the Late Preclassic period the use of cobblestones was implemented in these constructions, a technique that continued to be used up to the Late Classic period.

One interesting piece of information is that during the Late Classic period, the size of the ditches increased in relation to their length and width, so probably this change corresponds to new architectural concepts such as the nearly exclusive use of large stones. Likewise, it should be noted that only the ditches of this epoch include fragmented monuments as part of their construction, as observed in the canal of Structure 7, where the monuments –despite being mutilated- seem to keep a preconceived arrangement associated to the function of the ditch, and not in relation to the original idea after which they were created.

Like we said, the use of canals at Tak'alik Ab'aj was initiated at an early age, suggesting some knowledge on water management systems, which probably evolved with time by means of the implementation of techniques to control the flow, the speed and the volume of water, both in the drainage and the supplying ditches. The localization of ditches both in the structures and in the accesses to terraces, together with the drop of the plaza floors, leads us to suggest that there was a system of drainage canals that took advantage of the ground's topography to divert the water from the plazas towards the closest rivers. This makes it clear that the construction of canals involved careful planning so that these evacuation systems could become an integral part of Tak'alik Ab'aj's architecture.

The data now at hand allow us to argue that each access to the terraces –depending on their dimensions- must have had several draining ditches probably placed in specific places for the evacuation of water from plazas and structures. Hopefully, future investigations will make it possible to corroborate this approach, and to establish whether there are other construction variables or whether other techniques associated with water management were implemented. All these data will be of help to gain a more comprehensive understanding of the hydraulic system at Tak'alik Ab'aj.

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